SocketModem® HSDPA MultiModem® iCell MultiModem® rCell

AT Commands
Reference Guide

MultiTech®
Systems

AT Commands for Multi-Tech HSDPA Modems
    Embedded Wireless HSDPASocketModem® (MTSMC-H)
    Embedded Wireless HSDPA SocketModem® USB (MTSMC-H-U)
    MultiModem® iCell (MTCMR-H)
    MultiModem® rCell (MTCBA-H-EN2)

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Revisions

Revision Level	Date	Description
A	06/30/08	Initial release (based on Siemens document version 02.050, May 9, 2008).
	07/23/08	Removed voice and audio commands.
B	01/15/09	Add MultiModem® iCell (MTCMR-H) and MultiModem® rCell (MTCBA- H-EN2) to the list of products that use these commands.
C	03/10/10	Clarified defaults in AT&C and AT&D.
		Changed Technical Support statement.

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Technical Support
Please refer to the Copyright/Technical Support page in the product User Guide or Developer Guide.

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Chapter 1 – Introduction

1.1   Scope of the Document

This document presents the AT Command set for the Multi-Tech Systems, Inc. wireless HSDPA devices.

1.2   Related Documents

1. ISO/IEC10646: "Universal Multiple-Octet Coded Character Set (UCS)"; UCS2, 16 bit coding
2. ITU-T Recommendation V.24: List of definitions for interchange circuits between data terminal equipment (DTE) and data circuit-terminating equipment (DCE)
3. ITU-T Recommendation V.250: Serial asynchronous automatic dialing and control
4. 3GPP TS 100 918/EN 300 918 (GSM 02.04): General on Supplementary Services
5. 3GPP TS 100 907 (GSM 02.30): Man-Machine Interface (MMI) of the Mobile Station (MS)
6. 3GPP TS 23.038 (GSM 03.38): Alphabets and language specific information
7. 3GPP TS 27.005 (GSM 07.05): Use of Data Terminal Equipment - Data Circuit terminating Equipment (DTE DCE) interface for Short Message Service (SMS) and Cell Broadcast Service (CBS)
8. 3GPP TS 27.007 (GSM 07.07): AT command set for User Equipment (UE)
9. 3GPP TS 27.060 (GSM 07.60): Mobile Station (MS) supporting Packet Switched Services
10. 3GPP TS 51.011 (GSM 11.11): Specification of the Subscriber Identity Module - Mobile Equipment (SIM - ME) interface
11. ETSI 102 221: Smart cards; UICC-Terminal interface; Physical and logical characteristics
12. 3GPP TS 31.102: 3rd Generation Partnership Project; Technical Specification Group Network and Terminals; Characteristics of the USIM application
13. 3GPP TS 11.14 (GSM 11.14): Specification of the SIM Application Toolkit for the Subscriber Identity Module Mobile Equipment (SIM - ME) interface
14. 3GPP TS 31.111: Universal Subscriber Identity Module (USIM) Application Toolkit (USAT)
15. 3GPP TS 22.101 (GSM 22.101): Service principles
16. Common PCN Handset Specification (CPHS) v4.2
17. USB.ORG: www.usb.org/developers/docs/USB_LANGIDs.pdf
18. USB Class Definitions for Communication Devices, Version 1.1 January 19, 1999

1.3   Abbreviations and Acronyms

Throughout the document, the GSM engines are referred to as:

ME (Mobile Equipment)
MS (Mobile Station)
TA (Terminal Adapter)
DCE (Data Communication Equipment)

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 '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 Interpreter

The Multi-Tech wireless modem features two interfaces for processing AT commands: Modem interface and Application interface. Both AT command interfaces can be assigned to the various physical and virtual interfaces of the wireless modem. Basically, their allocation is dependent on whether the modem is configured for operation through its asynchronous serial interface or as a USB composite device comprising two virtual COM ports and a virtual wireless Ethernet adapter. Serial operation and USB operation are mutually exclusive: Serial usage disables access to the virtual USB devices and, vice versa, USB usage disables access to the serial interface. The command AT^SUSB="Startup",<start> determines which mode to use.

This section describes the functions of the Modem interface and the Application interface as well as their allocation to the module's physical and virtual interfaces:

- *Modem interface:*

    This interface is referred to as "Modem" if queried with AT^SQPORT. In the quick reference tables it is named MDM.

    The Modem interface is intended particularly for circuit and packet switched transmission (HSDPA, GPRS, CSD).

    URCs relevant for data calls (RING, NO CARRIER) are issued on the modem interface, all other URCs normally only on the application interface. For further detail on URCs, please refer to Section 1.8, Unsolicited Result Code Presentation, and the configuration command AT^SCFG, parameter <udi>.

    The Modem interface can be assigned to one of these interfaces:

    - Asynchronous serial interface
    - A logical channel of the USB composite device. For example, in Windows XP or Windows Vista set up as "Siemens HSDPA USB Modem" listed in the *Windows Device Manager* under *Modems*.

- *Application interface:*

    This interface is referred to as "Application" if queried with AT^SQPORT. In the quick reference tables it is named APP.

    The Application interface is designed especially for controlling the wireless modem; i.e., for entering AT commands, receiving URCs, or sending and receiving short messages. It cannot be used as data interface for HSDPA, GPRS, and CSD.

    The Application interface can be assigned to one of this interface:

    - A logical channel of the USB composite device. For example, in Windows XP or Windows Vista set up as "Siemens HSDPA USB Com Port" listed in the Windows Device Manager, under Ports (COM&LPT).

Please note that URCs are normally indicated only on this interface, no matter whether the Modem interface or the Application interface was used to send the AT commands for activating their presentation. This URC management scheme is the default configuration recommended for typical application. For further detail on URCs please refer to Section 1.8, Unsolicited Result Code Presentation, and the configuration command AT^SCFG, parameter <udi>.

Bear in mind that the Modem interface and the Application interface are handled by the same AT command interpreter. As a result, AT commands entered on both interfaces are not executed in parallel but sequentially, one after the other. So, an AT command issued on one interface will be buffered on this interface to be executed after the other interface has completed processing earlier AT command(s).

When a dial-up connection is established over the Modem interface, the Application interface can be used simultaneously for any control functions. This eliminates the need for the user to enter AT commands, such as +++ and ATO, to switch back and forth between command and online mode when working on one interface only. Yet, it should be noted that the dial-up connection disables the echo on both interfaces, due to the initialization strings typically set by modems. The echo can be re-activated by executing ATE1.

1.5   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 1.4:   Types of AT commands and responses.

AT Command Type	Syntax	Function
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(s).
Write command	AT+CXXX=<...>	This command sets user-definable parameter values.
Exec(ution) command	AT+CXXX	The execution command reads non-variable parameters determined by internal processes in the GSM engine.

1.5.1   Using Parameters

- Optional parameters are enclosed in square brackets. If optional parameters are omitted, the current settings are used until you change them.
- Optional parameters or subparameters can be omitted unless they are followed by other parameters. If you want to omit a parameter in the middle of a string it must be replaced by a comma. See also example 1.
- A parameter value enclosed in square brackets represents the value that will be used if an optional parameter is omitted.
- 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 in quotation marks will be recognized as strings.
- All spaces will be ignored when using strings without quotation marks.
- It is possible to omit the leading zeros of strings which represent numbers.
- If an optional parameter of a V.250 command is omitted, its value is assumed to be 0.

Example 1:   Omitting parameters in the middle of a string

```
AT+CCUG?               Query current setting
+CCUG: 1,10,1
OK
AT+CCUG=,9             Set only the middle parameter
OK
AT+CCUG?               Query new setting
+CCUG: 1,9,1
OK
```

1.6   Supported Character Sets

The ME supports three character sets:

1. GSM 03.38 (7 bit, also referred to as GSM alphabet or SMS alphabet)
2. UCS2 (16 bit, refer to ISO/IEC 10646)
3. IRA (International Reference Alphabet, ITU T T.50).

Refer AT+CSCS for information about selecting the character set. See AT+CSCS for information about selecting the character set. Character tables can be found below.

Explanation of terms

- **International Reference Alphabet (IRA)**
  The International Reference Alphabet is equivalent to ASCII (American Standard Code for Information Interchange) and ISO 646, i.e. it defines a 7-bit coded character set. The mapping can be obtained from the character set tables below (UCS2 values 0x0000 to 0x007F).

- **Escape sequences**
  The escape sequence used within a text coded in the 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.

- **Terminal Adapter (TA)**
  TA is used equivalent to Mobile Equipment (ME) which stands for the GSM module described here. It uses GSM default alphabet as its character set.

- **Terminal Equipment (TE)**
  TE is the device connected to the TA via serial interface. In most cases TE is an ANSI/ASCII terminal that does not fully support the GSM default alphabet, for example MS HyperTerminal.

- **TE Character Set**
  The character set currently used by Terminal Equipment is selected with AT+CSCS.

- **Data Coding Scheme (dcs)**
  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 and determines the coded character set.

The behavior when encountering characters, that are not valid characters of the supported alphabets, is undefined.
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 (between TE and TA) are in the range from 0 to 127 (7 Bit range). CAUTION: ASCII alphabet (TE) is not GSM alphabet (TA/ME)!

Several problems resulting from the use of GSM alphabet with ASCII terminal equipment:

- "@" character with GSM alphabet value 0 is not printable by an ASCII terminal program (e.g., Microsoft© HyperTerminal®).

- "@" character with GSM alphabet value 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 the table below.

  By the way, this may be the reason why even network providers often replace "@"with "@=*" in their SIM application.

- 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.

- 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 1.5: Examples of character definitions depending on alphabet

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
@	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.

1.6.1 GSM Alphabet Tables and UCS2 Character Values

This section provides tables for the GSM 03.38 alphabet supported by the ME. Below any GSM character find the corresponding two byte character value of the UCS2 alphabet.

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	🖊	+ 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

Figure 1.1: Main character table of GSM 03.38 alphabet

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.
3. As the standard GSM alphabet does not provide a backspace functionality, the Multi-Tech EDGE modem is designed to use the GSM character 08 (hex 0x08) as backspace. This allows the user to easily erase the last character when using an ASCII terminal. On the other hand, this solution requires entering the escape sequence \08 for writing the "ò" character in GSM alphabet.

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					

Figure 1.2: Extension character table of GSM 03.38 alphabet

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.

1.6.2 UCS2 and GSM Data Coding and Conversion for SMS Text Mode

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

1.6.2.1 Implementing Output of SIM Data to Terminal (Direction TA to TE)

Used Character Set	DCS = 7 bit GSM	DCS = 8 bit Data	DCS = 16 bit UCS2
GSM	Case 1 GSM (1:1)	Case 2 8 bit to IRA (1:2)	Case 3 UCS2 to IRA (2:4)
UCS2	Case 4 GSM to IRA (1:4)	Case 5 8 bit to IRA (1:4)	Case 6 UCS2 to IRA (2:4)

Note: The ratio of SIM bytes to output bytes is given in parentheses.

Case 1
Every GSM character is sent to TE as it is (8-bit value with highest bit set to zero).
Example: 47'H, 53'H, 4D'H → 47'H, 53'H, 4D'H, displayed as "GSM".

Case 2
Every data byte will is sent to TE as 2 IRA characters each representing a half byte.
Example: B8'H (184 decimal) → 42'H, 38'H, displayed as "B8".

Case 3
Every 16-bit UCS2 value is sent to TE as 4 IRA characters.
Example: C4xA7'H (50343 decimal) → 43'H, 34'H, 41'H, 37'H, displayed as "C4A7".
Problem: An odd number of bytes leads to an error because there are always two bytes needed for each USC2 character.

Case 4
Every GSM character is sent to TE as 4 IRA characters to show UCS2 in text mode.
Example: 41'H ("A") → 30'H, 30'H, 34'H, 31'H, displayed as "0041".

Case 5
Every data byte is sent to TE as IRA representation of UCS2 (similar to case 4).
Example: B2'H → 30'H, 30'H, 42'H, 32'H, displayed as "00B2".

Case 6
Every 16-bit value is sent to TE as IRA representation of it. It is assumed that number of bytes is even.
Example: C3x46'H → 43'H, 33'H, 34'H, 36'H, displayed as "C346".

1.6.2.2 *Implementing Input of Terminal Data to SIM (Direction TE to TA)*

Used Character Set	DCS = 7 bit GSM	DCS = 8 bit Data	DCS = 16 bit UCS2
GSM	Case 1 GSM (1:1)	Case 2 IRA to 8 bit (2:1)	Case 3 IRA to 16 bit (4:2)
UCS2	Case 4 GSM to IRA (1:4)	Case 5 8 bit to IRA (1:4)	Case 6 UCS2 to IRA (2:4)

Note: The ratio between the number of input characters and bytes stored on the SIM is given in parentheses.

Case 1
Every character is sent from TE to TA as GSM character (or ASCII with HyperTerminal).
Character value must be in range from 0 to 127 because of 7-bit GSM alphabet.
To reach maximum SMS text length of 160 characters in 140 bytes space characters will be compressed on SIM. This must be set using the parameter <dcs> of AT+CSMP (add 64).
Example: "ABCDEFGH" typed is sent and stored uncompressed as → 4142434445464748'H (stored compressed as 41E19058341E91'H).

Case 2
Every data byte is sent to TA as 2 IRA characters.
Maximum text length is 280 IRA characters which will be converted into 140 bytes SMS binary user data.
Example: "C8" typed is sent as 43'H, 38'H → stored as C8'H.

Case 3
Every 16-bit value is sent to TA as 4 IRA characters.
Maximum text length is 280 IRA characters which will be converted into 70 UCS2 characters (16-bit each).
Number of IRA characters must be a multiple of four because always 4 half bytes are needed for a 16-bit value.
Example: "D2C8" typed is sent as 44'H, 32'H, 43'H, 38'H → stored as D2C8'H.

Case 4
Every GSM character is sent to TA as 4 IRA characters representing one UCS2 character.
Example: To store text "ABC" using UCS2 character set you have to type "004100420043".
This is sent as 30'H,30'H,34'H,31'H, 30'H,30'H,34'H,32'H, 30'H,30'H,34'H,33'H → detected as IRA representation of 3 UCS2 characters, converted to GSM character set and stored as 41'H, 42'H, 43'H.
Maximum input is 640 IRA characters representing 160 UCS2 characters when compression is active. These are converted to 160 GSM 7-bit characters.
Without compression only 140 GSM characters can be stored which are put in as 560 IRA characters.
Values of UCS2 characters must be smaller than 80'H (128 decimal) to be valid GSM characters.
Number of IRA characters must be a multiple of four. Problems:

- "41" →¨ Error, there are four IRA characters (two bytes) needed
- "0000" → Error, not an UCS2 character
- "4142" → Error, value of UCS2 character > 7F'H
- "008B" → Error, value of UCS2 character > 7F'H

This affects the maximum input length of a string)

Case 5
Every UCS2 character is sent as 4 IRA characters and is converted into two 8-bit values. This means that the first two characters have to be '00'.
Example: UCS2 character 009F'H typed as "009F" is sent as 30'H,30'H,39'H,46'H → converted into 8-bit value 9F'H.
Maximum number of UCS2 characters is 140 which are represented by 560 IRA characters. Number of IRA characters must be a multiple of four.

Case 6
Every UCS2 character is sent as 4 IRA characters each and is converted into a 16-bit value again.
Example: UCS2 character 9F3A'H typed as "9F3A" is sent as 39'H,46'H,33'H,41'H → converted into 9F3A'H.
Maximum number of UCS2 characters is 70 which are represented by 280 IRA characters. Number of IRA characters must be a multiple of four.
Invalid UCS2 values must be prevented.

1.7 Communication between Customer Application and Multi-Tech Wireless Modem

Leaving hardware flow control unconsidered the Customer Application (TE) is coupled with the Multi-Tech wireless modem (ME) via a receive and a transmit line.

Since both lines are driven by independent devices, collisions may (and will) happen; i.e., while the TE issues an AT command, the Multi-Tech wireless modem starts sending an URC. This will probably lead to the TE's misinterpretation of the URC being part of the AT command's response.

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 the Multi-Tech wireless modem the opportunity to transmit pending URCs and get necessary service. Note that some AT commands may require more delay after "OK" or "ERROR" response, refer to the following command specifications for details.

- The TE shall communicate with the Multi-Tech wireless modem using activated echo (ATE1); i.e., the Multi-Tech wireless modem 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.

1.8 Unsolicited Result Code (URC) Presentation

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

Typical events leading to URCs are incoming calls ("RING"), waiting calls, received short messages, changes in temperature, network registration etc. For most of these messages, the ME needs to be configured whether or not to send a URC. Descriptions of these URCs are provided with the associated AT command. Only the URCs related to automatic undervoltage and overvoltage shutdown are not user definable. These URCs are described in Section 1.8.1, Common URCs. A summary of all URCs can be found in Section 18.5, Summary of Unsolicited Result Codes (URC).

As specified in Section 1.4, the AT Command Interpreter, the modem interface is dedicated to data transmission (HSDPA, GPRS, CSD). The application interface is designed primarily for control functions. This implies that the majority of URCs are normally issued on the application interface, no matter which of the AT interfaces was used to send the AT command for activating their presentation. Only URCs relevant for data calls (RING, NO CARRIER) are issued on the modem interface to ensure compatibility with existing modem applications.

If the interface is blocked by a running AT command, the URCs are buffered internally and issued when the interface becomes idle again. As far as supported by hardware RING line will be set for 100 ms on URC destination interface <udi> if an URC is buffered internal.

Enabled by default when the ME is powered up, the above URC management scheme is the recommended approach for a typical application. Yet, as an alternative to this approach, the configuration command AT^SCFG provides the option to determine the interface used for issuing the URCs. Refer to the <udi> parameter for details.

Please note that the URC routing is different if the AT^SUSB startup mode "None" is active. In this case all URCs are sent to the modem interface (see description of value "None" for parameter "Startup" (<start>) in section AT^SUSB).

IMPORTANT: When using the modem interface for URC output, keep in mind that if the interface is blocked by an active data connection you are required to suspend the connection to check for pending URCs after RING line signaling.

1.8.1 Common URCs

This section contains all URCs not associated to a certain AT command. They cannot be defined by the user and appear automatically when the voltage conditions described below occur. Please refer to [2] for specifications regarding the minimum and maximum operating voltage limits. The automatic shutdown procedure is usually equivalent to the Power-down initiated with the AT^SMSO command, except when the voltage threshold is exceeded very quickly.

URC 1

^SBC: Undervoltage
The URC indicates that the ME is close to the undervoltage threshold. If the undervoltage persists the ME keeps sending the URC up to three times within 60 seconds before switching off automatically. When the undervoltage threshold is exceeded before the 60-second period expires the ME will switch off instantly.

URC 2

^SBC: Overvoltage Warning
Module close to overvoltage.

URC 3

^SBC: Overvoltage Shutdown
Overvoltage threshold exceeded. Module switches off within 5 seconds after sending the URC.

1.9   Errors and Messages

The command result codes "+CME ERROR: <err>" and "+CMS ERROR: <err>" indicate errors related to mobile equipment or network functionality.

The format of <err> can be either numeric or verbose and is selectable via AT+CMEE.

A 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.

Using the wrong command syntax may result in errors: For example, using the execute command syntax although the command has no execute format, causes "ERROR" to be returned. Likewise, using the write command syntax although the command has no write format causes "+CME ERROR: <err>" to be returned.

See also:

• Section 2.4.1, Verbose and numeric result codes
• Section 2.8.1, CME/CMS Error Code Overview
• Section 3.2, AT+CEER

Chapter 2 – Configuration Commands

The AT commands described in this chapter allow the external application to determine the modem's behavior under various conditions.

2.1 AT&F Set All Current Parameters to Manufacturer Defaults

Description: **AT&F** sets all current parameters to the manufacturer defined profile.

Syntax:
> **Exec. Command:**   AT&F[value]
> **Exec. Response:**   OK

Parameter Description:
> **<value>**
> 0   Sets all TA parameters to manufacturer defaults.

Notes:
- List of parameters reset to manufacturer default can be found in Section 20.6, Factory Default Settings Restorable with AT&F.
- Every ongoing or incoming call will be terminated.

2.2 AT&V Display Current Configuration

Description: AT&V returns the status of all AT command parameters applicable to the current operating mode, including the single-letter AT command parameters not otherwise readable.

Syntax:
> **Exec. Command:**   AT&V
> **Exec. Response:**   ... Status of all AT command parameters applicable to the current operating mode ...
>   OK

2.3 ATQ   Set Result Code Presentation Mode

Description: This parameter setting determines whether or not the TA transmits any result code to the TE. Information text transmitted in response is not affected by this setting.

Syntax:
   Exec. Command: ATQ[<n>]
   Exec. Response: If <n> = 0, then ***OK***. Default
                         If <n> = 1, then (none).
Parameter Values:
   <n>
     0   DCE transmits result code. Default.
     1   Result codes are suppressed and not transmitted

2.4 ATV   Set Result Code Format Mode

Description: This command determines the contents of the header and trailer transmitted with AT command result codes and information responses. Possible responses are described in Section 2.6.1, Verbose and numeric result codes.

Syntax:
   Exec. Command: ATV[<value>]
   Exec. Response: OK
                         ERROR
Parameter Values:
   <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>. Default.

2.4.1 Verbose and Numeric Result Codes

Verbose format	Numeric format	Meaning
OK	0	Command executed, no errors
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

2.5 ATX Set CONNECT Result Code Format and Call Monitoring

Description: ATX determines whether or not the TA transmits particular result codes to the TE. It also controls whether or not the TA verifies the presence of a dial tone when it begins dialing, and whether or not engaged tone (busy signal) detection is enabled.

Syntax:
Exec. Command:	ATX[<value>]
Exec. Response:	OK
	ERROR

Parameter Description:
<value>

0	CONNECT result code only returned. Dial tone and busy detection are both disabled. Default.
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. Default.

2.6 ATZ Set all Current Parameters to the Default Configuration

Description: ATZ sets all current parameters to the default configuration. It does not change DCE baud rate or PDP context profiles.

Syntax:
Exec. Command:	ATZ[<value>]
Exec. Response:	OK

Parameter Description:
<value>

0	Reset to user profile

2.7   AT+CFUN   Set Phone Functionality

Description: This command serves to control the functionality level of the mobile equipment (ME). It can be used to reset the ME. To use after restart, you are advised to add it to the user profile saved with AT&W.

Syntax:

Test Command: The test command returns the values of the supported parameters.
AT+CFUN=?

Test Response: +CFUN: (list of supported <fun>s) , (list of supported <rst>s)
OK
ERROR
+CME ERROR <err>

Read Command: The read command returns the current functionality value.
AT+CFUN?

Read Response: +CFUN: <fun>
OK
ERROR
+CME ERROR <err>

Write Command: The write command can be used to reset the ME, to choose one of the SLEEP modes or to return to full functionality.
AT+CFUN=<fun>[, <rst>]

Write Response: OK
ERROR
+CME ERROR

Parameter Descriptions:

<fun>

0 – Minimum functionality. TX and RX RF off. The ME logs off from the network.
The SIM remains accessible for network independent functions.
Note: If used the first time after power-up the AT+CFUN=0 command sometimes does not take effect. In such case, it is necessary to send AT+CFUN=1 (even though still set), followed by AT+CFUN=0. The problem can be avoided by using AT+CFUN=4 which has the same functionality and works properly.

1 – Default. Normal functionality.

4 – Minimum functionality. TX and RX RF off. The ME logs off from the network. The SIM remains accessible for network independent functions.

5 – Do not use.

6 – Do not use.

7 – Do not use.

<rst>

Due to the command syntax, you need to enter parameter <fun>, followed by <rst>, where <fun> needs to be set to 1.

0   Default. Do not reset the MT before setting it to <fun> power level.

1   ME resets and restarts. After this, PIN 1 authentication is necessary (AT+CPIN).

2.8 AT+CMEE   Mobile Equipment Error Message Format

Description: AT+CMEE controls the format of the error result codes that indicates errors related to the Multi-Tech wireless modem's functionality. Format can be selected between plain "ERROR" output, error numbers or verbose "+CME ERROR: <err>" and "+CMS ERROR: <err>" messages.

Possible error result codes are listed in Table 2.1, General "CME ERROR" Codes (GSM 07.07), Table 2.5, GPRS related "CME ERROR" Codes (GSM 07.07) and Table 2.4, SMS related "CMS ERROR" Codes (GSM 07.05).

Syntax:
Test Command: AT+CMEE=?
Test Response: +CMEE : (list of supported<errMode>s)
                       OK

Read Command: AT+CMEE?
Read Response: +CMEE : <errMode>
                       OK

Exec. Command: AT+CMEE
Exec. Response: OK
                        ERROR
                        +CME ERROR: <err>

Write Command: AT+CMEE=<errMode>
Write Response: OK
                        ERROR
                        +CME ERROR: <err>

Note:
The exec. command performs a write command with factory default parameter setting.

Parameter Description:
<errMode>
0   Default. Disable result code; i.e., only "ERROR" will be displayed.
1   Enable error result code with numeric values.
2   Enable error result code with verbose (string) values.

2.8.1 CME/CMS Error Code Overview

Table 2.1: General "CME ERROR" Codes (GSM 07.07)

<err> Code	Text (if AT+CMEE=2)
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

<err> Code	Text (if AT+CMEE=2)
27	invalid characters in dial string
30	no network service
31	Network timeout
32	Network not allowed emergency calls only
40	Network personalization PIN required
41	Network personalization PUK required
42	Network subset personalization PIN required
43	Network subset personalization PUK required
44	service provider personalization PIN required
45	service provider personalization PUK required
46	Corporate personalization PIN required
47	Corporate personalization PUK required
100	unknown

Table 2.2: GPRS Related "CME ERROR" Codes (GSM 07.07)

<err> Code	Text (if AT+CMEE=2)
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
132	service option not supported
133	requested service option not subscribed
134	service option temporarily out of order
148	unspecified GPRS error
149	PDP authentication failure
150	minimum TFTs per PDP address violated
273	service option temporarily out of order
274	TFT precedence index not unique
275	invalid parameter combination

Table 2.3: SMS Related "CME ERROR" Codes (GSM 07.05)

<err> Code	Text (if AT+CMEE=2)
0	none
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 acknowledgement expected
500	unknown error
512	user abort

2.9   AT+CSCS   Select TE Character Set

Description: The AT+CSCS write command informs the TA which character set <chset> is used by the TE. This enables the TA to convert character strings correctly between TE and ME character sets. See also Section 1.5, Supported Character Sets.
Note that when the TA-TE interface is set to 8-bit operation and the used TE alphabet is 7-bit, the highest bit will be set to zero.

Syntax:
Test Command:	AT+CSCS=?
Test Response:	+CSCS: (list of supported<chset>s)
	OK
Read Command:	AT+CSCS?
Read Response:	+CSCS: <chset>
	OK
Write Command:	AT+CSCS=[<chset>]
Write Response:	ERROR
	+CME ERROR <err>
	OK

Parameter Description:
<chset>
"**GSM**"   GSM default alphabet (GSM 03.38 subclause 6.2.1). Default.
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.

"**IRA**"   Default. International reference alphabet (ITU T T.50).

2.10   AT+GCAP   Request Complete TA Capabilities List

Description: AT+GCAP returns a list of additional capabilities.

Syntax:
Test Command:	AT+GCAP=?
Test Response:	OK
Exec. Command:	AT+GCAP
Exec. Response:	+GCAP: <name>
	OK

Parameter Description:
<name>
e.g., +CGSM

Note:
+CGSM: The response text shows which GSM commands of the ETSI standard are supported.

2.11 AT^SCFG Extended Configuration Settings

Description: AT^SCFG queries and configures various settings of the Multi-Tech wireless modem.

AT^SCFG read command returns a list of all supported parameters and their current values.

The write command queries a configuration parameter (if no value is entered) or sets its value(s).

If not stated otherwise, then all string parameters of this command are IRA encoded, independent of the current AT+CSCS setting.

Input of parameter names is always coded in GSM character set; parameter values are expected to be given as specified via AT+CSCS.

The following error messages may be returned to the AT^SCFG write commands:

- "+CME ERROR: operation temporary not allowed"
  Change of parameter value(s) temporarily not allowed.
- "+CME ERROR: invalid index"
  Invalid parameter name or value(s).
- "+CME ERROR: invalid characters in text string"
  Character set conversion of parameter value(s) failed.
- "+CME ERROR: memory failure"
  Could not allocate necessary memory or storing a parameter failed.
- "+CME ERROR: operation not allowed"
  Change of parameter value(s) not allowed
- "+CME ERROR: unknown"
  Other error

Syntax:

Test Command: AT^SCFG=?

Test Response: ^SCFG: "Call/ECC", (list of supported <ecc>s)
^SCFG: "Call/SyncPPP", (list of supported <sppp>s)
^SCFG: "Call/UDI", (list of supported <cudi>s)
^SCFG: "GPRS/Auth", (list of supported <gauth>s)
^SCFG: "GPRS/AutoAttach", (list of supported <gaa>s)
^SCFG: "Ident/Manufacturer", (max. string length of <manufacturer>)
^SCFG: "Ident/Product", (max. string length of <product>)
^SCFG: "MEopMode/RingOnData", (list of supported <ring>s)
^SCFG: "MEopMode/RM", (list of supported <rm>s)
^SCFG: "MEShutdown/OnIgnition", (list of supported <msi>s)
^SCFG: "Radio/Band",("0-127","0-1")
^SCFG: "URC/DstIfc", (list of supported <udi>s)
OK

Read Command: AT^SCFG?

Read Response: ^SCFG: "Call/ECC", <ecc>
^SCFG: "Call/SyncPPP", <sppp>
^SCFG: "Call/UDI", <cudi>
^SCFG: "GPRS/Auth", <gauth>
^SCFG: "GPRS/AutoAttach", <gaa>
^SCFG: "Ident/Manufacturer", <manufacturer>
^SCFG: "Ident/Product", <product>
^SCFG: "MEopMode/RingOnData", <ring>
^SCFG: "MEopMode/RM", <rm>
^SCFG: "MEShutdown/OnIgnition", <msi>
^SCFG: "Radio/Band","124"
^SCFG: "URC/DstIfc", <udi>
OK

Write Command: Query/Configure Emergency numbers for SIM without ECC field
AT^SCFG="Call/ECC"[, <ecc>]

Write Response: ^SCFG: "Call/ECC", <ecc>
OK
ERROR
+CME ERROR: <err>

Write Command:	PPP configuration for CS data calls **(for HSDPA modems with USB)** AT^SCFG="Call/SyncPPP"[, <sppp>]
Write Response:	^SCFG: "Call/SyncPPP", <sppp> OK ERROR +CME ERROR: <err>
Write Command:	Select configuration for UDI data calls AT^SCFG="Call/UDI"[, <cudi>]
Write Response:	^SCFG: "Call/UDI", <cudi> OK ERROR +CME ERROR: <err>
Write Command:	Configure PPP authentication AT^SCFG="GPRS/Auth"[, <gauth>]
Write Response:	^SCFG: "GPRS/Auth", <gauth> OK ERROR +CME ERROR: <err>
Write Command:	Automatic GPRS Attach AT^SCFG="GPRS/AutoAttach"[, <gaa>]
Write Response:	^SCFG: "GPRS/AutoAttach", <gaa> OK ERROR +CME ERROR <err>
Write Command:	Configure manufacturer name. **IMPORTANT: Do not change this parameter. If changed, PTCRB certification becomes void.** AT^SCFG="Ident/Manufacturer"[, <manufacturer>]
Write Response:	^SCFG: "Ident/Manufacturer", <manufacturer> OK ERROR +CME ERROR: <err>
Write Command:	Configure product name. **IMPORTANT: Do not change this parameter. If changed, PTCRB certification becomes void.** AT^SCFG="Ident/Product"[, <product>]
Write Response:	^SCFG: "Ident/Product", <product> OK ERROR +CME ERROR: <err>
Write Command:	Ring on URCs and incoming data packets: AT^SCFG="MEopMode/RingOnData"[, <ring>]
Write Response:	^SCFG: "MEopMode/RingOnData", <ring> OK ERROR +CME ERROR: <err>
Write Command:	Query/Configure Registration Mode: AT^SCFG="MEopMode/RM"[, <rm>]
Write Response:	^SCFG: "MEopMode/RM", <rm> OK ERROR +CME ERROR: <err>
Write Command:	Enable/disable shutdown by ignition line **(Disabled by Default – Do not Change – For Reference Only.)** AT^SCFG="MEShutdown/OnIgnition"[, <msi>]
Write Response:	^SCFG: "MEShutdown/OnIgnition", <msi> OK ERROR +CME ERROR: <err>

Write Command:	Enable/disable radio bands
	AT^SCFG="Radio/Band"[, <rba>][, <rbe>]
Write Response:	^SCFG: "Radio/Band", <rba>
	OK
	ERROR
	+CME ERROR: <err>

Write Command:	Specify frequency band group
	AT^SCFG="Radio/Band/Group"[, <rbg>]
Write Response:	^SCFG: "Radio/Band/Group", <rbg>
	OK
	ERROR
	+CME ERROR: <err>

Write Command:	Network selection mode
	AT^SCFG="Radio/NWSM"[, <NetworkSelectionMode>]
Write Response:	^SCFG: "Radio/NWSM", <NetworkSelectionMode>
	OK
	ERROR
	+CME ERROR: <err>

Write Command:	Configure URC destination interface:
	AT^SCFG="URC/DstIfc"[, <udi>]
Write Response:	^SCFG: "URC/DstIfc", <udi>
	OK
	ERROR
	+CME ERROR: <err>

Parameter Descriptions:

<ecc> Emergency call numbers on non-ECC SIM

This parameter specifies emergency call numbers on SIM cards without ECC field. The parameter has no influence on the commonly used emergency numbers 112 and 911 which are always supported.

Please refer also to Section 7.3, ATD where you can find a list of emergency call numbers supported if no SIM is inserted.

The value range of <ecc> is "0"..."255". To select or deselect an emergency number calculate the sum of the values of all desired numbers and use the resulting value. For example, for "08" (2) and "118" (8) please enter the value (10).

Parameter is global for the ME, non-volatile and will not be reset by AT&F. Any change to this parameter will take effect after reboot or SIM insertion.

"0"	No additional emergency numbers
"1"	000
"2"	08
"4"	110
"8"	118
"6"	119
"32"	999
"64"	Reserved
"128"	Reserved
"255"	Default. All additional emergency call numbers are supported.

<sppp> PPP configuration for CS data calls (for HSDPA modems with USB)

This parameter can be used to enable the asynchronous to synchronous conversion for PPP-Frames as described in RFC 1662. It is only used for CS data calls when AT+CBST is set to "transparent" and "64000bps" and "synchronous modem".

Parameter is global for all interfaces, volatile and will not be reset by AT&F.

"0"	Default. Asynchronous PPP
"1"	Synchronous PPP

<cudi> UDI data call configuration

This parameter can be used to change the used configuration for UDI data calls to meet specific provider requirements.

Parameter is global for all interfaces, volatile and will not be reset by AT&F.

"0"	Default. Generic UDI data call configuration (provider independent)
"1"	Configuration 1

<gauth> PPP configuration mechanism

This parameter can be used to configure which authentication algorithm the AT+CGDATA or ATD*99# commands will apply, during the PPP startup phase, for PDP contexts not yet activated.

Parameter is global for all interfaces, volatile and will not be reset by AT&F.

For contexts activated with AT+CGACT please use the AT command AT^SGAUTH to configure the authentication method.

"0"   CHAP only
"1"   PAP only
"2"   Default. Try CHAP first, then PAP

<gaa>   GPRS with AutoAttach

This parameter can be used to control whether the ME will perform a GPRS attach immediately after registering to the network or not. If the setting is changed to "enabled" and the ME is not attached yet, it will not initiate an attach immediately but after the next registration to the network.

Parameter is global for all interfaces, non volatile and will not be reset by AT&F.

   "disabled"   Default. GPRS auto attach is disabled.
   "enabled"   GPRS auto attach is enabled.

<manufacturer> Manufacturer Name

This parameter can be used to configure the name of the product which is displayed with the commands ATI, AT+GMI and AT+CGMI. Maximal length of the Manufacturer name is 25 characters (or less if you use multibyte characters).

Parameter is global for all interfaces, non volatile and will not be reset by AT&F.

   "SIEMENS"   Default.

<product> Product Name

This parameter can be used to configure the name of the product which is displayed with the commands ATI, AT+GMM and AT+CGMM. Maximal length of the product name is 25 characters (or less if you use multibyte characters).

Parameter is global for all interfaces, non volatile and will not be reset by AT&F.

   "HC25"   Default.

<ring> Ring on Data

The modem provides an option to wake up external user applications on the serial interface (see AT^SUSB).

When an external user application is using a power saving mode this should be signaled to the module by an inactive RTS line on the serial interface. In that case the serial interface of the MODEM can activate the RING line for 100 ms to wake up the external user application when a URC or incoming circuit switched data packets are sent by the module.

Parameter <ring> can be used to control the behavior of the RING line on the serial interface to indicate URCs or incoming data packets. Parameter <ring> is volatile and will not be reset by AT&F.

   "on"   If the RTS line is inactive and there are URCs or incoming circuit switched data packets then the RING line will be activated once for 100 ms.
   "off"   Default. The RING line is not activated when URCs or incoming data packets are transmitted while the RTS line is inactive.

<rm> Registration Mode

This parameter can be used to influence the time the ME takes to register to the network. Any change to this parameter will take effect after reboot.

Parameter is global for all interfaces, non-volatile and will not be reset by AT&F.

   "0"   Default. Normal
                 When trying to register to a network the ME sleeps longer than in "Fast mode" before restarting a network scan.
   "1"   Fast
                 "Fast mode" reduces the time the ME sleeps before restarting a network scan when trying to register.
                 Advantage: If the ME is out of network service it may take less time to find a network.
                 Disadvantage: Higher current consumption while the ME is out of network service.

<msi> MEShutdown/OnIgnition: Enable/disable shutdown by IGT line

The parameter specifies two different switching modes of the ignition line IGT: The line may either be used only to switch on the ME, or to switch it on and off.

Parameter <msi> is global for all interfaces, non-volatile and will not be reset by AT&F.

   "on"   Ignition line (IGT) can be used to switch on and off the ME.
   "off"   Default. Ignition line (IGT) can be used to switch on the ME.

<rba> Radio/Band: Enable/Disable Frequency Band(s)

The parameter can be used to select or deselect one or several frequency band(s) the ME is allowed to register to. Please note that the band selection implementation of the modem is based on a single band group that includes all frequency bands the module is capable of. This enables the module to easily find a suitable network in any country around the world, no matter which frequency bands or band combinations and access technologies are present in a particular area.

Factory default of <rba> is "127", meaning that all bands are allowed. Together with the module's power-up default AT+COPS=0 (automatic mode) this solution allows the subscriber to take advantage of a full-featured automatic network selection when trying to register.

Therefore, changes to the band configuration are recommended only if the subscriber wishes to restrict the allowed bands to a specific band or band combination, in particular to speed up the network search, and thus, to reduce the power consumption. In such case, <rba> may be one of the single values listed below or the sum of the values of all desired bands. For example, for 1800 MHz (2) and 850 MHz (8) please enter the value 10.

When changing the <rba> value you can use the additional <rbe> parameter to make the changes take effect immediately without reboot being required (<rbe>="1") or after reboot only (<rbe>="0"). In either case, the <rba> value returned by the read command AT^SCFG="Radio/Band" is non-volatile and will be the value used after next reboot.

Parameter is global for all interfaces, non-volatile and will not be reset by AT&F.

1	GSM 900
2	GSM 1800
4	GSM 850
8	GSM 1900
16	WCDMA 2100 (BC1)
32	WCDMA 1900 (BC2)
64	WCDMA 850 (BC5)

<rbe> Radio/Band: Set Frequency Band(s) Immediately Effective

The additional <rbe> parameter determines when a changed <rba> value becomes effective.

0	<rba> takes effect after next restart.
1	<rba> takes effect immediately and will also be effective after next restart.
	Setting a new <rba> value and <rbe>= 1 causes the ME to restart a network search and to deregister and re-register. If old and new <rba> are the same the command will be accepted without triggering a network search and without effect on the registration.

<NetworkSelectionMode> Network Selection Mode

This parameter allows network selection without considering the MCC.

Parameter is global for all interfaces, volatile and will not be reset by AT&F.

In order to comply with AT&T requirements regarding network selection, the application controlling the modem will have to send the following AT command during the initialization phase: AT^SCFG="Radio/NWSM","1"

"0"	Default. Network selection compliant with the 3GPP standards.
"1"	Network selection without considering the MCC.

<udi> URC Destination Interface

This parameter can be used to configure the interface which will be used to output URCs. Note that the recommended approach for a typical modem application is using the default configuration. If you consider changing the configuration please carefully read Section 1.4, AT Command Interpreter and Section 1.8, Unsolicited Result Code Presentation.

If the application port is not available, then it is not possible to select it.

If the AT^SUSB startup mode "None" is active, then the powerup value is "mdm", otherwise "app".

Parameter is global for all interfaces, volatile and will not be reset by AT&F.

If the modem interface is used, keep in mind, that if the interface is blocked by an active data connection, then this connection should be periodically suspended to check for pending URCs!

"mdm"	Use modem interface to output URCs
"app"	Use application interface to output URCs
"usb0-mdm"	Use modem interface to output URCs.
	This value is depreciated and supported for compatibility only. This value is not displayed in test command and also never returned in a response.
	Please use "mdm" instead.
"usb0-app"	Use application interface to output URCs.
	This value is depreciated and supported for compatibility only. This value is not displayed in test command and also never returned in a response.
	Please use "app" instead.

2.12 AT^SMSO   Switch off Mobile Station

Description: AT^SMSO initiates the power-off procedure.

Syntax:
    Test Command: AT^SMSO=?
    Test Response: OK

    Exec. Command: AT^SMSO
    Exec. Response: OK
                            ERROR
                            +CME ERROR: <err>
Note: Do not send any other AT command after AT^SMSO.

2.13 AT^SUSB   USB Configuration

Description: AT^SUSB can be used to query and configure various settings of the USB interface.
                          The AT^SUSB read command returns a list of all supported parameters and their current values.
                          The AT^SUSB write commands query a configuration parameter (if no value is entered) or set the
                          value(s).

Syntax:
    Test Command: AT^SUSB=?
    Test Response: ^SUSB: "Startup", (list of supported <start>s)
                            ^SUSB: "MaxPower", (list of supported <maxpow>s)
                            ^SUSB: "PowerSource", (list of supported <powsrc>s)
                            ^SUSB: "Mdm/DD", (list of supported <ddType>s), (max. string length of <langId>), (max. string
                            length of <vendorId>), (max. string length of <productId>), (max. string length of <manufacturer>),
                            (max. string length of <product>), (max. string length of <serialNo>)
                            ^SUSB: "MdmNet/DD", (list of supported <ddType>s), (max. string length of <langId>), (max. string
                            length of <vendorId>), (max. string length of <productId>), (max. string length of <manufacturer>),
                            (max. string length of <product>), (max. string length of <serialNo>)
                            ^SUSB: "MdmNet/TO", (list of supported <mnto>s)
                            ^SUSB: "MS/CRC", (range of supported <mscrc>s)
                            ^SUSB: "MS/DD", (list of supported <ddType>s), (max. string length of <langId>), (max. string
                            length of <vendorId>), (max. string length of <productId>), (max. string length of <manufacturer>),
                            (max. string length of <product>), (max. string length of <serialNo>)
                            ^SUSB: "MS/OnEject", (list of supported <msoe>s)
                            ^SUSB: "MS/WProt", (list of supported <mswprot>s)
                            OK

    Read Command: AT^SUSB?
    Read Response: ^SUSB: "Startup", <start>
                            ^SUSB: "MaxPower", <maxpow>
                            ^SUSB: "PowerSource", <powsrc>
                            ^SUSB: "Mdm/DD", <ddType>[, <langId>, <vendorId>, <productId>, <manufacturer>, <product>,
                            <serialNo>]
                            ^SUSB: "MdmNet/DD", <ddType>[, <langId>, <vendorId>, <productId>, <manufacturer>,
                            <product>, <serialNo>]
                            ^SUSB: "MdmNet/TO", <mnto>
                            ^SUSB: "MS/CRC", <mscrc>
                            ^SUSB: "MS/DD", <ddType>[, <langId>, <vendorId>, <productId>, <manufacturer>, <product>,
                            <serialNo>]
                            ^SUSB: "MS/OnEject", <msoe>
                            ^SUSB: "MS/WProt", <mswprot>
                            OK
                            ERROR
                            +CME ERROR: <err>

    Write Command: Startup configuration:
                            AT^SUSB="Startup"[, <start>]
    Write Response: ^SUSB: "Startup", <start>
                            OK
                            ERROR
                            +CME ERROR: <err>

Write Command:	Maximum power: AT^SUSB="MaxPower"[, <maxpow>]
Write Response:	^SUSB: "MaxPower", <maxpow> OK ERROR +CME ERROR: <err>
Write Command:	Power source: AT^SUSB="PowerSource"[, <powsrc>]
Write Response:	^SUSB: "PowerSource", <powsrc> OK ERROR +CME ERROR: <err>
Write Command:	"Mdm" device descriptor configuration: AT^SUSB="Mdm/DD"[, <ddType>[, <langId>, <vendorId>, <productId>, <manufacturer>, <product>, <serialNo>]]
Write Response:	^SUSB: "Mdm/DD", <ddType>[, <langId>, <vendorId>, <productId>, <manufacturer>, <product>, <serialNo>] OK ERROR +CME ERROR: <err>
Write Command:	"MdmNet" device descriptor configuration: AT^SUSB="MdmNet/DD"[, <ddType>[, <langId>, <vendorId>, <productId>, <manufacturer>, <product>, <serialNo>]]
Write Response:	^SUSB: "MdmNet/DD", <ddType>[, <langId>, <vendorId>, <productId>, <manufacturer>, <product>, <serialNo>] OK ERROR +CME ERROR: <err>
Write Command:	Modem Class request timeout period: AT^SUSB="MdmNet/TO"[, <mnto>]
Write Response:	^SUSB: "MdmNet/TO", <mnto> OK ERROR +CME ERROR: <err>
Write Command:	Query Mass Storage CRC: AT^SUSB="MS/CRC"
Write Response:	^SUSB: "MS/CRC", <mscrc> OK ERROR +CME ERROR: <err>
Write Command:	Mass Storage device descriptor configuration: AT^SUSB="MS/DD"[, <ddType>[, <langId>, <vendorId>, <productId>, <manufacturer>, <product>, <serialNo>]]
Write Response:	^SUSB: "MS/DD", <ddType>[, <langId>, <vendorId>, <productId>, <manufacturer>, <product>, <serialNo>] OK ERROR +CME ERROR: <err>
Write Command:	Query usable Mass Storage size: AT^SUSB="MS/FSize"
Write Response:	^SUSB: "MS/FSize", <msfs> OK ERROR +CME ERROR: <err>
Write Command:	Configure the mode after Mass Storage eject: AT^SUSB="MS/OnEject"[, <msoe>]
Write Response:	^SUSB: "MS/OnEject", <msoe> OK ERROR +CME ERROR: <err>

Write Command:	Mass Storage write protection:
	AT^SUSB="MS/WProt"[, <mswprot>]
Write Response:	^SUSB: "MS/WProt", <mswprot>
	OK

Write Command:	Mass Storage write protection:
	AT^SUSB="MS/WProt"[, <mswprot>]
Write Response:	ERROR
	+CME ERROR: <err>

Parameter Descriptions

<start>

USB startup configuration

This parameter can be used to control the USB startup enumeration. Any change takes effect the next time the ME is re-enumerated.

Parameter is global for all interfaces, non-volatile and will not be reset by AT&F.

"MS" On power-up the modem enumerates as USB mass storage device.

The Product ID for the mass storage device is 0x0041.

The mass storage can be used with standard drivers typically integrated in most operating systems. When you are finished using the mass storage you can easily switch over to composite device operation. To do so, use the Eject option. Under Windows XP, for example, open the Windows Explorer, right-click the "Removable Disk" drive and select "Eject". This deactivates the mass storage and, at the same time, activates the USB composite communication device without any need to restart the ME. Parameter <msoe> determines the type of USB composite communication device to activate when the mass storage is ejected.

The option "Safely Remove the Hardware" commonly used for USB devices under Windows terminates the mass storage function without activating the composite device function.

"MdmNet" Default. On power-up the MODEM enumerates as USB composite communication device with the following virtual ports: modem port, application port (VCOM) and wireless network adapter (NET).

The Product ID for this enumeration is 0x0040.

The "MdmNet" enumeration mode is intended for PC based Windows operating systems and is fully supported by the MODEM USB driver package supplied by Siemens for Windows XP and Windows Vista.

"Mdm" On power-up the MODEM enumerates as USB composite communication device supporting modem port and application port (VCOM), but no wireless network adapter (NET).

The Product ID for this enumeration is 0x0047.

The "Mdm" enumeration mode is not supported by the MODEM USB driver package supplied by Siemens for Windows XP and Windows Vista.

"None" On power-up the modem port is assigned to serial interface. All URCs are routed to the modem interface (for details see AT^SCFG parameter "URC/DstIfc" (<udi>) and Section 1.8, Unsolicited Result Code Presentation).

Please note that the MODEM enumerates as USB composite communication device, but neither the virtual USB ports nor the wireless network adapter (NET) are operational.

The Product ID for this enumeration is the same as for "MdmNet".

<max power>

Maximum power

Maximum power consumption of the USB device from the USB bus. This parameter is reported to a USB host as part of the USB enumeration.

Only even values are supported. Odd values are truncated.

Any change of this parameter becomes active with the next device enumeration.

Parameter is global for all interfaces, non-volatile and will not be reset by AT&F.

0...500 Default = 10. Device maximum power consumption in mA

<powsrc>

Power source

This parameter can be used to specify the power source. Any change of this parameter becomes active with the next device enumeration.

Parameter is global for all interfaces, non-volatile and will not be reset by AT&F.

"BUS" Device enumerates as bus powered device.

"SELF" Default. Device enumerates as self powered device.

<mnto>

Modem and Modem/Net Class Request timeout.

This parameter specifies the time the MODEM waits for a Communication Device Class request from the host. Any change takes effect the next time the ME is restarted.

Parameter is global for all interfaces, non-volatile and will not be reset by AT&F.

"0"	No timeout supervision
100...65535	Default = 10000. Timeout in ms

If no Communication Device Class request is received within the specified time the ME enumerates as mass storage device.

This is typically the case if you have not yet installed the supplied modem USB drivers on Windows XP or Windows Vista, or if you select an enumeration mode not supported by the operating system and then reboot the ME on the same system (e.g. "Mdm" on a Windows system or "MdmNet" on a non-Windows system). See notes below.

<msfs>

Mass storage size

This parameter reports the usable USB mass storage size.

0...2147483647   Usable mass storage size in bytes.

<mscrc>

Mass storage CRC value

This parameter reports the USB mass storage CRC value.

00000000...FFFFFFFF   ASCII hex CRC value up to 8 digits long; if CRC recalculation is not finished yet, then an ASCII question mark is appended.

<msoe>

Mode on mass storage eject

This parameter determines the type of USB composite communication device to activate when the mass storage is ejected.

Parameter is global for all interfaces, non-volatile and will not be reset by AT&F.

"MdmNet"	Default. After ejecting the mass storage the MODEM enumerates as USB composite communication device with modem port, application port (VCOM) and wireless network adapter (NET).
"Mdm"	After ejecting the mass storage, the modem enumerates as USB composite communication device with modem port and application port (VCOM).
	The "Mdm" enumeration mode is not supported by the modem USB driver package supplied by Siemens for Windows XP and Windows Vista.

<mswprot>

Mass storage write protection

This parameter can be used to enable or disable the USB mass storage write protection. communication device (modem). Any change of this parameter becomes active immediately.

Parameter is global for all interfaces, non-volatile and will not be reset by AT&F.

"Enabled"	Mass storage is write protected
"Disabled"	Default. Mass storage is not write protected

<ddtype>

Device descriptor type

This parameter determines whether to use the Siemens standard USB Device Descriptor configuration (default) or a Device Descriptor configuration customized by the application manufacturer.

Parameter is global, stored non-volatile in ME and not reset by AT&F. Setting will be active after modem restart.

"0"	Default. Siemens standard USB Device Descriptor.
	If <ddType>=0 is set all other parameters related to the device descriptor configuration cannot be changed are not displayed by the read command.
"1"	Customer specific USB Device Descriptor.
	If <ddType>=1 is set all other parameters related to the device descriptor configuration can be changed and are displayed by the read command.
	Customizing the USB Device Descriptor configuration requires a unique Vendor ID obtained from the USB Implementers Forum. For information please refer to http://www.usb.org.
	Attention! You may need an appropriate driver (e.g. for use under Windows a customized INF file must be present in which all the contained strings must be identical with the strings given for the customized device descriptor configuration parameters). *Otherwise you may not longer be able to access the module!*

\<langId\>

Language ID

Please refer to USB.ORG to find the language IDs currently defined for USB devices.

Parameter is displayed and can be set only if Device descriptor type \<ddType\> is set to "1".

Parameter is global, stored non-volatile in ME and not reset by AT&F. Setting will be active after modem restart.

Parameter length: maximum 4 hexadecimal characters.

\<vendorId\>

Vendor ID

This parameter represents the hexadecimal encoded Vendor ID obtained from the USB Implementers Forum.

The Vendor ID will, together with the Product ID, be transmitted to the host during initialization. The given Vendor ID must be included in the INF file needed for Windows.

Parameter is displayed and can be set only if Device descriptor type \<ddType\> is set to "1".

Parameter is global, stored non-volatile in ME and not reset by AT&F. Setting will be active after restart.

Parameter length: maximum 4 hexadecimal characters.

\<prodId\>

Product ID

Hexadecimal encoded Product ID (PID) defined by the application manufacturer to identify the USB device.

The Product ID will, together with the Vendor ID, be transmitted to the host during initialization. The given Product ID must be included in the INF file needed for Windows.

Parameter is displayed and can be set only if Device descriptor type \<ddType\> is set to "1".

Parameter is global, stored non-volatile in ME and not reset by AT&F. Setting will be active after restart.

Parameter length: maximum 4 hexadecimal characters.

\<manufacturer\>

Manufacturer name

Manufacturer string defined by the application manufacturer. The same string shall be included in the INF file needed for Windows.

Parameter is displayed and can be set only if Device descriptor type \<ddType\> is set to "1".

Parameter is global, stored non-volatile in ME and not reset by AT&F. Setting will be active after restart.

Parameter length: maximum 25 characters.

\<product\>

Product string

Optional product name defined by the application manufacturer. It is recommended to include the same string into the INF file.

Parameter is displayed and can be set only if Device descriptor type \<ddType\> is set to "1".

Parameter is global, stored non-volatile in ME and not reset by AT&F. Setting will be active after restart.

Parameter length: maximum 25 characters.

\<serialNo\>

Device's serial number

Serial number. If not used please use a empty string.

A serial number has several advantages. For example, it enables the host to assign the same virtual COM port to same USB device even though the device is connected to another USB port. This eliminates the need for the host to load the driver again.

Parameter is displayed and can be set only if Device descriptor type \<ddType\> is set to "1".

Parameter is global, stored non-volatile in ME and not reset by AT&F. Setting will be active after restart.

Parameter length: maximum 25 characters.

Note:

When changing the USB enumeration parameters take care to choose the right configuration depending on the type of USB drivers used. Keep in mind that "Mdm" makes the ME inaccessible with the Windows XP and Windows Vista USB drivers supplied by Siemens.

If alternate usage with different USB drivers is necessary during application development, take care not to change all three enumeration parameters \<start\>, \<msoe\> and \<mnto\> for only one specific driver setup.

In particular, we strongly recommend to configure \<start\> and \<msoe\> for different USB enumeration modes. This gives you the flexibility to easily revert to the enumeration mode needed when you connect the ME to a USB host based on another driver setup. For example, if \<start\> equals "Mdm" select "MdmNet" for \<msoe\> or vice versa.

Also, do not set \<mnto\>= "0" because the timeout enables the ME to enumerate as mass storage if the drivers

required by the currently selected enumeration mode are not found. Depending on whether drivers are installed you can then decide how to proceed: installing the USB drivers if required, or, if the drivers are already installed, ejecting the mass storage to revert to the composite device enumeration needed.

Of course, if you do not wish to operate the ME with different drivers the "MdmNet" and "Mdm" enumeration modes should not be different for \<start\> and \<msoe\>.

Chapter 3 – Status Control Commands

The AT Commands described in this chapter allow the external application to obtain various status information from the Multi-Tech wireless modem.

3.1   AT^SIND   Extended Indicator Control

Description: The AT^SIND command controls the presentation of Indicator Event Reports. You can enable / disable URCs to be output each time when the value of the related indicator changes, you can request the current status of all indicators, and you can also query the status of a single indicator.

Syntax:

Test Command:	AT^SIND=?
Test Response:	^SIND: (<indDescr>, list of supported <indValue>s)[, (<indDescr>, list of supported <indValue>s)[,...]], (list of supported <mode>s)
	OK

Read Command:	AT^SIND?
Read Response:	^SIND: <indDescr>, <mode>, <indValue>
	^SIND: <indDescr>, <mode>, <indValue>
	...
	OK
	ERROR
	+CME ERROR: <err>

Write Command:	AT^SIND=<indDescr>, <mode>
Write Response:	^SIND: <indDescr>, <mode>, <indValue>
	In case of: <indDescr>="eons" and <mode>=2
	^SIND: <indDescr>, <mode>, <indValue>, <eonsOperator>, <servProvider>, <servProviderType>
	In case of: <indDescr>="nitz" and <mode>=2
	^SIND: <indDescr>, <mode>, <nitzUT>, <nitzTZ>, <nitzDST>
	OK
	ERROR
	+CME ERROR: <err>

Unsolicited Result Codes:

   URC 1
   Format of the standard indicator:
   +CIEV: <indDescr>, <indValue>
   Value related to an indicator has changed.

   URC 2
   Format of the "eons" indicator
   +CIEV: <indDescr>, <indValue>, <eonsOperator>, <servProvider>, <servProviderType>
   One URC is issued for each new LAI (Location Area Information) broadcast by the network.

   URC 3
   Format of the "nitz" indicator:
   +CIEV: <indDescr>, <nitzUT>, <nitzTZ>, <nitzDST>

Parameter Descriptions:

   <indDescr>
   String values and their <indValue> ranges.

   "signal"   Channel bit error rate of the signal received:
                        The parameter is always set to value 99. See also AT+CSQ.

   "service"   Service availability:
                        0   Not registered on any network.
                        1   Registered to home network or, if "roam"=1 then registered to another network.

"sounder"   Sounder activity:
Reports every event that causes the ME to generate a tone.
0   Tone generator not active.

1   Tone generator active.
Value 1 means for example:
Incoming call - ME is ringing. Note that in this case the URC "+CIEV:
sounder" will be output only if ringing tones are enabled with AT^SRTC.
Waiting call - ME generates waiting call tone (if call waiting is enabled).
Outgoing call - ME generates BUSY tone.
Playback of ringing tones when tested with AT^SRTC.

"message"   Unread short message at memory location <mem1>. Refer to AT+CPMS.
0   No unread message(s) available.
1   Unread message(s) available.

"call"   Call in progress:
0   No call.
1   At least one MO or MT call is in state "active" (connection established).

"roam"   Roaming indicator:
0   Registered to home network or not registered.
1   Registered to other network.

"smsfull"   Capacity of storage for received short messages:
0   The short message memory location <mem3> is still free or has just become free again.
Refer to AT+CPMS.
1   All memory locations of <mem3> are used up.

"rssi"   Received signal (field) strength:
0   Signal strength ≤ -112 dBm
1 - 4   Signal strength in 15 dB steps
5   Signal strength ≥ -51 dBm
99   Signal strength not known or not detectable
Received signal (field) strength can also be obtained with AT+CSQ. However, the signal strength is
scaled to value range 0..31 by this command.

"eons"   Enhanced Operator Name String (EONS) Indication.
The Enhanced Operator Name String indicator feature allows the Multi-Tech wireless modem to
output various operator names for different PLMN identities via URC. It also allows the output of a
different operator name based on a subset of the registered network by using a range of Location
Area Codes (LACs) or a single LAC.
The presentation of the "eons" indicator is determined by network activity. For example, the indicator
appears every time a location update occurs or a NITZ information is sent, no matter whether or not
the status of the EONS information has changed. This means that the same EONS information may
be reported several times.
The EONS tables are stored in the SIM card and will be read at power-up.
This is a list of the SIM Elementary Files that are affected by the introduction of EONS feature in the
SIM card:
EF_{SST} (SIM Service Table) - describes which features are active.
EF_{OPL} (Operator PLMN List) - contains the PLMN identification and location ID together with
the index of the corresponding PNN record.
EF_{PNN} (PLMN Network Name) - contains the full and short form version of the network name
for the registered PLMN.
If the Operator Name Source is CPHS Operator Name String long and short form,
refer to <indValue>, the following two SIM Elementary Files are used:
$EF_{ONString}$ (Operator Name String) - contains the name of the PLMN operator who issued the
SIM.
$EF_{OPShort}$ (Operator Name Short form) - contains a short form of the name of the PLMN
operator who issued the SIM.

"nitz"   Network Identity and Time Zone Indication.

This indicator shows the time relevant information elements of an MM Information (MMI) or GMM Information (GMMI) message received from the network (see GSM 24.008, ch. 9.2.15a and 9.4.19). The network usually sends a NITZ indicator when the mobile attaches to the network, when it enters a location area with different time zone or when a daylight change occurs.

A NITZ indicator may consist of the following parameters: Universal Time (UT), local Time Zone (TZ), Daylight Saving Time (DST). All information elements of MMI/GMMI are optional and, therefore, the presentation of the parameters <nitzUT>, <nitzTZ>, <nitzDST> varies with the network. For example, the network may send all three parameters UT, TZ, DST, or only UT and TZ or only TZ.

UT is indicated in usual date/time format and represents the current world time (GMT) at the moment when sent.

TZ is given as a positive (east) or negative (west) offset from UT in units of 15 minutes.

DST shows the number of hours added to the local TZ because of daylight saving time (summertime) adjustment. Usually DST is 1 hour but it can be also 2 hours in certain locations.

Example for time and time zone with DST:

+CIEV: nitz,"04/07/23,13:39:20",-28,1

In this example TZ is -28, showing a time offset of -7 hours (west) to Universal Time/GMT (which never changes for DST). DST is 1 which indicates that one hour was added to TZ because of Daylight Saving Time. If a network does not send the DST parameter the TZ value would be -32 (8 hours west) as would be done in winter:

+CIEV: nitz,"04/11/23,13:39:20",-32

Please be aware that despite the last NITZ value can be looked up again via "AT^SIND=nitz,2" the returned values may be out of date. Especially the UT value is obsolete because there is no internal NITZ clock and therefore no continuation of UT.

NITZ values are lost when the module detaches from network. Also when a manual network selection fails and the module automatically falls back to the previous network the NITZ values cannot be recalled. Nevertheless an indicated time zone is valid until a new MMI/GMMI will trigger another NITZ indication.

"simstatus"   SIM Status Indication
The SIM Status indicator allows the MC75 to output the status of the subscriber
identity module (SIM) via URC.

0	SIM card removed.
	Note: Another way to verify the SIM card connection is the "^SCKS" URC enabled with AT^SCKS.
1	SIM card inserted.
5	SIM initialization completed - ME has finished reading SIM data.

"psinfo"   Packet Switched Status Indication
"psinfo" indicates the status of the module related to packet switched data calls.

0	GPRS/EGPRS not available in currently used cell
1	GPRS available in currently used cell
2	GPRS attached
3	EGPRS available in currently used cell
4	EGPRS attached
5	camped on WCDMA cell
6	WCDMA PS attached
7	camped on HSDPA-capable cell
8	PS attached in HSDPA capable cell

"vcall"   Incoming call is a video call

0	No incoming video call.
1	The incoming call is a video call.

<indValue>

Integer type value in the range stated above for the corresponding <indDescr>.

Notes specific to the EONS feature:

If the indicator is "eons", the <indValue> is a type associated to the operator name according to GSM 22.101. This type depends on the source of the operator name.

Priority of types associated to the operator names is defined as follows (the type listed first has the highest priority). If a type cannot be indicated the next one will be used.

0   Not registered.
1   EF-OPL and EF-PNN (alphanumeric format, can contain up to 24 characters.)
2   Operator Name String in long and short format according to Common PCN Handset Specification (CPHS) (alphanumeric format, can contain up to 16 characters).
3   Name information received by the NITZ service long and short form (alphanumeric format, can contain up to 16 characters). The short form will be displayed only if EF$_{OPShort}$ from CPHS is available.

    4   Any operator name stored internal to the ME (alphanumeric format, can contain up to 16 characters).
    5   Broadcast MCC-MNC (numeric format which consists of a 3-digit country code plus a 2- or 3-digit network code).
    If the type is 2, 4 or 5, AT+COPS with the appropriate <mode> displays the same operator name.

<mode>
    0   Default. Disables the presentation of a specific URC.
    1   Enables the presentation of a specific URC.
    The URC will be buffered in the TA when the TA-TE link is reserved (e.g. in online data mode), and flushed to the TE when the TA-TE link is free again.
    Otherwise, the URC will be forwarded directly to the TE.
    2   Requests the presentation mode of the URC status and the current value of a single indicator type.

<eonsOperator>
    Operator in format which depends on the type associated to the operator name. Refer to <indValue>.

<servProvider>
    Service Provider Name according to the status settings (SIM Service No. 17) in the SIM Service Table (SST) of the SIM.
    Service Provider Name (SPN) will be read from EFSPN. Service Provider Display Information (SPDI) will be read from EF$_{SPDI}$ list.

<servProviderType>
    Service Provider Type according to Registered Public Land Mobile Network (RPLMN) and Home Public Land Mobile Network (HPLMN).
    0   No Service Provider Information available.
    1   Service Provider Name will be displayed. RPLMN is the HPLMN.
    2   Service Provider Display Information will be displayed. One list entry is equal to the RPLMN.

<nitzUT>
    Universal Time delivered as part of the "nitz" Indicator. Refer to <indDescr>.

<nitzTZ>
    Time Zone delivered as part of the "nitz" Indicator. Refer to <indDescr>.

<nitzDST>
    Adjustment for Daylight Saving Time as part of the "nitz" Indicator. Refer to <indDescr>.

3.2 AT+CEER   Extended Error Report

Description: AT+CEER returns an extended error report regarding the reason of the last
- call release
- failure to set up a call (both mobile originated or terminated)
- failure to modify a call by using Supplementary Services
- failed attempt to activate, register, query, deactivate or deregister a Supplementary Service
- unsuccessful GPRS attach or unsuccessful PDP context activation
- GPRS detach or PDP context deactivation

The release cause report <report> is a single line containing the cause information given by GSM network in textual format.

Syntax:

Test Command:	AT+CEER=?
Test Response:	OK
	ERROR
	+CME ERROR <err>
Exec. Command:	AT+CEER
Exec. Response:	+CEER: <report>
	OK
	ERROR
	+CME ERROR

Parameter Description:

<report>
Release Cause Report
Reason for the last call failure to setup or release (listed in Section 3.2.1, List of status codes for the extended error report).
Both CS and PS domain call types are reported. Cause data is captured from Call Manager events and cached locally to later use by this command.

3.2.1 List of Status Codes for the Extended Error Report

CS Internal Cause Lookup
no cause information available (default)
phone is offline
no service available
network release, no reason given
received incoming call
client ended call
UIM not present
access attempt already in progress
access failure, unknown source
concur service not supported by network
no response received from network
SMS call ended for user call
data call ended for emergency call
rejected during redirect or handoff
lower-layer ended call
call origination request failed
client rejected incoming call
client rejected setup indication
network ended call
no funds available
no service available
full service not available
maximum packet calls exceeded
video connection lost
video protocol closed after setup
video protocol setup failure
internal error

CS Network Cause Lookup

    unassigned/unallocated number
    no route to destination
    channel unacceptable
    operator determined barring
    normal call clearing
    user busy
    no user responding
    user alerting, no answer
    call rejected
    number changed
    non selected user clearing
    destination out of order
    invalid/incomplete number
    facility rejected
    response to status enquiry
    normal, unspecified
    no circuit/channel available
    network out of order
    temporary failure
    switching equipment congestion
    access information discarded
    requested circuit/channel not available
    resources unavailable, unspecified
    quality of service unavailable
    requested facility not subscribed
    incoming calls barred within the CUG
    bearer capability not authorized
    bearer capability not available
    service/option not available
    bearer service not implemented
    ACM >= ACM max
    requested facility not implemented
    only RDI bearer is available
    service/option not implemented
    invalid transaction identifier value
    user not member of CUG
    incompatible destination
    invalid transit network selection
    semantically incorrect message
    invalid mandatory information
    message non-existent/not implemented
    message type not compatible with state
    IE non-existent/not implemented
    conditional IE error
    message not compatible with state
    recovery on timer expiry
    protocol error, unspecified
    interworking, unspecified

CS Network Reject Lookup

    IMSI unknown in HLR
    illegal MS
    IMSI unknown in VLR
    IMEI not accepted
    illegal ME
    GPRS services not allowed
    GPRS and non GPRS services not allowed
    MS identity cannot be derived
    implicitly detached
    PLMN not allowed
    location area not allowed
    roaming not allowed
    GPRS services not allowed in PLMN
    no suitable cells in location area
    MSC temporary not reachable
    network failure
    MAC failure
    synch failure

congestion
GSM authentication unacceptable
service option not supported
requested service option not subscribed
service option temporary out of order
call cannot be identified
no PDP context activated
semantically incorrect message
invalid mandatory information
message type non-existent
message type not compatible with state
information element non-existent
message not compatible with state
RR release indication
RR random access failure
RRC release indication
RRC close session indication
RRC open session failure
low level failure
low level failure no redial allowed
invalid SIM
no service
timer T3230 expired
no cell available
wrong state
access class blocked
abort message received
other cause
timer T303 expired
no resources
release pending
invalid user data

PS Internal Cause Lookup

invalid connection identifier
invalid NSAPI
invalid primary NSAPI
PDP establish timeout
invalid field
SNDCP failure
RAB setup failure
no GPRS context
PDP activate timeout
PDP modify timeout
PDP inactive max timeout
PDP lowerlayer error
PDP duplicate
access technology change
PDP unknown reason

CS PS Network Cause Lookup

LLC or SNDCP failure
insufficient resources
missing or unknown APN
unknown PDP address or PDP type
user authentication failed
activation rejected by GGSN
activation rejected, unspecified
service option not supported
requested service option not subscribed
service option temporary out of order
NSAPI already used (not sent)
regular deactivation
QoS not accepted
network failure
reactivation required
feature not supported
semantic error in the TFT operation

syntactical error in the TFT operation
unknown PDP context
PDP context without TFT already activated
semantic errors in packet filter
syntactical errors in packet filter
invalid transaction identifier
semantically incorrect message
invalid mandatory information

CS PS network cause lookup

message non-existent/not implemented
message type not compatible with state
IE non-existent/not implemented
conditional IE error
message not compatible with state
protocol error, unspecified

3.3 AT+CPAS   Mobile Equipment Activity Status

Description: The AT+CPAS execute command indicates the activity status of the ME.

Syntax:
Test Command:	AT+CPAS=?
Test Response:	+CPAS: (list of supported<pas>s)
	OK
Exec Command:	AT+CPAS
Exec. Response:	+CPAS: <pas>
	OK

Parameter Description:
   <pas>
   0   Ready
   3   Incoming call (ringing)
   4   Call in progress or call hold

3.4 AT+WS46   Select Wireless Network

Description: The AT+WS46 command is intended for reading the current status of the network selection. The write command has no effect. To select the network please use the AT+COPS command.

Syntax:
Test Command:	AT+WS46=?
Test Response:	+WS46: (list of supported<n>s)
	OK
Read Command:	AT+WS46?
Read Response:	<n>
	OK
Write Command:	AT+WS46=[<n>]
Write Response:	OK
	ERROR
	+CME ERROR

Parameter Description:
   <n>
   12   GSM digital cellular
   22   UTRAN only
   25   3GPP Systems (both GERAN and UTRAN)

Chapter 4 – Serial Interface Control Commands

The AT Commands described in this chapter allow the external application to determine various settings related to the Multi-Tech wireless modem's serial interface.

4.1 AT\Q   Flow Control

Description: The Multi-Tech wireless modem always uses RTS/CTS hardware flow control. This command exists for compatibility reasons only; using this command will have no effect.

Syntax:
    Exec. Command: AT\Q[<n>]
    Exec. Response: OK

Parameter Description:
    <n>
      3   Default. RTS/CTS hardware flow control

4.2 AT&C   Set Data Carrier Detect (DCD) Mode

Description: This command determines how the state of the DCD line reflects the ME's internal activity.

Syntax:
    Exec. Command: AT&C[value]
    Exec. Response: OK

Parameter Description:
    <value>
      0   DCD line is always ON. Zero is the default if no value is entered when the command is executed.
      1   DCD line is ON in the presence of data carrier only.
      2   Setting winks (briefly transitions off, then back on) the DCD line when data calls end. This is the factory default – the value is restored to 2 when the AT&F command is executed.

4.3 AT&D   Set Data Terminal Ready (DTR) Line Mode

Description: AT&D determines how the ME responds if the DTR line is changed from ON to OFF state during data mode.

Syntax:
    Exec. Command: AT&D[<value>]
    Exec. Response: OK

Parameter Description:
    <value>
      0   ME ignores status of DTR. Zero is the default if no value is entered when the command is executed.
      1   ON->OFF on DTR: Change to command mode while retaining the connected call.
      2   ON->OFF on DTR: Disconnect (CSD or PPP) data call and change to command mode. During OFF state of the DTR line auto-answer is disabled. This is the factory default – the value is restored to 2 when the AT&F command is executed.

4.4   AT&S   Set Data Set Ready (DSR) Line Mode

Description: AT&S determines how the ME sets the DSR line depending on its communication state.

Syntax:
  Exec. Command: AT&S<value>
  Exec. Response: OK

Parameter Description:
  <value>
    0   Default. DSR line is always ON.
    1   ME in command mode: DSR is OFF.
                        ME in data mode: DSR is ON.

4.5   ATE   Enable Command Echo

Description: The ATE command determines whether or not the TA echoes characters received from TE during
                        command state.

Syntax:
  Exec. Command: ATE[<value>]
  Exec. Response: OK

Parameter Description:
  <value>
    0   Echo mode off.
    1   Default. Echo mode on.

4.6   AT+IPR   Set Local Bit Rate

Description: ME uses fixed bit rate of 115200 for its asynchronous serial interface. Therefore, AT+IPR exists for
                        compatibility reasons only. Using it will have no effect.
                        The test command returns the values of the supported fixed bit rates.
                        The read command returns the current bit rate of the interface.

Syntax:
  Test Command: AT+IPR=?
  Test Response: +IPR: (list of supported auto-detectable <rate>s) , (list of supported fixed-only <rate>s)
                        OK

  Read Command: AT+IPR?
  Read Response: +IPR: <rate>
                        OK

  Write Command: AT+IPR=<rate>
  Write Response: OK
                        ERROR
                        +CME ERROR <err>

Parameter Descriptions:
  <rate>
    bit rate per second (bps)
    300
    600
    1200
    2400
    4800
    9600
    14400
    19200

28800
38400
57600
115200
230400

4.7 AT^SQPORT   Query Port Type

Description: AT^SQPORT enables the host application to query the type of virtual COM port it is connected to. Further details on the different types of virtual interfaces can be found in Section 1.4, *AT Command Interpreter*.

Syntax:

Test Command:	AT^SQPORT=?
Test Response:	OK
Read Command:	AT^SQPORT?
Read Response:	<type>
	OK
Exec. Command:	AT^SQPORT
Exec. Response:	<type>
	OK

Parameter Description:

<type>

"Modem"   The virtual COM port is defined for use as a modem, mainly intended for dialup connections. Using AT commands is not recommended except for the dialing command ATD.

"Application" The virtual COM port is defined as application interface. It is recommended that this interface be used for controlling the modem, e.g. for entering AT commands, receiving URCs, or sending and receiving short messages. URCs are indicated only on this interface, no matter which of the two interfaces was used to send the AT commands for activating their presentation. For further detail on URCs, please refer to Section 1.8, *Unsolicited Result Code Presentation.*

Chapter 5 – Security Commands

The AT Commands described in this chapter allow the external application to determine various security related settings.

5.1 AT+CLCK   Facility Lock

Description: AT+CLCK can be used to lock, unlock or interrogate a network or ME <facility>. The command can be aborted when network facilities are being set or interrogated.

Syntax:
>   **Test Command:**   AT+CLCK=?
>   **Test Response:**   +CLCK:list of supported <facility>s
>   OK
>
>   **Write Command:**   AT+CLCK=<facility>, <mode>[, <password>][, <class>]
>   **Write Response:**   If <mode> is not equal 2 and command successful:
>   OK
>   if <mode>= 2 and command successful:
>   +CLCK: <status>[, <class>]
>   [+CLCK: <status>[, <class>]]
>   [+CLCK: ...]
>   OK
>   ERROR
>   +CME ERROR

Parameter Descriptions:
>   **<facility>**
>   **Phone security locks set by client or factory**
>   Primarily intended for the client to take safety precautions, "SC" can be configured individually.
>   Parameter <class> is not applicable to security locks.
>   See examples below for further details.

>   **"SC"**   SIM (lock SIM cards). SIM requests password upon ME power-up and when this lock command is issued.
>   <password>: SIM PIN1.

>   **"FD"**   SIM fixed dialing memory: If the mobile is locked to "FD", only the phone numbers stored to the "FD" memory can be dialed. (Capacity of FD phonebook depending on the SIM card).
>   <password>: SIM PIN 2.
>   If a lock on the SIM fixed dialing memory is active, the following applies:
>   - Outgoing data calls can be made only to numbers stored in "FD" phonebook.
>   Result code depends on the type of the call:
>   for data 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 phone book, and used with ATD.
>   Indication is "+CME ERROR: call barred".
>   Setting call forwarding using command AT+CCFC is possible only if <number> is stored in "FD" phonebook.
>   - Access to Unstructured Supplementary Services ("USSD") with ATD is possible only if the exact desired USSD string is stored in the fixed dialing number phone book.
>   Indication is "+CME ERROR: call barred".
>   However please note that the USSD command AT+CUSD is not barred while the "FD" lock is active.
>   - SMS can be sent only to phone numbers which are stored in the "fixed dialing numbers" phonebook "FD".
>   Indication is "+CMS ERROR: 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: call barred".

Supplementary Service Call Barring:

Supplementary Service "Call Barring" allows 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 the client will need to subscribe them, though a limited number of call barring types may be included in the basic tariff package.

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", "+CME ERROR: Operation not allowed", "+CME ERROR: Operation not supported" etc.). To make sure check the extended error response with AT+CEER and the lock status with <mode>=2.

<password>: Network password supplied from the provider or operator. Usually there is one password which applies to all call barring options. For details contact your provider.

"AO"	BAOC (Bar All Outgoing Calls) "OI" BOIC
"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

<status>
- **0** lock is inactive
- **1** lock is active

<password>

Password string used to lock and to unlock a <facility>. Length and authority for passwords depend on the <facility> in question and are therefore listed in the section on parameter <facility>. Passwords can be modified with AT+CPWD.

<class>

Integer or sum of integers each representing a class of information; i.e., a bearer service, telecommunication service or bearer service group as defined in "GSM 02.04".

- **2** class 2 ("data") comprises all those individual data classes 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 individual 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 data class 64, "dedicated packet access".
- **8** SMS
- **16** data circuit sync
- **32** data circuit async
- **64** dedicated packet access
- **128** dedicated PAD access
- **1-255** Default 7. Combination of some of the above classes. For example, the default setting 7 represents the sum of the integers 1, 2 and 4 (data).
  The value 255 covers all classes.
  If parameter "class" is omitted, the default value 7 is used.

Notes:
- The AT+CLCK command offers the full range of <class> parameters according to the GSM specifications. However, when you attempt to use a service 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 extended error response with AT+CEER and the lock status with <mode>=2.
- The command has been implemented with the full set of <class> parameters according to GSM 07.07. For actual applicability of a desired Call barring service to a specific service or service group (a specific <class> value) please consult table A.1 of GSM 02.04.
- If an outgoing Data Call is rejected due to an active "call barring" supplementary service, the call will be terminated with result code NO CARRIER.
  If an invalid <password> is entered several times in succession, a delay incremented after each failed attempt will increase the time to wait before the input of the <password> is accepted. To avoid blocking the serial interface the running AT+CLCK command is aborted after a short timeout and returns CME ERROR 100 ("unknown"). If then the AT+CLCK command is issued once again execution is denied with CME ERROR 256 ("Operation temporary not allowed"). For details regarding the delay see Section 5.2.1, What to do if PIN or password authentication fails?
- If the user tries to set a lock although it is already active or, the other way round, tries to unlock an inactive lock, the response will be OK, but the <password> will not be checked or verified.
- As stated above <class> 2 is intended only to send the data classes 16/32/64/128 to the network. However, the responses returned when the subscriber sets or queries the lock refer only to the status of the data classes received from the network. This means that the responses will display only those data classes between 16 and 128 which are supported by the network and currently activated. There will be no output for class 2, nor for classes which are not supported or not set.
- The parameter <class> will not be sent to the network if <mode>=2. Therefore it may happen that the response of the query command contains information about classes which were not requested, or it shows only the inactive status of the class 1 or 255. This means that the status is valid for all classes.
- For PN (Network Personalization) value of <facility> parameter refer to AT^SCSL command.
- Upper-case and lower-case characters cannot be used together for the <facility> parameter. For example, you can write either "FD" or "fd", but not "Fd".

Example

Lock SIM card (<facility>= "SC")

AT+CLCK="SC",1,"9999" OK	The "SC" parameter enables or disables the SIM PIN authentication (PIN 1) when you power up the GSM engine SIM card locked. As a result, SIM PIN 1 must be entered to enable ME to register to the GSM network.
AT+CLCK="SC",0,"9999" OK	Unlocks SIM card. 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.

To query the status of the SIM card lock:

AT+CLCK="SC",2 +CLCK: 1 OK	Query the status of SIM card lock. SIM card is locked. SIM PIN1 must be entered to enable ME to register to the GSM network.

5.2 AT+CPIN PIN Authentication

Description: AT+CPIN controls network authentication of the Multi-Tech wireless modem.

The read command returns an alphanumeric string indicating whether or not network authentication is required.

The write command allows the Multi-Tech wireless modem to 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 SIM PIN1 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.

If no PIN1 request is pending (for example if PIN1 authentication has been done and the same PIN1 is entered again), the Multi-Tech wireless modem responds "+CME ERROR: operation not allowed"; no further action is required.

Each time a password is entered with AT+CPIN the module starts reading data from the SIM. The duration of reading varies with the SIM card. This may cause a delay of several seconds before all commands which need access to SIM data are effective. See Section 20.1, Restricted access to SIM data after SIM PIN authentication for further detail.

Syntax:

Test Command:	AT+CPIN=?
Test Response:	OK
Read Command:	AT+CPIN?
Read Response:	+CPIN: <code>
	OK
	ERROR
	+CME ERROR: <err>
Write Command:	AT+CPIN=<pin>[, <new pin>]
Write Response:	OK
	ERROR
	+CME ERROR: <err>

Parameter Descriptions:

<pin>
Password (string type), usually SIM PIN1.
If the requested password was a PUK, such as SIM PUK1 or PH-FSIM PUK or another password, then <pin> must be followed by <new pin>.

<new pin>
If the requested code was a PUK: specify a new password or restore the former disabled password. See Section 5.2.1, What to do if PIN or password authentication fails? for more information about when you may need to enter the PUK.

<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.
SIM PUK2	ME is waiting for PUK2 to unblock a disabled PIN2.

Phone security locks set by client or factory

PH-SIM PIN	ME is waiting for phone-to-SIM card password if "PS" lock is active and the client inserts other SIM card than the one used for the lock. ("PS" lock is also referred to as phone or antitheft lock).
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 personalization password
PH-NET PUK	ME is waiting for network personalization unblocking password
PH-NETSUB PIN	ME is waiting for network subset personalization password
PH-NETSUB PUK	ME is waiting for network subset unblocking password
PH-SP PIN	ME is waiting for service provider personalization password
PH-SP PUK	ME is waiting for service provider personalization unblocking password
PH-CORP PIN	ME is waiting for corporate personalization password
PH-CORP PUK	ME is waiting for corporate personalization un-blocking password

Notes:
- 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.
  The Multi-Tech wireless modem offers various options to verify the present status of network registration: For example, the AT+COPS command indicates the currently used network. With AT+CREG 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).
- <pin> and <new pin> can also be entered in quotation marks (e.g., "1234").
- See AT+CPWD and AT^SPWD for information on passwords.
- See AT+CLCK and AT^SLCK for information on lock types.
- See AT+CPBS for information on write access to the FD phonebook with PIN2
- PIN2 can be entered after at least first usage of protected functionality or along with the command used for accessing the PIN2 dependent feature
- If the SIM PIN is entered on the serial interface immediately after restarting the module it is possible that the AT+CPIN write command returns "+CME ERROR: operation not allowed", although the PIN has been accepted and PIN authentication completes successfully. To avoid the error response please wait at least 2 seconds before entering the PIN.

5.2.1 What to Do if PIN or Password Authentication Fails?

PIN1 / PUK1:
After three failures to enter PIN 1, the SIM card is blocked (except for emergency calls). "+CME ERROR: SIM PUK required" 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 prevents unauthorized access to the features listed in AT+CPIN2. 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 authentication, 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*PUK2*newPIN2*newPIN2#;.

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. If incorrectly input, the password is governed by a specific timing algorithm: (n-1)*256 seconds (see Table below).

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

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.

Related Sections:
"+CME ERROR: <err>" values are specified at Section 2.8.1, CME/CMS Error Code Overview. For further instructions and examples see AT+CLCK, and AT+CPWD.
For a complete list of Star-Hash codes please refer Section 20.2, Star-Hash (*#) Network Commands.

5.3 AT+CPWD Change Password

Description: AT+CPWD allows to set a new password for a password protected <facility> lock function. Each password is a string of digits, the length of which varies with the associated <facility>.

The **test command** returns a list of pairs which represent the available facilities and the maximum length of the associated password. See AT command AT+CLCK for more information on the various lock features.

To delete a password use the following syntax: at+cpwd=<facility>,<old password>

Syntax:

Test Command:	AT+CPWD=?
Test Response:	+CPWD : (list of supported (<facility>, <password length>) OK

Write Command:	AT+CPWD=<facility>, <old password>[, <new password>]
Write Response:	New password has been registered for the facility lock function. OK If parameter <old password> was not correct: +CME ERROR 16 (+CME ERROR: incorrect password) If the password for the selected <facility> has been invalidated due to too many failed attempts: +CME ERROR ... If the network provider or network operator doesn't supply the Network Password: +CME ERROR 258 (+CME ERROR: retry operation) If error is related to ME functionality: +CME ERROR <err>

Parameter Descriptions:

<facility>

Phone security locks set by client or factory:
Primarily intended for the client to take safety precautions. Passwords "SC" (SIM PIN) and "P2" (SIM PIN2) are usually predefined, but can be configured individually.

"SC"   SIM PIN. SIM requests password upon ME power-up and when this lock command is issued.
If incorrectly entered three times, the SIM PUK is required to perform authentication.
Input of the SIM PUK password is possible only with AT command AT+CPIN or ATD. For further details please refer to Section 5.2.1, What to do if PIN or password authentication fails?.
<password length>: 4 to 8 digits.

"P2"   SIM PIN 2 is required for authentication with facility lock "FD" (cf. AT+CLCK).
If incorrectly entered three times, the SIM PUK 2 is required to perform authentication.
Input of the SIM PUK 2 password is possible only with AT command AT+CPIN2 or ATD. For further detail please refer to Section 5.2.1, What to do if PIN or password authentication fails?.
<password length>: 4 to 8 digits.

Supplementary Service Call Barring:
Supplementary Service "Call Barring" allows 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 the client will need to subscribe them, though a limited number of call barring types may be included in the basic tariff package.
<password length>: The Network Password needs to be supplied from the network provider or network operator.
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

<password length>
  4...8 Length of password. The range of permitted length for a password depends on the associated <facility>. It is
        available from the test command response or in the description of <facility>. If the entered password is longer
        then the maximum password length it will be stripped to the maximum length and the remaining digits will be
        ignored.

<old password>
  Password specified for the facility.
  Parameter <old password> 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. Mandatory, if <old password> was an unblocking key (PUK).

Note:
As stated above there is usually a one 4-digit password for all call barring facilities. To change the password
please use only the "AB" <facility> (All Barring services).

Examples:
  Example 1: To change PIN2

AT+CPWD="P2","0000","8888"	(where "0000" = old PIN2 and "8888" = new PIN2)
OK	PIN2 Password has been changed to "8888"

  Example 2: To set password used to enable or disable barring of all outgoing calls:

AT+CPWD="AO","0000","3333"	Requests the network to change the password for supplementary service.
OK	Even though issued for "AB" only, the request applies to all other call barring services, too.

Chapter 6 – Identification Commands

The AT Commands described in this chapter allow the external application to obtain various identification information related to the Multi-Tech wireless modem and linked entities.

6.1 ATI   Display Product Identification Information

Description: The ATI execute command delivers a product information text.
The 'Revision' information consists of the following parts: Version xx and variant yy of software release.

Syntax:

Exec. Command:	ATI
Exec. Response:	SIEMENS
	HC25
	REVISION xx.yy
	OK
Exec. Command:	ATI
Exec. Response:	OK

Notes:
- If the user changed the setting of the AT^SCFG parameter "Ident/Manufacturer", then instead of "SIEMENS" the changed value will be returned (for details please refer to description of parameter <manufacturer>).
- If the user changed the setting of the AT^SCFG parameter "Ident/Product", then instead of "HC25" the changed value will be returned (for details please refer to description of parameter <product>).

 IMPORTANT: Do **not** changed this parameter. Doing so will void PTCRB certification.

6.2 AT+CGMI   Request Manufacturer Identification

Description: AT+CGMI returns a manufacturer identification text. See also: AT+GMI.

Syntax:

Test Command:	AT+CGMI=?
Test Response:	OK
Exec. Command:	AT+CGMI
Exec. Response:	SIEMENS
	OK

Notes:
- If the user changed the setting of the AT^SCFG parameter "Ident/Manufacturer", then instead of "SIEMENS" the changed value will be returned (for details please refer to description of parameter <manufacturer>).
- *IMPORTANT:* Do **not** changed this parameter. Doing so will void PTCRB certification.

6.3 AT+GMI   Request Manufacturer Identification

Description: AT+GMI returns a manufacturer identification text. See also: AT+CGMI.

Syntax:

Test Command:	AT+GMI=?
Test Response:	OK
Exec. Command:	AT+GMI
Exec. Response:	SIEMENS
	OK

Notes:
- If the user changed the setting of the AT^SCFG parameter "Ident/Manufacturer", then instead of "SIEMENS" the changed value will be returned (for details please refer to description of parameter <manufacturer>).
- *IMPORTANT:* Do **not** changed this parameter. Doing so will void PTCRB certification.

6.4 AT+CGMM   Request Model Identification

Description: AT+CGMM returns a product model identification text. Command is identical with AT+GMM.
Syntax:
    Test Command: AT+CGMM=?
    Test Response: OK

    Exec. Command: AT+CGMM
    Exec. Response: HC25
        OK

Notes: If the user changed the setting of the AT^SCFG parameter "Ident/Product", then instead of "HC25" the changed value will be returned (for details please refer to description of parameter <product>).

    IMPORTANT: Do **not** changed this parameter. Doing so will void PTCBR certification.

6.5 AT+GMM   Request Model Identification

Description: This command is identical to AT+CGMM. AT+GMM returns product model identification text.
Syntax:
    Test Command: AT+GMM=?
    Test Response: OK

    Exec. Command: AT+GMM
    Exec. Response: HC25
        OK

Notes: If the user changed the setting of the AT^SCFG parameter "Ident/Product", then instead of "HC25" the changed value will be returned (for details please refer to description of parameter <product>).

    IMPORTANT: Do **not** changed this parameter. Doing so will void PTCBR certification.

6.6 AT+CGMR   Request Revision Identification of Software Status

Description: Command is identical to AT+GMR. AT+CGMR delivers the product firmware version identification.
Syntax:
    Test Command: AT+CGMR=?
    Test Response: OK

    Exec. Command: AT+CGMR
    Exec. Response: REVISION <xx.yy>
        OK

Parameter Description:
    <xx.yy>
    Version xx and variant yy of software release.

6.7   AT+GMR   Request Revision Identification of Software Status

Description: Command is identical to AT+CGMR. AT+GMR delivers the product firmware version identification.

Syntax:
Test Command: AT+GMR=?
Test Response: OK

Exec. Command: AT+GMR
Exec. Response: REVISION <xx.yy>
                        OK

Parameter Description:
<xx.yy>
    Version xx and variant yy of software release.

6.8   AT+CGSN   Request International Mobile Equipment Identity (IMEI)

Description: AT+CGSN delivers the International Mobile Equipment Identity (IMEI). Command is identical to AT+GSN.

Syntax:
Test Command: AT+CGSN=?
Test Response: OK

Exec. Command: AT+CGSN
Exec. Response: <sn>
                        OK

Parameter Description:
<sn>
    International Mobile Equipment Identity (IMEI) used to identify a GSM mobile equipment to the GSM network.

6.9   AT+GSN   Request International Mobile Equipment Identity (IMEI)

Description: AT+GSN delivers the International Mobile Equipment Identity (IMEI). Command is identical to AT+CGSN

Syntax:
Test Command: AT+GSN=?
Test Response: OK

Exec. Command: AT+GSN
Exec. Response: <sn>
                        OK

Parameter Description:
<sn>
    International Mobile Equipment Identity (IMEI) used to identify a GSM mobile equipment to the GSM network.

6.10 AT+CIMI Request International Mobile Subscriber Identity (IMSI)

Description: AT+CIMI delivers the International Mobile Subscriber Identity (IMSI). The IMSI permits the TE to identify the individual SIM attached to the ME.

Syntax:
Test Command:	AT+CIMI=?
Test Response:	OK
Exec. Command:	AT+CIMI
Exec. Response:	<imsi>
	OK
	ERROR
	+CME ERROR: <err>

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

Chapter 7 – Call-Related Commands

The AT Commands described in this chapter are related to Mobile Originated Calls (MOC; i.e., outgoing) and Mobile Terminated Calls (MTC; i.e., incoming).

7.1 ATA   Answer a Call

Description: TA causes remote station to go off-hook (e.g., answer call).

Syntax:
Exec. Command: ATA
Exec. Response: In case of data call, if successfully connected (TA switches to data mode):
CONNECT <text>
When TA returns to command mode after call release:
OK
If no connection:
NO CARRIER

Parameter Description:
<text>
Connection status
Output only if ATX parameter setting with value greater 0. Connection speed values:
9600
14400
28800
57600
64000

Notes:
- The command may be aborted generally by receiving a character during execution. It can't be aborted in some connection setup states, such as handshaking.
- See also ATX for <text>.
- If an incoming call is no longer available (already disconnected/hang up), a "NO CARRIER" result code will be given.

7.2 ATD Mobile Originated Call to a Specified Number

Description: This command can be used to set up outgoing data calls. It also serves to control Supplementary Services. The termination character ";" is mandatory to send *# codes for Supplementary Services. It must not be used for data calls.

Additional notes on the responses returned after dialing with ATD:

- For data connections, call setup always terminates when the call has been established (indicated by the result code "CONNECT <text>"), or when it fails (indicated by "NO CARRIER" or "BUSY") at the modem port.

Syntax:

Exec. Command: ATD<n>[<mgsm>][;]

Exec. Response: If busy (parameter setting ATX3 or ATX4):
BUSY
If a connection cannot be set up:
NO CARRIER
NO ANSWER
OK
If successfully connected (TA switches to online data mode):
CONNECT <text>
When TA returns to command mode after call release:
OK

Parameter Description:

<n>
String of dialing digits and optional V.250 modifiers: 0-9, *, #, +, A, B, C
The following V.250 modifiers are ignored: ,(comma), T, P, !, W ,@

<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   Activate Closed User Group explicit invocation for this call only.
g   Deactivate Closed User Group explicit invocation for this call only.

Notes:

- The command may be aborted generally when receiving a character during execution. It cannot be aborted in some connection setup states, such as handshaking.
- See also ATX for <text>.
- Emergency calls:

If no SIM is inserted, call numbers 000, 08, 110, 112, 118,119, 911 and 999 cause an emergency call setup.
If a SIM with ECC file is inserted, 112 and 911 and all additional call numbers stored in the ECC file cause an emergency call setup.

If a SIM without ECC file is inserted, call numbers 112 and 911 and in addition all call numbers specified with AT^SCFG, "Call/ECC", parameter <ecc> will cause an emergency call setup.

7.3 ATD›‹mem›‹n› Mobile Originated Call Using Specific Memory and Index Number

Description: TA attempts to set up an outgoing call to the specified number.

Syntax:
Exec. Command:	ATD><mem><n>;
Exec. Response:	ERROR
	+CME ERROR: <err>
	If no dial tone (parameter ATX2 or ATX4):
	NO DIALTONE
	If busy (parameter setting ATX3 or ATX4):
	BUSY
	If connection cannot be set up:
	NO CARRIER
	When TA returns to command mode after call release:
	OK

Parameter Descriptions:

<mem>
Phonebook storage: For detailed description of storages see AT+CPBS.

"FD"	Fixed dialing phonebook
"SM"	SIM phonebook.
"ON"	MSISDN list
"ME"	Mobile Equipment Phonebook
"LD"	Last number dialed phonebook
"MC"	Missed (unanswered received) calls list
"RC"	Received calls list
"EN"	Emergency numbers
"DC"	Dialed calls list

<n>
Integer type memory location in the range of locations available in the selected memory; i.e., the index number returned by AT+CPBR.

Notes:
- 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.
- See ATX for setting result code and call monitoring parameters.

Examples:

Example 1 – To query the location number of the phonebook entry:
AT+CPBR=1,xx
TA returns the entries available in the active phonebook.

Example 2 – To dial a number from the SIM phonebook, for example the number stored to location 15:
ATD>SM15;
OK

Example 3 – To dial a phone number stored in the last dial memory on the SIM card:
ATD>LD9;
OK

7.4 ATD›‹n› Mobile Originated Call from Active Memory Using Index Number

Description: TA attempts to set up an outgoing call to the stored number.

Syntax:
    Exec. Command: ATD><n>;
    Exec. Response: ERROR
                           +CME ERROR: <err>
                           If no dial tone (parameter ATX2 or ATX4):
                           NO DIALTONE
                           If busy (parameter setting ATX3 or ATX4):
                           BUSY
                           If connection cannot be set up:
                           NO CARRIER
                           When TA returns to command mode after call release:
                           OK
                           If successfully connected:
                           OK
                           If csv call successful or not:
                           OK

Parameter Descriptions:
    <n>
        Integer type memory location in the range of locations available in the selected memory; i.e., the index number returned by AT+CPBR.

Note:
    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.

7.5 ATD›‹str› Mobile Originated Call from Active Memory Using Corresponding Field

Description: This command searches the active phonebook for a given string <str> and dials the assigned phone number.

Syntax:
    Exec. Command: ATD><str>;
    Exec. Response: ERROR
                           +CME ERROR: <err>
                           If no dial tone (parameter ATX2 or ATX4):
                           NO DIALTONE
                           If busy (parameter setting ATX3 or ATX4):
                           BUSY
                           If connection cannot be set up:
                           NO CARRIER
                           When TA returns to command mode after call release:
                           OK
                           If successfully connected:
                           OK
                           If csv call, successful or not:
                           OK

Parameter Descriptions:
    <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, section "Supported character sets".
        If AT+CSCS is set to "UCS2", with respect to the coding of UCS2-characters only phonebook entries that contain an alphanumeric string with as size less than the half of the parameter <tlength> from AT+CPBW can be dialed.

Note:
    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.

7.6 ATH   Disconnect Existing Connection

Description: Disconnect existing data (cds) call from command line by local TE and terminate call.

Syntax:
   Exec. Command: ATH[<n>]
   Exec. Response: OK

Parameter Description:
   <n>
      0   Default. Disconnect from line and terminate call

7.7 AT+CHUP   Hang Up Call

Description: Cancels all active, waiting, and held calls. (Not applicable at this time)

Syntax:
   Test Command: AT+CHUP=?
   Test Response: OK
                                    ERROR
                                    +CME ERROR <err>

   Exec. Command: AT+CHUP
   Exec. Response: OK
                                    ERROR
                                    +CME ERROR <err>

Note: AT+CHUP supports only voice calls. Data connections can be disconnected with ATH only.

7.8 AT^SHUP   Hang Up Call(s) Indicating a Specific GSM04.08 Release Cause

Description: The write command serves to end one specific call or all calls known to the ME, indicating a specific GSM04.08 release cause specified by the user. The command can be used for data calls in any call status (i.e., any calls listed by AT+CLCC).

Syntax:
   Test Command: AT^SHUP=?
   Test Response: OK

   Write Command: AT^SHUP=<cause>[, <cn>]
   Write Response: OK
                                    ERROR
                                    NO CARRIER

Parameter Descriptions:
   <cause>
      Release Cause
      Release cause from GSM04.08 to be indicated to the network.
      The Multi-Tech wireless modem will release the selected connection(s) with release cause indication "cause" and location "user" (0) in the "disconnect" protocol message to the GSM Network. It depends on the network whether or not the release cause will be forwarded to the remote party.
      1   send GSM04.08 release cause "unassigned (unallocated) number"
      16   send GSM04.08 release cause "Normal call clearing"
      17   send GSM04.08 release cause "User busy"
      18   send GSM04.08 release cause "No user responding"
      21   send GSM04.08 release cause "Call rejected"
      27   send GSM04.08 release cause "Destination out of order"
      31   send GSM04.08 release cause "Normal, unspecified"
      88   send GSM04.08 release cause "Incompatible destination"

\<cn\>
   Call Number
   The "call number" is an optional index into the list of current calls available via AT+CLCC. AT command AT^SHUP will terminate the call identified by the specified call number. The default call number "0" is not assigned to any call, but signifies "all calls". As "0" is the default value, it may be omitted.
   With AT^SHUP, Calls will be terminated regardless of their current call status, which may be any of the states allowed by AT+CLCC.
   0   terminate all known calls. Default.
   1...7   terminate the specific call number \<cn\>

Notes:
- it depends on the network whether or not a delivered release cause will be forwarded to the remote party.
- With AT^SHUP, calls will be terminated regardless of their current call status, which may be any of the states allowed by AT+CLCC.

7.9 ATS0   Set Number of Rings before Automatically Answering a Call

Description: This command determines the number of rings before automatic answering a call.
Syntax:
   Read Command: ATS0?
   Read Response: \<n\>
                            OK
                            ERROR
   Write Command: ATS0=\<n\>
   Write Response: OK
                            ERROR

Parameter Description:
   \<n\>
   000   Default. Automatic answer mode is disabled.
   001-255   Enable automatic answering after specified number of rings.

Notes:
- This command works for MT data calls.
- If \<n\> is set to higher values, the calling party may hang up before the call is automatically answered.
- The correlation between ATS7 and ATS0 is important. Example: Call setup may fail if ATS7=30 and ATS0=20.

7.10 ATS6   Set Pause before Blind Dialing

Description: No effect for GSM.
Syntax:
   Read Command: ATS6?
   Read Response: \<n\>
                            OK

   Write Command: ATS6=\<n\>
   Write Response: OK
                            ERROR

Parameter Description:
   \<n\>
   002 – 10 Default is 002

7.11   ATS7   Set Number of Seconds to Wait for Connection Completion

Description: ATS7 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.

Syntax:

Read Command:	ATS7?
Read Response:	<n>
	OK
Write Command:	ATS7=<n>
Write Response:	OK
	ERROR

Parameter Description:

<n>
Number of seconds to wait for connection completion
001...255 (Default is 050)

Notes:

- Command ATS7 is applicable only to data calls.
- The correlation between ATS7 and ATS0 is important. If the called party has specified a high value for ATS0=<n>, call setup may fail.
  Example: Call setup may fail if ATS7=30 and ATS0=20.

7.12   ATS8   Set Number of Seconds to Wait for Comma Dialing Modifier

Description: This command specifies the amount of time, in seconds, that the DCE shall pause, during signaling of call addressing information to the network (dialing), when a "," (comma) dial modifier is encountered in a dial string. No effect for GSM.

Syntax:

Read Command:	ATS8?
Read Response:	<n>
	OK
Write Command:	ATS8=<n>
Write Response:	OK
	ERROR

Parameter Description:

<n>

0	DCE does not pause when "," encountered in dial string.
1...255	Default = 2. Number of seconds to pause

7.13   ATS10   Set Disconnect Delay after Indicating the Absence of Data Carrier

Description: 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.

Syntax:
Read Command: ATS10?
Read Response: <n>
                      OK

Write Command: ATS10=<n>
Write Response: OK
                      ERROR

Parameter Description:
<n>
     number of tenths of seconds of delay
     001 - 255 Default is 14.

7.14   ATO   Switch from Command Mode to Data Mode

Description: ATO is the corresponding command to the +++ escape sequence: When you have established a CSD call and TA is in command mode, ATO causes the TA to resume the data connection and takes you back to data mode.

Syntax:
Exec. Command: ATO[<n>]
Exec. Response: If connection is not successfully resumed:
                      NO CARRIER
                      or
                      TA returns to data mode from command mode
                      CONNECT <text>
                      Note: <text> output only if ATX parameter setting with value > 0.

Parameter Description:
<n>
     0   Switch from command mode to data mode.

7.15   +++   Switch from Data Mode to Command Mode

Description: 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.
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.

Syntax:
Exec. Command: +++
Exec. Response: OK

Notes:
  • To return from command mode to data or PPP online mode: Enter ATO.
  • The DTR function mode 1 provides the same functionality as "+++" (see AT&D).

7.16 AT+CLCC   List Current Calls

Description: The execute command returns a list of current calls. If command is successful, but no calls are available, no information response is sent to TE.

Syntax:

Test Command:	AT+CLCC=?
Test Response:	OK
Exec. Command:	AT+CLCC
Exec. Response:	[+CLCC: <idx>, <dir>, <stat>, <mode>, <mpty>[, <number>, <type>[, <alpha>]]]
	[+CLCC: <idx>, <dir>, <stat>, <mode>, <mpty>[, <number>, <type>[, <alpha>]]]
	[+CLCC: ...]
	OK
	ERROR
	+CME ERROR <err>

Parameter Descriptions:

<idx>
Call identification number as described in GSM02.30 subclause 4.5.5.1; this number can be used in AT+CHLD command operations.

<dir>

0	Mobile originated call (MOC)
1	Mobile terminated call (MTC)

<stat>
State of the call

0	Active
1	Held
2	Dialing (MOC)
3	Alerting (MOC)
4	Incoming (MTC)
5	Waiting (MTC)

<mode>
Bearer/teleservice

1	Data

<mpty>

0	Call is not one of multiparty (conference) call parties
1	Call is one of multiparty (conference) call parties

<number>
Phone number in format specified by <type>

<type>
Type of address octect

128	Restricted <number> included unknown type and format.
145	Dialing string <number> includes international access code character '+'
129	Otherwise

<alpha>
Alphanumeric representation of <number> corresponding to the entry found in phonebook.
The maximum displayed length of <alpha> is 14 characters.

Note:
For alphanumeric representation the number stored in phonebook must be identical to the number transported over the network, then the associated name will be recognized.

7.17   AT^SLCC   Extended List of Current Calls

Description: AT^SLCC covers essentially the same information as AT+CLCC, with the following additions:
- The additional write command allows to activate Event reporting for the list of current calls.
- The additional read command returns an indication whether event reporting is active for the current interface.
- The exec command returns, like AT+CLCC, a list of current calls. If the command is successful, but no calls are available, no information response is sent to the TE.

Syntax:

Test Command:	AT^SLCC=?
Test Response:	^SLCC: (list of supported<n>s)
	OK
Read Command:	AT^SLCC?
Read Response:	^SLCC: <n>
	OK
Exec. Command:	AT^SLCC
Exec. Response:	[^SLCC:<idx>, <dir>, <stat>, <mode>, <mpty>, <Reserved>[, <number>,<type>[, <alpha>]]]
	[^SLCC:<idx>, <dir>, <stat>, <mode>, <mpty>, <Reserved>[, <number>,<type>[, <alpha>]]]
	[^SLCC:...]
	OK
	ERROR
	+CME ERROR: <err>
Write Command:	AT^SLCC=[<n>]
Write Response:	OK
	ERROR
	+CME ERROR: <err>

Unsolicited Result Code:

Unsolicited Call Status information

if the list of current calls is empty:
    ^SLCC:

if one or more calls are currently in the list:
    ^SLCC: <idx>, <dir>, <stat>, <mode>, <mpty>, <Reserved>[, <number>, <type>[, <alpha>]]
    [^SLCC: <idx>, <dir>, <stat>, <mode>, <mpty>, <Reserved>[, <number>, <type>[, <alpha>]]]
    [...]

^SLCC:
URC "^SLCC" displays the list of current calls as displayed with the execute command AT^SLCC. The list is displayed in the state it has at the time of display, not in the state it had when the signal was generated.

The URC's occurrence indicates call status changes for any of the calls in the list of current calls.

If multiple displays of identical list configurations occur, this happens because of short intermediate states of the list, that have already been overridden by new transitions and states. Thus, it is guaranteed that the configuration displayed is always the current configuration at the time of the last display.

The list of active calls displayed with this URC will always be terminated with an empty line preceded by prefix "^SLCC: ", in order to indicate the end of the list.

Parameter Descriptions:

<n>

0	Default. Presentation of URC "^SLCC" disabled.
1	Presentation of URC "^SLCC" enabled

<idx>
This number can be used in AT+CHLD command operations. Call identification number is described in GSM02.30 subclause 4.5.5.1.

<dir>
 0   mobile originated call (MOC)
 1   mobile terminated call (MTC)

<stat>
 state of the call
 0   active
 1   held
 2   dialing (MOC)
 3   alerting (MOC)
 4   incoming (MTC)
 5   waiting (MTC)

<mode>
 bearer/teleservice
 1   data

<mpty>
 0   call is not one of multiparty (conference) call parties
 1   call is one of multiparty (conference) call parties

<Reserved>
 0   Reserved

<number>
 phone number in format specified by <type>

<type>
 type of address octect
 145   dialing string <number> includes international access code character '+'
 128   number is restricted
 129   otherwise

<alpha>
 Alphanumeric representation of <number> corresponding to the entry found in phonebook.
 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.

Notes:
- Some parameters of AT command AT+CHLD, as well as some situations where the call status in the network changes very quickly (e.g., the transition between <stat>= "unknown", "dialing" and "alerting" for a call to a reachable subscriber within the registered network) may lead to quasi-simultaneous changes to the states of one or several calls in the list, possibly leading to multiple displays of identical list configurations.
- If multiple displays of identical list configurations occur, this happens because of intermediate states of the list, that have already been overridden by new transitions and states. Thus, it is guaranteed that the configuration displayed in such cases is the current configuration at the time of the last display.
- For alphanumeric representation the number stored in the phonebook must be identical to the number transported over the network - then the associated name will be recognized.

7.18 AT+CR Service Reporting Control

Description: AT+CR configures the TA whether or not to transmit an intermediate result code +CR: <serv> to TE when a call is being set up.
Setting the value of <mode> to 1 may lead to connection failure, if the application waits for default result code/URC.

Syntax:

Test Command:	AT+CR=?
Test Response:	+CR: (list of supported<mode>s)
	OK
	ERROR
Read Command:	AT+CR?
Read Response:	+CR: <mode>
	OK
	ERROR
Write Command:	AT+CR=<mode>
Write Response:	OK
	ERROR

Parameter Descriptions:

<mode>

0	Disable. Default
1	Enable

<serv>

"REL ASYNC"	Asynchronous non-transparent
"GPRS"	GPRS

Intermediate Result Code:

If enabled, an intermediate result code is transmitted 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>

7.19 AT+CRC Set Cellular Result Codes for Incoming Call Indication

Description: The AT+CRC command controls whether or not to use the extended format of incoming call indication.
<mode>=1 may lead to a connection failure if the application waits for the default URC.

Syntax:

Test Command:	AT+CRC=?
Test Response:	+CRC: (list of supported<mode>s)
	OK
	ERROR
Read Command:	AT+CRC?
Read Response:	+CRC: <mode>
	OK
	ERROR
Exec. Command:	AT+CRC
Exec. Response:	OK
	ERROR
Write Command:	AT+CRC=[<mode>]
Write Response:	OK
	ERROR

Parameter Descriptions:

<mode>

0	Default. Disable extended format.
1	Enable extended format

<type>

"REL ASYNC"	Asynchronous non-transparent

Unsolicited Result Codes:

URC 1
RING
Indicates incoming call to the TE if <mode>=0.

URC 2
+CRING: <type>
Indicates incoming call to the TE if <mode>=1.

7.20 AT+CBST Select Bearer Service Type

Description: The AT+CBST write command 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. See GSM 02.02.

Syntax:

Test Command:	AT+CBST=?
Test Response:	+CBST: (list of supported<speed>s), (list of supported<name>s), (list of supported<ce>s)
	OK
Read Command:	AT+CBST?
Read Response:	+CBST: <speed>, <name>, <ce>
	OK
Write Command:	AT+CBST=<speed>[, <name>[, <ce>]]
Write Response:	OK
	ERROR

Parameter Descriptions:

<speed>

0	Default. Autobauding
7	9600 bps (V.32)
12	9600 bps (V.34)
14	14400 bps (V.34)
16	28800 bps (V.34)
17	33600 bps (V.34)
39	9600 bps (V.120)
43	14400 bps (V.120)

48	28800 bps (V.120)
51	56000 bps (V.120)
71	9600 bps (V.110)
75	14400 bps (V.110)
80	28800 bps (V.110 or X.31 flag stuffing)
81	38400 bps (V.110 or X.31 flag stuffing)
83	56000 bps (V.110 or X.31 flag stuffing; this setting can be used in conjunction with asynchronous non-transparent UDI or RDI service in order to get FTM)
84	64000 bps (X.31 flag stuffing; this setting can be used in conjunction with asynchronous non-transparent UDI service in order to get FTM)
116	64000 bps (bit transparent) (for HSDPA modems with USB)
134	64000 bps (multimedia)

<name>

0	Default. Asynchronous modem
1	Synchronous modem (for HSDPA modems with USB)
4	Asynchronous (RDI)

<ce>

0	Transparent
1	Default. Non-transparent

7.20.1 Parameter Configurations Supported by AT+CBST

Table 7.1: Parameter configurations supported by AT+CBST

<speed>	GSM	WCDMA	SYNC.	ASYNC.	TRANSP.	NONTRANSP.
0	+	+		+		+
7	+			+	+	+
14	+	+		+	+	+
16		+		+		+
17		+		+		+
39	+			+		+
43	+	+		+		+
48		+		+		+
51		+		+		+
71	+			+		+
75	+	+		+		+
80	+	+		+		+
81	+	+		+		+
83	+	+		+		+
84		+		+		+
116		+	+		+	
134		+	+		+	

7.21 AT+CRLP   Select Radio Link Protocol Parameters for Originated Non-Transparent Data Calls

Description: The AT+CRLP write command sets radio link protocol (RLP) parameters used when non-transparent data calls are originated. The read command returns the current settings for the supported RLP version 0 to 2.

Syntax:

Test Command:	AT+CRLP=?
Test Response:	+CRLP: (list of supported<iws>s), (list of supported<mws>s), (list of supported<T1>s), (list of supported<N2>s), (list of supported<ver>s)
	OK

Read Command:	AT+CRLP?
Read Response:	+CRLP: <iws>, <mws>, <T1>, <N2>, <ver>
	+CRLP: <iws>, <mws>, <T1>, <N2>, <ver>
	+CRLP: <iws>, <mws>, <T1>, <N2>, <ver>
	OK

Write Command:	AT+CRLP=[<iws>[, <mws>[, <T1>[, <N2>[, <ver>]]]]]
Write Response:	OK
	ERROR
	+CME ERROR: <err>

Parameter Descriptions:

<iws>
Interworking window size (IWF to MS)
0...61	Default is 61
0…488	Default is 240 for <ver>=2

<mws>
Mobile window size (MS to IWF)
0...61	Default is 61
0…488	Default is 240 for <ver>=2

<T1>
Acknowledgement timer (T1 in 10 ms units)
38…255	Default is 48
42…255	Default is 52 for <ver>=2

<N2>
Re-transmission attempts N2
1...255	Default is 6

<ver>
RLP version number
0…2	

7.22 ATP   Select Pulse Dialing

Syntax:
Exec. Command:	ATP
Exec. Response:	OK

Note: No effect for GSM.

7.23 ATT   Select Tone Dialing

Syntax:
Exec. Command:	ATT
Exec. Response:	OK

Note: No effect for GSM.

7.24 AT+ES Synchronous Data Mode Configuration

Description: This command enables the Synchronous Data Mode **(for HSDPA modems with USB only)**.

Syntax:

Test Command: AT+ES=?
Test Response: +ES: list of supported <orig_rqst>values, , list of supported <ans_fbk>values
OK
ERROR
+CME ERROR: <err>

Read Command: AT+ES?
Read Response: +ES:[<orig_rqst>], [, <ans_fbk>]
OK
ERROR
+CME ERROR: <err>

Write Command: AT+ES=[<orig_rqst>], [, <ans_fbk>]
Write Response: OK
ERROR
+CME ERROR: <err>

Parameter Description:

<orig_rqst>
Requested mode
6   Default. Initiate Synchronous Access mode when connection is completed, and Data Suite is entered.

<ans_fbk>
Fallback mode answerer
8   Default. Initiate Synchronous Mode when connection is completed, and Data Suite is entered.

7.25 AT+ESA Synchronous Access Mode Configuration

Description: This command configures the Synchronous access Mode **(for HSDPA modems with USB only)**.

Syntax:

Test Command: AT+ESA=?
Test Response: +ESA: (list of supported <trans_idle>values), , , , (list of supported <crc_type>values), (list of supported <nrzi_en>values), (list of supported <syn1>values),
OK
ERROR
+CME ERROR: <err>

Read Command: AT+ESA?
Read Response: +ESA:<trans_idle>, , , , <crc_type>, <nrzi_en>, <syn1>,
OK
ERROR
+CME ERROR: <err>

Write Command: AT+ESA=[<trans_idle>][,][,][,][,][<crc_type>][<nrzi_en>][<syn1>]
Write Response: OK
ERROR
+CME ERROR: <err>

Parameter Description:

<trans_idle>
transmitted_bit_sequence
specifies the bit sequence transmitted by the DCE when a transmit data buffer under run condition occurs, while operating in Transparent sub-Mode.
0   In Transparent sub-Mode, DCE transmits 8-bit SYN sequence on idle. DCE receiver does not hunt for synchronization sequence.

\<crc_type\>
CRC checking
0   CRC generation and checking disabled

\<nrzi_en\>
nrzi encoding
0   NRZI encoding and decoding disabled

\<syn1\>
When \<trans_idle\>=0, specifies the 8-bit transmit idle sequence to be used by the DCE. When \<trans_idle\>=1, specifies the 8-bit synchronization sequence to be used by the DCE. When \<trans_idle\>=2, specifies first 8 bits of 16-bit synchronization sequence to be used by the DCE.
0 - 255

7.26   AT+CSTA   Select Type of Address

Description: Set command selects the type of number for further dialing commands ATD according to GSM/UMTS specifications.
Test command returns values supported a compound value.

Syntax:
Test Command: AT+CSTA=?
Test Response: +CSTA: (list of supported\<type\>s)
                          OK

Read Command: AT+CSTA?
Read Response: +CSTA: \<type\>
                          OK

Write Command: AT+CSTA=\<type\>
Write Response: OK
                          ERROR

Parameter Description:

\<type\>
145   when dialing string includes international access code character "+"
129   otherwise

Chapter 8 – Network Service Commands

The AT Commands described in this chapter are related to various network services. More commands related to this area can be found in Chapter 9, Supplementary Service Commands.

8.1 AT+COPN   Read Operator Names

Description: The AT+COPN command 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.

Syntax:

Test Command: AT+COPN=?
Test Response: OK
ERROR
+CME ERROR

Exec. Command: AT+COPN
Exec. Response: +COPN: <numericn>, <alphan>
+COPN: ...
OK
ERROR
+CME ERROR: <err>

Parameter Descriptions:

<numericn>
Operator in numeric format; GSM location area identification number.

<alphan>
Operator in long alphanumeric format; can consists of up to 16 characters.

8.2 AT+COPS   Operator Selection

Description: AT+COPS queries the present status of the Multi-Tech wireless modem's network registration and allows to determine whether automatic or manual network selection shall be used.

Additional service is available with AT^SOPS.

Three operator selection modes are available:

- **Automatic**
  The Multi-Tech wireless modem searches for the home operator automatically. If successful the Multi-Tech wireless modem registers to the home network.
  If the home network is not found, the Multi-Tech wireless modem goes on searching. If a permitted operator is found, the Multi-Tech wireless modem registers to this operator.
  If no operator is found the Multi-Tech wireless modem remains unregistered.
- **Manual**
  Desired operator can be determined using the AT+COPS write command. If the operator is found, the Multi-Tech wireless modem registers to it immediately. If the selected operator is forbidden, the Multi-Tech wireless modem remains unregistered.
- **Manual/automatic**
  The ME first tries to find the operator determined via AT+COPS write command. If the ME fails to register to this operator, then it starts to select another (permitted) operator automatically.

The AT+COPS test command lists sets of four parameters, each representing an operator present in the network. A set consists of

- an integer indicating the availability of the operator,
- long alphanumeric format of the operator's name,
- short alphanumeric format of the operator's name,
- numeric format representation of the operator and
- an integer indicating the access technology of the operator.

Any of the parameters may be unavailable and will then be an empty field (,,). The list of operators comes in the following order: Home network, networks referenced in SIM and other networks. The operator list is followed by a list of the supported <mode>s and <format>s. These lists are delimited from the operator list by two commas.

The response to the AT+COPS test command is dependent on the settings made with <mode> and <AcT>. If <mode> equals "0"and <AcT> is omitted (automatic selection mode for both parameters) the AT+COPS test command will return a list of operators with the supported <AcT>s. If <AcT> is explicitly set (i.e. restricted to UTRAN or GMS) the AT+COPS the response contains only a list of operators with the selected RAT type.

The response to the AT+COPS read command depends on the registration status. If the ME is not registered, the read command returns only the current <mode>. If the ME is registered the response returns the currently selected operator, the currently set format and the currently used <AcT>.

The AT+COPS write command forces an attempt to select and register to a network operator (see note below). If the selected operator is not available, no other operator will be selected (except <mode>=4). The selected operator name <format> will apply to further read commands, too.

The AT+COPS exec command returns OK and has no effect on the current <mode>.

Syntax:

Test Command:	AT+COPS=?
Test Response:	+COPS: [list of present operators (<opStatus>, long alphanumeric <oper>s, short alphanumeric <oper>s, numeric <oper>s, <AcT>], , (list of supported <mode>s), (list of supported <format>s)
	OK
	ERROR
	+CME ERROR: <err>
Read Command:	AT+COPS?
Read Response:	+COPS:<mode>[, <format>[, <oper>][, <AcT>]]
	OK
	ERROR
	+CME ERROR: <err>
Exec. Command:	AT+COPS
Exec. Response:	OK
Write Command:	AT+COPS=<mode>[, <format>[, <oper>][, <AcT>]]
Write Response:	OK
	ERROR
	+CME ERROR: <err>

Parameter Descriptions:

<opStatus>
Status
0	Unknown
1	Operator available
2	Current operator
3	Operator forbidden

<oper>
Operator
If test command: Operator name in long alphanumeric format, short alphanumeric format, and numeric format.
If read command: Operator name as per <format>.
If write command: Operator name in numeric format.

<mode>
Parameter values 0 and 1 are stored non-volatile in the Multi-Tech wireless modem.
0	Default. Automatic mode; <oper> field is ignored.
1	Manual operator selection.
	The tref ref="cops"/> write command requires <oper> in numeric format; i.e., <format> shall be 2. The AT+COPS read command returns the current <mode>, the currently selected <oper> and the currently used <AcT>. If the ME is not registered the AT+COPS read command returns only the currently set <mode>.
2	Manually deregister from network and remain unregistered until <mode>=0 or 1 or 4 is selected.
3	Set only <format> (for AT+COPS read command).
4	Automatic / manual selection; if manual selection fails, automatic mode (<mode>=0) is entered (<oper> field will be present).

<AcT>
Access technology also referred to as RAT (Radio Access Technology)

By delivery default, the <AcT> parameter is set to an automatic selection mode which enables the ME to select either UTRAN (UMTS) or GSM, depending on the network coverage. This automatic mode for selecting <AcT> remains enabled until you explicitly set either "0" for GSM or "2" for UTRAN. This means, setting the <AcT> parameter is a

restriction; i.e., it forces the ME to select either UTRAN only or GSM only. If the selected <AcT> is not available, the ME cannot register to a network.

The automatic <AcT> selection mode can be restored any time by executing the AT+COPS write command without choosing a specific <AcT>, i.e. simply by omitting the <AcT> value. When you do so, it does not matter, which value(s) you select for other AT+COPS parameters. For example, an easy way is setting AT+COPS=0, which means both PLMN and RAT are automatically selected. Another way is giving the AT+COPS write command with any <mode>, <format>, or <oper>, but <AcT> omitted.

The <AcT> setting remains unchanged upon power-up, in contrast to <mode> that is always restored to "0" after power-up. Yet, please consider that the AT+COPS? read command does not reflect whether <AcT> was omitted or explicitly set. This is because the response to the AT+COPS? read command will always indicate the currently used <AcT>.

0   GSM
2   UTRAN

<format>
0   Default. Long alphanumeric format of <oper>. Can be up to 16 characters long.
1   Short alphanumeric format of <oper>. Can be up to 8 characters long.
2   Numeric format of <oper>. This is the GSM Location Area Identification (LAI) number, which consists of the 3-digit Mobile Country Code (MCC) plus the 2- or 3-digit Mobile Network Code (MNC).

Note:
It is not recommended to use the AT+COPS command before passing the CHV (card holder verification) / SIM PIN1 verification. In case of entering of AT+COPS= 0 before PIN1 verification the module will answer with OK and does not try to register to the network. Also, the test command should only be used after PIN1 authentication.

8.3 AT^SOPS Extended Operator Selection

Description: AT^SOPS queries the present status of the Multi-Tech wireless modem's network registration. Since basic operator selection services are available with AT+COPS this command uses the methods of the Enhanced Operator Name String (EONS) specification while handling operator name strings. Additional EONS related information is available with AT^SIND.

AT^SOPS test command lists sets of five parameters, each representing an operator present in the network. A set consists of:

1.   an integer indicating the availability of the operator,
2.   specification of the source of the operator name <eonsOperator>,
3.   operator name according to EONS Table,
4.   Service Provider Name from the SIM Service Table and
5.   numeric format representation of the operator.

Any of the parameters may be unavailable and will then be an empty field (,,).

The list of operators comes in the following order: Home network, networks referenced in SIM and other networks.

After the operator list the Multi-Tech wireless modem returns lists of supported <mode>s and <format>s. These lists are delimited from the operator list by two commas.

If the test command is used while an ongoing GPRS transfer, traffic will be interrupted for up to one minute.

Syntax:

Test Command: AT^SOPS=?
Test Response: ^SOPS:[list of present operator(<opStatus>, <eonsType>, <eonsOperator>, <servProvider>, <servProviderType>, <opName>, <acT>)s], , (list of supported <mode>)s, (list of supported <format>)s
OK
ERROR
+CME ERROR: <err>

Parameter Descriptions:

<opStatus>
Status
0	unknown
1	operator available
2	current operator
3	operator forbidden

<eonsType>
Specification of the source of the operator name <eonsOperator>. Details of EONS-supplied operator name types are available at AT^SIND.

<eonsOperator>
Operator name; format depends on the source of the operator name, specified by <eonsType>.

<servProvider>
Service Provider Name according to setting of Service No. 17 in the SIM Service Table (EF$_{SST}$).
Service Provider Name (SPN) will be read from EF$_{SPN}$. Service Provider Display Information (SPDI) will be read from EF$_{SPDI}$ list.

<servProviderType>
Service Provider Type according to Registered Public Land Mobile Network (RPLMN) and Home Public Land Mobile Network (HPLMN).
0	No Service Provider Information available.
1	Service Provider Name will be displayed. RPLMN is the HPLMN.
2	Service Provider Display Information will be displayed. One list entry is equal to the RPLMN.

<opName>
Operator name in numerical presentation contains the GSM Location Area Identification (LAI) number, which consists of the 3-digit Mobile Country Code (MCC) plus the 2- or 3-digit Mobile Network Code (MNC). Parameter is stored non-volatile to the SIM.

<mode>
Parameter is not applicable.

<acT>
Access technology selected
0	GSM
2	Default. UTRAN

<format>
Parameter is not applicable.

Note: The AT^SOPS Test command is only accepted by the module after a valid pin has been entered.

8.4 AT+CREG   Network Registration

Description: The AT+CREG command serves to verify the network registration status of the ME. For this purpose two types of URCs are available.
The AT+CREG read command returns the URC presentation mode <n> and an integer <stat> that shows the registration status of the ME. The AT+CREG exec. command sets the URC presentation mode <n> to the factory default value.

Syntax:

Test Command:	AT+CREG=?
Test Response:	+CREG: (list of supported<n>s)
	OK
Read Command:	AT+CREG?
Read Response:	+CREG: <n>, <stat>[, <lac>, <ci>]
	OK
	ERROR
	+CME ERROR: <err>
Exec. Command:	AT+CREG
Exec. Response:	OK
	ERROR
	+CME ERROR: <err>
Write Command:	AT+CREG=[<n>]
Write Response:	OK
	ERROR
	+CME ERROR: <err>

Unsolicited Result Codes:

URC 1
If <n>=1 and there is a change in the ME network registration status:
+CREG: <stat>

URC 2
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>]

Parameter Descriptions:

<n>
0	Disable +CREG URC. Default.
1	Enable URC +CREG:<stat> to report status of network registration
2	Enable URC +CREG:<stat>[,<lac>,<ci>] to report status of network registration including location information. Optional parameters <lac> and <ci> will not display during calls or if these values have not changed since last AT+CREG read command or since last indication by +CREG URC.

<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 are:

- No SIM card available
- 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

- Authentication or registration fails after Location Update Reject due to one of the following:
  - ∗ #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. No further attempt is made to reach or log into a network. User intervention is required. Emergency calls can be made, if any network is available.

4	Unknown (not used)

5	Registered; roaming. The ME is registered at a foreign network (national or international network)

<lac>

Two byte location area code in hexadecimal format (e.g., "00C3" equals 193 in decimal).

<ci>

Two byte cell ID in hexadecimal format.

Example:

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

8.5 AT+CSQ   Signal Quality

Description: The AT+CSQ execute command indicates the received signal strength <rssi> and the channel bit error rate <ber>.

Syntax:

Test Command:	AT+CSQ=?
Test Response:	+CSQ: (list of supported<rssi>s), (list of supported<ber>s)
	OK
Exec. Command:	AT+CSQ
Exec. Response:	+CSQ: <rssi>,<ber>
	OK

Parameter Descriptions:

<rssi>

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>

99	not known or not detectable

Note: After using network related commands such as AT+CCWA and AT+CCFC, users are advised to wait 3s before entering AT+CSQ. This is recommended to be sure that any network access required for the preceding command has finished.

8.6 AT^CPOL   Preferred Operator List

Description: The AT+CPOL read command returns the list of the preferred operators. The AT+CPOL write command allows to edit the list of the preferred operators. If <index> is given but <operator> is left out, the entry is deleted.

Syntax:

Test Command:	AT+CPOL=?
Test Response:	+CPOL:(list of supported <index>s), (list of supported <format>s)
	OK
	ERROR
	+CME ERROR: <err>
Read Command:	AT+CPOL?
Read Response:	+CPOL: <index>, <format>, <operator>
	+CPOL: ...
	OK
	ERROR
	+CME ERROR: <err>
Write Command:	AT+CPOL=<index>[, <format>, <operator>]
Write Response:	OK
	ERROR
	+CME ERROR: <err>

Parameter Descriptions:

<index>
The order number of the operator in the SIM preferred operator list.

<format>

2	Numeric format

<operator>
Operator in numeric format (GSM Location Area Identification number which consists of a 3-digit country code plus a 2- or 3-digit network code).

Note:

If you enter AT+CPOL=? immediately after the CHV, you get the URC: "+CME ERROR: operation not allowed". In addition the AT+CPOL command is blocked until the ME is restarted. You get at any time the faulty response: "+CME ERROR: operation not allowed". The preferred operator list will not be shown.

To avoid this problem and to check the status of SIM initialization after CHV you can activate the "^SIND: simstatus" URC provided by AT^SIND.

Columns for Serving Cell (3G parameters):

Column	*Description*
UARFCN	UARFCN (UTRAN Absolute Radio Frequency Channel Number) of the BCCH carrier
PSC	Primary Synchronization Code
EC/n0	Carrier to noise ratio in dB = measured Ec/Io value in dB. Please refer to 3GPP 25.133, section 9.1.2.3, Table 9.9 for details on the mapping from EC/n0 to EC/Io.
RSCP	Received Signal Code Power 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
cell	Cell ID
SQual	Quality value for base station selection in dB (see 3GPP 25.304)
SRxLev	RX level value for base station selection in dB (see 3GPP 25.304)

8.7.2 Service States

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

8.8   AT^SMONP   Monitor Neighbor Cells

Description: The AT^SMONP supplies information of neighbor cells. To retrieve the information, use the execute command.

Syntax:

Test Command:	AT^SMONP=?
Test Response:	OK
Exec. Command:	AT^SMONP
Exec. Response:	See: Section 8.8.1, AT^SMONP responses
	OK

Notes:
- Due to the fact that not all necessary information of the neighbor cells can be decoded during a connection, there are several constraints to be considered:
  * Only neighbor 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 neighbor 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.
- The neighbor cells have the same PLMN as the serving cell. In case of searching for a network the serving cell can change and the ME shows different sets of neighbor cells depending on the PLMN of the serving cell.
- In case of a 2G serving cell the ME shows 2G and 3G neighbor cells. If 3G is available then no neighboring 2G cells are shown.
- Not all parameters are shown. The output is still under development and will be changed in future releases. Unsupported parameters are signed as "-" .

8.8.1 AT^SMONP Responses

2G:
ARFCN1,BCCH1
ARFCN2,BCCH2
...
ARFCNn,BCCHn
3G:
UARFCN1,PSC1,EC/n01,RSCP1
UARFCN2,PSC2,EC/n02,RSCP2
...
UARFCNn,PSCn,EC/n0n,RSCPn
Example:
2G:
8,-110
12,-110
51,-110
55,-110
59,-110
67,-110
75,-110
737,-110
744,-110
746,-110
3G:
10564,296,6,-68
10564,96,35,-83

Columns for 2G parameters:

Column	Description
ARFCN	Absolute Radio Frequency Channel Number of the BCCH carrier
BCCH	Receiving level of the BCCH carrier in dBm

Columns for 3G parameters:

Column	Description
UARFCN	UTRAN Absolute Radio Frequency Channel Number of the BCCH carrier
PSC	Primary Synchronization Code
EC/n0	Carrier to noise ratio in dB = measured Ec/Io value in dB. Please refer to 3GPP 25.133, section 9.1.2.3, Table 9.9 for details on the mapping from EC/n0 to EC/Io.
RSCP	Received Signal Code Power in dBm

8.9 AT+SNWS Network Selection

Description: The AT^SNWS command is obsolete and supported only for backward compatibility. It was intended for release 1 as an extra option to perform a band scan across all frequency bands and manually select a network, because AT+COPS was always determined by the band most recently used and therefore started searching either across the GSM 850, WCDMA 850, PCS 1900, WCDMA 1900 bands or across the DCS 1800, EGSM 900, WCDMA 2100 bands.

The AT^SNWS command may still be used to manually select a network, but is no longer recommended. Due to the single band group solution introduced with release 2 the same function is now fully available with AT+COPS. For more information on the single band group scheme please refer to the "Radio/Band" parameter <rba> of the AT^SCFG command.

The AT^SNWS write command forces an attempt to select and register to the given operator. If the selected operator is not found, the ME reverts to the band previously used and tries to register again.

The AT^SNWS test command enforces a multiple band selection in order to find all available networks. This procedure will take a few seconds depending on the amount of available networks. During this time the serving cell will be lost because of band changing. After the scan the ME reverts to the previously used network. The test command returns a list of all operators currently available. The response consists of several sets of five parameters, where each set is representing a visible operator. Each set contains the following information:

- an integer indicating the availability of the operator,
- long alphanumeric format of the operator's name,
- short alphanumeric format of the operator's name,
- numeric format representation of the operator and
- an integer indicating the access technology of the operator.

Any of the parameters may be unavailable and will then be an empty field (,,). The list of operators comes in the following order: Home network, networks referenced in SIM and other networks. The operator list is followed by a list of the supported <mode>s and <format>s. These lists are delimited from the operator list by two commas.

Syntax:

Test Command:	AT^SNWS=?
Test Response:	^SNWS: [list of present operators (<opStatus>, long alphanumeric <oper>s, short alphanumeric <oper>s, numeric <oper>s], <AcT>], ,(supported <mode>), (supported <format>)
	OK
	ERROR
	+CME ERROR: <err>
Write Command:	AT^SNWS=<mode>[, <format>, <oper>[, <AcT>]
Write Response:	OK
	ERROR
	+CME ERROR: <err>

Parameter Descriptions:

<opStatus>
Status
0	unknown
1	Operator available
2	Current operator
3	Operator forbidden

<oper>
Operator
If test command: Operator name in long alphanumeric format, short alphanumeric format and numeric format.
If write command: Operator name in numeric format.

<mode>
1	Manual operator selection
	Write command requires <oper> in numeric format, i.e. <format> shall be 2.

<AcT>
Access technology selected
0	GSM
2	Default. UTRAN

If the parameter is omitted in the AT^SNWS write command, the ME will register to the given operator using the <AcT> determined with the last AT+COPS or AT^SNWS write command. This means that the found <AcT> is either the one explicitly specified by the user, or if <mode> of AT+COPS is set to automatic, it is automatically assigned. Likewise, the AT^SNWS test command will show the operators either with the <AcT> explicitly selected or automatically assigned.

<format>
2	Numeric format of <oper>. This is the GSM Location Area Identification (LAI) number, which consists of the 3-digit Mobile Country Code (MCC) plus the 2- or 3-digit Mobile Network Code (MNC).

Notes
- It is not recommended to use the AT^SNWS command before passing the CHV (card holder verification) / SIM PIN1 verification. Also, the test command should only be used after PIN1 authentication.
- It is not recommended to use the AT^SNWS command when an active connection is established.
- If the PLMN given in the AT^SNWS write command equals the PLMN the ME is registered to please use AT+COPS read command after using AT^SNWS write command to check <mode> parameter.

Chapter 9 – Supplementary Service Commands

The AT Commands described in this chapter are related to the Supplementary Services offered by the GSM network.

9.1   AT+CACM   Accumulated Call Meter (ACM) Reset / Query

Description: The read command returns the current ACM value.
The write command 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 for both the current and preceding calls.

Syntax:

Test Command:	AT+CACM=?
Test Response:	OK
Read Command:	AT+CACM?
Read Response:	+CACM: <acm>
	OK
	ERROR
	+CME ERROR: <err>
Write Command:	AT+CACM=[<passwd>]
Write Response:	OK
	ERROR
	+CME ERROR: <err>

Parameter Descriptions:

<acm>
Three bytes of the current ACM value in hexadecimal format (e.g., "00001E" indicates decimal value 30) 000000 - FFFFFF.

<passwd>
SIM PIN2

9.2   AT+CAMM   Accumulated Call Meter Maximum (ACMmax) Set or Query

Description: The **read command** returns the current ACMmax value.
The **write command** 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.

Syntax:

Test Command:	AT+CAMM=?
Test Response:	OK
Read Command:	AT+CAMM?
Read Response:	+CAMM: <acmmax>
	OK
	ERROR
	+CME ERROR: <err>
Write Command:	AT+CAMM=[<acmmax>[, <passwd>]
Write Response:	OK
	ERROR
	+CME ERROR: <err>

Parameter Descriptions:

<acmmax>
Three bytes of the max. ACM value in hexadecimal format (e.g., "00001E" indicates decimal value 30) 000000 disable ACMmax feature 000001-FFFFFF.

<passwd>
SIM PIN2

9.3 AT+CAOC   Advice of Charge Information

Description: The **write command** sets the Advice of Charge supplementary service function mode.

Syntax:

Test Command:	AT+CAOC=?
Test Response:	+CAOC: (list of supported<mode>s)
	OK
Read Command:	AT+CAOC?
Read Response:	+CAOC: <mode>
	OK
Exec. Command:	AT+CAOC
Exec. Response:	OK
	ERROR
	+CME ERROR: <err>
Write Command:	AT+CAOC=[<mode>].
Write Response:	ERROR
	+CME ERROR: <err>
	If <mode>=0, TA returns the current <ccm> value.
	+CAOC: <ccm>
	OK

Parameter Descriptions:

<mode>

0	query CCM value
1	deactivate the unsolicited reporting of <ccm> value
2	activate the unsolicited reporting of <ccm> value

<ccm>
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.

Unsolicited Result Code:

+CCCM: <ccm>
When activated, an unsolicited result code is sent when the CCM value changes, but not more often than every 10 seconds.

9.4 AT+CCUG Closed User Group

Description: The **Test command** returns the supported parameters.
The **Read command** returns if the Explicit CUG invocation is activated (in parameter <n>), which CUG <index> is chosen, and if Preferential Group or Outgoing Access is suppressed (in parameter <info>).
The **Write command** serves to activate or deactivate the explicit CUG invocation, to set the desired index, and to specify if Preferential Group or Outgoing Access shall be suppressed.

Syntax:

Test Command:	AT+CCUG=?
Test Response:	OK

Read Command:	AT+CCUG?
Read Response:	+CCUG:<n>, <index>, <info>
	OK
	ERROR
	+CME ERROR: <err>

Write Command:	AT+CCUG=[[<n>][, <index>][, <info>]]
Write Response:	OK
	ERROR
	+CME ERROR: <err>

Parameter Descriptions:

<n>
Explicit CUG invocation options
0	Deactivate explicit CUG invocation. Default.
1	Activate explicit CUG invocation

<index>
0-9	explicit selection of CUG index
10	No index (preferred CUG taken from subscriber data). Default.

<info>
State of the call
0	No information. Default.
1	Suppress outgoing access
2	Suppress preferential CUG
3	Suppress preferential CUG and Outgoing Access.

Notes:
- The active settings for omitted parameters are retained without changes.
- Explicit CUG invocation means that at each call setup, CUG information is added to the called number.
- Upon delivery, settings are predefined with
  <n>=0,
  <index>=10,
  <info>=0.
  These delivery defaults cannot be recalled automatically.
- When starting a call with ATD, Parameter 'G' or 'g' of command ATD will have no effect if the option selected for this single call is identical to the option already selected with AT+CCUG.
- Current settings are saved in the ME automatically.
- ATZ or AT&F do not influence the current settings.
- Some combinations of parameters may lead to rejection of CUG calls by the network.

9.5 AT+CCFC   Call Forwarding Number and Conditions Control

Description: AT+CCFC controls the call forwarding supplementary service. Registration, erasure, activation, deactivation and status query are supported.

Syntax:

Test Command: AT+CCFC=?
Test Response: +CCFC:(list/range of supported <reason>s)
OK

Write Command: AT+CCFC=<reason>, <mode>[, <number>, <type>][, <class>][, <sub-number>, <sub-type>][, <time>]
Write Response: If <mode> is not equal 2 and command successful:
OK
If <mode>= 2, <reason> is not equal 2 and command successful:
+CCFC: <status>, <class>[, <number>, <type>, <sub-number>, <sub-type>]
OK
If <mode>= 2, <reason>= 2 and command successful:
+CCFC: <status>, <class>[, <number>, <type>, <sub-number>, <sub-type>, <time>]
OK
If error is related to ME functionality
ERROR
+CME ERROR: <err>

Parameter Descriptions:

<reason>
Reason for call forwarding
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>
Network operation to be performed for Supplementary service "call forwarding"
0   disable call forwarding (disable service)
1   enable call forwarding (enable service)
2   query status of call forwarding (query service status)
3   register <number. and activate call forwarding (register service)
4   erase <number> and deactivate call forwarding (erase service)

<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 octect
145   dialing string <number> includes international access code character '+'
129   otherwise

<class>
Integer or sum of integers each representing a class of information; i.e., a bearer service, telecommunication service or bearer service group as defined in "GSM 02.04"
2   data
               <Class 2> (data) comprises all those <class> values between 16 and 128 supported both by the network and the MS. This means, a setting for <Class 2> applies to all remaining data classes (if supported). Also, 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.
8   SMS
16   data circuit sync
32   data circuit async
64   dedicated packet access

| **128** | dedicated PAD access |
| **1...255** | Default = 7. 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 data). The value 255 covers all classes. If the <class> parameter is omitted, the default value 7 is used. |

<sub-number>
String type phone number of sub address in format specified by <type>.

<sub-type>
Type of sub-address octect

| **145** | international access code character '+' |
| **129** | otherwise |

<time>

| **5...30** | Default = 20. Time to wait before call is forwarded, rounded to a multiple of 5 sec. (only for <reason>=no reply) |

<status>

| **0** | Call Forwarding not active |
| **1** | Call Forwarding active |

Notes:

- For some networks, the request information command will return the same result for each requested class.
- You can register, disable, enable and erase <reason> 4 and 5 as described above. However, querying the status of <reason> 4 and 5 with AT+CCFC will result in an error.
- Most networks will not permit registration of new parameters for conditional call forwarding (reasons 1,2,3,5) while unconditional call forwarding is enabled.
- 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.
- Some networks may choose to have certain call forwarding conditions permanently enabled (e.g., forwarding to a mailbox if the mobile is not reachable). In this case, erasure or deactivation of call forwarding for these conditions will not be successful, even if the CCFC request is answered with response "OK".
- 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.
- There is currently no release of GSM standard "GSM 02.04", in which the "Call Forwarding" Supplementary Service is defined as applicable to SMS services.
- It may happen that the response of the query command shows only the inactive status of the class 1 or 255 instead of each requested class. This means, that the status is valid for all classes.
- As stated above <class> 2 is intended only to send the data classes 16/32/64/128 to the network. However, the responses returned when the subscriber sets or queries call forwarding refer only to the status of the data classes received from the network. This means that the responses will display only those data classes between 16 and 128 which are supported by the network and currently activated. There will be no output for class 2, nor for classes which are not supported or not set.
- The parameter <class> will not be sent to the network if <mode>=2. Therefore it may happen that the response of the query command contains information about classes which were not requested, or it shows only the inactive status of the class 1 or 255. This means that the status is valid for all classes.

Example:

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). The handling of classes is equivalent to AT+CLCK.

- **To register the destination number for unconditional call forwarding (CFU):**
    at+ccfc=0,3,"+493012345678",145
    OK
  The destination number will be registered for data services (default <class> 7).
  In most networks, the registration will also cause call forwarding to be activated for these <class> values.

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

- **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: 0,4
  OK

- **To query the status of CFU for all classes:**
  at+ccfc=0,2,,,255
  +CCFC: 0,255
  OK

- **<reason> 4 or 5 cannot be used to query the status of all call forwarding reasons (see notes above):**
  at+ccfc=4,2
  error
  at+ccfc=5,2
  error

9.6 AT+CCWA Call Waiting

Description: The AT+CCWA write command controls the "Call Waiting" supplementary service according to GSM 02.83. Activation, deactivation and status query are supported. The read command returns the current value of <n>.

Syntax:

Test Command: AT+CCWA=?
Test Response: +CCWA:(list of supported <n>s)
OK

Read Command: AT+CCWA?
Read Response: +CCWA:<n>
OK
Write Command: AT+CCWA=[[<n>][, <mode>][, <class>]]
Write Response: If <mode> is not equal 2 and command successful:
OK
If <mode>= 2 and command successful:
+CCWA: <status>, <class>
[+CCWA: <status>, <class>]
[+CCWA: ...]
OK
If error is related to ME functionality:
ERROR
+CME ERROR: <err>

Parameter Descriptions:

<n>
Switch URCs "+CCWA" for call waiting on/off
0   Disable display of URC "+CCWA"
1   Enable display of URC "+CCWA"

<mode>
Network operation to be performed for Supplementary service call waiting
0   Disable call waiting (disable service)
1   Enable call waiting (enable service)
2   Query status of call waiting (query service status)

<class>
Integer or sum of integers each representing a class of information; i.e., a bearer service, telecommunication service or bearer service group as defined in "GSM 02.04".
In the write command, parameter <class> specifies the class of the active call during which an incoming call of any class is to be regarded as a waiting call.
In URC "+CCWA: <calling number>, <type of number>[, <class>], [, <CLI validity>]", parameter <class> specifies the class of the waiting call.
2   Data
    <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.
7   Default. (2+4)
8   SMS
16   Data circuit sync
32   Data circuit async
64   Dedicated packet access
128   Dedicated PAD access
1...255   Default = 7. 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 data). The value 255 covers all classes. If parameter "class" is omitted, the default value 7 is used.

<status>
0   Call waiting service is not active
1   Call waiting service is active

<calling number>
Phone number of waiting caller in the format specified by parameter <type of number>.

<type of number>
Type of address octet in integer format (refer to GSM 04.08, subclause 10.5.4.7)

145	<calling number> includes international access code character '+'
128	Number restricted
129	Otherwise

<CLI validity>

0	CLI valid
1	CLI has been withheld
2	CLI is not available

Unsolicited Result Codes:

Indication of a call that is currently waiting and can be accepted.

+CCWA: <calling number>, <type of number>[, <class>], [, <CLI validity>]

If <n>=1 and the call waiting supplementary service is enabled in the network, URC "+CCWA" indicates a waiting call to the TE. It appears while the waiting call is still ringing.

Notes

- 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.
- The AT+CCWA command offers a broad range of options according to the GSM specifications. However, when you attempt to enable call waiting for a <class> for which the service 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.
- The AT+CCWA command has been implemented with the full set of <class> parameters according to GSM 07.07. For actual applicability of SS call waiting to a specific service or service group (a specific <class> value) please consult table A.1 of GSM 02.04
- 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.
- As stated above <class> 2 is intended only to send the data classes 16/32/64/128 to the network. However, the responses returned when the subscriber sets or queries call waiting refer only to the status of the data classes received from the network. This means that the responses will display only those data classes between 16 and 128 which are supported by the network and currently activated. There will be no output for class 2, nor for classes which are not supported or not set.
- The parameter <class> will not be sent to the network if <mode>= 2. Therefore it may happen that the response of the query command contains information about classes which were not requested or it shows only the inactive status of the class 1 or 255. This means, that the status is valid for all classes.

9.7 AT+CHLD   Call Hold and Multiparty

Description: TA controls the Supplementary Services Call Hold and Multiparty. Calls can be put on hold, recovered, released, and added to a conversation.

As for all Supplementary Services, the availability and detailed functionality of Call Hold and Multiparty services depends on the configuration of the GSM network. The Multi-Tech wireless modem can only request the service, but the network decides whether and how the request will be answered.

Syntax:

Test Command:	AT+CHLD=?
Test Response:	+CHLD: (list of supported <n>s)
	OK
Write Command:	AT+CHLD=[<n>]
Write Response:	OK
	ERROR
	+CME ERROR: <err>

Parameter Descriptions:

<n>

0   Release all held calls or set User Determined User Busy (UDUB) 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 becomes active.

1X   Terminate a specific 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 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 becomes active.

2X   Place all active calls except call X (X= 1-7) on hold. Parameter X is the call 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 in order to set up a conference (multiparty) call.

4   Connects the two calls of a multiparty call and disconnects the subscriber from both calls (ECT).

Notes:
- The AT+CHLD command offers a broad range of options according to the GSM specifications. However, 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.).
- In conflict 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.
- See also the AT+CCWA command for details on how to display waiting calls.

Example

at+cpin="9999"	
OK	
+CREG: 2	
+CREG: 1,"0145","0016"	The mobile is now registered.
at+ccwa=1,1,1	You activate the indication of waiting calls during voice calls.
OK	
atd"1234567";	You make a voice call.
OK	
+CCWA: "+491791292364",145,32,,0	You receive a URC indicating a waiting data call.
at+chld=2	You put the voice call on hold.
OK	
RING	You now receive the RING of the data call.
RING	
RING	
ATA	You accept the data call.
OK	
CONNECT 9600/RLP	The data connection is set up.
hello	
+++	With "+++" you go in command mode.
OK	
at+clcc	You interrogate the status of all established calls.
+CLCC: 1,0,1,0,0,"03038639268",129	
+CLCC: 2,1,0,1,0,"+491791292364",145	
OK	
at+chld=1 T	he active data call is terminated and the held voice call becomes active.
OK	
at+clcc	
+CLCC: 1,0,0,0,0,"03038639268",129	
OK	

9.8 AT+CLIP Calling Line Identification Presentation

Description: 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.

The **write 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.

The **read command** gives the status of <n>, and also triggers an interrogation of the provision status of the CLIP service according GSM 02.81 (given in <m>).

Syntax:

Test Command:	AT+CLIP=?
Test Response:	+CLIP: (list of supported<n>s)
	OK
	ERROR
	+CME ERROR: <err>
Read Command:	AT+CLIP?
Read Response:	+CLIP: <n>, <m>
	OK
	ERROR
	+CME ERROR: <err>
Write Command:	AT+CLIP=<n>
Write Response:	OK
	ERROR
	+CME ERROR: <err>

Parameter Descriptions:

<n>

0	Default. Suppress unsolicited result codes.
1	Display unsolicited result codes

<m>

0	CLIP not provisioned
1	CLIP provisioned
2	unknown

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

<type>
type of address octet in integer format; 145 when dialing string includes international access code character "+", otherwise 129.
TA shall return the recommended value 128 for <type> (TON/NPI unknown in accordance with GSM 04.08 subclause 10.5.4.7).

<alpha>
string type alphanumeric representation of <number> corresponding to the entry found in phonebook; used character set is the one selected with AT+CSCS

<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 be "145". 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 GSM 02.81 and GSM 03.81), <number> and <type> are provided. Otherwise, TA shall return the same setting for <number> and <type> as if the CLI were not available.

Unsolicited Result Codes:
+CLIP: <number>, <type>, , [, <alpha>] [, <CLI validity>]
When CLIP is enabled at the TE (and is permitted by the calling subscriber), this URC is delivered after every "RING" or "+CRING" URC when a mobile terminated call occurs. For data calls, the URC is delivered only once.

Note:
For alphanumeric representation the number stored in the phonebook must be identical to the number transported via the network - then the associated name will be recognized.

9.9 AT+CLIR   Calling Line Identification Restriction

Description: The AT+CLIR command refers to the GSM supplementary service CLIR (Calling Line Identification Restriction). 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.

Syntax:

Test Command:	AT+CLIR=?
Test Response:	+CLIR: (list of supported <n>s)
	OK
Read Command:	AT+CLIR?
Read Response:	+CLIR<n>, <m>
	OK
	ERROR
	+CME ERROR: <err>
Write Command:	AT+CLIR=[<n>]
Write Response:	+CLIR: <n>, <m>
	OK
	ERROR
	+CME ERROR: <err>

Parameter Descriptions:

<n> Parameter shows the settings for outgoing calls:
0	Default. Presentation indicator is used according to the subscription of the CLIR service.
1	CLIR invocation
2	CLIR suppression

<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

9.10 AT+COLP   Connected Line Identification Presentation

Description: This command refers to the GSM supplementary service COLP that enables a calling subscriber to get the connected line identity (COL) of the called party after setting up a mobile originated call. The command enables/disables the presentation of the COL at the TE. It has no effect on the execution of the supplementary service COLR in the network.

Syntax:

Test Command:	AT+COLP=?
Test Response:	+COLP:(list of supported <n>s)
	OK
Read Command:	AT+COLP?
Read Response:	+COLP: <n>, <m>
	OK
	ERROR
	+CME ERROR: <err>
Write Command:	AT+COLP=[<n>]
Write Response:	OK
	ERROR
	+CME ERROR: <err>

Parameter Descriptions:

<n>
0	Disable - suppress unsolicited result codes
1	Enable - display unsolicited result codes

<m>

0	COLP not provisioned (no presentation)
1	COLP provisioned
2	Unknown

<number>

String type phone number of connected 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.

<sub-number>

String type phone number of sub address in format specified by <sub-type>.

<sub-type>

Type of sub-address octect

145	international access code character '+'
129	otherwise

<alpha>

String type alphanumeric representation of <number> corresponding to the entry found in phonebook; used character set is the one selected with AT+CSCS.

Unsolicited Result Code:

Call response format:
+COLP: <number>, <type>[, <sub-number>][, <sub-type>][, <alpha>]

Note:

For alphanumeric representation the number stored in the phonebook must be identical to the number transported over the network - then the associated name will be recognized.

9.11 AT+CPUC Price Per Unit and Currency Table

Description:	The **read command** returns the current parameters of PUC.
	The **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.

Syntax:

Test Command:	AT+CPUC=?
Test Response:	OK
Read Command:	AT+CPUC?
Read Response:	+CPUC: <currency>, <ppu>
	OK
	ERROR
	+CME ERROR: <err>
Write Command:	AT+CPUC=<currency>, <ppu>[, <passwd>]
Write Response:	OK
	ERROR
	+CME ERROR: <err>

Parameter Descriptions:

<currency>

Three-character currency code (e.g., "GBP", "EUR"). 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>

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>

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.

9.12 AT+CSSN Supplementary Service Notifications

Description: The **write command** enables or disables the presentation of URCs for supplementary services.

Syntax:

Test Command:	AT+CSSN=?
Test Response:	+CSSN: (list of supported<n>s), (list of supported<m>s)
	OK
Read Command:	AT+CSSN?
Read Response:	+CSSN: <n>, <m>
	OK
Write Command:	AT+CSSN=<n>[, <m>]
Write Response:	OK
	ERROR
	+CME ERROR: <err>

Parameter Descriptions:

<n>

0	Suppress "+CSSI" URCs. Default.
1	Activate "+CSSI" URCs

<m>

0	Suppress "+CSSU" URCs. Default.
1	Activate "+CSSU" URCs

<code 1>

0	unconditional call forwarding is active
1	some of the conditional call forwarding is active
2	call has been forwarded
3	Waiting call is pending
5	Outgoing calls are barred

<code 2>

0	The incoming call is a forwarded call
5	Held call was terminated
10	Unconditional call forwarding is active

Unsolicited Result Codes:

URC 1

+CSSI: <code 1>

When <n>=1 and a supplementary service notification is received after a mobile originated call setup, intermediate result code "+CSSI: <code 1>" is sent to TE before any other MO call setup result codes.

URC 2

+CSSU: <code 2>

When <m>=1 and a supplementary service notification is received during a mobile terminated call setup or during a call, unsolicited result code "+CSSU: <code 2>" is sent to TE.

Note:

Some URCs will be displayed for data calls (like "+CSSU"=0).

9.13 AT+CUSD   Unstructured Supplementary Service Data

Description: This command allows control of the Unstructured Supplementary Service Data (USSD). 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_urc>[<dcs>]]" to the TE.

When parameter <str_write> 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 result code "+CUSD"

Syntax:

Test Command:	AT+CUSD=?
Test Response:	+CUSD: (list of supported<n>s)
	OK
Read Command:	AT+CUSD?
Read Response:	+CUSD: <n>
	OK
Write Command:	AT+CUSD=<n>[, <str_write>[, <dcs>]]
Write Response:	OK
	ERROR
	+CME ERROR: <err>

Parameter Descriptions:

<n>
0	Default. 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_write>   String type USSD-string (when <str_write> parameter is not given, network is not interrogated). For the write command, only <dcs>= 15 is supported.

<str_urc>   String type USSD-string .
If <dcs> indicates that GSM 03.38 default alphabet is used TA converts GSM alphabet into current TE character set according to rules of GSM 07.05 Annex A. Otherwise in case of invalid or omitted <dcs> conversion of <str_urc> is not possible.

<dcs>   GSM 03.38 Cell Broadcast Data Coding Scheme in integer format (default 15). In case of an invalid or omitted <dcs> from the network side (MT), <dcs> will not be given out.

<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). If <m>=1, then the URC ends with ">" to prompt the user for input. The user action is finished with **<CTRL-Z>** or aborted with **<ESC>**.
2	USSD terminated by network.
3	Other local client has responded. This means the interface was not idle and a busy signal was sent to the network already.
4	Operation not supported.
5	Network time out.

Unsolicited Result Code:

+CUSD: <m>[<str>[<dcs>]]
URC "+CUSD" indicates an USSD response from the network, or network initiated operation.

Notes:
- When a USSD string is sent via ATD, a "AT+CUSD=1" is executed implicitly.
- It is recommended to finalize or escape a pending USSD user interaction before further actions are done to prevent blocking situations.

Chapter 10 – GPRS Commands

This chapter describes AT Commands that a TE (Terminal Equipment; e.g., an application running on a controlling PC) may use to control the Multi-Tech wireless modem acting as GPRS Mobile Termination (MT).

10.1 AT+CGATT PS Attach or Detach

Description:
The execution command is used to attach the MT to, or detach the MT from, the Packet Domain service. After the command has completed, the MT remains in V.25ter command state. If the MT is already in the requested state, the command is ignored and the OK response is returned. If the requested state cannot be achieved, an ERROR or +CME ERROR response is returned.
Any active PDP contexts will be automatically deactivated when the attachment state changes to detached.
The **read command** returns the current Packet Domain service state.
The **test command** is used for requesting information on the supported Packet Domain service states.

Syntax:

Test Command: AT+CGATT=?
Test Response: +CGATT: (list of supported <state>s)
OK

Read Command: AT+CGATT?
Read Response: +CGATT: <state>
OK

Write Command: AT+CGATT=[<state>]
Write Response: OK
ERROR
+CME ERROR: <err>

Parameter Descriptions:
<state>
Indicates the state of PS attachment.
0   Detached
1   Default. Attached

Note:
If the currently used access technology is GSM and an CS call is in progress, then the write command returns "+CME ERROR: GPRS services not allowed".

10.2 AT+CGACT   PDP Context Activate or Deactivate

Description: The **test command** is used for requesting information on the supported PDP context activation states.
The **read command** returns the current activation states for all the defined PDP contexts.
The **write command** is used to activate or deactivate the specified PDP context(s). After the command has completed, the MT remains in V.250 command state. If any PDP context is already in the requested state, the state for that context remains unchanged. If the 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.

Syntax:

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

Parameter Descriptions:

<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 used in other PDP context related commands.
1...16

Note:
A maximum of 3 contexts can be activated at the same time, no matter on which interface. Trying to activate more than 3 contexts will cause "+CME ERROR: operation temporary not allowed". Note that, depending on the provider, the number of activated contexts may be further restricted.
Remember that contexts may be activated implicitly by using the ATD*99# GPRS compatibility command without specifying a <cid>.

10.3 AT+CGDATA   Enter Data State

Description: The **test command** is used for requesting information on the supported layer 2 protocols to be used between the TE and MT.

The **write command** causes the MT to perform all actions which are necessary to establish communication between the TE and the network using one or more GPRS PDP types. This may include performing a GPRS attach and one or more PDP context activations. Commands following the AT+CGDATA command in the AT command line will not be processed by the MT.

If the write command is successful, the MT issues the intermediate result code CONNECT and enters V.250 online data state.

The application that initiates the PPP mode must be designed to start all LCP configure requests in accordance with TS 27.060 par 9.1. Otherwise the MT remains, after the CONNECT, infinitely in a waiting state.

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

If the <L2P> parameter value is unacceptable to the MT, the MT returns ERROR or +CME ERROR.

In the event of erroneous termination or a failure to start up, the command state is reentered and the MT returns NO CARRIER, or if enabled +CME ERROR.

Syntax:

Test Command: AT+CGDATA=?
Test Response: +CGDATA: (list of supported <L2P>s)
OK

Write Command: AT+CGDATA=[<L2P>[, <cid>]]
Write Response: CONNECT
NO CARRIER
ERROR
+CME ERROR: <err>

Parameter Descriptions:

<L2P>
Layer 2 protocol to be used between the TE and MT.
"PPP"   Default. 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.
Secondary PDP contexts are not supported.
If parameter is not specified, then the first defined primary context is used.
1...16

10.3.1 Automatic Deactivation of PDP Context During Dial-up PPP

When using the AT+CGDATA write command or ATD*99#, the MT issues the intermediate result code CONNECT and enters V.250ter online data state. In V.250 online data state, first some LCP protocol exchange between MT and TE is performed to set up the PPP link. After successfully establishing the PPP link, the MT performs the PDP context activation procedure if the context is not already activated. As a result, the MT is in a "PDP context activated" state within the PLMN, the PPP link is established on the mobile side and the mobile is ready for IP data transfer.

If the TE wants to close the LCP link the MT may perform an LCP termination request procedure on PPP level.

After this LCP termination procedure the MT deactivates the PDP context automatically and the MT returns to V.250 command mode and issues the final result code NO CARRIER.

If DTR is configured to disconnect data connections (AT&D2), then the application should not toggle DTR during the implicit PDP context deactivation and before "NO CARRIER" is received.

10.4 AT+CGDCONT Define PDP Context

Description: The **test command** returns supported values as a compound value.
The **read command** returns the current settings for each defined PDP context.
The **write command** specifies the parameters for a PDP context identified by the context identifier
<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 write command (AT+CGDCONT=<cid>)
causes the values for context <cid> to become undefined.

Syntax:

Test Command: AT+CGDCONT=?
Test Response: +CGDCONT: (range of supported<cid>s), <PDP_type>, , , (list of supported <d_comp>s), (list of
supported<h_comp>s)
OK
ERROR
+CME ERROR: <err>

Read Command: AT+CGDCONT?
Read Response: +CGDCONT: [<cid>, <PDP_type>, <APN>, <PDP_addr>, <d_comp>, <h_comp>]
[+CGDCONT: <cid>, <PDP_type>, <APN>, <PDP_addr>, <d_comp>, <h_comp>]
[+CGDCONT: ...]
OK
ERROR
+CME ERROR: <err>

Write Command: AT+CGDCONT=<cid>[, <PDP_type>[, <APN>[, <PDP_addr>[, <d_comp>[, <h_comp>]]]]]
Write Response: OK
ERROR
+CME ERROR: <err>

Parameter Descriptions:

<cid>
PDP Context Identifier
Parameter specifies a particular PDP context definition. The parameter is used in other PDP context-related
commands.
1...16

<PDP_type>
Packet Data Protocol Type
Specifies the type of the packet data protocol.
"IP" Internet Protocol (IETF STD 5)

<APN>
Access Point Name
The 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
Identifies the MT in the address space applicable to 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.

<d_comp>
Data Compression
Controls the PDP data compression (applicable for Sub network Dependent Convergence Protocol (SNDCP) only)
3GPP TS 44.065
0   off

<h_comp>
Header Compression
Controls the PDP header compression 3GPP TS 44.065, 3GPP TS 25.323
0   off (Default)
1   on

Note:
All context definitions will be stored in the non volatile memory.

10.5 AT+CGPADDR   Show PDP Address

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

The **exec command** returns a list of PDP addresses for all defined GPRS contexts.

The **write command** returns a list of PDP addresses for the specified context identifiers. If a context is not defined, then no output line is generated for it.

Syntax:

Test Command: AT+CGPADDR=?
Test Response: [+CGPADDR: (list of defined <cid>s)]
OK

Exec. Command: AT+CGPADDR
Exec. Response: [+CGPADDR: <cid>, <PDP_address>]
[+CGPADDR: ...]
OK
ERROR
+CME ERROR: <err>

Write Command: AT+CGPADDR=<cid>[,<cid>[, …]]
Write Response: [+CGPADDR: <cid>, <PDP_address>]
OK
ERROR
+CME ERROR: <err>

Parameter Descriptions:

<cid>
A numeric parameter which specifies a particular PDP context definition (see AT+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.

10.6 AT+CGQMIN Quality of Service Profile (Minimum Acceptable)

Description:

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.

The **read command** returns the current settings for each defined context for which a QOS was explicitly specified.

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 set command specifies a profile for the context identified by the (local) context identification parameter, <cid>.

A special form of the set command, AT+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.

Syntax:

Test Command: AT+CGQMIN=?
Test 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: <err>

Read Command: AT+CGQMIN?
Read Response: +CGQMIN: [<cid>, <precedence>, <delay>, <reliability>, <peak>, <mean>]
[+CGQMIN: <cid>, <precedence>, <delay>, <reliability>, <peak>, <mean>]
[+CGQMIN : ...]
OK
ERROR
+CME ERROR: <err>

Write Command: AT+CGQMIN=<cid>[, <precedence>[, <delay>[, <reliability>[, <peak>[, <mean>]]]]]
Write Response: OK
ERROR
+CME ERROR: <err>

Parameter Descriptions:

<cid>
Parameter specifies a particular PDP context definition. The parameter is used in other PDP context-related commands.
1...16

<precedence>
Precedence class
0   Default. 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
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. Default.
1..4   SDU size: 128 octets and
              SDU size: 1024 octets:

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

<reliability>
Reliability class
0	Network subscribed value. Default.
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 (in octets per second).
0	network subscribed value. Default
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 (1024 kbit/s).
9	Up to 256 000 (2048 kbit/s).

<mean>
Mean throughput class(in octets per hour).
0	Network subscribed value. Default.
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

<PDP_type>
Packet Data Protocol Type
"IP"   Internet Protocol (IETF STD 5)

Notes:
- Definitions of parameters can be found in 3GPP 23.107.
- All QOS settings will be stored non volatile.

10.7 AT+CGEQMIN 3G Quality of Service Profile (Minimum Acceptable)

Description: The **test command** returns values supported as a compound value.

The **read command** returns the current settings for each defined context for which a QOS was explicitly specified.

The **write command** allows the TE to specify a Quality of Service Profile for the context identified by the (local) context identification parameter <cid> which is checked by the MT against the negotiated profile returned in the Activate/Modify PDP Context Accept message. A special form of the write command, AT+CGEQMIN=<cid> causes the requested profile for context number <cid> to become undefined.

Syntax:

Test Command: AT+CGEQMIN=?
Test Response: +CGEQMIN: <PDP_type>, (list of supported <Traffic class>s), (list of supported <Maximum bitrate UL>s), (list of supported <Maximum bitrate DL>s), (list of supported <Guaranteed bitrate UL>s), (list of supported <Guaranteed bitrate DL>s), (list of supported <Delivery order>s), (list of supported <Maximum SDU size>s), (list of supported <SDU error ratio>s), (list of supported <Residual bit error ratio>s), (list of supported <Delivery of erroneous SDUs>s), (list of supported <Transfer delay>s), (list of supported <Traffic handling priority>s)
OK

Read Command   AT+CGEQMIN?
Read Response: +CGEQMIN: [<cid>, <Traffic class>, <Maximum bitrate UL>, <Maximum bitrate DL>, <Guaranteed bitrate UL>, <Guaranteed bitrate DL>, <Delivery order>, <Maximum SDU size>, <SDU error ratio>, <Residual bit error ratio>, <Delivery of erroneous SDUs>, <Transfer delay>, <Traffic handling priority>]
[+CGEQMIN: <cid>, <Traffic class>, <Maximum bitrate UL>, <Maximum bitrate DL>, <Guaranteed bitrate UL>, <Guaranteed bitrate DL>, <Delivery order>, <Maximum SDU size>, <SDU error ratio>, <Residual bit error ratio>, <Delivery of erroneous SDUs>, <Transfer delay>, <Traffic handling priority>]
[+CGEQMIN: ...]

Write Command: AT+CGEQMIN=<cid>[, <Traffic class>[, <Maximum bitrate UL>[, <Maximum bitrate DL>[, <Guaranteed bitrate UL>[, <Guaranteed bitrate DL>[, <Delivery order>[, <Maximum SDU size>[, <SDU error ratio>[, <Residual bit error ratio>[, <Delivery of erroneous SDUs>[, <Transfer delay>[, <Traffic handling priority>]]]]]]]]]]]]
Write Response: OK
ERROR
+CME ERROR <err>

Parameter Descriptions:

<cid>
Parameter specifies a particular PDP context definition. The parameter is used in other PDP context-related commands.
1...16

<Traffic class>
0	conversational
1	streaming
2	interactive
3	background
4	Default. subscribed value.

<Maximum bitrate UL>
This parameter indicates the maximum number of kbits/s delivered to UMTS (up-link traffic) at a SAP. As an example a bitrate of 32kbit/s would be specified as 32 (e.g., AT+CGEQMIN=...,32,...).
0	Default. subscribed value.
1...512	

<Maximum bitrate DL>
This parameter indicates the maximum number of kbits/s delivered by UMTS (down-link traffic) at a SAP. As an example a bitrate of 32kbit/s would be specified as 32 (e.g., AT+CGEQMIN=...,32,...).
0	Default. subscribed value.
1...16000	

<Guaranteed bitrate UL>
This parameter indicates the guaranteed number of kbits/s delivered to UMTS (up-link traffic) at a SAP (provided that there is data to deliver). As an example a bitrate of 32kbit/s would be specified as 32 (e.g., AT+CGEQMIN=...,32,...).

0	Default. subscribed value.
1...512	

<Guaranteed bitrate DL>
This parameter indicates the guaranteed number of kbits/s delivered by UMTS (down-link traffic) at a SAP (provided that there is data to deliver). As an example a bitrate of 32kbit/s would be specified as 32 (e.g., AT+CGEQMIN=...,32,...).

0	Default. subscribed value
1...16000	

<Delivery order>
This parameter indicates whether the UMTS bearer shall provide in-sequence SDU delivery or not.

0	no
1	yes
2	Default. subscribed value.

<Maximum SDU size>
This parameter indicates the maximum allowed SDU size in octets.

0	Default. subscribed value.
10...1520	(value needs to be divisible by 10 without remainder)

<SDU error ratio>
This parameter indicates the target value for the fraction of SDUs lost or detected as erroneous. SDU error ratio is defined only for conforming traffic. The value is specified as "mEe". As an example a target SDU error ratio of $5*10^{-3}$ would be specified as "5E3" (e.g., AT+CGEQMIN=...,"5E3",...).

"0E0"	Default. subscribed value.
"1E2"	
"7E3"	
"1E3"	
"1E4"	
"1E5"	
"1E6"	
"1E1"	

<Residual bit error ratio>
This parameter indicates the target value for the undetected bit error ratio in the delivered SDUs. If no error detection is requested, Residual bit error ratio indicates the bit error ratio in the delivered SDUs. The value is specified as "mEe". As an example a target residual bit error ratio of 5*10-3 would be specified as "5E3" (e.g., AT+CGEQMIN=...,"5E3",...).

"0E0"	Default. subscribed value.
"5E2"	
"1E2"	
"5E3"	
"4E3"	
"1E3"	
"1E4"	
"1E5"	
"1E6"	
"6E8"	

<Delivery of erroneous SDUs>
This parameter indicates whether SDUs detected as erroneous shall be delivered or not.

0	no
1	yes
2	no detect
3	Default. subscribed value.

<Transfer delay>
This parameter indicates the targeted time between request to transfer an SDU at one SAP to its delivery at the other SAP, in milliseconds.

0	Default. subscribed value.
10...150	(value needs to be divisible by 10 without remainder)
200...950	(value needs to be divisible by 50 without remainder)
1000...4000	(value needs to be divisible by 100 without remainder)

<Traffic handling priority>
This parameter specifies the relative importance for handling of all SDUs belonging to the UMTS bearer compared to the SDUs of the other bearers.
0   Default. subscribed
1
2
3

<PDP_type>
Packet Data Protocol Type
"IP"   Internet Protocol (IETF STD 5)

Notes:
- Definitions of parameters can be found in 3GPP TS 23.107
- All QOS settings will be stored non volatile.

10.8 AT+CGREG   GPRS Network Registration Status

Description: AT+CGREG **write command** enables presentation of URC "+CGREG: <stat>" when <n>=1 and ME's GPRS network registration status changes.

AT+CGREG **read command** queries the current URC presentation status <n> and an integer <stat> which shows whether the network has currently indicated the registration of the ME.

Syntax:

Test Command: AT+CGREG=?
Test Response: +CGREG: (list of supported <n>s)
OK

Read Command: AT+CGREG?
Read Response: +CGREG: <n>, <stat>
OK

Write Command: AT+CGREG=[n]
Write Response: OK
ERROR
+CME ERROR: <err>

Parameter Descriptions:

<n>
0   Default. Disable network registration unsolicited result code
1   Enable network registration unsolicited result code "+CGREG: <stat>"

<stat>
0   Not registered; ME is not currently searching an operator to register to. The ME is in GMM state GMM-NULL or GMM-DEREGISTERED-INITIATED.
The GPRS service is disabled; the ME is allowed to attach to GPRS if requested by the user.
1   Registered; home network. The ME 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 ME is in GMM state GMM-DEREGISTERED or GMM-REGISTERED-INITIATED. The GPRS service is enabled, but an allowable PLMN is currently not available. The ME will start a GPRS attach as soon as an allowable PLMN is available.
3   Registration denied. The ME is in GMM state GMM-NULL. The GPRS service is disabled, the ME is not allowed to attach to GPRS if requested by the user.
4   Unknown
5   Registered; roaming. The ME is in GMM state GMM-REGISTERED or GMMROUTING-AREA-UPDATING-INITIATED on a visited PLMN.

Unsolicited Result Code:

+CGREG: <stat>
Indicates a change in the ME's GPRS network registration status.

10.9 AT+CGQREQ   Quality of Service Profile (Requested)

Description: 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.

The **read command** returns the current settings for each defined context for which a QOS was explicitly specified.

This command allows the TE to specify a Quality of Service Profile that is used when the MT sends an Activate PDP Context Request message to the network.

The set command specifies a profile for the context identified by the (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.

Syntax:

Test Command: AT+CGQREQ=?
Test 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

Read Command: AT+CGQREQ?
Read Response: +CGQREQ: [<cid>, <precedence>, <delay>, <reliability>, <peak>, <mean>]
[+CGQREQ: <cid>, <precedence>, <delay>, <reliability>, <peak>, <mean>]
[+CGQREQ: ...]

Write Command: AT+CGQREQ=<cid>[, <precedence>[, <delay>[, <reliability>[, <peak>[, <mean>]]]]]
Write Response: OK
ERROR
+CME ERROR <err>

Parameter Descriptions:

<cid>
Parameter specifies a particular PDP context definition. The parameter is also used in other PDP context-related commands.
1...16

<precedence>
Precedence class
0   Default. 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
This parameter defines the end-to-end transfer delay incurred in the transmission of SDUs through the GPRS network(s).
0   Default. Network subscribed value.
1..4   with SDU size = 128 octets and
with SDU size = 1024 octets:

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

<reliability>
Reliability class
0   Default. 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 in octets per second

0	Default. network subscribed value.
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 (1024 kbit/s)
9	Up to 256 000 (2048 kbit/s)

\<mean\>
Mean throughput class in octets per hour

0	Network subscribed value. Default.
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

\<PDP_type\>(str)
Packet Data Protocol type

"IP"	Internet Protocol (IETF STD 5)

Notes

- Definitions of parameters can be found in 3GPP 23.107.
- All QOS settings will be stored non volatile.

10.10   AT+CGEQREQ   3G Quality of Service Profile (Requested)

Description:
The **test command** returns values supported as a compound value.

The **read command** returns the current settings for each defined context for which QOS was explicitly specified.

The **write command** allows the TE to specify a Quality of Service Profile for the context identified by the (local) context identification parameter <cid> which is used when the MT sends an Activate PDP Context Request message to the network.

A special form of the write command, AT+CGEQREQ=<cid> causes the requested profile for context number <cid> to become undefined.

Syntax:

Test Command: AT+CGEQREQ=?
Test Response: +CGEQREQ : <PDP_type>, (list of supported <Traffic class>s), (list of supported <Maximum bitrate UL>s), (list of supported <Maximum bitrate DL>s), (list of supported <Guaranteed bitrate UL>s), (list of supported <Guaranteed bitrate DL>s), (list of supported <Delivery order>s), (list of supported <Maximum SDU size>s), (list of supported <SDU error ratio>s), (list of supported <Residual bit error ratio>s), (list of supported <Delivery of erroneous SDUs>s), (list of supported <Transfer delay>s), (list of supported <Traffic handling priority>s)
OK

Read Command: AT+CGEQREQ?
Read Response: +CGEQREQ: [<cid>, <Traffic class>, <Maximum bitrate UL>, <Maximum bitrate DL>, <Guaranteed bitrate UL>, <Guaranteed bitrate DL>, <Delivery order>, <Maximum SDU size>, <SDU error ratio>, <Residual bit error ratio>, <Delivery of erroneous SDUs>, <Transfer delay>, <Traffic handling priority>]
[+CGEQREQ: <cid>, <Traffic class>, <Maximum bitrate UL>, <Maximum bitrate DL>, <Guaranteed bitrate UL>, <Guaranteed bitrate DL>, <Delivery order>, <Maximum SDU size>, <SDU error ratio>, <Residual bit error ratio>, <Delivery of erroneous SDUs>, <Transfer delay>, <Traffic handling priority>]
[+CGEQREQ: ...]

Write Command: AT+CGEQREQ=<cid>[, <Traffic class>[, <Maximum bitrate UL>[, <Maximum bitrate DL>[, <Guaranteed bitrate UL>[, <Guaranteed bitrate DL>[, <Delivery order>[, <Maximum SDU size>[, <SDU error ratio>[, <Residual bit error ratio>[, <Delivery of erroneous SDUs>[, <Transfer delay>[, <Traffic handling priority>]]]]]]]]]]]]
Write Response: OK
ERROR
+CME ERROR: <err>

Parameter Descriptions:

<cid>
Parameter specifies a particular PDP context definition. The parameter is used in other PDP context-related commands.
1...16

<Traffic class>

0	conversational
1	streaming
2	interactive
3	background
4	Default. subscribed value.

<Maximum bitrate UL>
This parameter indicates the maximum number of kbits/s delivered to UMTS (up-link traffic) at a SAP. As an example a bitrate of 32kbit/s would be specified as 32 (e.g. AT+CGEQREQ=...,32,...).

0	Default. subscribed value.
1...512	

<Maximum bitrate DL>
This parameter indicates the maximum number of kbits/s delivered by UMTS (down-link traffic) at a SAP. As an example a bitrate of 32kbit/s would be specified as 32 (e.g. AT+CGEQREQ=...,32,...).

0	Default. subscribed value.
1…1600	

<Guaranteed bitrate UL>
This parameter indicates the guaranteed number of kbits/s delivered to UMTS (up-link traffic) at a SAP (provided that there is data to deliver). As an example a bitrate of 32kbit/s would be specified as 32 (e.g., AT+CGEQREQ=...,32,...).
0   Default. subscribed value.
1...512

<Guaranteed bitrate DL>
This parameter indicates the guaranteed number of kbits/s delivered by UMTS (down-link traffic) at a SAP (provided that there is data to deliver). As an example a bitrate of 32kbit/s would be specified as 32 (e.g., AT+CGEQREQ=...,32,...).
0   Default. subscribed value.
1...16000

<Delivery order>
This parameter indicates whether the UMTS bearer shall provide in-sequence SDU delivery or not.
0   no
1   yes
2   Default. subscribed value.

<Maximum SDU size>
This parameter indicates the maximum allowed SDU size in octets.
0   Default. subscribed value.
10...1520   (value needs to be divisible by 10 without remainder)

<SDU error ratio>
This parameter indicates the target value for the fraction of SDUs lost or detected as erroneous. SDU error ratio is defined only for conforming traffic. The value is specified as "mEe". As an example a target SDU error ratio of $5*10^{-3}$ would be specified as "5E3" (e.g., AT+CGEQREQ=...,"5E3",...).
"0E0"   subscribed value. Default
"1E2"
"7E3"
"1E3"
"1E4"
"1E5"
"1E6"
"1E1"

<Residual bit error ratio>
This parameter indicates the target value for the undetected bit error ratio in the delivered SDUs. If no error detection is requested, Residual bit error ratio indicates the bit error ratio in the delivered SDUs. The value is specified as "mEe". As an example a target residual bit error ratio of 5*10-3 would be specified as "5E3" (e.g., AT+CGEQREQ=...,"5E3",...).
"0E0"   subscribed value. Default
"5E2"
"1E2"
"5E3"
"4E3"
"1E3"
"1E4"
"1E5"
"1E6"
"6E8"

<Delivery of erroneous SDUs>
This parameter indicates whether SDUs detected as erroneous shall be delivered or not.
0   no
1   yes
2   no detect
3   subscribed value. Default

<Transfer delay>
This parameter indicates the targeted time between request to transfer an SDU at one SAP to its delivery at the other SAP, in milliseconds.
0   Default. subscribed value.
10...150   (value needs to be divisible by 10 without remainder)
200...950   (value needs to be divisible by 50 without remainder)
1000...4000   (value needs to be divisible by 100 without remainder)

<Traffic handling priority>
This parameter specifies the relative importance for handling of all SDUs belonging to the UMTS bearer compared to the SDUs of the other bearers.
0   subscribed. Default
1
2
3

<PDP_type>
Packet Data Protocol Type
"IP"   Internet Protocol (IETF STD 5)

Notes:

- Definitions of parameters can be found in 3GPP 23.107.
- All QOS settings will be stored non volatile.

10.11   AT+CGSMS   Select Service for MO SMS Messages

Description: The **test command** is used for requesting information on which services and service preferences can be set by using the AT+CGSMS write command.
The **read command** returns the currently selected service or service preference.
The **write command** is used to specify the service or service preference that the MT will use to send MO SMS messages. If parameter <service> is not given, the current value remains unchanged.

Syntax:

Test Command:	AT+CGSMS=?
Test Response:	+CGSMS: (list of supported <service>s)
	OK
Read Command:	AT+CGSMS?
Read Response:	+CGSMS: <service>
	OK
Write Command:	AT+CGSMS=<service>
Write Response:	OK
	ERROR
	+CME ERROR: <err>

Parameter Descriptions:

<service>
A numeric parameter which indicates the service or service preference to be used. The parameter is global for all interfaces and is volatile.
0   GPRS
1   Circuit switched
2   Default. GPRS preferred (use circuit-switched SMS transfer if mobile is not GPRS attached).
3   Circuit switched preferred (use GPRS if circuit switched is not available).

10.12 ATD*99# Request GPRS Service

Description: This command causes the MT to perform whatever actions are necessary to establish communication between the TE and the external PDN.

The V.250 'D' (Dial) command causes the MT to enter the V.250 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 already been performed using the AT+CGATT and AT+CGACT commands.

To confirm acceptance of the command before entering the V.250 online data state command will respond with CONNECT.

The application that initiates the PPP mode must be designed to start all LCP configure requests in accordance with TS 27.060 par 9.1. Otherwise the MT remains, after the CONNECT, infinitely in a waiting state.

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.250 command state and returns NO CARRIER. For details refer to Section 10.3.1, Automatic deactivation of PDP context during dial-up PPP.

Syntax:
Exec. Command: ATD*99[* [<called_address>][* [<L2P>][* [<cid>]]]]#
Exec. Response: CONNECT
                                        NO CARRIER

Parameter Descriptions:
<called_address>
To confirm acceptance of the command before entering the V.250 online data state command will respond with CONNECT.

<L2P>
Layer 2 protocol to be used between the TE and MT.
"PPP"   Layer 2 protocol PPP
"1"   Layer 2 protocol PPP

<cid>
Parameter specifies a particular PDP context definition (see AT+CGDCONT).
Secondary PDP contexts are not supported.
1...16 Default=1.

10.13 AT^SGAUTH   Set Type of Authentication for PDP-IP Connections

Syntax:

Test Command:	AT^SGAUTH=?
Test Response:	^SGAUTH:(range of supported<cid>s), (list of supported <auth_type>s), ,
	OK
	ERROR
	+CME ERROR: <err>
Read Command:	AT^SGAUTH?
Read Response:	^SGAUTH:(range of supported<cid>s), (list of supported <auth_type>s), ,
	OK
	ERROR
	+CME ERROR: <err>
Write Command:	AT^SGAUTH=<cid>[, <auth_type>[, <passwd>[, <user>]]]
Write Response:	OK
	ERROR
	+CME ERROR

Parameter Descriptions:

<cid>
Parameter specifies a particular PDP context definition. This is also used in other PDP context-related commands.
1...16

<auth-type>
Indicates the types of authentication to be used for the specified context. If CHAP is selected another parameter <passwd> needs to be specified. If PAP is selected two additional parameters <passwd> and <user> need to specified.
0   Default. none
1   PAP
2   CHAP

<passwd>
Parameter specifies the password used for authentication. It is required for the authentication types PAP and CHAP.

<user>
Parameter specifies the user name used for authentication. It is required for the authentication type PAP.

Note:
All settings will be stored the non-volatile memory.

Chapter 11 – Short Message Service (SMS) Commands

The AT Commands described in this chapter allow an external application to use the Short Message Service with the Multi-Tech wireless modem.

11.1 SMS Parameters

Parameter Descriptions:

<ackpdu>
The format is the same for <pdu> in the case of SMSs, but without GSM 24.11 SC address field. The parameter shall be bounded by double quote characters like a normal string type parameter.

<alpha>
String type alphanumeric representation of <da> or <oa> corresponding to the entry found in phonebook; implementation of this feature is manufacturer specific. This feature is not supported.

<ct>
Command Type GSM 03.40 TP-Command-Type in integer format.
0...255. Default = 0.

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

<data>
User 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 TPUser-Data-Header-Indication is set, then the 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).

In case of CBS: GSM 03.41 CBM Content of Message in text mode responses; format:
- If <dcs> indicates that GSM 03.38 default alphabet is used: 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: ME/TA converts each 8-bit octet into hexadecimal numbers containing two IRA characters.

<dt>
Discharge Time
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"

<index>
Integer type; value in the range of location numbers supported by the associated memory. Indexing starts from 0.

<length>
Message Length
Integer type value indicating in PDU mode (AT+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).

<mem1>
Memory to be used when listing, reading and deleting messages:
"SM"   SIM message storage
"ME"   Mobile Equipment message storage
"MT"   Default. Sum of "SM" and "ME" storages.

<mem2>

Memory to be used when writing and sending messages:

"SM"   SIM message storage
"ME"   Mobile Equipment message storage
"MT"   Sum of "SM" and "ME" storages. Default.

<mem3>

Received messages will be placed in this memory storage if routing to TE is not set. See command AT+CNMI with parameter <mt>=2.

"SM"   SIM message storage
"ME"   Mobile Equipment message storage
"MT"   Sum of "SM" and "ME" storages. Default.

<mid>

Message Identifier
GSM 03.41 CBM Message Identifier in integer format.

<mn>

Message Number
GSM 03.40 TP-Message-Number in integer format.

<mr>

Message Reference
GSM 03.40 TP-Message-Reference in integer format.

<oa>

Originating Address
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>.

<page>

Page Parameter
GSM 03.41 CBM Page Parameter bits 4-7 in integer format.

<pages>

Page Parameter
GSM 03.41 CBM Page Parameter bits 0-3 in integer format.

<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 Address-Value field in string format; BCD numbers (or GSM default alphabet characters) are converted into characters; type of address given by <tora>.

<ra>

Recipient Address
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 to command AT+CSCS.); type of address given by <tora>.

<sca>

Service Center Address
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 to command AT+CSCS); type of address given by <tosca>.

<scts>

Service Center Time Stamp
GSM 03.40 TP-Service-Center-Time-Stamp in time-string format (refer <dt>)

<sn>

Serial Number
GSM 03.41 CBM Serial Number in integer format.

<st>

Status
GSM 03.40 TP-Status in integer format .
0...255

<stat>

Message status

3GPP 27.005 Interface of SMS and CB. Indicates the status of message in memory.

Description	text mode (<mode>=1)	PDU mode (<mode>=0)	Default
Received unread messages	"REC UNREAD"	0	for SMS reading commands
Received read messages	"REC READ"	1	
Stored unsent messages	"STO UNSENT"	2	for SMS writing commands
Stored sent messages	"STO SENT"	3	
All messages	"ALL"	4	

<toda>

Type of Destination Address

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).

0...255

<tooa>

Type of Originating Address

GSM 04.11 TP-Originating-Address Type-of-Address octet in integer format (default refer <toda>).

<tora>

Type of Recipient Address

GSM 04.11 TP-Recipient-Address Type-of-Address octet in integer format (default refer <toda>).

<tosca>

Type of Service Center Address

GSM 04.11 RP SC address Type-of-Address octet in integer format (default refer <toda>).

11.2 AT+CMGC   Send an SMS Command

Syntax:

Test Command:	AT+CMGC=?
Test Response:	OK
Write Command:	If text mode (see AT+CMGF=1)
	AT+CMGC=<fo>, <ct>[, <pid>[, <mn>[, <da>[, <toda>]]]]<CR> Text can be entered <CTRL-Z>/<ESC>
Write Response:	+CMGC: <mr>[, <scts>]
	If sending fails
	ERROR
	+CMS ERROR: <err>
Write Command:	If PDU mode (see AT+CMGF=0)
	AT+CMGC=<length><CR> PDU can be entered <CTRL-Z>/<ESC>
Write Response:	+CMGC: <mr>[, <ackpdu>]
	OK
	ERROR
	+CMS ERROR <err>

Note:

After invoking the commands AT+CMGW, AT+CMGS or AT+CMGC it is necessary to wait for the prompt ">" before entering text or PDU. After the prompt a timer will be started to observe the input.

11.3   AT+CMGD   Delete Short Message

Description: The **write command** deletes a short message from preferred message storage <mem1> location <index>.

Syntax:

Test Command:	AT+CMGD=?
Test Response:	OK
Write Command:	AT+CMGD=<index>
Write Response:	OK
	ERROR
	+CMS ERROR <err>

Notes:
- If there is no short message stored at the selected index, the response is OK too.
- Users should be aware that when using this AT command quickly after SIM PIN authentication, the SIM data may not yet be accessible.

11.4   AT+CMGF   Select SMS Message Format

Description: The write command specifies the input and output format of the short messages.

Syntax:

Test Command:	AT+CMGF=?
Test Response:	+CMGF: (list of supported<mode>s)
	OK
Read Command:	AT+CMGF?
Read Response:	+CMGF: <mode>
	OK
Write Command:	AT+CMGF=<mode>
Write Response:	OK

Parameter Description:

<mode>

0	Default. PDU mode.
1	Text mode

11.5 AT+CMGL   List SMS Messages from Preferred Store

Description: The **write command** returns messages with status value <stat> from message storage <mem1> to the TE. If the status of the message is 'received unread', the status in the storage changes to 'received read'.
The **execute command** is the same as the write command with the given default for <stat>.

Syntax:

Test Command: AT+CMGL=?
Test Response: +CMGL: (list of supported <stat>s)
OK

Exec. Command: AT+CMGL
Exec. Response: +CMGL: (see write command for default of <stat>)
OK

Write Command: AT+CMGL=<stat>
Write Response: **Output if text mode (AT+CMGF=1) and command successful:**
 For SMS- SUBMITs and/or SMS-DELIVERs
 +CMGL: <index>, <stat>, <oa>/<da>, [<alpha>], [<scts>][, <tooa>/<toda>, <length>]
 data>
 [...]
 OK
 For SMS-STATUS-REPORTs
 +CMGL: <index>, <stat>, <fo>, <mr>, [<ra>], [<tora>], <scts>, <dt>, <st>
 [...]
 OK
 For SMS-Commands
 +CMGL: <index>, <stat>, <fo>, <ct>
 [...]
 OK

 Output if PDU mode AT+CMGF=0 and command successful:
 For SMS-SUBMITs and/or SMS-DELIVERs
 +CMGL: <index>, <stat>, [<alpha>], <length>
 <pdu>
 [...]
 OK
 If error is related to ME functionality
 ERROR
 +CMS ERROR

Notes:
- 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.
- Users should be aware that when using this AT command quickly after SIM PIN authentication, the SIM data may not yet be accessible, resulting in a short delay before the requested AT command response is returned.
- For alphanumeric representation the number stored in the phonebook must be identical to the number transported over the network - then the associated name will be recognized.

11.6 AT+CMGR   Read SMS Messages

Description: The write command 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'.

Syntax:

Test Command: AT+CMGR=?
Test Response: OK
Write Command: AT+CMGR=<index>
Write Response: **Output if text mode (AT+CMGF=1) and command successful:**

For SMS-DELIVER
+CMGR: <stat>, <oa>, [<alpha>], <scts>[, <tooa>, <fo>, <pid>, <dcs>, <sca>, <tosca>, <length>]
<data>
[...]
OK
For SMS-SUBMIT
+CMGR: <stat>, <da>, [<alpha>][, <toda>, <fo>, <pid>, <dcs>, [<vp>], <sca>, <tosca>, <length>]
<data>
[...]
OK
For SMS-STATUS-REPORT
+CMGR: <stat>, <fo>, <mr>, [<ra>], [<tora>], <scts>, <dt>, <st>
<data>
[...]
OK
For SMS-Commands
+CMGR: <stat>, <fo>, <ct>[, <pid>, [<mn>], [<da>], [<toda>], <length>]
<data>
[...]
OK

Output if PDU mode (AT+CMGF=0) and command successful:
For SMS-SUBMITs and/or SMS-DELIVERs
+CMGR: <stat>, [<alpha>], <length>
<pdu>
[...]
OK
ERROR
+CMS ERROR <err>

Notes:
- If AT+CMGR is used to read an empty record index: +CMGR: 0,,0.
- If AT+CMGR is used to read a non-existent record index: +CMS ERROR: invalid memory index
- Users should be aware that error will occur when using this AT command quickly after SIM PIN authentication due to the fact the SIM data may not yet be accessible.
- For alphanumeric representation the number stored in the phonebook must be identical to the number transported over the network - then the associated name will be recognized.

11.7 AT+CMGS   Send Short Message

Description: The **write command** transmits a short message from TE to network (SMS-SUBMIT).

After invoking the write command, wait for the prompt ">", and then start to write the message. To send the message simply enter <CTRL-Z>. After the prompt, a timer will be started to observe the input.

To abort sending use **<ESC>**. Abortion is acknowledged with "OK", though the message will not be sent.

The message reference <mr> is returned to the TE on successful message delivery. The value can be used to identify the message in a delivery status report provided as an unsolicited result code.

Syntax:

Test Command:	AT+CMGS=?
Test Response:	OK

Write Command: If text mode (see AT+CMGF=1)
AT+CMGS=<da>[, <toda>]*<CR>* Text can be entered. *<CTRL-Z>/<ESC>*
Write Response: +CMGS: <mr>[, <scts>]
OK
ERROR
+CMS ERROR <err>

Write Command: If PDU mode (see AT+CMGF=0)
AT+CMGS=<length>*<CR>* PDU can be entered. *<CTRL-Z>/<ESC>*
Write Response: +CMGS: <mr>[, <ackpdu>]
OK
ERROR
+CMS ERROR <err>

Notes:
- Note that some providers do not recognize an @ symbol used in a short message. A widely used alternative is typing "*" as defined in GSM 03.40 (GPP TS 23.40).
- Message Length in Text Mode
  The maximum length of a short message 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.

11.8   AT+CMGW   Write Short Messages to Memory

Description: The execute and write commands transmit a short message (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>.

After invoking the execute or write command wait for the prompt ">" and then start to write the message. To save the message simply enter *<CTRL-Z>*.

To abort writing use <ESC>. Abortion is acknowledged with "OK", though the message will not be saved.

Syntax:

Test Command:	AT+CMGW=?
Test Response:	OK
Exec. Command:	If text mode (see AT+CMGF=1):
	AT+CMGW
Exec. Response:	*<CR>* Text can be entered. *<CTRL-Z>/<ESC>*
	+CMGW: <index>
	OK
	ERROR
	+CMS ERROR <err>
Write Command:	If text mode (see AT+CMGF=1):
	AT+CMGW=<oa>/<da>[, [<tooa>/<toda>][, <stat>]]<CR> Text can be entered. *<CTRL-Z>/<ESC>*
Write Response:	+CMGW: <index>
	OK
	ERROR
	+CMS ERROR <err>
Write Command:	If PDU mode (see AT+CMGF=0):
	AT+CMGW=<length>[, <stat>]*<CR>* PDU can be entered. *<CTRL-Z>/<ESC>*
Write Response:	+CMGW: <index>
	OK
	If writing fails see notes below.

Notes:
- Note that some providers do not recognize an @ symbol used in a short message. A widely used alternative is typing "*" as defined in GSM 03.40 (GPP TS 23.40).
- Message Length in Text Mode
  The maximum length of a short message 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.

11.9   AT+CMMS   More Messages to Send

Description: The AT+CMMS write command controls the continuity of the SMS relay protocol link. When the feature is enabled (and supported by network) multiple messages can be sent much faster as the link is kept open.

Syntax:

Test Command:	AT+CMMS=?
Test Response:	+CMMS: (list of supported) <mode>s
Read Command:	AT+CMMS?
Read Response:	+CMMS: <mode>
	OK
Write Command:	AT+CMMS=<mode>
Write Response:	OK
	ERROR
	+CMS ERROR: <err>

Parameter Description:

<mode>

0   Default. Disable
1   Keep link enabled until the time between the response of the latest message send command (AT+CMGS, AT+CMSS, etc.) and the next send command exceeds 1-5 seconds. Then the ME will close the link and TA switch <mode> automatically back to <mode> 0.
2   Enable (if the time between the response of the latest message send command and the next send command exceeds 1-5 seconds. Then the ME will close the link, but TA will not switch automatically back to <mode>=0).

Note:
After issuing the read command a delay of 5-10 seconds is required before issuing the write command, otherwise the "+CMS ERROR: 500" will appear.

11.10   AT+CMSS   Send Short Messages from Storage

Description: 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. Value can be used to identify message upon unsolicited delivery status report result code.
If the optional parameter <da> is given, the old status of the short message at <index> remains unchanged (see <stat>).

Syntax:

Test Command:	AT+CMSS=?
Test Response:	OK
Write Command:	If text mode (AT+CMGF=1):
	AT+CMSS=<index>[, <da>[, <toda>]]
Write Response:	+CMSS: <mr>[, <scts>]
	OK
	If sending fails
	ERROR
	+CMS ERROR: <err>
Write Command:	If PDU mode (AT+CMGF=0):
	AT+CMSS=<index>[, <da>[, <toda>]]
Write Response:	+CMSS: <mr>[, <ackpdu>]
	OK
	ERROR
	+CMS ERROR: <err>

11.11   AT+CNMA   New Message Acknowledgement to ME/TE, Phase 2+

Description: The write / execute command confirms successful receipt of a new message (SMS-DELIVER or SMS-STATUS-REPORT) routed directly to the TE. If ME does not receive acknowledgment within required time (network time-out), ME sends RP-ERROR to the network. TA shall automatically disable routing to TE by setting both <mt> and <ds> values of AT+CNMI to zero.

Syntax:

Test Command: AT+CNMA=?
Test Response: +CNMA: (list of supported <n>s)
                       OK

Exec. Command: AT+CNMA
Exec. Response: OK
                       ERROR
                       +CMS ERROR <err>

Write Command: AT+CNMA=<n>
Write Response: OK
                       ERROR
                       +CMS ERROR: <err>

Parameter Description:

<n>
Parameter required only for PDU mode.
0   Command operates similarly as in text mode.
1   Send positive (RP-ACK) acknowledgement to the network. Accepted only in PDU mode.
2   Send negative (RP-ERROR) acknowledgement to the network. Accepted only in PDU mode.

Note:
The execute / write command shall only be used when AT+CSMS parameter <service> equals 1 (= phase 2+) and appropriate URC has been issued by the module; i.e.:

   <+CMT> for <mt>=2 incoming message classes 0,1,3 and none;

   <+CMT> for <mt>=3 incoming message classes 0 and 3;

   <+CDS> for <ds>=1.

11.12   AT+CNMI   New Short Message Indication

Description: The **write command** selects the procedure how the receipt of new short messages from the network is indicated to the TE when TE is active; e.g., the DTR signal is ON. If TE is inactive (e.g., DTR signal is OFF), message receiving should be done as specified in GSM 03.38. If the DTR signal is not available or the state of the signal is ignored, reliable message transfer can be assured by using AT+CNMA acknowledgment procedure.

The rules <mt>=2 and <mt>=3 for storing received messages are possible only if phase 2+ compatibility is activated with AT+CSMS=1. The parameter <ds>=1 is only available in phase 2+.

Syntax:

Test Command:	AT+CNMI=?
Test 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
Read Command:	AT+CNMI?
Read Response:	+CNMI: <mode>, <mt>, <bm>, <ds>, <bfr>
	OK
Write Command:	AT+CNMI=[<mode>][, <mt>][, <bm>][, <ds>][, <bfr>]
Write Response:	OK
	ERROR
	+CMS ERROR: <err>

Parameter Descriptions:

<mode>
- **0** Default. 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.

<mt>
Rules for storing received short messages depend on the relevant data coding method (refer to GSM 03.38), preferred memory storage (AT+CPMS) setting and this value.
- **0** Default. No SMS-DELIVER indications are routed to the TE.
- **1** Class 0 SMS-DELIVERs are routed directly to the TE using unsolicited result codes.
  For all other messages the following applies: If SMS-DELIVER is stored in ME/TA, indication of the memory location is routed to the TE using unsolicited result code
- **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:
- **3** Class 0 and 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), the setting of Select CBM Types (AT+CSCB) and this value:
- **0** Default. No CBM indications are routed to the TE.
- **2** New CBMs are routed directly to the TE using unsolicited result code:

<ds>
- **0** No SMS-STATUS-REPORTs are routed to the TE. Default.
- **1** SMS-STATUS-REPORTs are routed to the TE using unsolicited result code:
- **2** If SMS-STATUS-REPORT is routed into ME/TA, indication of the memory location is routed to the TE using unsolicited result code.

<bfr>
- **1** Default. TA buffer of unsolicited result codes defined within this command is cleared when <mode> changes from 0 to 1...3.

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

Notes:
- With <mt>=2,3 and <ds>=1 messages routed directly to the TE (either short messages or status reports) have to be acknowledged with AT+CNMA. To do this, GSM Phase 2+ has to be enabled (see AT+CSMS).
- If Phase 2+ is enabled and either a short message or a status report is not acknowledged within the required time, then <mt> and <ds> will be set to zero. See AT+CNMA for further detail.

Unsolicited Result Codes:

URC 1
<mt>=1,2 or 3 – indication only:
+CMTI: <mem3>, <index>
Indicates that new message has been received

URC 2
<mt>=1,2 or 3 – directly routed message (PDU mode enabled):
+CMT: <length><CR><LF><pdu>
Indicates that new message has been received

URC 3
<mt>=1,2 or 3 – directly routed message (text mode enabled):
+CMT: <oa>, <scts>[, <tooa>, <fo>, <pid>, <dcs>, <sca>, <tosca>, <length>]<CR><LF><data>
Indicates that new message has been received

URC 4
<bm>=2 (PDU mode enabled):
+CBM: <length><CR><LF><pdu>
Indicates that new cell broadcast message has been received

URC 5
<bm>=2 (text mode enabled):
+CBM: <sn>, <mid>, <dcs>, <page>, <pages><CR><LF><data>
Indicates that new cell broadcast message has been received

URC 6
<ds>=1 (PDU mode enabled):
+CDS: <length><CR><LF><pdu>
Indicates that new SMS status report has been received

URC 7
<ds>=1 (text mode enabled):
+CDS: <fo>, <mr>[, <ra>][, <tora>], <scts>, <dt>, <st>
Indicates that new SMS status report has been received

URC 8
<ds>=2:
+CDSI: <mem3>, <index>
Indicates that new SMS status report has been received

Notes:
- With <mt>=2,3 and <ds>=1 messages routed directly to the TE (either short messages or status reports) have to be acknowledged with AT+CNMA. To do this, GSM Phase 2+ has to be enabled (see AT+CSMS).
- If Phase 2+ is enabled and either a short message or a status report is not acknowledged within the required time, then <mt> and <ds> will be set to zero. See AT+CNMA for further detail.

11.13   AT+CPMS   Preferred SMS Message Storage

Description: The **write command** selects memory storages <mem1>,<mem2>, <mem3> to be used for reading, writing, etc.

Syntax:

Test Command: AT+CPMS=?
Test Response: +CPMS: (list of supported <mem1>s), (list of supported <mem2>s), (list of supported <mem3>s)
OK

Read Command: AT+CPMS?
Read Response: +CPMS: <mem1>, <used1>, <total1>, <mem2>, <used2>, <total2>, <mem3>, <used3>, <total3>
OK
ERROR
+CMS ERROR: <err>

Write Command: AT+CPMS=<mem1>[, <mem2>[, <mem3>]]
Write Response: +CPMS: <used1>, <total1>, <used2>, <total2>, <used3>, <total3>
OK
ERROR
+CMS ERROR: <err>

Parameter Descriptions:

<used1>   Number of messages currently in <mem1>
<used2>   Number of messages currently in <mem2>
<used3>   Number of messages currently in <mem3>
<total1>   Number of messages storable in <mem1>
<total2>   Number of messages storable in <mem2>
<total3>   Number of messages storable in <mem3>

Notes:

- The Mobile Equipment storage "ME" offers space for 255 short messages, see <mem1>.
- The <mem1>, <mem2> and <mem3> parameter will be stored in non-volatile memory.
- 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. For more information regarding SIM and ME specific message classes refer to the following specifications: GSM 03.38 and 3GPP TS23038.
- 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 clients 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 memory indices.
- Users should be aware that error will occur when using this AT command quickly after SIM PIN authentication due to the fact the SIM data may not yet be accessible.

11.14   AT+CSCA   SMS Service Center Address

Description: 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 the <pdu> parameter equals zero.

Syntax:

Test Command:	AT+CSCA=?
Test Response:	OK
Read Command:	AT+CSCA?
Read Response:	+CSCA: <sca>, <tosca>
	OK
Write Command:	AT+CSCA=<sca>[, <tosca>]
Write Response:	OK

Notes:
- This command writes the service center address to non-volatile memo.
- The SMS service center address should be entered as specified by the service provider.

11.15   AT+CSCB   Select Cell Broadcast Message Indication

Description: The test command returns the supported <operation>s as a compound value.
The read command displays the accepted message types. Depending on the <operation> parameter, the write command adds or deletes the message types accepted by the ME.

Syntax:

Test Command:	AT+CSCB=?
Test Response:	+CSCB: (list of supported <operation>s)
	OK
	ERROR
	+CMS ERROR: <err>
Read Command:	AT+CSCB?
Read Response:	+CSCB: <operation>, <mids>, <dcss>
	OK
	ERROR
	+CMS ERROR: <err>
Write Command:	AT+CSCB=[<operation>[, <mids>[, <dcss>]]]
Write Response:	OK
	ERROR
	+CMS ERROR: <err>

Parameter Descriptions:

<operation>
Add/delete operation

0	Default. Add new message types defined in <mids> to the list of accepted message types by ME and replace types defined in <dcss>. In case of using this operation code without parameters default (0-65535) range will be added to the list of <mids>.
1	Delete message types defined in <mids> from the list of accepted message types by ME and replace types defined in <dcss>. In case of using this operation code without parameters all <mids>s and <dcss>s will be deleted. (For more, see notes.)

<mids>
Cell Broadcast Message ID specification
All different possible combinations of CBM message identifiers; e.g., "0,1,5,320-478,922").

<dcss>
All different possible combinations of CBM data coding schemes (e.g., "0-3,5"). If default empty string is used, all CBMs are received independent of their dcss.
A given <dcss> replaces any former value and is used for consecutive requests.

Note:
The <operation> parameter shown in the AT+CSCB read command response retains the value last used in the write command. This way, the read command response always reflects the last action done: 0 means that the last action was adding new channel(s), 1 means that the last action was deleting channel(s).

11.16   AT+CSMP   Set SMS Text Mode Parameters

Description: The **write command** selects values for additional parameters needed when the short message is sent to the network or placed in a storage and when text format message mode is selected.
It is possible to set the validity period starting from the time when the short message is received by the SMSC (<vp> is in range 0...255) or to define the absolute time of the validity period termination (<vp> is a string). The format of <vp> is given by <fo>. If the TA supports the enhanced validity period format; it will be given as a hexadecimal coded string (e.g., <pdu>) with quotes.

Syntax:

Test Command:	AT+CSMP=?
Test Response:	OK
Read Command:	AT+CSMP?
Read Response:	+CSMP:<fo>, <vp>/ <scts>, <pid>, <dcs>
	OK
Write Command:	AT+CSMP=<fo>[, <vp>/<scts>[, <pid>[, <dcs>]]]
Write Response:	+CSMP: <index>
	OK
	If sending fails:
	ERROR
	CMS ERROR: <err>

Parameter Descriptions:

<fo>
First Octet
Depending on the command or result code: first octet of GSM 03.40 SMS-DELIVER, SMS-SUBMIT, SMS-STATUS-REPORT, or SMS-COMMAND in integer format.
0....255

<vp>
Depending on SMS-SUBMIT <fo> setting: GSM 03.40 TP-Validity-Period either in integer format or in time-string format (refer <dt>).
0....255

<dcs>
Data Coding Scheme
GSM 03.38 SMS Data Coding Scheme or Cell Broadcast Data Coding Scheme in integer format .
0...247 Default = 0.

<pid>
Protocol Identifier
GSM 03.40 TP-Protocol-Identifier in integer format.
0...255 Default = 0.

Notes:
- When storing a SMS DELIVER from the TE to the preferred memory storage in text mode (using the AT+CMGW write command), <vp> field can be used for <scts>.
- The command writes the parameters to the non-volatile memory.

11.17   AT+CSMS   Select Message Service

Syntax:

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

Parameter Descriptions:

<service>

0   GSM 03.40 and GSM 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). Default.

1   GSM 03.40 and GSM 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

Note:

Phase 2+ (<service>=1) must be set before acknowledging incoming short messages with AT+CNMA is possible. Acknowledgements are required for directly routed messages delivered using "+CMT" and "+CDS" URCs. Direct routing is used for certain message classes when <mt>=2, <mt>=3 or <ds>=1.

11.18   AT^SMGL   List Short Messages from Preferred Store without Setting Status to REC READ

Description: The write command lists messages stored in <mem1> without changing their status to "read". The execute command is identical to the write command with default <stat> (for defaults see Section 12.1, SMS parameters).

Syntax:

Test Command: AT^SMGL=?
Test Response: (list of supported <stat>s)

Exec. Command: AT^SMGL
Exec. Response: ^SMGL: (same as write command with default <stat>)
                     OK

Write Command: AT^SMGL=[<stat>]
Write Response: same as AT+CMGL

Notes:

- 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.
- Users should be aware that when using this AT command quickly after SIM PIN authentication, the SIM data may not yet be accessible.

Chapter 12 – SIM-Related Commands

The AT commands described in this chapter are related to the Subscriber Identity Module (SIM) connected to the Multi-Tech wireless modem.

If using data from the SIM please bear in mind that the content of all Elementary Files is *subject to change* at any moment!

This is true because the network can change the SIM's data in the background via the SIM Application Toolkit (SAT) procedure "Data download to SIM". For a detailed description please refer to GSM 11.14.

To get informed that changing Elementary Files has taken place, the TA needs to hook to the SAT Proactive Command "REFRESH". To achieve this, the AT command interface of SAT, i.e., Remote-SAT, needs to be activated.

12.1 AT+CRSM   Restricted SIM Access

Description: AT+CRSM offers easy access of the Elementary Files on the SIM. Access to the SIM database is restricted to the commands which are listed at <command>. However, additional SIM commands are available via AT^SXSM.

All parameters of AT+CRSM are used as specified by GSM 11.11. The Multi-Tech wireless modem handles internally all required SIM interface locking and file selection routines.

As response to the command, the Multi-Tech wireless modem sends the actual SIM information parameters and response data. 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, failure in the execution of the command in the SIM is reported in <sw1> and <sw2> parameters.

Please beware of possible changes to Elementary Files by the network at any time.

Syntax:

Test Command:	AT+CRSM=?
Test Response:	OK

Write Command:	AT+CRSM=<command>[, <fileID>[, <P1>, <P2>, <P3>[, <data>][, <pathId>]]]
Write Response:	+CRSM: <sw1>,<sw2>[,<response>]
	OK
	ERROR
	+CME ERROR: <err>

Parameter Descriptions:

<command>
SIM command number.

176	READ BINARY
178	READ RECORD
192	GET RESPONSE
214	UPDATE BINARY
220	UPDATE RECORD
242	STATUS

<fileID>
Identifier for an elementary data file on SIM, if used by <command>.

<P1>, <P2>, <P3>
Parameters to be passed on by the Multi-Tech wireless modem to the SIM.
0...255

<data>
Information which shall be written to the SIM (hexadecimal character format).

<pathID>
Contains the directory path of an elementary file on a UICC in hexadecimal format (e.g. "7F105F50").
Up to 3 Dedicated Files (DFs) can be listed.
The <pathId> parameter is applicable only to UICCs.
Some types of UICCs may have Dedicated Files which are not unique, because the same FileID is allocated to several applications on the UICC and this way used twice or even more times. Therefore, to access UICC files of SIM applications please use the optional parameter <pathId>. UICC files of USIM applications are accessible without any need for the <pathId> parameter.

<sw1>, <sw2>
Status information from the SIM about the execution of the actual command. It is returned in both cases, on successful or failed execution of the command.
0...255

<response>
Response data in case of a successful completion of the previously issued command.
"STATUS" and "GET RESPONSE" commands return data, which gives information about the currently selected elementary data field. This information includes the type of file and its size.
After "READ BINARY" or "READ RECORD" commands the requested data will be returned.
<response> is empty after "UPDATE BINARY" or "UPDATE RECORD" commands.

12.2 AT^CSIM Generic SIM Access

Description: AT+CSIM allows direct control of the SIM.
Compared to Restricted SIM Access command AT+CRSM, the definition of AT+CSIM allows the ME to take more control over the SIM interface.
However, the SIM Application Toolkit functionality is not supported by AT+CSIM. Therefore the following SIM commands cannot be used: TERMINAL PROFILE, ENVELOPE, FETCH and TEMINAL RESPONSE.

Syntax:
Test Command: AT+CSIM=?
Test Response: OK

Write Command: AT+CSIM=<length>, <command>
Write Response: +CSIM: <length>,<response>
                        OK
                        ERROR
                        +CME ERROR: <err>

Parameter Descriptions:
<length>
Length of <command> or <response> string.
<command>
Command passed on by the ME to the SIM.
Parameter length: maximum 257 Bytes.
<response>
Response data of the command returned by the SIM.
Parameter length: maximum 257 Bytes.

Example:

The following examples explain how to use AT+CSIM.

```
AT+CSIM=14,"A0A40000027F10"              Select DF-Telekom
+CSIM: 4,"9F19"                          Command successful, length '19' of the response data
OK
AT+CSIM=14,"A0A40000026F3A"              Select EF-ADN (Abbreviated dialing numbers)
+CSIM: 4,"9F0F"                          Command successful, length '0F' of the response data

OK
AT+CSIM=16,"A0C000000F000000"           Get Response
+CSIM: 34,"000002306F3A040011F0220102011C9000"
OK
```

12.3 AT^SCKS   Query SIM and Chip Card Holder Status

Description: This command controls the SIM connection presentation mode and queries the connection status of the SIM and the card holder tray of the Multi-Tech wireless modem.

The **read command** returns the URC presentation mode and the status of the SIM card connection.

The **write command** enables or disables the presentation of URCs to report whether or not the SIM card is connected.

If the ME is powered down or reset (AT+CFUN or AT^SMSO), the current presentation mode setting <mode> will not be retained. Therefore the setting <mode>=1 needs to be restored after power on the Multi-Tech wireless modem.

Syntax:

Test Command	AT^SCKS=?
Test Response:	^SCKS:(list of supported <mode>s)
	OK
Read Command:	AT^SCKS?
Read Response:	^SCKS: <mode>, <SimStatus>
	OK
	ERROR
	+CME ERROR: <err>
Write Command:	AT^SCKS=<mode>
Write Response:	OK
	ERROR
	+CME ERROR: <err>

Parameter Descriptions:

<mode>

0	Default. Suppress unsolicited result codes.
1	Output unsolicited result codes

<SimStatus>

0	SIM connection error
1	SIM inserted(refer to note)

<MCC>

The MCC (Mobile Country Code) of a SIM that is not supported by modem.

Unsolicited Result Code:

URC 1

^SCKS: <SimStatus>

If the modem's SIM connection status has changed an unsolicited result code (URC) is issued.

URC 2

^SCRD: <MCC>

If the SIM is not supported by the modem and the connection is rejected, an unsolicited result code (URC) is issued. The presentation of this URC cannot be suppressed.

Example:

AT^SCKS=1   Activates the presentation of unsolicited result codes ^SCKS
OK

Now, after removing a card tray, the following URC appears:

^SCKS: 0   No SIM card found

Notes:

- <SimStatus> reflects the status of the SIM and the card holder tray.
- <MCC> specifies the MCC (Mobile Country Code) of a SIM that is not supported by the modem.

Chapter 13 – SIM Application Toolkit (SAT) Commands

This chapter offers a brief reference to AT commands and responses related to the SIM Application Toolkit (SAT) implementation.

SIM Application Toolkit (SAT) is a technology that allows an application running on the SIM to control the Mobile Equipment (ME). Remote-SAT (RSAT) provides a link between applications located on the SIM and a customer application (TA). The purpose of RSAT is to allow the TA to send AT commands to the SAT interface and to display all SAT activities on the user interface of the customer application.

Two groups of commands are exchanged between the SAT located on the modem and the SIM Application running on the SIM:

- Proactive commands are sent from the SIM application to the modem's SAT, such as "DISPLAY TEXT".
- Envelope Commands are sent from the modem's SAT to the SIM Application, such as "MENU SELECTION".

13.1 AT^SSTA   SAT Interface Activation

Description: The **write command** activates the AT command interface of the SIM Application Toolkit in the Multi-Tech wireless modem and needs to be issued after every time you restart the modem. Removing and inserting the SIM does not affect the activation status.

SAT commands that are not using the AT interface (non MMI related SAT commands; e.g., PROVIDE LOCAL INFORMATION) are executed without activating Remote-SAT.

The **read command** requests the current operating status and the used alphabet of the Remote-SAT interface.

Syntax:

Test Command:	AT^SSTA=?
Test Response:	^SSTA:(list of supported <state>s), (list of supported <Alphabet>s)
	OK
Read Command:	AT^SSTA?
Read Response:	^SSTA: <state>, <Alphabet>, <allowedInstance>, <SatProfile>, <userTOut>, <AppMode>
	OK
Write Command	AT^SSTA=<mode>[, <Alphabet>]
Write Response:	OK

Parameter Descriptions:

<state>
The Multi-Tech wireless modem Remote-SAT interface states.

0	RESET
1	OFF
2	IDLE
3	PAC
4	WAIT

<Alphabet>
Parameter is stored in the non-volatile memory and takes effect after the next restart of the ME.

0	Default. GSM 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.

<allowedInstance>

0	Not applicable.
1	SAT may be started on this instance via the write version of this command.

<SatProfile>
SAT profile according to GSM 11.14 [27] or USAT profile according to 3GPP TS 31.111. The profile tells the SIM Application which features (e.g. proactive commands) are supported by the SIM Application Toolkit implementation of the modem.
There are different profiles available for 2G and 3G SIM applications. The returned profile depends of the possibilities of the used SIM card. In case of no SIM is inserted, the GSM profile will be returned for compatibility reasons to older products until SIM is inserted!

<userTOut>
User timeout in seconds.
To limit the time Remote-SAT is kept in states PAC or WAIT, any ongoing (but unanswered) proactive command will be aborted automatically after 5 minutes. In this case, the terminal response is either "ME currently unable to process command", or if applicable, "No response from user". In addition a URC "Terminate Proactive Command" will be sent to the external application. This value shall not be changed by the TA.

<AppMode>
Mode of SIM Application.
This parameter shows which kind of SIM application is running currently.
"1"   2G Application (GSM SAT)
"2"   3G Application (USAT)

<mode>
Select Remote SAT activation mode.
Parameter is stored non-volatile and takes effect after next restart of the ME. Removing and inserting the SIM does not affect the activation status.
0   Default. Automatic response (AR) mode.
            All commands and responses are exchanged automatically between the ME and the SIM application. This eliminates the need to enter any Remote SAT AT commands incl. the AT^SSTA command.
            If AR mode is enabled the ME enters the OFF state (<state>=1) after reboot.
1   Explicit response (ER) mode.
            This mode is intended for use with an MMI. If ER mode is enabled the MMI is required to handle, via the module's Remote-SAT interface, all commands and responses transmitted to or from the SIM.
            If ER mode is enabled the ME enters the IDLE state (<state>= 2) after reboot.

13.2 ^SSTN SAT Notification

Unsolicited Result Codes:

URC 1
Proactive Command notification

^SSTN: <cmdType>

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., a selected menu item.

URC 2
Terminate Proactive Command notification

^SSTN: <cmdTerminateValue>

When the SIM application has issued a Proactive Command to the ME, it is possible that this command will be
terminated later. URC "^SSTN" is sent with a different Proactive Command type number (added terminate offset 100) to
indicate the termination of the specified command.

The state changes to idle. Therefore, the TA should avoid sending any further commands related to the terminated
Proactive Command; e.g., AT^SSTGI or AT^SSTR.

URC 3
Notification that SIM Application has returned to main menu

^SSTN: 254

Notification to the TA when the SIM Application has finished a command cycle and again enters its main menu, which
was transferred with an URC "^SSTN: 37" (SET UP MENU) at start up.

This URC should be used to open this menu on the screen.

The TA does not need to respond directly; i.e., AT^SSTR is not required.

URC 4
SIM reset notification

^SSTN: 255

Notification to the TA if a Proactive Command "REFRESH - SIM Reset" has been issued by the SIM Application, please
refer to AT^SSTGI.

This URC should be used to set the TAs application to its initial state since the SIM Application will start from the
beginning, too.

The TA does not need to respond directly; i.e., related AT^SSTGI and AT^SSTR are neither required nor allowed.

Since the ME is still busy on SIM access the ME may respond with "+CME ERROR: SIM blocked" or "+CME ERROR:
SIM busy" on following PIN required AT Commands for a while. Then TA shall retry until the ME responds with "OK".
The time needed for this process depends on the SIM and may take more than 10 seconds.

Parameter Description:

<cmdType>
Proactive Command number

<cmdTerminateValue>
Defined as <cmdType> + terminate offset. The terminate offset equals 100.

13.3   AT^SSTGI   SAT Get Information

Description: This command is used upon receipt of an URC "^SSTN" to request the parameters of the Proactive Command. Then the TA is expected to acknowledge the AT^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 Proactive Command type value specifies to which "^SSTN" the command is related.

Syntax:

Test Command:	AT^SSTGI=?
Test Response:	^SSTGI:(list of supported <state>s), (list of supported <cmdType>s)
	OK
Read Command:	AT^SSTGI?
Read Response:	^SSTGI: <state>, <cmdType>
	OK
Write Command:	AT^SSTGI=<cmdType>
Write Response:	OK
	Error
	+CME ERROR: <err>

Parameter Descriptions:

<state>
   The Multi-Tech wireless modem Remote-SAT interface states
   0   RESET
   1   OFF
   2   IDLE
   3   PAC
   4   WAIT

<cmdType>
   Related Proactive Command

13.4   AT^SSTR   SAT Response

Description: The TA is expected to acknowledge the AT^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.

Syntax:

Test Command:	AT^SSTR=?
Test Response:	^SSTR:(list of supported <state>s), (list of supported <cmdType>s)
	OK
Read Command:	AT^SSTR?
Read Response:	^SSTR: <state>, <cmdType>
	OK
Write Command:	AT^SSTR=<cmdType>, <status>[, <inputNumber>][, <inputString>]
Write Response:	OK

Parameter Description:

<state>
   The Multi-Tech wireless modem Remote-SAT interface states
   0   RESET
   1   OFF
   2   IDLE
   3   PAC
   4   WAIT

<cmdType>
   Number related to Proactive Command or event type according to GSM 11.14.

<status>
   Command status return regarding the type of action that has taken place; e.g., action performed by the user.
   Values are in accordance with GSM 11.14.

<inputNumber>
   Response number entered by user.

<inputString>
   Response string entered by user.

Chapter 14 – Phonebook Commands

The AT commands described in this chapter allow the external application to access the phonebooks located in the Multi-Tech wireless modem's memory or on the attached Subscriber Identity Module (SIM).

14.1   AT+CNUM   Read Own Numbers

Description: AT+CNUM returns the subscribers own number(s) from the SIM.

Syntax:
Test Command:	AT+CNUM=?
Test Response:	OK
Exec. Command:	AT+CNUM
Exec. Response:	[+CNUM: [<alpha>], <number>, <type>]
	[+CNUM: ...]
	OK
	ERROR
	+CME ERROR: <err>

Parameter Descriptions:

<alpha>
Optional alphanumeric string associated with <number>.

<number>
Phone number in format specified by <type>.

<type>
Type of address octet, see also: AT+CPBR <type>.

Notes:
- Users should be aware that when using this AT command quickly after SIM PIN authentication, the SIM data may not yet be accessible, resulting in a short delay before the requested AT command response is returned. See Section 20.1, Restricted Access to SIM Data after SIM PIN Authentication for further detail.
- For alphanumeric representation the number stored in the phonebook must be identical to the number transported over the network - then the associated name will be recognized.

14.2   AT+CPBF   Find Phonebook Entries

Description: The AT+CPBF write command returns phonebook entries (from the current phonebook memory storage selected with AT+CPBS) which alphanumeric field start with string <findtext>.

Entry fields returned are location number <location>, phone number stored there <number> (of format <type>) and text <text> associated with the number.

The AT+CPBF test command returns the maximum lengths of <nlength> and <tlength> fields.

Syntax:
Test Command:	AT+CPBF=?
Test Response:	+CPBF: <nlength>, <tlength>
	OK
	ERROR
	+CME ERROR: <err>
Write Command:	AT+CPBF=<findtext>
Write Response:	+CPBF: <location>, <number>, <type>, <test>
	OK
	ERROR
	+CME ERROR: <err>

Parameter Descriptions:

<location>
The location number in the range of location numbers of the phonebook memory.

<number>

Phone number in format specified by <type>. It may be an empty string.

<type>

Type of address octet, which defines the used type of number (ton) and the numbering plan identification (npi).
Please consider that for types other than 129 or 145 dialing from phonebook with ATD><mem><n> is, depending on
the network, not always possible (refer to GSM 04.08 subclause 10.5.4.7 for details). See also <type> of AT+CPBW.
Possible values are:

128	Restricted <number> includes unknown type and format.
145	Dialing string <number> includes international access code character '+'.
161	National number. Network support of this type is optional.
177	Network specific number, ISDN format.
209	Dialing string <number> has been saved as ASCII string and includes non-digit characters other than "*", "#" or "+". Note that phonebook entries saved with this type cannot be dialed.
255	Dialing string <number> is a command to control a Supplementary Service; i.e., "*", "#" codes are contained. Network support of this type is optional.
129	Otherwise.

<text>

Text assigned to a phone number. The maximum length for this parameter is given with test command response
parameter <tlength>.
If using an ASCII terminal characters which are coded differently in ASCII and GSM have to be entered via
escape sequences as described in Section 1.6, Supported character sets.

<findtext>

String for finding the <text> in the active phonebook.

<nlength>

Maximum 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 <type>=209.

<tlength>

Maximum length of <text> assigned to the telephone number. The value indicated by the test command is
given in octets. If <text> is given as 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 at
least one less than half the number of GSM characters.

Notes:

- Users should be aware that when using this AT command quickly after SIM PIN authentication the SIM data may not
  yet be accessible, resulting in a short delay before the requested AT command response is returned. See Section
  20.1, Restricted access to SIM data after SIM PIN authentication for further detail.
- The search in the dialed calls (DC) phonebook is not supported.

Example:

AT+CPBF=?	First run the AT+CPBF test command to find out the lengths of <nlength> and <tlength> in the active phonebook.
+CPBF: 40,16	Modem returns the supported values, where 40 is the maximum length of the phone number and 16 is the maximum length of the associated text.
AT+CPBF="cha"	Then use the AT+CPBF write command to find any text string in the phonebook.
+CPBF:1,"+999999",145,"Charlie"	

14.3   AT+CPBR   Read from Phonebook

Description: AT+CPBR serves to read one or more entries from the phonebook selected with AT+CPBS.

The **test command** returns the location range supported by the current phonebook storage, the maximum length of <number> field and the maximum length of <text> field. Length information may not be available while SIM storage is selected. If storage does not offer format information, the format list contains empty parenthesizes.

The **write command** determines the phonebook entry to be displayed with <location1> or a location range from <location1> to <location2>. Hence, if no <location2> is given only the entry at <location1> will be displayed.

If no entries are found at the selected location "OK" will be returned.

Syntax:

Test Command:	AT+CPBR=?
Test Response:	+CPBR: (1-<maxloc>), <nlength>, <tlength>
	OK
	ERROR
	+CME ERROR: <err>
Write Command:	AT+CPBR=<location1>[, <location2>]
Write Response:	[+CPBR: <location1>, <number>, <type>, <text>]
	[+CPBR: <location2>, <number>, <type>, <text>]
	OK
	ERROR
	+CME ERROR

Parameter Description:

<location1>
The first (lowest) location number within phonebook memory where to start reading. The maximum range supported by the current phonebook is given in the test command response.
If <location1> exceeds the upper bound <maxloc> (as indicated by the test command), command will respond with "+CME ERROR: invalid index".

<location2>
The last (highest) location number within phonebook memory where to stop reading. The maximum range supported by the current phonebook is given in the test command response.
If both <location1> and <location2> are in the range indicated by the test command parameter <maxloc> the list of entries will be output and terminated with "OK".
If <location2> exceeds the range indicated by the test command parameter <maxloc>, the list of entries will be output but terminated with "+CME ERROR: invalid index".

<number>
Phone number in format specified by <type>, it may be an empty string.

<type>
Type of address octet, which defines the used type of number (ton) and the numbering plan identification (npi). Please consider that for types other than 129 or 145 dialing from phonebook with ATD><mem><n> is, depending on the network, not always possible (refer to GSM 04.08 subclause 10.5.4.7 for details). See also <type> of AT+CPBW. Possible values are:

128	Restricted <number> includes unknown type and format.
145	Dialing string <number> includes international access code character '+'
161	National number. Network support of this type is optional.
177	Network specified number, ISDN format.
209	Dialing string <number> has been saved as ASCII string and includes non-digit characters other than "*", "#" or "+". Note that phonebook entries saved with this type cannot be dialed.
255	Dialing string <number> is a command to control a Supplementary Service; i.e., "*", "#" codes are contained. Network support of this type is optional.
129	Otherwise

<text>
Text assigned to a phone number. The maximum length for this parameter is given with test command response parameter <tlength>. If using an ASCII terminal characters which are coded differently in ASCII and GSM have to be entered via escape sequences as described in Section 1.6, Supported character sets.

<maxloc>
Maximum location number for the currently selected storage. For phonebooks located on the SIM this value depends on the SIM card type.

<nlength>
Maximum 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 <type>=209.

<tlength>
Maximum length of <text> assigned to the telephone number. The value indicated by the test command is given in octets. If <text> is given as 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 at least one less than half the number of GSM characters.

Notes:

- Users should be aware that when using this AT command quickly after SIM PIN authentication, the SIM data may not yet be accessible, resulting in a short delay before the requested AT command response is returned. See Section 20.1, Restricted Access to SIM Data after SIM PIN Authentication.
- When storing a supplementary service command to the phonebook along with a "+" within the phone number please note that the ME will not display the "+" after restart, but correctly handles the phone number as international type.
- When emergency number ("EN") phonebook is selected by AT+CPBS write command the numbers 911 and 112 must always be output by using AT+CPBR write command. For more details about emergency numbers see notes in ATD dial command.

Example:

AT+CPBR=?	First run the AT+CPBR test command to find out the maximum range of entries stored in the active phonebook.
+CPBR:(1-100),20,17	The Multi-Tech wireless modem returns the supported values, 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.
AT+CPBR =1,3	Then use the AT+CPBR write command to display the phonebook entries sorted by location numbers.
+CPBR:1,"+999999",145,"Charlie" +CPBR:2,"+777777",145,"Bill" +CPBR:3,"+888888",145,"Arthur"	

14.4 AT+CPBS   Select Phonebook Memory Storage

Description: AT+CPBS selects the active phonebook storage; i.e., the phonebook storage that all subsequent phonebook commands will be operating on.
The **read command** returns the currently selected <storage>, the number of <used> entries and the <total> number of entries available for this storage.
The **test command** returns all supported <storage>s as compound value.

Syntax:

Test Command:	AT+CPBS=?
Test Response:	+CPBS: (list of supported <storage>s) OK ERROR +CME ERROR: <err>
Read Command:	AT+CPBS?
Read Response:	+CPBS: <storage>, <used>, <total> OK ERROR +CME ERROR: <err>
Exec. Command:	All records of the "MC", "RC", "DC" and "LD" phonebooks will be deleted. AT+CPBS
Exec. Response:	OK ERROR +CME ERROR: <err>
Write Command:	AT+CPBS=<storage>
Write Response:	OK ERROR +CME ERROR: <err>
Write Command:	For write access to FD phonebook AT+CPBS=<storage>, <pin>
Write Response:	OK ERROR +CME ERROR: <err>

Parameter Descriptions:

<storage>

"SM"   **Default. SIM Phonebook**
Capacity: depends on SIM card
Location: SIM

"DC"   **Dialed Calls List**
Capacity: max 10 entries
Location: ME
AT+CPBW command is not applicable to this storage.

"FD"   **Fixed Dialing Phonebook**
Capacity: depends on SIM card
Location: SIM

"LD"   **Last Number Dialed Phonebook. Stores all call numbers dialed with ATD.**
Capacity: max. 10 entries, depending on SIM
Location: SIM
AT+CPBW command is not applicable to this storage.

"MC"   **Missed (unanswered received) Calls List**
Capacity: max. 10 entries
Location: ME

"ME"   **Mobile Equipment Phonebook**
Capacity: max. 250 entries
Location: ME

"RC"   **Received Calls List**
Capacity: max. 10 entries
Location: ME
AT+CPBW command is not applicable to this storage.

"EN"   **Emergency Number**
               Capacity: max. 50 entries
               Location: SIM or ME
               AT+CPBW command is not applicable to this storage.

"ON"   **MSISDN List**
               Capacity: depends on SIM card
               Location: SIM

"VM"   **CPHS Voice Mailbox Phonebook**
               Capacity: 1 or 2 entries, depending on SIM
               1 - Line 1 mailbox
               2 - Line 2 mailbox
               Location: SIM

<used>
Value indicating the number of used locations in selected memory storage.

<total>
Value indicating the maximum number of locations allowed in the selected memory storage.

Notes:
- Users should be aware that when using this AT command quickly after SIM PIN authentication, the SIM data may not yet be accessible, resulting in a short delay before the requested AT command response is returned.
- To get write access to the "FD" phonebook the following input is required: AT+CPBS="FD","PIN2"
- When using "EN" phonebook the numbers 911 and 112 must always be output by using AT+CPBR write command. For more details about emergency numbers see notes in ATD dial command.

14.5 AT+CPBW Write into Phonebook

Description: The AT+CPBW write command can be used to create, edit and delete a phonebook entry at a <location> of the active storage selected with AT+CPBS.

If <storage>="FD" (SIM fixed dialing numbers) is selected, PIN2 authentication has to be performed prior to any write access.

The **test command** returns the location range supported by the current storage, the maximum length of the <number> field, the range of supported <type> values and the maximum length of the <text> field.

The length may not be available while SIM storage is selected. If storage does not offer format information, the format list contains empty parenthesizes.

Syntax:
Test Command: AT+CPBW=?
Test Response: +CPBW: (1-<maxloc>), <nlength>, (list of supported <type>s), <tlength>
                      OK
                      ERROR
                      +CME ERROR: <err>

Write Command: AT+CPBW=[<location>][, <number>[[, <type>][, <text>]]]
Write Response: OK
                      ERROR
                      +CME ERROR: <err>

Parameter Description:

<location>
Location number within phonebook memory. The maximum range supported by each storage type is indicated in the test command response. If <location> is not given, the first free entry will be used.
If <location> is given as the only parameter, the phonebook entry specified by <location> is deleted.

<number>
Phone number in format specified by <type>. Parameter must be present, although it may be an empty string. Alphabetic characters are not permitted. <number> may contain dial_string modifiers "*", "#" or "+".
If other printable non-alphabetic characters are used the entry needs to be saved with <type>=209. Otherwise, if <type>=209 is not used any non-digit characters other than "*", "#" or "+" will be removed from the string and only accepted modifiers from the GSM alphabet will be saved.
A <number> saved with <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, including all digits and dial string modifiers.
Extended locations may be used as stated below for <nlength>.

<type>
Type of address octet, which defines the used type of number (ton) and the numbering plan identification (npi). Please consider that for types other than 129 or 145 dialing from phonebook with ATD><mem><n> is, depending on the network, not always possible (refer GSM 04.08 subclause 10.5.4.7 for details). If <type> is not specified the unknown <type>=129 is used. If <number> contains a leading "+" <type>=145 (international) is used. Supported values are:

128	Restricted <number> includes unknown type and format.
145	Dialing string <number> includes international access code character '+'
161	National number. The network support for this type is optional.
209	Dialing string <number> will be saved as ASCII string. This is the default value, if <type> is not specified explicitly and characters other than "*", "#" or "+" are included in <number>. Note that phonebook entries saved with this type cannot be dialed.
255	Dialing string <number> is a command to control a Supplementary Service; i.e., "*", "#" codes are contained. Network support of this type is optional.
129	Unknown number. If <type> is unknown and the <number> contains a leading "+", <type>=145 (international) is used.

<text>
Text assigned to the phone number. The maximum length of this parameter is given in the test command response <tlength>. When using an ASCII terminal, characters which are coded differently in ASCII and GSM have to be entered via escape sequences as described in Section 1.6, Supported character sets.

<maxloc>
Maximum number of locations supported by the currently selected storage. For phonebooks located on SIM, this value varies depending on the SIM card. See AT+CPBS for typical values.

<nlength>
Maximum 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: memory full".

<tlength>
Maximum 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. In the worst case the number of UCS2 characters is at least one less than half the number of GSM characters. For a detailed description please refer to GSM 11.11, Annex B.

Note:
- Users should be aware that when using this AT command quickly after SIM PIN authentication, the SIM data may not yet be accessible, resulting in a short delay before the requested AT command response is returned. See Section 20.1, Restricted Access to SIM Data after SIM PIN Authentication.
- For more details, see AT+CPBS to determine phonebook <storage>.

Examples

Example 1 – Make a new phonebook entry at the first free location
        AT+CPBW=,"+431234567",145,"international"

Example 2 – Delete entry at location 1
        AT+CPBW=1

Example 3 – The following examples are provided to illustrate the effect of writing phonebook entries with different types of dial string modifiers in <number>
        AT+CPBW=5,"12345678",,"Arthur"
        AT+CPBW=6,"432!+-765()&54*654#",,"John"
        AT+CPBW=7,"432!+-765()&54*654#",129,"Eve"
        AT+CPBW=8,"432!+-765()&54*654#",145,"Tom"
        AT+CPBW=9,"432!+-765()&54*654#",209,"Richard"

Example 4 – Read phonebook entries from locations 5 - 9 via AT+CPBR
        +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"

Chapter 16 – Hardware-Related Commands

The AT Commands described in this chapter are related to the Multi-Tech wireless modem's hardware interface.

16.1   AT^SLED   LED Feature

Description: The AT^SLED command controls the LED function provided by the two status pins (STATUS0 and STATUS1). Each pin acts as a current sink and can be used to control a connected LED. The LEDs indicate the states listed below:

LED connected to STATUS0 line:
- Lights steadily (if <mode>=1) or flashes (depending on <flash_period> if mode>=2) when the ME is registered to the GSM network, awake, or in power saving state.
- Flashes at 1Hz and 50% duty cycle (0.5s on, 0.5s off) when the ME is awake and not registered to any network.
- Flashes at approx. 0.25 Hz and approx. 50% duty cycle (2s on, 2s off) when the ME is in power saving state and not registered to any network. When the ME is in power saving state and not registered, the flashing frequency may be less than 0.25Hz and the duty cycle may vary; for example, between 45% and 55%. These variations are not regular.
- If not registered the ME checks, at the beginning of each flash period, whether it is awake or in power saving state; i.e., whether to flash at 1Hz or at 0.25Hz. This means that a 1Hz or at 0.25Hz flash period always reflects the state that was valid before flashing has started. If a state transition occurs during a flash period (from awake to power saving or vice versa) then the flash period may vary. In the worst case, the LED will indicate a transition from power saving to awake after 4s.
- Is off if the ME is not registered to the GSM network, but registered to the UMTS, or if <mode>=0.
- While the STATUS0 signal is active the STATUS1 signal is inactive.

LED connected to STATUS1 line:
- Lights steadily (if <mode>=1) or flashes (depending on <flash_period> if <mode>=2) when the ME is registered to the UMTS network and either awake or in power saving state.
- Is off if the ME is not registered to the UMTS network, or if <mode>=0.
- While the STATUS1 signal is active the STATUS0 signal is inactive.

Syntax:

Test Command:	AT^SLED=?
Test Response:	^SLED: (list of supported <mode>s), (range of supported <flash_period>s)
	OK
Read Command:	AT^SLED?
Read Response:	^SLED: <mode>[, <flash_period>]
	OK
Write Command:	AT^SLED=<mode>[, <flash_period>]
Write Response:	OK
	ERROR
	+CME ERROR: <err>

Parameter Description:

<mode>
LED operating mode

0	Default. LED feature is disabled.
1	LED lights steadily when the ME is registered to the network and either awake or in power saving state.
2	LED is flashing when the ME is registered to the network and either awake or in power saving state. The duration of flashing can be configured using the parameter <flash_period>.

<flashing_period>
LED flash period

1...50	Default = 10. LED flash period (in milliseconds) if <mode>=2. LED off-time between flashing is approximately 4 seconds and is not configurable.

16.2 AT^SCTM Set Critical Operating Temperature Presentation Mode or Query Temperature

Description: Use this command to monitor the temperature range of the module.
CAUTION: During the first 15 seconds after start-up, the module operates in an automatic report mode: URCs can be always displayed regardless of the selected mode <n>.
The **write command** enables or disables the presentation of URCs to report critical temperature limits.
The **read command** returns:
- the URC presentation mode.
- information about the current temperature range of the module.

Select <n> to enable or disable the presentation of the URCs. Please note that the setting will not be stored upon Power Down; i.e., after restart or reset, the default <n>=0 will be restored. To benefit from the URCs <n>=1 needs to be selected every time you reboot the GSM engine.

Syntax:

Test Command: AT^SCTM=?
Test Response: ^SCTM:(list of supported <n>s)
                      OK

Read Command: AT^SCTM?
Read Response: ^SCTM: <n>, <m>
                      OK
                      ERROR
                      +CME ERROR: <err>

Write Command: AT^SCTM=<n>
Write Response: OK
                      ERROR
                      +CME ERROR: <err>

Parameter Descriptions:

<n>
0   Presentation of URCs is disabled (except for <m> equal to -2 or +2). Default.
1   Presentation of URCs is enabled.

<m>
-2   Below lowest temperature limit (causes immediate switch-off)
-1   Below low temperature alert limit
0   Normal operating temperature
1   Above upper temperature alert limit
2   Above uppermost temperature limit (causes immediate switch-off)

Unsolicited Result Codes:
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>
for module (board) temperature

Notes:
- To avoid damage the module will shut down once the critical temperature is exceeded.
  The 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 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 for 15 s time after the module was switched on. After 15 s operation, the presentation will be disabled; i.e., no URCs 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. The presentation of these URCs 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 engine 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 ME switches off immediately.

Examples:

Example 1

URCs issued when the operating temperature is out of range:

^SCTM_B: 1	Caution: Engine close to over temperature limit.
^SCTM_B: 2	Alert: Engine is above over temperature limit and switches off.
^SCTM_B: -1	Caution: Engine close to under temperature limit.
^SCTM_B: -2	Alert: Engine is below under temperature limit and switches off.

Example 2

URCs issued when the temperature is back to normal (URC is output once):

^SCTM_B: 0	Engine back to normal temperature.

Chapter 17 – Miscellaneous Commands

The AT Commands described in this chapter are related to various areas.

17.1 ATS3 Set Command Line Termination Character

Description: The ATS3 command determines the character recognized by the TA to terminate an incoming command line. It is also generated for result codes and information text, along with the ATS4 parameter.

Syntax:

Read Command:	ATS3?
Read Response:	<n>
	OK
Write Command:	ATS3=<n>
Write Response:	OK
	ERROR

Parameter Description:

<n>
Command line termination character
000.....127   Default = 13.

Note:
Using a value other than the default 13 may cause problems when entering commands.

17.2 ATS4 Set Response Formatting Character

Description: The ATS4 command determines the character generated by the TA for result code and information text, along with the ATS3 parameter.

Syntax:

Read Command:	ATS4?
Read Response:	<n>
	OK
Write Command:	ATS4=<n>
Write Response:	OK
	ERROR

Parameter Description:

<n>
Response formatting character
000....127   Default = 10

17.3 ATS5 Write Command Line Editing Character

Description: This parameter setting determines the character recognized by TA as a request to delete the immediately preceding character from the command line.

Syntax:

Read Command:	ATS5?
Read Response:	<n>
	OK
Write Command:	ATS5=<n>
Write Response:	OK
	ERROR

Parameter Description:

<n>
Command line editing character
000....127   Default = 8

Chapter 18 – Summary Tables

18.1   Restricted Access to SIM Data after SIM PIN Authentication

The following commands can be used only after 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 use any of the following commands will result in "+CME Error: 14" (SIM busy).

The "^SIND: simstatus" URC enabled with AT^SIND can be used to notify the user when the ME has finished reading the SIM card and SIM data are accessible after SIM PIN authentication.

ø ... AT Command not available
- ... AT command accessible immediately after PIN entry has returned OK
+ ... AT command fully accessible after SIM PIN authentication has been completed

AT Command	Exec	Test	Read	Write
AT+CMGL	+	-	ø	+
AT+CMGR	ø	-	ø	+
AT+CSCA	ø	-	+	-
AT+CNUM	+	+	ø	ø
AT+CPBF	ø	+	ø	+
AT+CPBR	ø	+	ø	+
AT+CPBS	ø	+	+	+
AT+CPBW	ø	+	ø	+

18.2 Star-Hash (*#) Network Commands

The following command strings can be sent to the network via ATD and have to be terminated with a semicolon.
The command strings are defined with GSM 2.30.

Table 18.1 Star-Hash (*#) Overview

Star-Hash Code	Functionality	Response, also refer to Table 18.3
Phone Security		
*#06#	Query IMEI	<IMEI> OK
**04[2]*oldPin[2]*newPin[2]*new-Pin[2]#	Change SIM pwd	+CME ERROR: <err> / OK
**05[2]*unblKey[2]*newPin[2]*new-Pin[2]#	Change/Unblocking SIM pwd	+CME ERROR: <err> / OK
[*]03[ZZ]*oldPw*newPw*newPw#	Registration of net password	+CME ERROR: <err> / OK
Phone Number Presentation		
*#30#	Check status of CLIP (Calling Line Identification Presentation)	+CLIP : <n>,<m> OK (see AT+CLIP)
*#31#	Check status of CLIR (Calling Line Identification Restriction)	+CLIR : <n>,<m> OK (see AT+CLIR)
*31#<Phonenumber>[;]	Suppress CLIR	(see AT+CLIR)
#31#<Phonenumber>[;]	Activate CLIR	(see AT+CLIR)
*#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		
(choice of *,#,*#,**,##)21*DN*BS#	Act/deact/int/reg/eras CFU	^CCFC : <reason>, <status>, <class> [,...] like +CCFC *) (see AT+CCFC)
(choice of *,#,*#,**,##)67*DN*BS#	Act/deact/int/reg/eras CF busy	see above
(choice of *,#,*#,**,##)61*DN*BS*T#	Act/deact/int/reg/eras CF no reply	see above
(choice of *,#,*#,**,##)62*DN*BS#	Act/deact/int/reg/eras CF no reach	see above
(choice of *,#,*#,**,##)002*DN*BS*T#	Act/deact/int/reg/eras CF all	see above
(choice of *,#,*#,**,##)004*DN*BS*T#	Act/deact/int/reg/eras CF all cond.	see above
Call Waiting		
(choice of *,#,*#)43*BS#	Activation/deactivation/int WAIT	+CCWA : <status>, <class> [,...] like +CCWA *) (see: AT+CCWA)
Call Barring		
(choice of *,#,*#)33*Pw*BS#	Act/deact/int BAOC	+CLCK : <status>, <class> [,...].(Refer to AT+CLCK)
(choice of *,#,*#)331*Pw*BS#	Act/deact/int BAOIC	see above
(choice of *,#,*#)332*Pw*BS#	Act/deact/int BAOIC exc.home	see above
(choice of *,#,*#)35*Pw*BS#	Act/deact/int. BAIC	see above
(choice of *,#,*#)351*Pw*BS#	Act/deact/int BAIC roaming	see above
#330*Pw*BS#	Deact. All Barring Services	see above
#333*Pw*BS#	Deact. All Outg.Barring Services	see above
#353*Pw*BS#	Deact. All Inc.Barring Services	see above
Call Hold / Multiparty		
C[C] in call	Call hold and multiparty	+CME ERROR: <err> / OK
USSD Messages		
[C]...[C]#	Send USSD message	+CME ERROR: <err> / OK
C[C] (excluded 1[C])	Send USSD message	+CME ERROR: <err> / OK

Table 18.2 Abbreviations of Codes and Parameters used in Star-Hash Network Commands Table Above

Abbreviation	Meaning	Value
ZZ	Type of supplementary services: Barring services All services	 330 Not specified
DN	Dialing number	String of digits 0-9
BS	Basic service equivalent to parameter class: SMS Data circuit asynchron Data circuit synchron dedicated PAD access dedicated Packet access Data circuit asynchron+PAD Data circuit synchron+Packet Data circuit asynchron+synchron+Packet+PAD All Services	 16 25 24 27 26 21 22 20 --
T	Time in seconds	In contrast to 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., asterisks, hash or digit in case of USSD, or digits in case of held calls or multiparty calls)	--

Table 18.3 Star-Hash Command Response Parameters

Parameter	Meaning
<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, refer to AT+CCFC, AT+CLCK
<fac>	Facility lock, refer to AT+CLCK
<reason>	Call forwarding reason

For exact specification of format and parameters for Star-Hash commands refer to GSM 02.04, Table 3.2 and GSM 02.30, Annex C.

Table 18.4 Star-Hash Commands for Supplementary Services

Star-Hash Code	Abbreviations in Table 18.1	Functionality
*	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

18.3 AT Commands and SIM PIN Dependency

Table 18.5: Available AT Commands and Dependency on SIM PIN.

ø	AT Command not available
-	Command does not require PIN 1
+	AT Command requires PIN 1
±	AT Command sometimes requires PIN 1

AT Command	Exec	Test	Read	Write
Configuration Commands				
AT&F	+	ø	ø	ø
AT&V	+	ø	ø	ø
ATQ	+	ø	ø	ø
ATV	-	ø	ø	ø
ATX	+	ø	ø	ø
ATZ	+	ø	ø	ø
AT+CFUN	ø	-	-	-
AT+CMEE	-	-	-	-
AT+CSCS	ø	+	+	+
AT+GCAP	+	+	ø	ø
AT^SCFG	ø	-	-	-
AT^SMSO	-	-	ø	ø
AT^SUSB	ø	-	-	-
Status Control Commands				
AT^SIND	ø	-	-	-
AT+CEER	+	+	ø	ø
AT+CPAS	-	-	ø	ø
AT+WS46	ø	-	-	-
Serial Interface Control Commands				
AT\Q	-	ø	ø	ø
AT&C	+	ø	ø	ø
AT&D	+	ø	ø	ø
AT&S	-	ø	ø	ø
ATE	-	ø	ø	ø
AT+IPR	ø	-	-	-
AT+SQPORT	-	-	-	ø
Security Commands				
AT+CLCK	ø	+	ø	+
AT+CPIN	ø	-	-	-
AT+CPWD	ø	+	ø	+
AT+SCSL	ø	-	ø	-
Identification Commands				
ATI	-	ø	ø	ø
AT+CGMI	-	-	ø	ø
AT+GMI	-	-	ø	ø
AT+CGMM	-	-	ø	ø
AT+GMM	-	-	ø	ø
AT+CGMR	-	-	ø	ø
AT+GMR	-	-	ø	ø
AT+CGSN	-	-	ø	ø
AT+GSN	-	-	ø	ø
AT+CIMI	+	+	ø	ø

AT Command	Exec	Test	Read	Write
Call-Related Commands				
ATA	+	ø	ø	ø
ATD	±	ø	ø	ø
ATD><mem><n>	+	ø	ø	ø
ATD><n>	+	ø	ø	ø
ATD><str>	+	ø	ø	ø
ATH	+	ø	ø	ø
AT+CHUP	-	-	ø	ø
AT+SHUP	ø	+	ø	+
ATS0	ø	ø	+	+
ATS6	ø	ø	+	+
ATS7	ø	ø	+	+
ATS8	ø	ø	+	+
ATS10	ø	ø	+	+
ATO	+	ø	ø	ø
+++	-	ø	ø	ø
AT+CLCC	+	+	ø	ø
AT^SLCC	+	+	+	+
AT+CR	ø	+	+	+
AT+CRC	+	+	+	+
AT+CBST	ø	+	+	+
AT+CRLP	ø	+	+	+
ATP	+	ø	ø	ø
ATT	+	ø	ø	ø
AT^CSTA	ø	+	+	+
Network Service Commands				
AT+COPN	+	+	ø	ø
AT+COPS	+	+	+	+
AT^SOPS	ø	+	ø	ø
AT+CREG	-	-	-	-
AT+CSQ	+	+	ø	ø
AT+CPOL	ø	+	+	+
AT^MONI	-	-	ø	ø
AT^MONP	-	-	ø	ø
AT^SNWS	ø	+	ø	+
Supplementary Service Commands				
AT+CACM	ø	+	+	+
AT+CAMM	ø	+	+	+
AT+CAOC	+	+	+	+
AT+CCUG	ø	+	+	+
AT+CCFC	ø	+	ø	+
AT+CCWA	ø	+	+	+
AT+CHLD	ø	+	ø	+
AT+CLIP	ø	+	+	+
AT+CLIR	ø	+	+	+
AT+COLP	ø	+	+	+
AT+CPUC	ø	+	+	+
AT+CSSN	ø	+	+	+
AT+CUSD	ø	+	+	+

AT Command	Exec	Test	Read	Write
GPRS Commands				
AT+CGACT	ø	+	+	+
AT+CGACT	ø	+	+	+
AT+CGDATA	ø	+	ø	+
AT+CGDCONT	ø	+	+	+
AT+CGPADDR	+	+	ø	+
AT+CGQMIN	ø	+	+	+
AT+CGEQMIN	ø	+	+	+
AT+CGREG	ø	+	+	+
AT+CGREG	ø	+	+	+
AT+CGQREQ	ø	+	+	+
AT+CGEQREQ	ø	+	+	+
AT+CGSMS	ø	+	+	+
ATD*99#	+	ø	ø	ø
AT+SGAUTH	ø	+	+	+
Short Message Service (SMS) Commands				
AT+CMGC	ø	+	ø	+
AT+CMGD	ø	+	ø	+
AT+CMGF	ø	+	+	+
AT+CMGL	+	+	ø	+
AT+CMGR	ø	+	ø	+
AT+CMGS	ø	+	ø	+
AT+CMGW	+	+	ø	+
AT+CMMS	ø	+	+	+
AT+CMSS	ø	+	ø	+
AT+CNMA	+	+	ø	+
AT+CNMI	ø	+	+	+
AT+CPMS	ø	+	+	+
AT+CSCA	ø	+	+	+
AT+CSCB	ø	+	+	+
AT+CSMP	ø	+	+	+
AT+CSMS	ø	+	+	+
AT^SMGL	+	+	ø	+
SIM-Related Commands				
AT+CRSM	ø	-	ø	-
AT+CSIM	ø	-	ø	-
AT^SCKS	ø	-	-	-
SIM Application Toolkit (SAT) Commands				
AT^SSTA	ø	-	-	-
^SSTN	ø	ø	ø	ø
AT^SSTGI	ø	-	-	-
AT^SSTR	ø	-	-	-
Phonebook Commands				
AT+CNUM	+	+	ø	ø
AT+CPBF	ø	+	ø	+
AT+CPBR	ø	+	ø	+
AT+CPBS	+	+	+	+
AT+SPBW	ø	+	ø	+
Hardware-Related Commands				
AT+SLED	ø	-	-	-
AT^SBV	-	-	ø	ø
AT^SCTM	ø	-	-	-
Miscellaneous Commands				
ATS3	ø	ø	-	-
ATS4	ø	ø	-	-
ATS5	ø	ø	-	-
AT^SFDL	-	-	ø	ø

18.4 Factory Defaults Restorable with AT&F

Table 18.6: Factory Defaults Restorable with AT&F Command

AT Command	Factory Defaults
Configuration Commands	
ATQ	<n>=0
ATV	<value>=1
ATX	<value>=0
AT+CMEE	<errMode>=0
AT+CSCS	<chset>="IRA"
Status Control Commands	
AT^SIND	<mode>=0
Serial Interface Control Commands	
AT\Q	<n>=3
AT&C	<value>=2
AT&D	<value>=2
AT&S	<value>=0
ATE	<value>=1
Call-Related Commands	
ATS0	<n>=000
ATS6	<n>=2
ATS7	<n>=050
ATS8	<n>=2
ATS10	<n>=014
AT^SLCC	<n>=0
AT+CR	<mode>=0
AT+CRC	<mode>=0
AT+CBST	<speed>=0, <name>=0, <ce>=1
AT+CRLP	<iws>=61, <mws>=61, <T1>=48, <N2>=6
Network Service Commands	
AT+COPS	<format>=0
AT+CREG	<n>=0
Supplementary Service Commands	
AT+CLIP	<n>=0
AT+CSSN	<n>=0, <m>=0
AT+CUSD	<n>=0
GPRS Commands	
AT+CGREG	<n>=0
Short Message Service (SMS) Commands	
AT+CMGF	<mode>=0
AT+CNMI	<mode>=0, <mt>=0, <bm>=0, <ds>=0, <bfr>=1
AT+CSCB	<operation>=0
AT+CSMP	<dcs>=0, <pid>=0
AT+CSMS	<service>=0
SIM-Related Commands	
AT^SCKS	<mode>=0
Phonebook Commands	
AT+CPBS	<storage>="SM"
Hardware-Related Commands	
AT^SCTM	<n>=0
Miscellaneous Commands	
ATS3	<n>=013
ATS4	<n>=010
ATS5	<n>=008

18.5 Summary of Unsolicited Result Codes (URC)

Table 18.7 Summary of Unsolicited Result Codes (URC)

AT Command	URC
Unsolicited Result Code Presentation	
	^SBC: Undervoltage
	^SBC: Overvoltage Warning
	^SBC: Overvoltage Shutdown
Status Control Commands	
AT^SIND	+CIEV: <indDescr>, <indValue>
AT^SIND	+CIEV: <indDescr>, <indValue>, <eonsOperator>, <servProvider>, <servProviderType>
AT^SIND	+CIEV: <indDescr>, <nitzUT>, <nitzTZ>, <nitzDST>
Call-Related Commands	

AT^SLCC	if the list of current calls is empty:
	   ^SLCC:
	if one or more calls are currently in the list:
	 ^SLCC: <idx>, <dir>, <stat>, <mode>, <mpty>, <Reserved>[,
	 <number>, <type>[, <alpha>]]
	 [^SLCC: <idx>, <dir>, <stat>, <mode>, <mpty>, <Reserved>[,
	 <number>, <type>[, <alpha>]]]
	 [...]
	 ^SLCC:

AT+CRC	RING
AT+CRC	+CRING: <type>
Network Service Commands	
AT+CREG	+CREG: <stat>
AT+CREG	+CREG: <stat>[, <lac>, <ci>]
Supplementary Service Commands	
AT+CAOC	+CCCM: <ccm>
AT+CCWA	+CCWA: <calling number>, <type of number>[, <class>], [, <CLI validity>]
AT+CLIP	+CLIP: <number>, <type>, , [, <alpha>][, <CLI validity>]
AT+COLP	+COLP: <number>, <type>[, <sub-number>][, <sub-type>][, <alpha>]
AT+CSSN	+CSSI: <code 1>
AT+CSSN	+CSSU: <code 2>
AT+CUSD	+CUSD: <m>[<str_urc>[<dcs>]]
GPRS Commands	
AT+CGREG	+CGREG: <stat>
Short Message Service (SMS) Commands	
AT+CNMI	+CMTI: <mem3>, <index>
AT+CNMI	+CMT: <length>**<CR><LF>**<pdu>
AT+CNMI	+CMT: <oa>, <scts>[, <tooa>, <fo>, <pid>, <dcs>, <sca>, <tosca>, <length>]**<CR><LF>**<data>
AT+CNMI	+CBM: <length>**<CR><LF>**<pdu>
AT+CNMI	+CBM: <sn>, <mid>, <dcs>, <page>, <pages>**<CR><LF>**<data>
AT+CNMI	+CDS: <length>**<CR><LF>**<pdu>
AT+CNMI	+CDS: <fo>, <mr>[, <ra>][, <tora>], <scts>, <dt>, <st>
AT+CNMI	+CDSI: <mem3>, <index>
SIM-Related Commands	
AT^SCKS	^SCKS: <SimStatus>
AT^SCKS	^SCRD: <MCC>
SIM Application Toolkit (SAT) Commands	
^SSTN	^SSTN: <cmdType>
^SSTN	^SSTN: <cmdTerminateValue>
^SSTN	^SSTN: 254
^SSTN	^SSTN: 255
Hardware-Related Commands	
AT^SCTM	^SCTM_B: <m>

18.6   AT Commands Supported Only on the Modem Interface

Table 18.8 AT Commands Supported Only on the Modem Interface

AT Command
Call-Related Commands
ATH
ATO
+++
GPRS Commands
AT+CGDATA
ATD*99#

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