Wireless EDGE Modems

AT Commands

Reference Guide

MultiTech® Systems

AT Commands for Multi-Tech EDGE Modems
MultiModem® EDGE (MTCBA-E)
MultiModem® EDGE with USB (MTCBA-E-U)
MultiModem® iCell (MTCMR-E)
MultiModem® rCell (MTCBA-E-EN2)
Embedded Wireless SocketModem® EDGE (MTSMC-E)
Reference Guide
PN S000371G, Revision G

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Revisions

Revision Level	Date	Description
A	07/07/05	Initial release.
B	01/24/06	Added trademarks and registered trademarks to the cover page. Added a product list and a command list. Removed the statement in 18.6 that the setting is stored non-volatile. Changed light blue non-hyperlinked text to black.
C	02/08/07	Added new model MTZPC-E.
D	05/14/07	Updated the Technical Support contact list. Added *Important Note* about Autobauding. Explained the ERROR message that sometimes displays with the AT&V command.
E	05/08/08	Updated for version 04.001. New commands: SNWS, SFNUR, SICI, SISI, SICO, SICC, SISX, SISE, Internet SIS, SCIM, SPBW.
F	01/15/09	Added MultiModem® iCell (MTCMR-E) to the list of products that use these commands. Removed model MTZPC-E from the list of products that use these commands. Removed Fax commands.
G	05/13/09	Added MultiModem® rCell (MTCBA-E-EN2) to the list of products that use these commands.

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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 EDGE devices.

1.2 Related Documents

1. ITU-T Recommendation V.24: List of definitions for interchange circuits between data terminal equipment (DTE) and data circuit-terminating equipment (DCE)
2. ITU-T Recommendation V.250: Serial asynchronous automatic dialing and control
3. 3GPP TS 100 918/EN 300 918 (GSM 02.04): General on supplementary services
4. 3GPP TS 100 907 (GSM 02.30): Man-Machine Interface (MMI) of the Mobile Station (MS)
5. 3GPP TS 23.038 (GSM 03.38): Alphabets and language specific information
6. 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)
7. 3GPP TS 27.007 (GSM 07.07): AT command set for User Equipment (UE)
8. 3GPP TS 27.060 (GSM 07.60): Mobile Station (MS) supporting Packet Switched Services
9. 3GPP TS 51.011 (GSM 11.11): Specification of the Subscriber Identity Module - Mobile Equipment (SIM - ME) interface
10. 3GPP TS 11.14 (GSM 11.14): Specification of the SIM Application Toolkit for the Subscriber Identity Module - Mobile Equipment (SIM - ME) interface
11. 3GPP TS 22.101 (GSM 22.101): Service principles
12. Common PCN Handset Specification (CPHS) v4.2

1.3 Document Conventions

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 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.

1.4.1 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. See also example 2.
- 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
```

Example 2: Using default parameter values for optional parameters

```
AT+CFUN=7,0                 Activate CYCLIC SLEEP mode, don't reset ME
OK
AT+CFUN?                    Query ME mode
+CFUN: 7
OK
AT+CFUN=                    Set ME back to normal (default parameters: 1,0)
OK
+CFUN: 1
OK
```

1.4.2 Combining AT Commands on the Same Command Line

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

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

AT Command Type	Comment
GSM 7.07 commands	with AT commands, Prefix AT^S)
GSM 7.05 commands	(SMS) To be used as standalone commands
Commands starting with AT&	To be used as standalone commands
AT+IPR	To be used as standalone commands

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

1.5 Supported Character Sets

The ME supports two character sets: GSM 03.38 (7 bit, also referred to as GSM alphabet or SMS alphabet) and UCS2 (16 bit, refer to ISO/IEC 10646). See AT+CSCS for information about selecting the character set. Character tables can be found below.

Explanation of terms

- **International Reference Alphabet (IRA)**
  IRA means that one byte is displayed as two characters in hexadecimal format. For example, the byte 0x36 (decimal 54) is displayed as "36" (two characters). IRA is used here for input 8-bit or 16-bit data via terminal devices using text mode. This means only characters 'A'..F','a'..'f' and '0'..'9' are valid.

- **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 for 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
ò	08	BSP	\08	5C 30 38
@	00	NULL	\00	5C 30 30

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

1.5.1 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	Ð	+ 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.

In the event that an MS receives a code where a symbol is not represented in Figure 1.2, Extension character table of GSM 03.38 alphabet the MS shall display the character shown in the main default 7 bit alphabet table (The Main character table of GSM 03.38 alphabet).

1.5.2 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.

1.5.2.1 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".

1.5.2.2 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.

1.6 Serial Interface Flow Control

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

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

1.6.1 Software Flow Control (XON/OFF Handshake)

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

1.6.2 Hardware Flow Control (RTS/CTS Handshake)

Hardware flow control sets or resets the RTS/CTS wires. This approach is faster and more reliable, and therefore, the better choice. When the HWM is reached, CTS is set inactive. When the LWM is passed, CTS goes active again. To achieve smooth data flow, ensure that the RTS/CTS lines are present on your application platform.

Configuring Hardware Flow Control

- Hardware flow control must be set on both sides: with AT\Q3 or AT+IFC in the ME and an equivalent RTS/CTS handshake option in the host application.

- The default setting of the ME is AT\Q0 (no flow control) which must be altered to AT\Q3 (RTS/CTS hardware handshake on). The setting is stored volatile and must be restored each time after rebooting the ME.

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

Buffer Design Considerations

- The serial interface (ASC0) uses two buffers, one for the uplink and one for the downlink. Each buffer has a capacity of minimum 1024 bytes.

- Uplink direction (where ME is receiving data from host application):
CTS control is based on the filling level of the ME's receive buffer. When the application detects that CTS is being deactivated it must instantly stop sending data to the ME's receive buffer. But still, after deactivation of CTS, the receive buffer of the ME can accept another 512 bytes.

- Downlink direction (where ME is sending data to host application):
The transmit buffer of the ME can hold at least 1024 bytes. After deactivation of RTS the ME sends max. 2 more bytes and then stops transferring data to the application.

  The maximum time RTS can be kept inactive without losing data is determined by the buffer size and the maximum possible over-the-air data rate. In any case, the local data rate between DCE and DTE (AT+IPR) should be set to a value higher than the maximum possible over-the-air data rate.

- Buffer size recommended for the host application:
Just like the ME, the host application should include send and receive buffers for each serial interface. To handle large amounts of data at high speed a buffer capacity of 1024 bytes is recommended. If the host application is designed mainly for one direction (uplink or downlink) a lower buffer size will do for the direction where less data is transferred.

  In fact, the optimal size of the host application buffers is a matter of finding the balance between the amount of data, data throughput, and reaction time of the application when handling the buffer, processor performance and available memory. To give an example, a small buffer size (such as 256 bytes) increases the frequency of deactivating RTS/CTS and the frequency of flushing the buffer, thus diminishing the efficiency of the application.

  Also, please consider that RTS/CTS flow control cannot stop the data stream coming from the network, e.g. in a GPRS or fax connection. So the lack of appropriate hardware flow control increases the risk of losing data packets if, like in the case of UDP, the connection protocol has no or only minimum error handling functions. Other network protocols are using high level flow control mechanisms. For example, to prevent loss of data the TCP protocol uses retransmission algorithms.

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 Presentation

URC stands for Unsolicited Result Code and is a report message issued by the ME without being requested by the TE; e.g., 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.

A list of all URCs can be found in Section 20.7, Summary of Unsolicited Result Codes (URC).

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

- The ME activates its RING line (logic "1") for one second; i.e., the line changes to physical "Low" level. This allows the TE to stay in power saving mode until an ME-related event requests service. If several URCs occur coincidentally or in quick succession, each URC triggers the RING line independently, although the line will not be activated between each URC. As a result, the RING line may stay low for more than one second.

  If an incoming call is answered within less than one second (with ATA or if auto answering is set to ATSO=1, then the RING line will be deactivated earlier.

  The "^SHUTDOWN" URC will not activate the RING line.

- If the AT command interface is busy a "BREAK" will be sent immediately but the URC will not be issued until the line is free. This may happen if the URC is pending in the following cases:

  ∗ During the processing of an AT command (i.e., the time after the TE echoes back the first character "A" of an AT command just sent by itself until the ME responds with "OK" or "ERROR").
  ∗ During a data call.

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

For most of these messages, the ME needs to be configured whether or not to send a URC. Depending on the AT command, the URC presentation mode can be saved to the user defined profile (see AT&W), or needs to be activated every time you reboot the ME. Several URCs are not user definable, such as "^SYSSTART", "^SYSSTART <text>", "^SHUTDOWN".

If autobauding is enabled (as factory default mode or set with AT+IPR=0), URCs generated after restart will be output with 57600 bps until the ME has detected the current bit rate. The URCs "^SYSSTART", "^SYSSTART

<text>", however, are not presented at all. For details please refer to Section 4.9.1, Autobauding. To avoid problems we recommend to configure a fixed bit rate rather than using autobauding.

1.9 Common PCN Handset Specification (CPHS)

The ME provides features to implement a device following the prerequisites of the Common PCN Handset Specification (CPHS) Phase 2.

CPHS Feature	Description/Remarks	AT command
Alternate Line Service	Using two phone numbers with one SIM card.	AT^SALS
Voice Message Waiting Indication	Indicate the receipt of a short message coded as Voice Message Waiting Indicator as defined by the CPHS Phase 2 standard.	AT^SIND, AT+CMER, indicators "vmwait1" and "vmwait2"
Operator (Service provider) name from SIM	Read specific Elementary Files (6F14h, 6F18h) from SIM.	AT+CRSM
Network and Service Provider Lock	Lock/Unlock an ME to specific HPLMN and service provider.	AT+CLCK, (AT+CPIN)
Call Forwarding	Get and set diverted call status. Access specific Elementary File (6F13h) from SIM.	AT+CCFC, AT+CRSM
Customer Service Profile (CSP)	Setting services and their menu entries depending on customer profiles.	AT+CRSM
Information numbers	Hierarchically structured service numbers phonebook on SIM according to CPHS 4.2 (mandatory).	AT+CRSM

1.10 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. If so, neither "ERROR" nor "OK" result codes are returned for these commands. A 30 seconds timeout will deliver "ERROR" when the input of a command is not complete.

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 2.5.1, Verbose and numeric result codes

• Section 2.12.1, CME/CMS Error Code Overview

• Section 3.4, 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. All defined GPRS contexts which are not activated or not online will be "undefined" (see AT+CGDCONT).

Exec Command Syntax: AT&F[value]

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.
- In addition to the default profile, you can store an individual one with AT&W. To alternate between the two profiles enter either ATZ (loads user profile) or AT&F (restores factory profile).
- Every ongoing or incoming call will be terminated.

2.2 AT&V Display Current Configuration

Description: AT&V returns the current parameter setting. The configuration varies depending on whether or not PIN authentication has been done.

Exec Command Syntax: AT&V[value]

Response: Active Profile (See Section 2.2.1 AT&V responses)
     OK

Parameter Description:
  <Value>:
    0   Profile number

Notes:
- The value of \Q (flow control) is also determined by the AT+IFC command. In case the value set by AT+IFC cannot be represented by a \Q equivalent, \Q255 will be displayed.
- The parameters of AT^SMGO can only be displayed after the SMS data from the SIM have been read successfully for the first time. Reading starts after successful SIM authentication has been performed, and may take up to 30 seconds depending on the SIM used. While the read process is in progress, an attempt to read the parameter will result in empty values.
- The parameter of AT+CSDH will only be displayed in SMS text mode, see AT+CMGF.

2.2.1 AT&V Responses

The following table shows different kinds of responses depending on whether or not the PIN is entered.

Table 2.1: Current configuration on ASC0 channel 1 (example)

PIN authentication done	No PIN authentication
ACTIVE PROFILE: E1 Q0 V1 X4 &C1 &D2 &S0 \Q0 \V1 S0:000 S3:013 S4:010 S5:008 S6:000 S7:060 S8:000 S10:002 S18:000 +CBST: 7,0,1 +CRLP: 61,61,78,6 +CR: 0 +FCLASS: 0 +CRC: 0 +CMGF: 0 +CSDH: 0 +CNMI: 0,0,0,0,1 +IFC:3 +IFC:0,0 +ILRR: 0 +IPR: 115200 +CMEE: 2 ^SMGO: 0,0 +CSMS: 0,1,1,1 ^SACM: 0,"000000","000000" ^SLCC: 0 ^SCKS: 0,1 ^SSET:0 +CREG: 0,1 +CLIP: 0,2 +CAOC: 0 +COPS: 0,0,"operator" +CGSMS: 3 OK	ACTIVE PROFILE: E1 Q0 V1 X4 &C1 &D2 &S0 \Q0 \V1 S0:000 S3:013 S4:010 S5:008 S6:000 S7:060 S8:000 S10:002 S18:000 +CBST: 7,0,1 +CRLP: 61,61,78,6 +CR: 0 +FCLASS: 0 +IFC:3 +IFC:0,0 +ILRR: 0 +IPR: 115200 +CMEE: 2 ^SCKS: 0,1 ^SSET:0 OK

Notes: **For MTCBA-E2-U, MTCBA-E2, MTSMC-E2:** The AT&V command displays some values that are stored on the SIM (SCMP and CSCA). If the SIM is not yet initialized when the AT&V command is used, you may see the current profile, but at the end of that an ERROR message may display instead of OK.

2.3 AT&W Stores Current Configuration to User Defined Profile

Description: AT&W stores the currently parameters to a user-defined profile in the non-volatile memory.

Exec Command Syntax: AT&W[value]

Response: OK

ERROR / +CME ERROR <err>

Parameter Values:

<value>

0 Number of the profile

Notes:

- The user defined profile will be restored automatically after power-up. Use ATZ to restore user profile and AT&F to restore factory settings. Until the first use of AT&W, ATZ works as AT&F.
- A list of parameters stored to the user profile can be found in Section 20.5, AT Command Settings Storable with AT&W.

2.4   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.
Store this parameter with the AT&W command.
Display this parameter with the AT&V command.

Exec Command Syntax: ATQ<n>

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

2.5   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 2.5.1, Verbose and numeric result codes.
Store this parameter with the AT&W command.
Display this parameter with the AT&V command.

Exec Command Syntax: ATV<value>

Response: OK
ERROR

Parameter Value:

  <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.

2.5.1   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

2.6 ATX Set CONNECT Result Code Format and Call Monitoring

Description: ATX determines whether or not the TA detects the presence of dial tone and busy signal and whether or not TA transmits particular result codes.
Store this parameter with the AT&W command.
Display this parameter with the AT&V command.

Exec Command Syntax: ATX<value>
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.

2.7 AT\V Set CONNECT Result Code Format

Exec Command Syntax: AT\V<value>
Response: OK
ERROR

Parameter Description:
  <value>

0	CONNECT <text> result code returned without RLP trailer.
1	CONNECT <text> result code returned with RLP trailer. Default.

Notes:
- For circuit-switched data calls only
- Output only if ATX parameter is set with value > 0.

2.8 ATZ Set all Current Parameters to User Defined Profile

Description: ATZ sets all current parameters to the user profile stored with AT&W. If a connection is in progress, it will be terminated.

All defined GPRS contexts which are not activated or not online will be undefined if the non-volatile storage of the CGDCONT settings is not activated by the AT^SCFG parameter "GPRS/Persistent Contexts" (see AT+CGDCONT). The user defined profile is stored to the non-volatile memory.
The user defined profile is stored to the non-volatile memory.

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

0	Reset to user profile

Notes:
- First the profile will be set to factory default (see AT&F). If there is a valid user profile (stored with AT&W), this profile will be loaded afterwards.
- Any additional commands on the same command line may be ignored. A delay of 300 ms is required before next command is sent, otherwise "OK" response may be corrupted.

2.9 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 choose one of the SLEEP modes, or to return to full functionality.
Intended for power saving, SLEEP mode reduces the functionality of the ME to a minimum and thus minimizes the current consumption. SLEEP mode falls in two categories:

- NON-CYCLIC SLEEP mode <fun>=0
- and CYCLIC SLEEP modes, selectable as <fun>= 7 or 9.

NON-CYCLIC SLEEP mode permanently blocks the serial interface. The benefit of the CYCLIC SLEEP mode is that the serial interface remains accessible and that, in intermittent wake-up periods, characters can be sent or received without terminating the selected mode. This allows the ME to wake up for the duration of an event and, afterwards, to resume power saving. Please refer to Section 2.8.1, Wake up the ME from SLEEP mode for a summary of all SLEEP modes and the different ways of waking up the module.

For CYCLIC SLEEP mode both the ME and the application must be configured to use hardware flow control. This is necessary since the CTS signal is set/reset every 0.9 to 2.7 seconds in order to indicate to the to the application when the UART is active. The default setting of hardware flow control is AT\Q0 which must be altered to AT\Q3.

For use after restart you are advised to add it to the user profile saved with AT&W.

Test Command Syntax: The test command returns the values of the supported parameters.
AT+CFUN=?
Response: +CFUN: (list of supported <fun>s) , (list of supported <rst>s)
OK
Read Command Syntax: The read command returns the current functionality value.
AT+CFUN?
Response: +CFUN: <fun>
OK
Write Command Syntax: 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>
Response: OK
ERROR
+CME ERROR

Parameter Descriptions:

  <fun>

    0 – NON-CYCLIC SLEEP mode:
In this mode, the AT interface is not accessible. Consequently, after setting <fun>=0, do not send further characters. Otherwise these characters remain in the input buffer and may delay the output of an unsolicited result code. The first wake-up event stops power saving and takes the ME back to full functionality level <fun>=1.

    1 – Full functionality. Default
If the ME is in one of the CYCLIC SLEEP modes you can issue AT+CFUN=1 to stop power saving and return to full functionality.
Keep in mind that, unlike the reset command described below, this action does not restart the ME but only changes the level of functionality. See parameter **<rst>** for details on the reset.

    7 – CYCLIC SLEEP mode:
In this mode, the serial interface is shortly enabled during paging. If characters are recognized on the serial interface, the ME stays active for 2 seconds after the last character was sent or received. ME exits SLEEP mode only, if AT+CFUN=1 is entered.

    9 – CYCLIC SLEEP mode:
In this mode, the serial interface is shortly enabled while CTS is active. If characters are recognized on the serial interface, the ME stays active after the last character was sent or received for at least the time, which can be configured by AT^SCFG="PowerSaver/Mode9/Timeout",<psm9to> (temporary wakeup).
In contrast to SLEEP mode 7 assertion of RTS can also be used to temporarily wake up the ME. In this case too, activity time is at least the time set with AT^SCFG="PowerSaver/Mode9/Timeout",<psm9to>.
ME exits SLEEP mode only, if AT+CFUN=1 is entered.

<rst>
The parameter can only be used if the serial interface is enabled.
Due to the command syntax, you need to enter parameter <fun>, followed by <rst>, where <fun> is only a placeholder and has no effect. See examples below.
- 0   Placeholder for <fun> as stated above. Default.
- 1   ME resets and restarts to full functionality. After reset and restart, PIN 1 authentication is necessary (AT+CPIN). If autobauding is enabled, it is recommended to wait 3 to 5 seconds before entering the first AT command. For details on autobauding refer to Section 4.9.1, Autobauding.

Unsolicited Result Codes:
   URC 1
     ^SYSSTART
     Indicates that the ME has been started and is ready to operate. If autobauding is active (AT+IPR=0), the URC is not generated.
     If the ME is configured to enter the Airplane mode after restart or reset the following URC is received on boot up:
        "^SYSSTART AIRPLANE MODE". In this mode, only the AT commands listed in Section 20.4, Availability of AT Commands Depending on Operating Mode of ME can be used. For details please refer to the AT^SCFG command, parameter <mapos>.

Notes:
- When a circuit-switched call is in progress, <fun>=7 or 9 can be activated without terminating the call. However, setting <fun>=0, during a circuit-switched call immediately disconnects this call.
- To check whether power saving is on, you can query the status with the read command AT+CFUN? only if the module is in full functionality mode or in CYCLIC SLEEP mode. If available, you can also take advantage of the status LED controlled by the SYNC pin (see AT^SSYNC). With AT^SSYNC you can select different modes of LED signalization during SLEEP modes (See Section 18.4.1., *ME Status Indicated by Status LED* for details. However, the module can wake up temporarily from power saving without leaving its CYCLIC SLEEP mode (without changing +CFUN "<fun>"); e.g., for a network scan after a loss of radio coverage, or after receipt of serial data during CYCLIC SLEEP mode. During this "temporary wakeup state" the LED will operate as if the ME was in full functionality mode.
- Recommendation: In NON-CYCLIC SLEEP mode, you can set an RTC alarm to wake up the ME and return to full functionality. This is a useful approach because, in this mode, the AT interface is not accessible.

2.9.1   *Wake up the ME from SLEEP Mode*

A wake-up event is any event that causes the mobile equipment (ME) to draw more current. Depending on the selected mode, the wake-up event either switches the SLEEP mode off and takes the ME back to full functionality AT+CFUN=1, or activates the ME temporarily without terminating the selected SLEEP mode.

Definitions of the state transitions described in the table below:
- Quit: ME exits SLEEP mode.
- Temporary: ME becomes active temporarily for the duration of the event and the mode-specific follow-up time after the last character was sent or received on the serial interface.
- No effect: Event is not relevant in the selected SLEEP mode. The ME does not wake up.

Table 2.3: Wake-up Events in NON-CYCLIC and CYCLIC SLEEP Modes

Event	Selected mode: <fun>=0	Selected mode: <fun>=7 or 9
Reset Line	Quit	Quit
RTS0 or RTS1 activation	Quit	Mode 7: No effect (RTS is only used for flow control) Mode 9: Temporary
Unsolicited Result Code (URC)	Quit	Temporary
Incoming voice or data call	Quit	Temporary
Any AT command (incl. outgoing SMS, voice or data call)	Not possible (UART disabled)	Temporary
Incoming SMS (AT+CNMI is set to 0,0 (this is the default setting)	No effect	No effect
Incoming SMS (AT+CNMI is set to 1,1)	Quit	Temporary
GPRS data transfer	Not possible (UART disabled)	Temporary
RTC alarm line	Quit	Temporary
AT+CFUN=1	Not possible (UART disabled)	Quit

2.10   AT^SMSO   Switch off Mobile Station

Description: AT^SMSO initiates the power-off procedure. High level of the module's PWR_IND and the URC "^SHUTDOWN" notifies that the procedure has completed and the module has entered the POWER DOWN mode. Therefore, be sure not to disconnect the operating voltage until PWR_IND is High or until the URC "^SHUTDOWN" is displayed. Otherwise, you run the risk of losing data.

Exec Command Syntax: AT^SMSO

Response(s):   ^SMSO: MS OFF
    OK

Test Command Syntax: AT^SMSO=?

Response: OK

Unsolicited Result Code:

    ^SHUTDOWN
    Indicates that the power-off procedure is finished and the module will be switched off in less than 1 second.

Note: Do not send any other AT command after AT^SMSO.

2.11   AT+GCAP   Request Complete TA Capabilities List

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

Exec Command Syntax: AT+GCAP

Response(s):   +GCAP: <name>, OK

Test Command Syntax: AT+GCAP=?

Response: OK

Parameter Description:

  <name>
    e.g., +CGSM,+FCLASS

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

2.12   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 2.6, General "CME ERROR" Codes (GSM 07.07), Table 2.5, GPRS related "CME ERROR" Codes (GSM 07.07) and Table 2.8, SMS related "CMS ERROR" Codes (GSM 07.05).

Test Command Syntax: AT+CMEE=?

Response: +CMEE : (list of supported<errMode>s)
    OK

Read Command Syntax: AT+CMEE?

Response: +CMEE : <errMode>
    OK

Write Command Syntax: AT+CMEE=<errMode>

Response: OK
    ERROR
    +CME ERROR: <err>

Parameter Description:

<errMode>

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

Example:

To obtain enhanced error messages it is recommended to choose <errMode>=2:

    AT+CMEE=2
    OK

2.12.1 CME/CMS Error Code Overview

Table 2.4: 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
27	invalid characters in dial string
30	no network service
31	Network timeout
32	Network not allowed emergency calls only
40	Network personalization PIN required
41	Network personalization PUK required
42	Network subset personalization PIN required
43	Network subset personalization PUK required
44	service provider personalization PIN required
45	service provider personalization PUK required
46	Corporate personalization PIN required
47	Corporate personalization PUK required
48	Master Phone Code required
100	unknown
132	service option not supported
133	requested service option not subscribed
134	service option temporarily out of order
256	Operation temporary not allowed
257	call barred
258	phone is busy
259	user abort
260	invalid dial string
261	ss not executed
262	SIM blocked
263	Invalid Block

Table 2.5: General "CME ERROR" Codes

<err> Code	Text (if AT+CMEE=2)
615	Network failure
616	Network is down
639	Service type not yet available
640	Operation of service temporarily not allowed
764	Missing input value
765	Invalid input value
767	Operation failed
769	Unable to get control or required module
770	SIM invalid – network reject
771	Call setup in progress
772	SIM powered down

Table 2.6: 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
148	unspecified GPRS error
149	PDP authentication failure
150	invalid mobile class

Table 2.7: GPRS-related "CMES ERROR" Codes

<err> Code	Text (if AT+CMEE=2)
578	GPRS – unspecified activation rejection
588	GPRS – feature not supported
594	GPRS – invalid address length
595	GPRS – invalid character in address string
596	GPRS – invalid cid value
607	GPRS – missing or unknown APN
625	GPRS – PDP type not supported
630	GPRS – profile (cid) not defined
632	GPRS – QOS not accepted
633	GPRS – QOS validation fail
643	GPRS – unknown PDP address or type
644	GPRS – unknown PDP context
646	GPRS – QOS invalid parameter

Table 2.8: SMS related "CMS ERROR" Codes (GSM 07.05)

<err> Code	Text (if AT+CMEE=2)
1	Unassigned (unallocated) number
8	Operator determined barring
10	Call barred
21	Short message transfer rejected
27	Destination out of service
28	Unidentified subscriber
29	Facility rejected
30	Unknown subscriber
38	Network out of order
41	Temporary failure
42	Congestion
47	Resources unavailable, unspecified
50	Requested facility not subscribed
69	Requested facility not implemented

<err> Code	Text (if AT+CMEE=2)
81	Invalid short message transfer reference value
95	Invalid message, unspecified
96	Invalid mandatory information
97	Message type non-existent or not implemented
98	Message not compatible with short message protocol state
99	Information element non-existent or not implemented
111	Protocol error, unspecified
127	Interworking, unspecified
128	Telematic interworking not supported
129	Short message Type 0 not supported
130	Cannot replace short message
143	Unspecified TP-PID error
144	Data coding scheme (alphabet) not supported
145	Message class not supported
159	Unspecified TP-DCS error
160	Command cannot be activated
161	Command unsupported
175	Unspecified TP-Command error
176	TPDU not supported
192	SC busy
193	No SC subscription
194	SC system failure
195	Invalid SME address
196	Destination SME barred
197	SM Rejected-Duplicate SM
198	TP-VPF not supported
199	TP-VP not supported
208	D0 SIM SMS storage full
209	No SMS storage capability in SIM
210	Error in MS
211	Memory Capacity Exceeded
212	SIM Application Toolkit Busy
213	SIM data download error
255	Unspecified error cause
300	ME failure
301	SMS service of ME reserved
302	Operation not allowed
303	Operation not supported
304	Invalid PDU mode parameter
305	Invalid text mode parameter
310	SIM not inserted
311	SIM PIN required
312	PH-SIM PIN required
313	SIM failure
314	SIM busy
315	SIM wrong
316	SIM PUK required
317	SIM PIN2 required
318	SIM PUK2 required
320	Memory failure
321	Invalid memory index
322	Memory full
330	SMSC address unknown
331	no network service
332	Network timeout
340	NO +CNMA ACK EXPECTED
500	Unknown error
512	User abort
513	unable to store
514	invalid status
515	invalid character in address string
516	invalid length
517	invalid character in pdu
518	invalid parameter

<err> Code	Text (if AT+CMEE=2)
519	invalid length or character
520	invalid character in text
521	timer expired
522	Operation temporary not allowed
532	SIM not ready
534	Cell Broadcast error unknown
535	Protocol Stack busy
538	Invalid parameter
549	Incorrect PDU length
550	Invalid message type indication (MTI)
551	Invalid (non-hex) characters in address
553	Incorrect PDU length (UDL)
554	Incorrect SCA length

2.13 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.

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

2.14 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).

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

Test Command Syntax: AT^SCFG=?
Responses:
        ^SCFG: "Call/ECC", (list of supported <ecc>s)
        ^SCFG: "GPRS/ATS0/withAttach", (list of supported <gs0aa>s)
        ^SCFG: "GPRS/AutoAttach", (list of supported <gaa>s)
        ^SCFG: "GPRS/PersistentContexts", (list of supported <gpc>s)
        ^SCFG: "GPRS/RingOnIncomingData", (list of supported <groid>s)
        ^SCFG: "MEopMode/Airplane", (list of supported <map>s)
        ^SCFG: "MEopMode/Airplane/OnStart", (list of supported <mapos>s)
        ^SCFG: "PowerSaver/Mode9/Timeout", (list of supported <psm9to>s)
        ^SCFG: "Radio/Band", (list of supported <rbp>s), (list of supported <rba>s)
        ^SCFG: "Radio/CNS", (list of supported <cns>s)
        ^SCFG: "Radio/FirstScan", (list of supported <firstscan>s)
        ^SCFG: "Radio/OutputPowerReduction", (list of supported <ropr>s)

      ^SCFG: "Serial/DDD" , (list of supported <deviceDescr>s) , (list of supported <descrIndex>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>)
      ^SCFG: "TCP/BufSize", (list of supported <tcpBufSize>)
^SCFG: "TCP/IRT", (list of supported <tcpIrt>)
^SCFG: "TCP/MR", (list of supported <tcpMr>)
^SCFG: "TCP/OT", (list of supported <tcpOt>)
^SCFG: "TCP/Sack", (list of supported <tcpSack>)
^SCFG: "TCP/TTcp", (list of supported <tcpTtcp>)
^SCFG: "TCP/WithURCs", (list of supported <tcpWithUrc>)
^SCFG: "URC/CallStatus/CIEV", (list of supported <succ>s)
^SCFG: "URC/CallStatus/SLCC", (list of supported <sucs>s)
^SCFG: "URC/Datamode/Ringline", (list of supported <udri>s)
^SCFG: "URC/Ringline", (list of supported <uri>s)
^SCFG: "URC/Ringline/ActiveTime", (list of supported <urat>s)
OK

Read Command Syntax: AT^SCFG?
Read Responses:
    ^SCFG: "CALL/ECC", <ecc>
    ^SCFG: "GPRS/ATS0/withAttach", <gs0aa>
    ^SCFG: "GPRS/AutoAttach", <gaa>
    ^SCFG: "GPRS/PersistentContexts", <gpc>
    ^SCFG: "GPRS/RingOnIncomingData", <groid>
    ^SCFG: "MEopMode/Airplane", (<map>)
    ^SCFG: "MEopMode/Airplane/OnStart", <mapos>
    ^SCFG: "PowerSaver/Mode9/Timeout", <psm9to>
    ^SCFG: "Radio/Band", <rbc>, <rba>
    ^SCFG: "Radio/CNS", <cns>
    ^SCFG: "Radio/FirstScan", <firstscan>
    ^SCFG: "Radio/OutputPowerReduction", <ropr>
    ^SCFG: "Serial/DDD" , <deviceDescr>, <descrIndex>, <langId>, <vendorId>, <productId>,
    <manufacturer>, <product>, <serialNo>
    ^SCFG: "TCP/BufSize", <tcpBufSize>
    ^SCFG: "TCP/IRT", <tcpIrt>
    ^SCFG: "TCP/MR", <tcpMr>
    ^SCFG: "TCP/OT", <tcpOt>
    ^SCFG: "TCP/SAck", <tcpSack>
    ^SCFG: "TCP/TTcp", <tcpTtcp>
    ^SCFG: "TCP/WithURCs", <tcpWithUrc>
    ^SCFG: "URC/CallStatus/CIEV", <succ>
    ^SCFG: "URC/CallStatus/SLCC", <sucs>
    ^SCFG: "URC/Datamode/Ringline", <udri>
    ^SCFG: "URC/Ringline", <uri>
    ^SCFG: "URC/Ringline/ActiveTime", <urat>
    OK

Write Command for Query/Configure Emergency Numbers for SIM without ECC Field
    AT^SCFG="Call/ECC"[, <ecc>]
Write Responses:
    ^SCFG: "Call/ECC", <ecc>
    OK
    ERROR
    +CME ERROR

Write Command for GPRS ATS0 with Automatic Attach:
    AT^SCFG="GPRS/ATS0/withAttach"[, <gs0aa>]
Write Responses:
    ^SCFG: "GPRS/ATS0/withAttach", <gs0aa>
    OK
    ERROR
    +CME ERROR

Write Command for GPRS Attach:
 AT^SCFG="GPRS/AutoAttach"[, <gaa>]
Write Responses:
 ^SCFG: "GPRS/AutoAttach", <gaa>
 OK
 ERROR
 +CME ERROR

Write Command for Persistent GPRS Contexts
 AT^SCFG="GPRS/PersistentContexts"[, <gpc>]
Write Responses:
 ^SCFG: "GPRS/PersistentContexts", <gpc>
 OK
 ERROR
 +CME ERROR

Write Command for Ring on Incoming GPRS IP Data Packets:
 AT^SCFG="GPRS/RingOnIncomingData"[,<groid>]
Write Responses:
 ^SCFG: "GPRS/RingOnIncomingData", <groid>
 OK
 ERROR
 +CME ERROR

Write Command for Query/Set Timeout Value for Power Saving Mode 9:
 AT^SCFG="PowerSaver/Mode9/Timeout"[, <psm9to>]
Write Responses:
 ^SCFG: "PowerSaver/Mode9/Timeout", <psm9to>
 OK
 ERROR
 +CME ERROR

Write Command for Radio Band Selection
 AT^SCFG="Radio/Band"[, <rbp>][, <rba>]
Write Responses:
 ^SCFG: "Radio/Band", <rbp>, <rba>
 OK
 ERROR
 +CME ERROR

Write Command for Query/Enable/Disable Continuous Network Search
 AT^SCFG="Radio/CNS"[, <cns>]
Write Responses:
 ^SCFG: "Radio/CNS", <cns>
 OK
 ERROR
 +CME ERROR

Write Command for Query/Enable/Disable First Network Scan over all Radio Bands
 AT^SCFG="Radio/FirstScan"[, <firstscan>]
Write Responses:
 ^SCFG: "Radio/FirstScan", <firstscan>
 OK
 ERROR
 +CME ERROR

Write Command for Radio Output Power Reduction:

AT^SCFG="Radio/OutputPowerReduction"[, <ropr>]

Write Responses:

^SCFG: "Radio/OutputPowerReduction", <ropr>
OK
ERROR
+CME ERROR

Write Command for Ciphering Algorithm A5/2

AT^SCFG="Security/A52"[, <a52>]

Write Responses:

^SCFG: "Security/A52", <a52>
OK
ERROR
+CME ERROR

Write Command for Configuration of TCP parameter 'BufSize':

AT^SCFG="Tcp/BufSize"[, <tcpBufSize>]

Write Responses:

^SCFG: "Tcp/BufSize", <tcpBufSize>
OK
ERROR
+CME ERROR

Write Command for Configuration of TCP parameter 'InitialRetransmissionTimeout':

AT^SCFG="Tcp/IRT"[, <tcpIrt>]

Write Responses:

^SCFG: "Tcp/IRT", <tcpIrt>
OK
ERROR
+CME ERROR

Write Command for Configuration of TCP parameter 'MaxRetransmissions':

AT^SCFG="Tcp/MR"[, <tcpMr>]

Write Responses:

^SCFG: "Tcp/MR", <tcpMr>
OK
ERROR
+CME ERROR

Write Command for Configuration of TCP parameter 'OverallTimeout':

AT^SCFG="Tcp/OT"[, <tcpOt>]

Write Responses:

^SCFG: "Tcp/OT", <tcpOt>
OK
ERROR
+CME ERROR

Write Command for Configuration of TCP parameter 'Selective Acknowledge':

AT^SCFG="Tcp/SAck"[, <tcpSack>]

Write Responses:

^SCFG: "Tcp/SAck", <tcpSack>
OK
ERROR
+CME ERROR

Write Command for Configuration of Internet Service URCs:

        AT^SCFG="Tcp/WithURCs"[, <tcpWithUrc>]
Write Responses:
        ^SCFG: "Tcp/WithURCs", <tcpWithUrc>
        OK
        ERROR
        +CME ERROR

Write Command for Configuration of URC "+CIEV: call" Call Status Indication:

         AT^SCFG="URC/CallStatus/CIEV"[, <succ>]
Write Responses:
        ^SCFG: "URC/CallStatus/CIEV", <succ>
        OK
        ERROR
        +CME ERROR

Write Command for Configuration of URC "^SLCC" Call Status Indication:

        AT^SCFG="URC/CallStatus/SLCC"[, <sucs>]
Write Responses:
        ^SCFG: "URC/CallStatus/SLCC", <sucs>
        OK
        ERROR
        +CME ERROR

Write Command for URC Indication in Datamode via Ring Line:

        AT^SCFG="URC/Datamode/Ringline"[, <udri>]
Write Responses:
        ^SCFG: "URC/Datamode/Ringline", <udri>
        OK
        ERROR
        +CME ERROR

Write Command for URC Indication via Ring Line:

        AT^SCFG="URC/Ringline"[, <uri>]
Write Responses:
        ^SCFG: "URC/Ringline", <uri>
        OK
        ERROR
        +CME ERROR

Write Command for Duration of Active RING Line for URC Indications:

        AT^SCFG="URC/Ringline/ActiveTime"[, <urat>]
Write Responses:
        ^SCFG: "URC/Ringline/ActiveTime", <urat>
        OK
        ERROR
        +CME ERROR

Unsolicited Result Code

^SYSSTART AIRPLANE MODE
This URC is issued each time the Airplane mode is activated, no matter whether Airplane mode is set with parameter
<map>="on" or <mapos>="on". The URC notifies the user that only the AT commands supported in Airplane mode
are accessible. After leaving the Airplane mode the URC "^SYSSTART" indicates that the ME has returned to Normal
mode and the full set of AT commands is accessible again.

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.

" 0"	No additional emergency numbers
" 1"	000
" 2"	08
" 4"	110
" 8"	118
"16"	119
"32"	999
"64"	Reserved
"128"	Reserved
"255"	All additional emergency call numbers are supported. Default.

<gs0aa> 0 with Attach

This parameter can be used to control the behavior of ATS0.

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

"on"	When the ATS0=<n> (<n>>0) command is received, the MT will attempt to perform a GPRS attach. Default.
"off"	When the ATS0=<n> (<n>>0) command is received, the MT will not attempt to perform a GPRS attach.

<gs0aa> GPRS ATS0 with Attach

This parameter can be used to control the behavior of ATS0.

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

"on"	When ATS0=<n> (<n>>0) is received, the MT will attempt to perform a GPRS attach. This is the power up default value of this parameter.
"off"	When ATS0=<n> (<n>>0) is received, the MT will not attempt to perform a GPRS attach.

<gaa> GPRS with Auto Attach

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

<gpc> GPRS with Persistent Contexts

This parameter can be used to control whether the ME will store the GPRS context information defined by the AT+CGDCONT volatile or non volatile.

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

"0"	GPRS context definitions are volatile. Default.
"1"	GPRS context definitions are non-volatile and will not be reset by AT&F.

<groid>   Ring on incoming GPRS IP data packets

This parameter can be used to control the behavior of the RING line for incoming IP packets in GPRS online mode.

Parameter is local for the interface, volatile and will not be reset by AT&F.

"on"	If ME is in power saving mode 7 or 9 (see AT+CFUN) and hardware flow control is in use (AT\Q3) and RTS line is inactive and there are incoming IP packets for a GPRS context which is online, then the RING line will be activated once, for a time which is configured by the parameter "URC/Ringline/ActiveTime" (<urat>). The RING line which will be used, can be configured by the parameter "URC/Ringline" (<uri>).
"off"	RING line is not activated for incoming IP packets. Default.

<map>   MEopMode/Airplane: Enable/disable Airplane mode during operation

The two parameters <map> and <mapos> can be used to enable/disable the Airplane mode. Airplane mode shuts down the radio part of the ME (PA and receiver), causes the ME to log off from the GSM/GPRS network and disables all AT commands whose execution requires a radio connection. A list of AT commands supported during Airplane mode can be found in Section 21.4, Availability of AT Commands Depending on Operating Mode of ME. The benefit of Airplane mode is that, at locations where no RF emission is allowed (typically airplanes, hospitals etc.), the subscriber can continue using network-independent features rather than powering off the entire device (e.g. a PDA or smartphone).

If the subscriber tries to use an AT command not available in Airplane mode the response "+CME ERROR: Unsupported AT command" is returned.

Parameter <map> allows entering or leaving the Airplane mode any time during operation, eliminating the need to enter the SIM PIN again. It can be used no matter whether the parameter <mapos> is "on" or "off".

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

"on"	Activates Airplane mode and shuts down the radio part of the ME. The URC "^SYSSTART AIRPLANE MODE" appears.
"off"	Deactivates Airplane mode, wakes up the radio part of the ME and restores access to network-dependent AT commands. The URC "^SYSSTART" appears. Default.

<mapos>   MEopMode/Airplane: Airplane mode upon ME restart

There are two ways to enter Airplane mode upon restart: One is using AT^SCFG with <mapos> as described below.

Another approach is configuring the ME to restart into Airplane mode at a scheduled time. In this case, use the AT+CALA command, set an alarm time and then switch the ME off. When the alarm time is reached the ME wakes up to Airplane mode, no matter whether <mapos> was set "on" or "off".

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

"on"	Causes the ME to enter the Airplane mode each time the ME is restarted or reset. After restart or reset, the URC "^SYSSTART AIRPLANE MODE" appears and parameter <map> is "on". The SIM PIN can be entered using the AT+CPIN command. This enables the ME to read data from the SIM and give access to SIM PIN dependent AT commands which are available in Airplane mode, such as phonebook commands or several SMS commands. To notify the user when SIM data are accessible it is recommended to activate the "^SSIM READY" URC and store its presentation mode to the user profile with AT&W. To return from Airplane mode to Normal mode set the parameter <map> to "off" as described above. If PIN authentication was already done, the ME will try now to register to the GSM network.
"off"	Airplane mode will not be activated after ME restart or reset. Default.

<psm9to> Power Saving Mode 9 Timeout

This parameter can be used to query or configure the wake up time for power saving mode 9 (see AT+CFUN with parameter <fun>=9). The granularity of the timeout value is 100ms (i.e. a value of 10 equal 1 second). The minimum timeout value that can be applied is 5, but accuracy is only guaranteed for timeout values greater than 20.

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

5.....36000   (default is 20)

<rba> Allowed Radio Band(s)

The parameters <rba>, <rbp> and <rbc> allow the subscriber to set and query preferences for selecting frequency bands.

This device normally uses an automode algorithm designed to recognize automatically the radio bands of the current country, typically a combination of two bands. Commonly used dual-band combinations are, for example, 900/1800 MHz in European countries or 850/1900 MHz in North America. The standard radio band combination of a country depends on the ARFCNs (Absolute Frequency Channel Number) and the MCCs (Mobile Country Code) visible at the air interface. This enables the ME to easily find the standard band or band combination of a country every time after power-up and, thus, usually eliminates the need for the subscriber to make any changes. So, if automode is used and the allowed bands are not restricted with <rba> the response parameter <rbc> shows the standard band(s) of the current area.

As an alternative, if any bands other than those automatically selected by the ME are needed, the automode can be influenced using the AT^SCFG command. This may be necessary, for example, when running tests of GSM applications, when access to specific radio bands shall be restricted or when the final product is not intended for operation in certain countries.

Before changing <rba> or <rbp> ensure that no network activity occurs. The write command cannot be executed when making a call or sending/receiving short messages.

Execution of the write command causes the ME to deregister from and re-register to the network, no matter whether the selected <rbp> or <rba> setting really changes. Therefore, it is useful to have the URC "+CREG" enabled.

Please note that <firstscan>=1 ("Radio/FirstScan" feature enabled) may override the settings selected <rba>. The status of the SIM PIN authentication remains unchanged, eliminating the need to enter the SIM PIN again after the change.

The parameter <rba> is intended to restrict the allowed bands to less than four bands. By default, all four bands are allowed. Each band not contained in <rba> is generally disabled.

All bands of <rbp> must be contained in the range set with <rba>. The response parameter <rbc> will never show a value outside the <rba> range. <rba> has precedence over <rbp> and <rbc>.

The <rba> value to select resp. deselect radio bands can be either a single band value or a multiple band value as listed below. The multiple band values are calculated by adding up the appropriate single band values.

Parameter <rba> is global for the ME, non-volatile and will not be reset by AT&F.

"1"	GSM 900 MHz
"2"	GSM 1800 MHz
"4"	GSM 1900 MHz
"8"	GSM 850 MHz
"3"	GSM 900 MHz + GSM 1800 MHz
"5"	GSM 900 MHz + GSM 1900 MHz
"10"	GSM 850 MHz + GSM 1800 MHz
"12"	GSM 850 MHz + GSM 1900 MHz
"15"	all bands

<rbp> Preferred Radio Band(s)

The write command will trigger the band selection, starting with the user preference specified by <rbp>. This means bands contained in <rbp> will be searched first, regardless of the standard band combination of the current country. The final result of the band selection can be read from <rbc>.

If <rbp> was a band or band combination which differs from the standard band(s) and the requested band(s) are not visible at the air interface the ME reverts to the standard band(s) of this country. Please note that the band selection procedure is independent of the registration procedure, i.e. the ME selects a band no matter whether or not there is a PLMN (Public Land Mobile Network) the ME can register to. So, if the <rbp> was a band or band combination supported by the country, but currently no PLMN can be found, the ME will select the "preferred" band (indicated by <rbc>) without registering to the network. To avoid registration problems, for example when the settings are configured for testing the GSM application it is recommended that the tester first activates the desired band(s) on the test equipment and then executes the AT^SCFG write command. Besides remember that the network registration also depends on the settings made with AT+COPS. The <rbp> is volatile and cannot be read back with the AT^SCFG read command. This is because the value is used only for triggering one single search operation.

The parameter <rbp> may be one of the single bands or one of the four dual band combinations listed below.

All preferred bands must be contained in the range of allowed bands set with <rba>, invalid combinations are not accepted. To give priority to a certain single band or band combination and suppress all others simply select the same value both for <rbp> and <rba>.

"1"	GSM 900 MHz
"2"	GSM 1800 MHz
"4"	GSM 1900 MHz
"8"	GSM 850 MHz
"3"	GSM 900 MHz + GSM 1800 MHz
"5"	GSM 900 MHz + GSM 1900 MHz
"10"	GSM 850 MHz + GSM 1800 MHz
"12"	GSM 850 MHz + GSM 1900 MHz

<rbc> Currently Selected Radio Band(s)

<rbc> is the single band or dual band combination currently used by the ME, found either by the automode algorithm or after the network search was triggered with <rbp>. The <rbc> value is saved on power down. When restarted next time the ME tries to select the same band(s) if these are visible. If the band(s) stored with <rbc> are not visible the ME uses the standard band(s) of the current country and consequently updates the <rbc> value.

<rbc> is only a response parameter returned either after sending the read command AT^SCFG? or writing AT^SCFG="Radio/Band".

In addition to <rbc> and to allow the subscriber to be notified whenever the selected band changes it is recommended to activate the "+CIEV: band" (see Section 3.3, AT^SIND).

"1"	GSM 900 MHz
"2"	GSM 1800 MHz
"4"	GSM 1900 MHz
"8"	GSM 850 MHz
"3"	GSM 900 MHz + GSM 1800 MHz
"5"	GSM 900 MHz + GSM 1900 MHz
"10"	GSM 850 MHz + GSM 1800 MHz
"12"	GSM 850 MHz + GSM 1900 MHz

<cns> Continuous Network Search Mode

This parameter can be used to influence the time the ME takes to register to the network.

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

"0"	Normal. Default.
	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.

Note: To monitor the search process it may be useful to have the "+CREG" URC enabled. Each time the network search starts, the URC "+CREG" equals "2" (searching). When the network search stops, the URC is issued again, indicating either "0" (not registered), or "1" (registered) or "5" (registered, roaming). As long as no network can be found, the URC will be toggling between "2" and "0".

<firstscan> First Scan over all Radio Bands

"Radio/FirstScan" is a specific band selection feature, designed only to initiate a one-time network search across all band combinations when the ME is forced to select a network the first time after reboot.

The feature may be activated if the ME is expected to operate in a country using a band configuration other than the typical European or North American combinations. In most cases, the settings selected with "Radio/Band" parameter <rba> and <rbp> will do.

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

"0"	Disabled. Default.

Band search follows the rules specified for the "Radio/Band" parameter <rba>. So the ME will try to register to a network within a band or band combination currently visible at the air interface. If no network can be found the ME will continue to search, but only within the same band combination.

"1"	Enabled

Band search will start within the current band combination. If this band combination provides only Limited Service or no service at all, the ME starts to scan all other bands, i.e. it will try to find a band outside the currently visible standard band combination. This mechanism will override the band settings selected with <rba>.

Bands outside the current band combination will be scanned only one time. If there is still no appropriate network, the ME will resume the network search in the first band combination. Conditions for using this mode:

AT+COPS must be set to "Automatic mode" (AT+COPS=0).

Whilst the "Radio/FirstScan" feature is active other band or network selection commands cannot be used, such as AT+COPS, AT^SNWS or the "Radio/Band" parameters <rba> and <rbp> of AT^SCFG.

Note: To keep track of all changes you can activate the "band" indicator provided by AT^SIND which pops up when another band was selected. To track the network registration status you can activate the "+CREG" URC.

The result of the band selection can be checked with <rbc>.

<ropr> Radio Output Power Reduction

According to 3GPP Rel99, output power reduction for multiple TX slots is a mandatory feature. The amount of power reduction is configurable up to 3.0dB for 2TX, 4.8dB for 3Tx to 6dB for 4TX. To optimize heat dissipation, power consumption, and SAR values, it is recommended to use full power reduction (value "3").

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

"1"	Medium Reduction at GMSK and 8PSK (0dB for 1TX and 2TX, 1.8dB for 3TX and 3dB reduction 4TX
"2"	Medium Reduction at GMSK (1TX 0dB, 2TX 3dB, 3TX 4.8dB and 4TX 6dB reduction) and Full Power at 8PSK (1TX and 2TX 0dB reduction)
"3"	Maximal Reduction at GMSK and 8PSK (1TX 0dB, 2TX 3dB, 3TX 4.8dB and 4TX 6dB reduction). Default.

<a52> Ciphering Algorithm A5/2

Defines A5/2 ciphering algorithm availability.

Parameter change takes effect after restart.

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

Please note that no test and read commands are implemented for the A5/2 feature. To check the set value you may use the write command AT^SCFG="Security/A52".

"0"	A5/2 is unavailable. This setting is permanent and cannot be changed again.
"1"	A5/2 is available. Default.

<tcpBufSize> BufferSize

This value defines the default size of the TCP receive queue in bytes. Higher values allow higher throughput but less number of parallel connections. The total throughput is limited by the GPRS/EDGE network resources and cannot exceed the theoretical maximum gross throughput of 230Kbit.

Parameter is global for the ME and non-volatile. Use of default value is recommended. If changed the new value takes effect the next time you start an Internet service with AT^SISO.

3000......20000	Size of TCP receive buffer in bytes. Default = 5200

Possible number of parallel socket connections depending on buffer size:
- 5200 bytes (default): max. 8 connections
- 10000 bytes (medium): max. 4 connections
- 20000 bytes (high): max. 2 connections

<tcpIrt> Initial Retransmission Timeout (IRT)

1....60	This parameter determines the time (in seconds) the TCP/IP stack will wait before starting the first retransmission of packets during the initial connection establishment phase.

The TCP protocol ensures the retransmission of packets several times at increasing intervals until some upper limit is reached.
This mechanism prevents packet loss and serious congestion problems.
Parameter is global for the ME and non-volatile. Use of default value is recommended.
If changed the new value takes effect the next time you start an Internet service with AT^SISO.
Default = 3

<tcpMr> Maximum Number of Retransmissions (MR)

1....30	This parameter determines the maximum number of times to retransmit TCP packets while the service is in connected state. If the service is still connecting (connection setup) another algorithm applies.

The value set with <tcpMr> will be assumed as default for the <srv-ParmTag> "tcpMR" when a new service profile is created with AT^SISS. In each service profile, you can set another "tcpMR" value which has precedence over the global value set with AT^SCFG. Existing service profiles are not affected when you change the global value via AT^SCFG.
Parameter is global for the ME and non-volatile. Use of default value is recommended.
Default = 10

<tcpOt> Overall TCP Timer for outstanding connections (tcpOT)

1...6000	This parameter specifies the number of seconds to wait before closing a connection if TCP/IP packets are not acknowledged.

Setting the maximum value is practically equivalent to deactivating the tcpOT mechanism because the maximum time would never be reached by the TCP/IP stack.
The value set with <tcpOt> will be assumed as default for the <srv-ParmTag> "tcpOT" when a new service profile is created with AT^SISS. However, in each service profile, you can set another "tcpOT" value which has precedence over the global value set with AT^SCFG.
Existing service profiles are not affected when you change the global value via AT^SCFG.
Parameter is non-volatile. Use of default value is recommended.
Default = 6000

<tcpSack> Selective Acknowledge (SAck)

This parameter concerns a set of TCP extensions to improve performance and to provide reliable operation. It defines new TCP options for scaled windows and timestamps, which are designed to provide compatible interworking with TCPs that do not implement the extensions.
The set of TCP extensions to improve performance is described in RFC 1323. The value set with <tcpSack> enables or disables the set of TCP extensions.
Parameter is global for the ME. Use of power up value is recommended.

"0"	Disable set of TCP extensions.
"1"	Enable set of TCP extensions. Default.

<tcpTtcp> Transaction/TCP (T/TCP)

This parameter concerns T/TCP, an extension of TCP to provide a transaction-oriented service.
T/TCP is described in RFC 1644. The value set with <tcpTtcp> enables or disables T/TCP.
Parameter is global for the ME. Use of power up value is recommended.

"0"	Disable T/TCP extension. Default.
"1"	Enable T/TCP extension.

<tcpWithUrc> URC Mode or Polling Mode for Internet Service Commands

This parameter enables or disables the presentation of the following URCs related to Internet service commands: "^SISR" URC, "^SISW" URC and "^SIS" URC for parameter <urcCause>=0 (Internet service events). "^SIS" URCs with <urcCause>=1 or 2 used to indicate incoming Socket connections are always enabled.
Parameter is global for the ME and non-volatile.

"on"	Enable URCs related to Internet service commands. Throughout the Chapter "Internet Service AT Commands" the mode is also referred to as URC mode. Default.
"off"	Disable URCs related to Internet service commands. This requires the host application to employ polling techniques when using the Internet service AT commands: The host application is responsible to retrieve all status information needed to control an Internet session. The method is referred to as polling mode.

<descrIndex> Descriptor Index
As the EDGE modem is capable of holding 0 - 3 customized Device Descriptor configurations, the <descrIndex> allows you to create and select different parameter sets consisting of the parameters listed below.
Please note that release 04.001 supports only one parameter set associated to value 0.
Parameter is global, stored non-volatile in ME and not reset by AT&F. Setting will be active after restart.

"0"	Index for the first descriptor definition. Default.
"1"	Future use.
"2"	Future use.
"3"	Future use.

<succ>   CIEV Call Status Indication
This parameter can be used to control the behavior of URC "+CIEV: call". See also AT+CIND, AT+CMER and Section 7.1, Call Status Information.
Parameter is global for all interfaces and will not be reset by AT&F.

"restricted"	URC "+CIEV: call" will be issued only when a Call Status transition ends in state "active" or "unknown". This is the power up default value of this parameter; it is not stored at power down. (see Section 7.1, Call Status Information) for a call in the list of active calls.
"verbose"	URC "+CIEV: call" will be issued when any state transition (including transitions beginning or ending in state "unknown") occurs in the list of active calls, or when a traffic channel is established.

<sucs>   SLCC Call Status Indication
This parameter can be used to control the behavior of URC "^SLCC". See also AT^SLCC and Section 7.1, Call Status Information.
Parameter is global for all interfaces and will not be reset by AT&F.

"restricted"	URC "^SLCC" will be issued only when a Call Status transition ends in state "active" or "unknown" (see Section 7.1, Call Status Information) for a call in the list of active calls.
"verbose"	URC "^SLCC" will be issued when any state transition (including transitions beginning or ending in state "unknown") occurs in the list of active calls, or when a traffic channel is established. Default.

<uri>   URC RING Line
This parameter can be used to control the behavior of the RING line to indicate URCs (both for idle interfaces and, if configured by the parameter "URC/Datamode/Ringline", if link is reserved) and, if configured, the indicator for incoming IP packets (see parameter "GPRS/RingOnIncomingData" (<groid>).
Parameter is local for the interface, volatile and will not be reset by AT&F.

"off"	URC is not indicated by RING.
"local"	Default. URC will be indicated by an activated RING line of the interface on which the URC appears.
"asc0"	URC is indicated by an activated RING0 line.

<udri>   URC Datamode RING Line
This parameter specifies whether RING or BREAK is used for the signaling of URCs when the TA-TE link is reserved (e.g., during circuit-switched data calls, in GPRS data mode or during the execution of an AT command).
Parameter is global for all interfaces, volatile and will not be reset by AT&F.

"off"	URC will be indicated by BREAK. Default.
"on"	URC is indicated by an active RING line for a time. It is configured by "URC/Ringline/ActiveTime" (<urat>). The RING line, which will be used, can be configured by "URC/Ringline" (<uri>).

<urat>   URC RING line Active Time
This parameter can be used to control how long the RING line is activated to indicate URCs (both for idle interfaces and, if configured by "URC/Datamode/Ringline" (<udri>), to indicate if link is reserved) and, if configured by "GPRS/RingOnIncomingData", to indicate incoming GPRS IP data packets (<groid>).
Parameter is global for all interfaces, volatile and will not be reset by AT&F.

"0"	RING line will be activated for a time between 4.6 and 9.2 ms.
"1"	RING line will be activated for about 100ms.
"2"	RING line will be activated for about 1s. Default.

Note
- Parameters "GPRS/ATS0/withAttach" (<gs0aa>) and "GPRS/RingOnIncomingData" (<groid>) are available only for modules supporting GPRS.

Example

Usage of "URC/Ringline" and "URC/Datamode/Ringline":

AT+CSCS="GSM"	Switch to GSM character set.
OK	
AT^SCFG? Query all parameters.	
...	
^SCFG:"URC/Datamode/Ringline","off"	While the TA-TE link is reserved URCs will be indicated by BREAK.
^SCFG:"URC/Ringline","local"	URCs on this interface will be indicated by Ring line.
...	
OK	
AT^SCFG="URC/Datamode/Ringline","on"	
^SCFG:"URC/Datamode/Ringline","on"	While the TA-TE link is reserved URCs will be indicated by an activated "local" Ring line.
OK	
AT^SCFG="URC/Ringline","asc0"	
^SCFG:"URC/Ringline","asc0"	URCs on *this* interface will be indicated by an activated RING0 no matter whether or not the TA-TE link is reserved.
OK	
AT^SCFG="URC/Datamode/Ringline","off"	
^SCFG:"URC/Datamode/Ringline","off"	URCs on *this* interface will be indicated by an activated RING0 if the TA-TE link is *not* reserved and by BREAK if the TA-TE link is reserved.
OK	
AT^SCFG="URC/Ringline"	Disable any Ring line indication for URCs on this interface.
^SCFG:"URC/Ringline","off"	
OK	

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+CMER   Mobile Equipment Event Reporting

Description: This command controls details of the "+CIEV" URC presentation related to AT^SIND and AT+CIND. If registered via these commands the URCs are sent whenever a value of the related indicator changes.

In addition, AT+CMER controls "^SLCC" URCs related to AT^SLCC. For details refer to Call Status Information, AT^SLCC and AT^SCFG, parameter <sucs>.

The read command returns the URC presentation mode <mode> and among others, the indicator event reporting status <ind>.

The write command enables and disables the presentation of "+CIEV: <indDescr>, <indValue>1[, <ind-Value>2]" URCs. <indDescr> refers to the name of a "+CIEV" indicator and <indValue> is the new value of this indicator. After AT+CMER has been switched on, URCs for all registered indicators will be issued. See examples provided in Section 3.2, AT+CIND and Section 3.3, AT^SIND.

Test Command Syntax: AT+CMER=?
Test Response: +CMER: (list of supported<mode>s), (list of supported <keyp>s), (list of supported <disp>s), (list of supported <ind>s), (list of supported <bfr>s)
OK
Read Command Syntax: AT+CMER?
Read Response: +CMER: <mode>, <keyp>, <disp>, <ind>, <bfr>
OK
Write Command Syntax: AT+CMER=[<mode>[, <keyp>[, <disp>[, <ind>[, <bfr>]]]]]
Read Response: OK
ERROR
+CME ERROR

Unsolicited Result Code:
+CIEV: <indDescr>, <indValue>1[, <indValue>2][, <indValue>[,...]]
A value of an indicator has changed. For more details see AT^SIND.

Parameter Description:
<mode>
  0   Discard "+CIEV" and "^SLCC" URCs. Default.
  1   Discard "+CIEV" and "^SLCC" URCs when TA-TE link is reserved (e.g., in online data mode). Otherwise, they are forwarded directly to the TE.
  2   Buffer "+CIEV" and "^SLCC" URCs in the TA while TA-TE link is reserved; e.g., in online data mode and flush them to the TE afterwards. Otherwise, they are forwarded directly to the TE.
  3   Forward "+CIEV" and "^SLCC" URCs directly to the TE. If the Multi-Tech wireless modem is in online data mode, URCs are signaled via sending BREAK (100ms) and stored in a buffer. Once it is back in command mode (e.g., after +++ was entered), all URCs stored in the buffer will be output.
<keyp>
  0   Keypad event reporting is not supported by the Multi-Tech wireless modem. Default.
<disp>
  0   Display event reporting is not supported by the Multi-Tech wireless modem. Default.
<ind>
  0   Disable indicator event reporting. Default.
  2   Enable indicator event reporting.
<bfr>
  0   TA buffer of URCs defined within this command is cleared when <mode> 1..3 is entered. Default.
<indDescr>
  Name of indicator; for a list of all supported indicators please refer to AT+CIND and AT^SIND.
<indValue>
  Value of indicator; for a list of all values for the supported indicators please refer to AT+CIND and AT^SIND.
Note:
It is recommended that priority be given to AT+CMER=<mode> 2 or 3. Otherwise, if <mode> equals 1, URCs will be discarded in case of long running AT commands or an active data connection.

3.2 AT+CIND Indicator Control

Description: The AT+CIND command controls the presentation of Indicator Event Reports related to various functions such as signal quality, service availability, sound generation, indication of unread short messages, full SMS storage, call in progress or roaming activities.

Use of AT+CIND has become outdated. Rather we recommend the more powerful AT^SIND command which is easier to use and provides additional indicators. All indicators provided by AT+CIND can be handled with AT^SIND as well.

AT+CIND supports two ways to get the values related to indicators:

- One approach is to query the current status of each indicator by using the read command AT+CIND?. It returns the status no matter whether the indicator has been registered with the write command AT+CIND=[<mode>[,<mode>[,...]]].
- The other way is an event-driven notification based on the "+CIEV" URCs. In this case, the ME will automatically send a message to the application, whenever the value of an indicator changes. The application should be designed to react adequately when receiving a URC. The presentation of these URCs depends on two settings:
  - ∗ The indicators must be registered with the write command AT+CIND=[<mode>[,<mode>[,...]]]. When the ME is switched on all of them are in registered mode. Any indicator can be excluded if deregistered with <mode>=0. To register or deregister an indicator the AT+CIND write command requires to type the value <mode>=1 or 0 exactly at the position where the indicator is located in the list. This is not necessary with AT^SIND which allows to specify indicators by name. See examples below.
  - ∗ The presentation of the registered indicators must be enabled with AT+CMER.

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

Read Command Syntax: AT+CIND?
Read Response: +CIND: <indValue>[, <indValue>[, ...]]
OK
ERROR
+CME ERROR: <err>

Write Command Syntax: AT+CIND=<mode>[, <mode>[, ...]]
Write Response: OK
ERROR
+CME ERROR: <err>

Parameter Descriptions:

<indValue>
Integer type value, which shall be in range of corresponding <indDescr>

<indDescr>
String values and their <indValue> ranges.
More indications are available via AT^SIND. Therefore use of AT^SIND for control of all indications is recommended.
The following indications are accessible via AT+CIND:

"signal" Signal quality (0..7). The indicated value is the bit error rate of the signal received. Bit errors are estimated values. See also AT+CSQ.

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

"sounder" Sounder activity (0-1)
Reports every event that causes the ME to generate a tone.
Value 1 means for example:
Incoming call – ME is ringing. Note that the URC "+CIEV: sounder" will be output only if ringing tones are activated with AT^SRTC.
Waiting call – ME generates waiting call tone (if call waiting is enabled).
Outgoing call – ME generates Call Progress tone.
Outgoing call – ME generates BUSY tone.
The value changes to 0 when the tone stops.

"message" Unread short message at memory location <mem1> (0-1); refer to AT+CPMS

"call"	Call in progress (0-1). Indicator value is "1" if at least one call is in state "active" or "held". Depending on the parameter <succ> selected with AT^SCFG the indicator "call" will be issued

- when a state transition ends in state "active" or state "unknown", if <succ>="restricted",
- when any state transition (including transitions beginning or ending in state "unknown") occurs in the list of active calls or when a traffic channel is established, if <succ>="verbose".

Also refer to Section 7.1, Call Status Information.

"roam"	Roaming indicator (0-1)
	0: Registered to home network or not registered
	1: Registered to other network
"smsfull"	A short message memory storage in the MT has become full (1) or memory locations are available (0); i.e., range is (0-1)
"rssi"	Received signal (field) strength (0..5).
	0: signal strength <= -112 dbm
	1-4: signal strength in 15 dbm steps
	5: signal strength >= -51 dbm
	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.

<mode>

0	Indicator is deregistered. The indicator will not be presented as "+CIEV" URC, but can be queried with AT+CIND?.
1	Indicator is registered, indicator event report allowed. Default.

Notes:
- Due to its restrictive value range, indicator "call" does not clearly reflect specific call states (such as alerting, active, held etc.), but rather serves to trigger the application to retrieve the new call status from the list of current calls with the AT commands AT^SLCC, AT+CLCC or AT^SCNI.
- If AT^SCFG setting <succ>="verbose", indicator "call" will be issued also when a traffic channel is established, or when a call enters states "terminating" or "dropped" (see Call Status Information). In these cases, the relevant information about the cause of the display is available only from AT command AT^SLCC.

Examples

Example 1
```
^SYSSTART
AT+CPIN=9999
OK
AT+CIND?
+CIND: 5,1,0,0,0,0,0          The bit error rate of the signal quality is not available (since there is no
                              call in progress). The ME is registered to its home network.
OK
AT+CMER=2,0,0,2              Now activate the Indicator Event Report with AT+CMER.
OK
+CIEV: signal,0
+CIEV: service,1
+CIEV: sounder,0
+CIEV: message,0
+CIEV: call,0
+CIEV: roam,0
+CIEV: smsfull,0
+CIEV: rssi,5               Full receive signal strength.
ATD0123456;                Make a call.
OK
+CIEV: sounder,1           A set of "+CIEV" URCs is received.
+CIEV: call,1
+CIEV: sounder,0
+CIEV: call,0              Called party hangs up.
NO CARRIER
AT+CIND=,,,0,,0            Deregister the indicators "sounder" and "call".
OK
ATD0123456;                Dial the same call.
OK                         This time, no URCs are displayed.
NO CARRIER                 Called party hangs up.
```

Example 2
```
Deactivation of indicator "sounder" via AT+CIND
AT+CIND=? Query the current status of indicators.
+CIND: 5,1,0,1,0,0,0,4
OK
AT+CIND=,,,0              To deactivate indicator "sounder" (= fourth item in list of indicators).
OK
```

Example 3
```
Deactivation of indicator "sounder" via AT^SIND
AT^SIND="sounder",0       To deactivate indicator "sounder".
^SIND: sounder,0,0
OK
```

3.3 AT^SIND Extended Indicator Control

Description: Designed for extended event indicator control AT^SIND
- offers greater flexibility than the standard command AT+CIND,
- offers several extra indicators,
- can show the current status of all indicators supported by AT+CIND and AT^SIND,
- can be used to register or deregister the indicators of both commands,
- displays all indicator event reports via "+CIEV" URCs.

Presentation mode of the generated URCs is controlled via AT+CMER.

The AT^SIND read command provides a list of all indicators supported by AT+CIND and AT^SIND. Each indicator is represented with its registration mode and current value.
The AT^SIND write command can be used to select a single indicator in order to modify its registration and to view the current value.

Test Command Syntax: 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 Syntax: AT^SIND?

Read Response: ^SIND: <indDescr>, <mode>, <indValue>
^SIND: <indDescr>, <mode>, <indValue>, <eonsOperator>, <servProvider>
^SIND: <indDescr>, <mode>, <nitzUT>, <nitzTZ>, <nitzDST>
[^SIND: <indDescr>, <mode>, <indValue>]

...
OK
ERROR
+CME ERROR: <err>

Write Command Syntax: AT^SIND=<indDescr>, <mode>

Write Response: ^SIND: <indDescr>, <mode>, <indValue>
In case of: <indDescr>="eons" and <mode>=2
^SIND: <indDescr>, <mode>, <indValue>, <eonsOperator>, <servProvider>
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 "adnread" indicator issued when accessing the ADN phonebook records stored on the SIM:
+CIEV: <indDescr>, <adnEntry>, <adnNumber>, <adnType>, <adnText>
+CIEV: <indDescr>, "READY"
One URC is issued for every used Abbreviated Dialing Number (ADN) phonebook record. After the last record of the ADN phonebook was read, a URC with "READY" tag signals end of processing.

URC 3

Format of the Voice Message indicator, if the number of waiting messages is delivered by the network:
+CIEV: <indDescr>, <indValue>, <vmCounter>
If the number of waiting messages is not delivered the standard indicator applies.

URC 4

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

URC 5

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

Parameter Descriptions:

<indDescr>

String values and their <indValue> ranges.
All indicators supported by AT+CIND are accessible with this command, too. A detailed description of these indicators can be found there. The following indicators are accessible via AT^SIND only:

"audio"   Activity of the built-in audio unit.

0 Audio unit not active.

1 Audio unit is active, for example:
MO voice call: Indicator is output with value 1 when dialing starts.
MT voice call: Indicator is output with value 1 when call is ringing.

"vmwait1" Voice Message Waiting Indication for line 1
    0   Notifies that no new voice message is available, and is provided by the service center to clear the voice message indication after the subscriber has retrieved all voice messages.
    1   Notifies the subscriber that the mailbox contains one or several messages.

"vmwait1" and "vmwait2" indicate the receipt of a special short message with a Voice Message Waiting Indicator. The service must be provisioned by the operator.

The numbers 1 or 2 in "vmwait1" and "vmwait2" are related to the two lines of the Alternate Line Service (ALS), also defined in CPHS Phase 2 standard. For further details refer to the AT^SALS command.

The presentation mode of the indicator varies with the operator: If more than one message are waiting, some operators only indicate the first one, others deliver the indicator each time a new voice message is put into the mailbox.

After the subscriber has retrieved all voice messages the service center automatically sends another message indication which provides the value 0.

Some operators may also send the number of waiting voice messages along with the indication. In this case, this number will be displayed by the Multi-Tech wireless modem as part of the URC. For example, "+CIEV: vmwait1,1,5" notifies that five new voice messages are waiting. However, it should be noted that neither the read command AT^SIND? nor the write command AT^SIND=<mode>,2 display the number of waiting messages.

The "vmwait" indicators do not apply if a network provider signals new voice mail(s) via standard SMS. In this case the indicator "message" will be displayed (see AT+CIND).

"vmwait2" Voice Message Waiting Indication for line 2
    0   See description of "vmwait1".
    1   See description of "vmwait1".

"ciphcall" Ciphering Status Change Indication
    0   Current call or SMS is not ciphered.
    1   Current call or SMS is ciphered.

As stated in GSM specifications 02.07 and 02.09 the ciphering indicator feature allows the Multi-Tech wireless modem to detect that ciphering is not switched on and to indicate this to the user.

The ciphering indicator feature may be disabled by the home network operator setting data in the "administrative data" field (EF$_{AD}$) in the SIM, as defined in GSM 11.11.

If this feature is not disabled by the SIM, then whenever a connection is in place or is not enciphered, an indication shall be given to the user. This enables the user's decision how to proceed.

Read command returns valid ciphering status only if a call is in progress or active.

If EF$_{AD}$ setting disables the ciphering indicator feature read command always indicates a ciphered link and no URC presentation will take place.

The following restrictions apply if the same serial channel is used for AT^SIND "ciphcall" indication and for the action triggering this URC. In general, the recommended solution is to use a dedicated channel for all status signaling via URCs.

- If an unciphered mobile originated SMS is performed, AT^SIND "ciphcall" URCs on the same serial channel will be issued after the related "OK" and indicate the ciphering state at *this* time.
- If an unciphered mobile originated data call is performed, AT^SIND "ciphcall" URCs on the same serial channel will be issued after the interface is not longer blocked by the call (call is released or temporarily stopped) and indicate the ciphering state at *this* time.

"adnread" Abbreviated Dialing Number (ADN) Phonebook Read Indication
    0   Phonebook reading is not finished.
    1   Phonebook reading is finished.

Every time after entering the AT+CPIN the module starts reading the AND phonebook. This can be used to enable the TE to output the phonebook records as URCs. The advantage is that the user does not need to wait until the phonebook read command AT+CPBR is accessible after entering the SIM PIN (depending on the SIM card this may take up to 30 seconds without RSA or 2 minutes with RSA).

If <mode>=1 all used ADN phonebook records stored on the SIM will be output as URCs after SIM PIN authentication has been performed successfully. A URC with "READY" tag issued at the end of the list indicates that the EDGE modem has finished reading the phonebook.

Note that the settings of AT^SIND and AT+CMER will be restored to their default values when restarting. Therefore it is recommended that the settings be enabled before entering the SIM PIN. This can be done, for example, after rebooting.

"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.

Note: This note applies only to SIM cards with EF_{OPL} and EF_{PNN} fields typically used by providers on the North American market:

After SIM PIN authentication, the initial process of reading data from the SIM takes more than on cards without these two fields. This because the ME first starts reading SIM data related to phonebooks, SMS or Remote SAT, and then continues to read EONS data from the EF_{OPL} and EF_{PNN} fields. As a result, if the "^SSIM READY" URC and/or the AT^SIND "simstatus" URC are enabled the subscriber may already be notified that the SIM initialization has completed, although reading the EONS data is still ongoing for another 2 seconds (without Remote SIM Access) or approx. 10 seconds (if Remote SIM Access was already started). Therefore, trying to access the SIM during this time may cause the CME Error 14 or CMS Error 315 ("SIM busy") to occur.

"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. For use after restart, its presentation mode can be
                              stored to the user profile with AT&W.
               1   SIM card inserted.
               2   SIM PIN1 not required - SIM card unlocked. MC75 automatically registers to the
                              GSM network without requesting SIM PIN1.
               3   SIM PIN1 required - SIM card locked. SIM PIN1 must be entered to enable MC75
                              to register to the GSM network.
               4   Personalization info ready - CHV (Card Holder Verification) data has been
                              verified (if required).
               5.   SIM initialization completed - ME has finished reading SIM data.
                              Note: Another way to notify the user when SIM data are accessible is the "^SSIM
                              READY" URC enabled with AT^SSET. For use after restart, its presentation
                              mode can be stored to the user profile with AT&W.
"band"   Currently selected frequency band or band combination.
               1...14   Identical with <rbc> of AT^SCFG. The value indicates the band(s) currently
                              available for network selection, depending on the network configuration either a
                              single band or a dual band combination. The URC appears whenever the status
                              of the currently available band(s) changes, for example after using the AT^SCFG
                              command to change the "Radio/Band" parameters <rba> or <rbp>. Please see
                              AT^SCFG for further detail about the feature "Radio/Band" selection.
"simlocal"   Availability of the SIM card, physically connected
               0   SIM removed.
               1   SIM inserted.
               If RSA is active: The AT^SIND "simlocal" URC refers to the unused local SIM.
               The status of the remote SIM card currently used for the RSA connection is controlled by
               AT^SCKS.
               If RSA is inactive: The AT^SIND "simlocal" URC refers to the currently used local SIM. In this
               case the value is identical to the AT^SCKS value, except for AT^SCKS value 2.

<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).
   The name information received by the NITZ service (type 3) will be saved in the non-volatile RAM. It replaces
   the operator name of the registered PLMN (type 4) or its numeric form (type 5) stored in the ME. However,
   when after restart the ME registers to another PLMN that is not equal to the saved NITZ name information, the
   NITZ name information must be invalidated.
   If the type is 2, 4 or 5, AT+COPS with the appropriate <mode> displays the same operator name.
<mode>
   0   Indicator is deregistered; i.e., no such indicator event report (URC) will be issued. <mode>=0 is power-up
       and factory default of indicators defined by AT^SIND only.
   1   Indicator is registered.
       • Indicator event reports are controlled via AT+CMER.
       • All indicators can be registered or deregistered via AT^SIND, but different default settings apply:
         Power-up and factory default of the indicators supported by AT+CIND is <mode>=1, while, as stated
         above, indicators defined by AT^SIND only are set to <mode>=0.
   2   Query the registration status and the current value of a single indicator type.

<adnEntry>
ADN phonebook record number on the SIM.

<adnNumber>
Phone number. For further details see AT+CPBR.

<adnType>
Address type, for further details see AT+CPBR.

145	Dialing string <adnNumber> includes international access code character '+'.
209	Dialing string <adnNumber> contains printable non-alphabetic non-digit characters saved with the number string.
129	otherwise

<adnText>
Text assigned to a phone number. For further details see AT+CPBR.

<vmCounter>
If delivered by the network: Number of new voice messages sent as part of the Voice Message Waiting Indicator. Refer to <indDescr>.

<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.

<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>.

Example of Activation and use of indicator "audio":

AT^SIND="audio",1	You register the indicator "audio".
^SIND: audio,1,0	
OK	
AT+CMER=2,,,2	You activate the Indicator Event Report with AT+CMER.
OK	A set of all registered URCs is presented. (Please note that the example includes the indicators registered due to the power-up default settings of AT+CIND.)
+CIEV: signal,99	
+CIEV: service,1	
+CIEV: sounder,0	
+CIEV: message,1	
+CIEV: call,0	
+CIEV: roam,0	
+CIEV: smsfull,0	
+CIEV: rssi,4	
+CIEV: audio,0	
ATD030123456	You make a call.
OK	
+CIEV: audio,1	
+CIEV: sounder,1	
+CIEV: call,1	
+CIEV: signal,0	
+CIEV: sounder,0	
ATH	You hang up.
OK	
+CIEV: call,0	
+CIEV: rssi,3	
+CIEV: audio,0	
+CIEV: signal,99	
+CIEV: rssi,4	

3.4 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 is presented in numeric format. Default output in case of a non-error-situation is +CEER: 0,0,0. A description associated with each number can be found in the tables given in the following subclauses and the relevant GSM specifications.

The first parameter <locationID> serves to locate the other two parameters. Depending on the failure or release cause either <reason> or <ssRelease> are applicable; i.e., if <reason> $\neq$ 0, then <ssRelease> = 0.

Vice versa, if <reason> = 0, then <ssRelease> may be $\neq$ 0.

In addition to AT+CEER, the command ATS18 can be used to check especially the status of data calls.

Exec. Command Syntax: AT+CEER
Exec. Response: +CEER: <locationID>, <reason>, <ssRelease>
OK
ERROR
+CME ERROR
Test Command Syntax: AT+CEER=?
Test Response: OK
ERROR
+CME ERROR

Parameter Description:

<locationID>

Location ID as number code. Location IDs are listed in Section 3.4.1, Cause Location ID for the extended error report. Each ID is related with another table that contains a list of <reason>s or <ssRelease>s.

<reason>

Reason for last call release as number code. The number codes are listed in several tables, sorted by different categories in the following subclauses. The tables can be found proceeding from the Location ID given in Section 3.4.1, Cause Location ID for the extended error report.

<ssRelease>

Release cause for last Supplementary Service call (listed in Section 3.4.5, GSM Release cause for Supplementary Service Call).

Examples:

Example 1

ATD"01751223344";	A mobile originated call is rejected by the remote party.
NO CARRIER	Call setup is terminated with NO CARRIER.
AT+CEER	To check the cause, the caller enters AT+CEER.
+CEER: 8,21,0	The Location ID 8 in Section 3.4.1 points to Section 3.4.4, where 21 =
OK	"Call rejected". 0 = "No error" refers to parameter <ssRelease> that is not applicable.

Example 2

The user attempts to activate call barring, but uses the wrong password.

AT+clck=oi,1,"0000",3;	
+CME ERROR:	incorrect password
AT+CEER	
+CEER: 35,0,43	The Location ID 35 in Section 3.4.1 points to Section 3.4.5, where 43 =
OK	"NumberOfPWAttemptsViolation" may mean that a wrong password has been entered for more than 3 times. 0 = "No error" refers to parameter <reason> that is not applicable.

3.4.1 Cause Location ID for the Extended Error Report

ID	Description
0	No error (default)
2	GSM cause for L3 Radio Resource Sublayer (GSM 04.08 annex F)
4	GSM cause for L3 Mobility Management (GSM 04.08 annex G)
8	GSM cause for L3 Call Control (GSM 04.08 10.5.4.11 and annex H)
12	GSM cause for L3 SMS CP Entity
14	GSM cause for L3 SMS RL Entity
16	GSM cause for L3 SMS TL Entity
21	GSM cause for L3 Call-related Supplementary Services
34	Network cause for Supplementary Services (GSM 04.08 10.5.4.11 and annex H)
35	Supplementary Services network error (GSM 04.803.6.6)
48	GSM cause for GPRS Mobility Management (GSM 04.08 annex G.6)
50	GSM cause for Session Management (GSM 04.08 annex I)
128	Supplementary Services general problem (GSM 04.80 3.6.7)
129	Supplementary Services invoke problem (GSM 04.80 3.6.7)
130	Supplementary Services result problem (GSM 04.80 3.6.7)
131	Supplementary Services error problem (GSM 04.80 3.6.7)
241	Cause for GPRS API
242	Cause for Link Management
243	Cause for PPP/IP-Stack

3.4.2 GSM Release Cause for L3 Radio Resource (RR)

Number/Description

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

3.4.3 GSM Release Cause for Mobility Management (MM) or Session Management

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

3.4.4 GSM Release Cause for L3 Call Control (CC)

Number/Description
0   No error

Normal class
1   Unassigned (unallocated) number
3   No route to destination
6   Channel unacceptable
8   Operator determined barring
16   Normal call clearing
17   User busy
18   No user responding
19   User alerting, no answer
21   Call rejected
22   Number changed
25   Pre-emption
26   Non-selected user clearing
27   Destination out of order
28   Invalid number format (incomplete number)
29   Facility rejected
30   Response to STATUS ENQUIRY
31   Normal, unspecified

Resource unavailable class
34   No circuit/channel available
38   Network out of order
41   Temporary failure
42   Switching equipment congestion
43   Access information discarded
44   Requested circuit/channel not available
47   Resource unavailable, unspecified

Service or option not available class
49   Quality of service unavailable
50   Requested facility not subscribed
55   Incoming calls barred within the CUG
57   Bearer capability not authorized
58   Bearer capability not presently available
63   Service or option not available, unspecified

Service or option not implemented
65   Bearer service not implemented
68   ACM equal or greater than ACMmax
69   Requested facility not implemented
70   Only restricted digital information bearer capability is available
79   Service or option not implemented, unspecified

Invalid message (e.g., parameter out of range) class
81   Invalid transaction identifier value
87   User not member of CUG
88   Incompatible destination
91   Invalid transit network selection
95   Semantically incorrect message

Protocol error (e.g., unknown message) class
96   Invalid mandatory information
97   Message type non-existent or not implemented
98   Message type not compatible with protocol state
99   Information element non-existent or not implemented
100   Conditional information element error
101   Message not compatible with protocol
102   Recovery on timer expiry
111   Protocol error, unspecified

Interworking class
127   Interworking, unspecified

3.4.5 GSM Release Cause for Supplementary Service Call

Number/Description

0	No error (default)
1	UnknownSubscriber
9	IllegalSubscriber
10	BearerServiceNotProvisioned
11	TeleserviceNotProvisioned
12	IllegalEquipment
13	CallBarred
15	CUGReject
16	IllegalSSOperation
17	SSErrorStatus
18	SSNotAvailable
19	SSSubscriptionViolation
20	SSIncompatibility
21	FacilityNotSupported
27	AbsentSubscriber
29	ShortTermDenial
30	LongTermDenial
34	SystemFailure
35	DataMissing
36	UnexpectedDataValue
37	PWRegistrationFailure
38	NegativePWCheck
43	NumberOfPWAttemptsViolation
71	UnknownAlphabet
72	USSDBusy
126	MaxNumsOfMPTYCallsExceeded
127	ResourcesNotAvailable

General Problem Codes

300	Unrecognized Component
301	Mistyped Component
302	Badly Structured Component

Invoke Problem Codes

303	Duplicate Invoke ID
304	Unrecognized Operation
305	Mistyped Parameter
306	Resource Limitation
307	Initiating Release
308	Unrecognized Linked ID
309	Linked Response Unexpected
310	Unexpected Linked Operation

Return Result Problem Codes

311	Unrecognized Invoke ID
312	Return Result Unexpected
313	Mistyped Parameter

Return Error Problem Codes

314	Unrecognized Invoke ID
315	Return Error Unexpected
316	Unrecognized Error
317	Unexpected Error
318	Mistyped Parameter

3.4.6 GSM Release Cause for Session Management

Number/Description

102	Recovery on timer expiry

3.4.7 GSM Cause for L3 Protocol Module or Other Local Cause

Number/Description

10	Unspecified RLP Error
14	Unreliable data link or if the peer instance is not RLP
15	SREJ timed out
16	REMAP procedure timed out

3.5 ATS18   Extended Call Release Report

Description: ATS18 controls the presentation of extended call release reports for circuit switched data calls. Extended call release reports related to voice calls are controlled via AT+CEER.

The call release report is presented in numeric format and shows as follows:
+CAUSE: <locationID>:<reason>

If enabled the message will be reported every time a data call is released or fails to be established.

Read Command Syntax: ATS18?
Read Response: <n>
OK
Write Command Syntax: ATS18=<n>
Write Response: OK
ERROR

Parameter Descriptions:

<n>
An odd number enables the presentation of the extended call release report. Any even number disables this feature. This parameter can be stored with the AT&W command. It can be displayed with the AT&V command. The default is 0.
0...255

<locationID>
Location ID as number code, see also <locationID> of AT+CEER.
Location IDs are listed in Section 3.4.1, Cause Location ID for the extended error report. Each ID is related to another table that contains a list of <reason>s.

<reason>
Reason for last call release as number code (see also <reason> of AT+CEER).
<reason> numbers and the associated descriptions are listed in several tables, sorted by different categories at AT+CEER. The tables can be found proceeding from the Location IDs listed in Section 3.4.1, Cause Location ID for the extended error report.

Examples

Example 1

ATS18=1	Enables the presentation of extended call release reports.
OK	
ATD03012345678	Now, a mobile originated data call fails.
+CAUSE: 8:17	An extended error report is output, followed by the result code BUSY.
BUSY	The Location ID 8 stated in Section 3.4.1 points to Section 3.4.4, with 17 = "User busy".

Example 2

ATS18=1	Enables the presentation of extended call release reports.
OK	
ATD03012345678	Now, a mobile originated data call is set up.
CONNECT 9600/RLP	
Hello,....	
+++	Call ends after remote party hung up.
+CAUSE: 8:16	Normal call release is reported, followed by the result code NO CARRIER.
NO CARRIER	The Location ID 8 stated in Section 3.4.1 points to Section 3.4.4, with 16 = "Normal call clearing".

3.6 AT+CPAS   Mobile Equipment Activity Status

Description: The AT+CPAS execute command indicates the activity status of the ME.
Test Command Syntax: AT+CPAS=?
Test Response: +CPAS: (list of supported<pas>s)
OK
Exec Command: AT+CPAS
Response: +CPAS: <pas>
OK

Parameter Description

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

3.7 AT+WS46 Select Wireless Network

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

Parameter Description
  <n>
    12   GSM digital cellular

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

Exec Command Syntax: AT\Q[<n>]
Response: OK
If RTS/CTS flow control is not supported by interface and <n> is 2 or 3:
ERROR

Parameter Description:
  <n>
  0   Disable flow control. Default.
  1   XON/XOFF software flow control
  2   Only CTS by DCE (TA)
  3   RTS/CTS hardware flow control
       Recommended for the following procedures: incoming or outgoing data calls, and MUX mode.

Notes:
- When using XON/XOFF flow control (AT\Q1) in online mode, +++ should not be used while the data transmission is paused with XOFF. Before entering the command mode with +++ the paused transmission should be resumed using the XON character.
- With AT+IFC, flow control can be set separately for each data direction, while AT\Q applies to both directions. The two commands influence each other, i.e. settings made with AT\Q apply to AT+IFC and, vice versa, AT+IFC changes the AT\Q setting.

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

Description: The AT&C command determines how the state of the DCD line (circuit 109) reflects EDGE modem's internal activity.
Exec Command Syntax: AT&C[value]
Response: OK

Parameter Description:
  <value>
  0   DCD line is always ON.
  1   DCD line is ON in the presence of data carrier only. Default.
  2   DCD line shall be on when one or more Internet services defined on the related serial channel are in state "Connecting" or "Up" as described below. For details on the various service states refer to AT^SISI, parameter <srvState> or AT^SISO, parameter <srvState>.
       •   SOCKET, HTTP, SMTP, POP3: DCD shall be on when <srvState>="Connecting" or "Up"
       •   FTP: DCD shall be on when data channel is connected; i.e., <srvState>="Up"

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 during data mode.
Exec Command Syntax: AT&D[<value>]
Response: OK
Parameter Description:
  <value>
  0   ME ignores status of DTR.
  1   ON->OFF on DTR: Change to command mode while retaining the connected call.
  2   ON->OFF on DTR: Disconnect data call, change to command mode. During state DTR = OFF auto-answer is disabled. Default.

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.
Exec Command: AT&S<value>
Response: OK
Parameter Description:
  <value>
   0   DSR line is always ON. Default.
   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.
Exec Command: ATE[<value>]
Response: OK
Parameter Description:
  <value>
   0   Echo mode off.
   1   Echo mode on. Default.
  Note: In case of using the command without parameter, <value> is set to 0.

4.6   AT+ICF   Serial Interface Character Framing

Description: The command AT+ICF controls the serial interface character framing format and parity used for receiving and transmitting. The following settings are supported:
- 7 bits, even parity, 1 stop bit (AT+ICF=5,1)
- 7 bits, odd parity, 1 stop bit (AT+ICF=5,0)
- 8 bits, even parity, 1 stop bit (AT+ICF=2,1)
- 8 bits, no parity, 1 stop bit (AT+ICF=3)
- 8 bits, odd parity, 1 stop bit (AT+ICF=2,0)
- 8 bits, no parity, 2 stop bits (AT+ICF=1)

Test Command Syntax: AT+ICF=?
Response(s): +ICF: (list of supported <format>s), (list of supported <parity>s)
OK
Read Command Syntax: AT+ICF?
Response(s): +ICF: <format>[, <parity>]
OK
Write Command Syntax: AT+ICF=[<format>][, <parity>]
Response(s): OK
ERROR
Parameter Descriptions:
  <format>
  Specifies the character format used for receiving and transmitting.
   1   8 data 0 parity 2 stop
   2   8 data 1 parity 1 stop
   3   8 data 0 parity 1 stop. Default.
   5   7 data 1 parity 1 stop
  <parity>
  Specifies the method of calculating the parity bit, if a parity bit is supported by <format>.
  If <format> does not support parity, this parameter has to be omitted.
   0   odd
   1   even
Notes:
- If AT+ICF modes 7E1 or 7O1 are set, the parity bit will by default not be transmitted over the air. If the remote party expects the parity bit to be transmitted, additional settings are required via AT^STPB.
- When using a bit rate of 300 bps there must be a delay of 500ms before entering the next command. At bit rates of 1200 bps the delay must be 300ms. For higher bit rates use of the default delay is sufficient.
- The Multi-Tech wireless modem's autobaud feature detects the bit rate currently used by the TE. However, this detection suffers some limitations described in Section 4.9.1, Autobauding. If autobauding is enabled, the AT+ICF read command does not show the current character framing, but the character framing that will be used when autobauding is disabled.

- If a <format> is selected without parity (e.g. <format>=3) and you try to activate a format with parity (e.g., <format>=2), you need to explicitly set the parameter <parity> (e.g. AT+ICF=2,1). Otherwise you will get '+CME ERROR: invalid index'. This is because for <format>=3, the parameter <parity> is set to the internal value 'no parity' which is not supported by <format>=2. (Remember that if an optional parameter is omitted for which no default is stated in this specification, the value of the parameter remains unchanged).

4.7   AT+IFC   Set Flow Control Separately for Data Directions

Description: The command AT+IFC can be used to set or query the data flow control separately for each data direction. In contrast to this, flow control settings made with AT\Q are valid in both data directions.

Please note that AT+IFC and the AT\Q commands are designed for configuring only the TA. The TE must, of course, also be configured. When programming the TE bear in mind that the flow control method set on the TA must be compliant with the flow control method set on the TE. See notes below.

Test Command Syntax: AT+IFC=?
Response(s):   +IFC: (list of supported <TEflowcontrol>s), (list of supported <TAflowcontrol>s)
OK
Read Command Syntax: AT+IFC?
Response(s):   +IFC: <TEflowcontrol>, <TAflowcontrol>
OK
Write Command Syntax: AT+IFC=<TEflowcontrol>, <TAflowcontrol>
Response(s):   OK
ERROR

Parameter Descriptions:

<TEflowcontrol>

Specifies the method used by the TA when sending data to the TE.

0	none
1	XON/XOFF
	Local setting on the TA. Terminates flow control in the TA and thus, causes the TA to stop sending data to the remote TA.
2	RTS line
	Local setting on the TA.
3	XON/XOFF

Used to evaluate flow control in the TA. If the data flow from the TA requires that the transmission be stopped, the TE inserts the XON/OFF control characters into the data stream to be sent, over the air, to the opposite TE. It is the responsibility of the receiving TE to recognize and filter out from the data stream the XON/OFF control characters. So, both TEs must have XON/OFF flow control enabled.

Also, the receiving TA must be configured to use software flow control. This means, that if the sending TA is configured for AT+IFC=3,x the receiving TA must be set to AT+IFC=y,1. In addition, XON/OFF flow control must be enabled on either TE.

If the TAs and TEs on both sides are properly configured, the transmission of the XON/OFF control characters will instantly stop the data flow. So, value "3" has an immediate effect on the over-the-air connection between both TEs.

<TAflowcontrol>

Specifies the method used by the TA when receiving data from the TE.

0	none. Default.
1	XON/XOFF
2	CTS line

Notes:

- When using XON/XOFF flow control (AT+IFC=1,x or AT+IFC=3,x) in data mode, +++ should not be used while the data transmission is paused with XOFF. Before entering the command mode with +++ the paused transmission should be resumed using the XON character.
- The two commands AT+IFC and AT\Q influence each other, i.e. settings made with AT\Q apply to AT+IFC and, vice versa, AT+IFC changes the AT\Q setting.
- Bear in mind that when you set a flow control method for one direction on the TA (with AT+IFC) the TE must also be configured accordingly.
- The values "1" and "2" have only local effect for the connection between TA and TE. Value "3" has an immediate effect on the over-the-air connection.
- XON/OFF flow control is not recommended for transferring binary files. This is because the data stream might contain characters equal to the hex values typically used as XON/OFF control characters; i.e., values 11 (hex) resp. 17 (dec) and 13 (hex) resp. 19 (dec).

4.8 AT+ILRR Set TE-TA Local Rate Reporting

Description: The command AT+ILRR controls whether or not the intermediate result code "+ILRR" is transmitted from the TA to the TE while a connection is being set up. The result code indicates the local rate. It is issued before the final result code of the connection; e.g., *CONNECT* is transmitted to the TE.

Test Command Syntax: AT+ILRR=?
Response: +ILRR: (list of supported <value>s)
                         OK
Read Command Syntax: AT+ILRR?
Response: +ILRR: <value>
                         OK
Write Command Syntax: AT+ILRR=<value>
Response: OK
                         ERROR
                         +CME ERROR
Intermediate Result Code: +ILRR: <rate>
                         Indicates local port rate setting upon connection setup.
Parameter Descriptions:
  <value>
    0   Disables reporting of local port rate. Default.
    1   Enables reporting of local port rate
  <rate>
    Port rate setting upon connection setup (bps)
    0   Autobauding (see Section 4.9.1, Autobauding).
    300
    600
    1200
    2400
    4800
    9600
    14400
    19200
    28800
    38400
    57600
    115200 Default
    230400
    460800

4.9 AT+IPR Set Fixed Local Rate

Description: The command AT+IPR can be used to set or query the TE-TA interface bit rate.
                         The test command returns the values of the supported automatically detectable bit rates and the values of the supported fixed bit rates.
                         The read command returns the current bit rate of the interface.
                         The write command specifies the bit rate to be used for the interface. When you set a fixed-rate, make sure that both TE (DTE) and TA (DCE) are configured to the same rate. When you select autobauding, the TA will automatically recognize the bit rate currently used by the TE.
                         The setting is stored in the non-volatile memory and will be used whenever the engine is powered up again. However, in case of autobaud mode (AT+IPR=0) the detected TA bit rate will not be saved and, therefore, needs to be resynchronized after restarting the GSM engine (see Section 4.91, Autobauding).
Test Command Syntax: AT+IPR=?
Response: +IPR: (list of supported auto-detectable <rate>s) , (list of supported fixed-only <rate>s)
                         OK
Read Command Syntax: AT+IPR?
Response: +IPR: <rate>
                         OK
Write Command Syntax: AT+IPR=<rate>
Response: OK
                         ERROR
                         +CME ERROR

Parameter Descriptions

<rate>

bit rate per second (bps)

0	Activates autobauding. See Section 4.91, Autobauding for further details.
300	
600	
1200	
2400	
4800	
9600	
14400	
19200	
28800	
38400	
57600	
115200	Default rate.
230400	
460800	

Notes:
- Delivery value for <rate> is 115200bps. It will not be restored with AT&F.
- The current setting of AT+IPR will be preserved when you download firmware or in the event of power failure. Note: A firmware update does not restore the factory setting.
- Generally, AT+IPR should be used as a standalone command. If combinations with other commands on the same command line cannot be avoided, there are several constraints to be considered:
  - ∗ Avoid combinations with the AT commands listed in Section 1.4.2, Combining AT commands on the same command line.
  - ∗ Take into account, that a delay of 100ms is required between the response to the last command (e.g., OK) and the next command on the same line.
  - ∗ When local echo is active (ATE1) and you enter AT+IPR=x with other commands you may encounter the following problem: if switching to the new bit rate takes effect while a response is being transmitted, the last bytes may be sent with the new bit rate and thus, not properly transmitted. The following commands will be correctly sent at the new bit rate.
- In order to account for greater amounts of data it is recommended to choose a minimum bit rate of 2400 bps.
- A selected bit rate takes effect after the write commands returns OK.

4.9.1 Autobauding

Important Note: If you set the modem for autobauding with +IPR=0, the autobauding wont actually take effect until you cycle power. Then, at that time autobauding works only once. After the first AT command, the modem simply locks itself to the speed detected. Autobaud won't function again until another power cycle.

To take advantage of autobaud mode specific attention must be paid to the following requirements:

Synchronization between TE and TA.
Ensure that TE and TA are correctly synchronized and the bit rate used by the TE is detected by the TA. To allow the bit rate to be synchronized simply use an "AT" or "at" string. This is necessary
- ∗ after you have activated autobauding
- ∗ when you start up the GSM engine while autobauding is enabled. It is recommended to wait 3 to 5 seconds before sending the first AT character. Otherwise undefined characters might be returned.

If you want to use autobauding and autoanswer at the same time, you can easily enable the TE-TA synchronization, when you activate autobauding first and then configure the autoanswer mode (ATS0 ≠' 0).

- **Restrictions on Autobauding**
  - ∗ If you switch to autobaud mode, then autobauding does not take effect immediately after the write command AT+IPR=0 ends. Instead the old bit rate remains active. The autobaud mode is activated with the next restart of the TA. This is indicated by any following AT+IPR read command which still returns the old baud rate until the next restart.
    Before you activate autobauding switch on the local echo with ATE1. To verify if autobauding has become effective after restart first send only the characters "AT" or "at" and check that they are echoed within 100ms. In some cases you may need to repeat this several times, until both characters are properly echoed within 100ms.
    Please note that after the successful synchronization between TE and TA the autobauding mechanism of the TA is deactivated until next restart. So, while autobauding is enabled you will need to restart the TA each time after changing the bit rate of the TE.
  - ∗ The TA cannot distinguish between 1 and 2 stop bits. Therefore, 1 stop bit will be used by the TA.
  - ∗ The command A/ cannot be used.
  - ∗ Only the first "AT" or "at" after restart of the module can be detected (neither "At" nor "aT"). This means that all the AT commands have to use the same bit rate and frame type.
  - ∗ URCs that may be issued before the ME detects a new bit rate (by receiving the first AT character) will be sent at the previously detected bit rate or, after ME restart, at 115200 bps.

- **Autobauding and bit rate after restart.**
  Unless the bit rate is determined, the following constraints apply:
  - ∗ An incoming CSD call or a network initiated GPRS request cannot be accepted. This must be taken into account when autobauding and autoanswer mode (ATS0 ≠' 0) are enabled at the same time, especially if SIM PIN 1 authentication is done automatically and the setting ATS0 ≠' 0 is stored to the user profile with AT&W.
  - ∗ Until the bit rate is found, URCs generated after restart will be output at 115200 bps. This applies only to user defined URCs, such as "+CREG", "CCWA", "^SCKS" etc. The URCs "^SYSSTART" and "^SYSSTART AIRPLANE MODE"will not be indicated when autobauding is enabled.
  Note: To avoid any problems caused by undetermined bit rates in the direction from TA to TE we strongly recommend to configure a fixed bit rate rather than autobauding.

4.10 AT+STPB Transmit Parity Bit (for 7E1 & 7O1 Only)

Description: This command is intended for use with 7E1 and 7O1 only. In addition to the 7E1 or 7O1 settings made with AT+ICF the command AT^STPB specifies whether or not to transmit the parity bit over the air.

Command Descriptions:

The **test command** returns the supported values of the parameter <n>.

The **read command** returns the current value of the parameter <n>.

The **write command** can be used to control the handling of the parity bit. If command fails, "+CME ERROR: unknown" will be returned.

Test Command Syntax: AT^STPB=?

Response(s): ^STPB: (list of supported <n>s)
OK

Read Command Syntax: AT^STPB?

Response(s): ^STPB: <n>
OK

Write Command Syntax: AT^STPB=<n>

Response(s): OK
ERROR
+CME ERROR: unknown

Parameter Descriptions:

<n>

0   The parity bit will not be transmitted over the air and will be replaced with 0.
This mode is the default setting if 7E1 or 7O1 is activated with AT+ICF.

1   In a data connection 8 bits will be transmitted, including the parity bit; i.e., the parity bit will be properly transmitted over the air. The setting shall be used if problems are encountered when Multi-Tech wireless modem is running in the default 7E1 or 7O1 mode enabled with AT+ICF. In this case, AT^STPB=1 shall be set in addition to the 7E1 or 7O1 settings selected with AT+ICF.

Chapter 5 – Security Commands

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

5.1 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.

Test Command Syntax: AT+CPIN=?
Response: OK
Read Command Syntax: AT+CPIN?
Response: +CPIN: <code>
OK
ERROR
+CME ERROR: <err>
Write Command Syntax: AT+CPIN=<pin>[, <new pin>]
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 5.1.1, 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. This is only applicable when an attempt to access a PIN2 related feature was acknowledged with +CME ERROR: 17 ("SIM PIN2 required"), for example when the client attempts to edit the FD phonebook). In this case the read command AT+CPIN? also prompts for SIM PIN2. Normally, the AT+CPIN2 command is intended for SIM PIN2.
    SIM PUK2   ME is waiting for PUK2 to unblock a disabled PIN2. As above, this is only necessary when the preceding command was acknowledged with +CME ERROR:
                 18 ("SIM PUK2 required") and only if the read command AT+CPIN? also prompts for SIM PUK2. Normally, the AT+CPIN2 command is intended for SIM PUK2.
    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-SIM PUK   ME is waiting for Master Phone Code, if the above "PS" lock password was incorrectly entered three times.

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 PUK	ME is waiting for network personalization unblocking password.
PH-NS PIN	ME is waiting for network subset personalization password.
PH-NS 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-C PIN	ME is waiting for corporate personalization password.
PH-C 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").
- To check the number of remaining attempts to enter the passwords use the AT^SPIC command.
- See AT+CPWD and AT^SPWD for information on passwords.
- See AT+CLCK and AT^SLCK for information on lock types.

5.1.1 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: 12 will prompt the client to unblock the SIM card by entering the associated PUK (= PIN Unblocking Key / Personal Unblocking Key). After ten failed attempts to enter the PUK, the SIM card will be invalidated and no longer operable. In such a case, the card needs to be replaced. PIN1 consists of 4 to 8 digits, PUK1 is an 8-digit code only.
To unblock a disabled PIN1 you have two options:
- You can enter AT+CPIN=PUK1,new PIN1.
- You can use the ATD command followed by the GSM code **05*PUK*newPIN*newPIN#;.

PIN2 / PUK2:
PIN2 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.
Failure to enter the password is subject to the same timing algorithm as the Master Phone Code (see Table above).

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 2.12.1, CME/CMS Error Code Overview. For further instructions and examples see AT+CLCK, AT^SLCK, AT+CPWD and AT^SPWD.
For a complete list of Star-Hash codes please refer Section 20.2, Star-Hash (*#) Network Commands.

5.2 AT+CPIN2 PIN2 Authentication

Description: AT+CPIN2 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 PIN2 to benefit from the features listed below or the SIM PUK2 to replace a disabled PIN2 with a new one. Note that PIN2 can only be entered if PIN1 authentication was done.

If the Multi-Tech wireless modem is requesting SIM PUK2, use <pin> to enter the PUK2, followed by <new pin> to specify the new PIN2.

Test Command Syntax: AT+CPIN2=?
Response: OK
Read Command Syntax: AT+CPIN2?
Response: +CPIN2: <code>
OK
ERROR
+CME ERROR: <err>
Write Command Syntax: AT+CPIN2=<pin>[, <new pin>]
Response: OK
ERROR
+CME ERROR: <err>

Parameter Descriptions:

<pin>
Password (string type), usually SIM PIN2 or, if requested, SIM PUK2.

<new pin>
If the requested code was SIM PUK2: new password (PIN2).
See Section 5.1.1, What to do if PIN or password authentication fails? for more information about when you may need to enter the PUK.

<code>
READY   ME is not pending for any password.
SIM PIN2 ME is waiting for SIM PIN2.
          This <code> is returned only when PIN2 authentication has not yet been done or has failed ("+CME ERROR:17").
SIM PUK2 ME is waiting for SIM PUK2.
          This <code> is returned only when PIN2 authentication has failed and ME is pending for SIM PUK2 (i.e., "+CME ERROR:18").

Note:

- Functions accessible only after PIN2 authentication:
  AT+CACM: Accumulated call meter (ACM) reset or query
  AT+CAMM: Accumulated call meter maximum (ACMmax) set or query
  AT+CLCK: Facility lock to "FD" (Fixed dialing phonebook)
  AT^SLCK: Facility lock to "FD" (Fixed dialing phonebook)
  AT+CPWD: Change "P2"password
  AT^SPWD: Change "P2"password
  AT+CPUC: Price per unit and currency table
  AT+CPIN2: Enter SIM PIN2 or SIM PUK2 if requested.

  For example, SIM PIN2 will be needed when you attempt to edit the "FD" phonebook and ME returns "+CME Error 17" or "+CPIN: SIM PIN2".

  Once the required <pin> has been entered correctly, PIN2 authentication code changes to READY. After 300s, a repetition of the authentication process is required; PIN2 authentication code changes from READY to SIM PIN2.

Examples:

Example 1: Change PIN2
AT+CPWD="P2","0000","8888"   (where "0000" = old PIN2 and "8888" = new PIN2)
OK

Example 2: Unblock a disabled PIN2
AT+CPIN2?
+CPIN2: SIM PUK2   PIN2 has been disabled, PUK2 must be entered
OK   to define a new PIN2
AT+CPIN2=12345678,8888   where "12345678" is the PUK2, and "8888" the new PIN2.

Example 3: Write into "FD" phonebook
AT+CPBS="FD"
OK
AT+CPBW=2,"+493012345678",145,"Charly"
+CME ERROR 17 access denied due to missing PIN2 authentication
AT+CPIN2=8888
OK
AT+CPBW=2,"+493012345678",145,"Charly"
OK

5.3 AT^SPIC   Display PIN Counter

Description: The AT^SPIC command can be used to find out whether the ME is waiting for a password and, if so, how many attempts are left to enter the password.

The execute command returns the number of attempts still available for entering the currently required password, for example the PIN, PUK, PH-SIM PUK etc.

The read command AT^SPIC? indicates which password the number of attempts stated by the execute command actually refers to. Also, the write command may be used to query the counter for a specific password: It indicates the number of attempts still available for entering the password identified by <facility>, for example the PIN, PIN2, PH-SIM PIN etc.

To check whether or not you need to enter a password use the read commands AT+CPIN?, AT+CPIN2? and AT^SPIC?. If the response to AT+CPIN? is "READY" the counter of the execute command AT^SPIC relates to PIN2. See last example. If the responses to AT+CPIN? and AT+CPIN2? both read "READY", no password is currently required, and the referrer of the execute command AT^SPIC is explicitly undefined.

Test Command Syntax: AT^SPIC=?
Response: OK
Read Command Syntax: AT^SPIC?
Response: ^SPIC: <code>
                                   OK
Exec Command Syntax: AT^SPIC
Response: ^SPIC: <counter>
                                   OK
Write Command Syntax: AT^SPIC=<facility>
Response: ^SPIC: <counter>
                                   OK
Parameter Descriptions:

<counter>
Number of attempts left to enter the currently required password. This number will be counted down after each failure.

<facility>
Password for which the corresponding PIN counter is to be displayed.

"SC"   SIM PIN or SIM PUK. If the SIM PIN has been deactivated after three failed attempts, the counter for SIM PUK will be returned instead.

"PS"   "Phone code" or "device code" (cf. AT+CLCK and AT+CPWD). If incorrectly entered three times, the Master Phone Code is required to lift the lock and the number of remaining attempts for the master phone code will be returned.

"P2"   SIM PIN2 or SIM PUK2. If the SIM PIN2 has been deactivated after three failed attempts, the counter for SIM PUK2 will be returned instead.

"PN"   Network Personalization

<code>
Identification of the currently required password.

SIM PIN   ME is waiting for SIM PIN1.
SIM PUK   ME is waiting for SIM PUK1 if PIN1 was disabled after three failed attempts to enter PIN1.
SIM PIN2   ME is waiting for PIN2, when the attempt to access PIN2 requiring features was acknowledged with +CME ERROR:17 (e.g., if the user attempts to edit the FD phonebook).
SIM PUK2   ME is waiting for PUK2 to unblock a disabled PIN2. Necessary if preceding command was acknowledged with +CME ERROR:18.
PH-SIM PIN   ME is waiting for phone-to-SIM card password if "PS" lock is active and user inserts other SIM card than the one used for the lock. ("PS" lock is also referred to as phone or antitheft lock).
PH-SIM PUK   ME is waiting for Master Phone Code, if the above "PS" lock password was incorrectly entered three times.
PH-NET PUK   ME is waiting for network personalization unblocking password

Notes:
- Whenever the required password changes, <counter> changes to reflect that change. Please refer to the examples below.
- For passwords associated to the phone lock ("PS" lock set by user or factory) or other factory set locks, such as "PF", "PN", "PU", "PP", "PC" the number of attempts is subject to a timing algorithm explained in AT+CPIN. If these passwords are incorrectly entered the counter first returns 3, 2 and 1 remaining attempt(s), but then gives the total number of attempts which amounts to 63 (see example below).
- See also commands AT+CLCK, AT+CPIN, AT+CPIN2, AT+CPWD, AT^SLCK for further information on locks and passwords.

Examples:
  Example 1
    The user fails to provide a correct SIM PIN three times. The counter decreases each time. After the counter
    reaches zero, the SIM PUK is required. After each failure to enter a correct SIM PUK, the counter decreases.

```
        at+cpin?
        +CPIN: SIM PIN
        OK                                  Currently required password is PIN1.
        at^spic
        ^SPIC: 3
        OK                                  3 attempts left.
        at+cpin=9999
        +CME ERROR: incorrect password
        at^spic
        ^SPIC: 2                            2 attempts left.
        OK
        at+cpin=9999
        +CME ERROR: incorrect password
        OK
        at^spic
        ^SPIC: 1                            1 attempt left.
        OK
        at+cpin=9999
        +CME ERROR: incorrect password
        at+cpin?
        +CPIN: SIM PUK
        OK                                  Now required password is PUK 1.
        at^spic
        ^SPIC: 10
        OK                                  10 attempts left for PUK 1.
        at+cpin=01234567,1234
        +CME ERROR: incorrect password
        at^spic
        ^SPIC: 9
        OK                                  9 attempts left for PUK 1.
```

  Example 2
    Though a mobile is locked to a specific SIM card (phone lock), the user attempts to operate it with another SIM
    card. The user correctly enters the SIM PIN of the SIM card currently inserted, but then fails to give the "PS" lock
    password (PH-SIM PUK):

```
        at+cpin=9999
        OK
        at+cpin?
        +CPIN: PH-SIM PIN                   ME is waiting for the phone lock password.
        OK
        at^spic
        ^SPIC: 3                            3 attempts left.
        OK
        at+cpin=4711
        +CME ERROR: incorrect password
        at^spic?
        ^SPIC: 2                            2 attempts left.
        OK
        at+cpin=4712
        +CME ERROR: incorrect password
        at^spic
        ^SPIC: 1                            1 attempt left.
        OK
        at^spic?
        ^SPIC: PH-SIM PIN                   Displayed counter refers to phone lock password.
        OK

        at+cpin=4713
        +CME ERROR: incorrect password
        at^spic
        ^SPIC: 63
        OK
        at^spic?
        ^SPIC: PH-SIM PUK                   Displayed counter refers to master phone code.
        OK

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

Example 3
This example shows that after successful SIM PIN1 authentication the counter of the AT^SPIC execute and read command refers to SIM PIN2; i.e., it does not reflect the status of SIM PIN1. This may be a problem if the user enters a wrong PIN1 and is not aware that the number of attempts left to enter SIM PIN1 is counted down.

+CREG: 0	
at+cpin=1234	
OK	
+CREG: 2	
+CREG: 1	The mobile list properly registered to the network.
at+cpin?	
+CPIN: READY	The AT+CPIN? read command confirms that SIM PIN1 authentication was successful.
at^spic	
^SPIC: 3	As SIM PIN1 authentication was successful, the counter relates to SIM PIN2 and correctly indicates that the user has 3 attempts to enter SIM PIN2.
OK	
AT^SPIC?	Likewise, the read command notifies that the ME is waiting for SIM PIN2.
^SPIC: SIM PIN2	
OK	
at+clck="SC",0,456789	First attempt to enter a wrong SIM PIN1.
CME ERROR: incorrect password	
at^spic	
^SPIC: 3	SIM PIN1 authentication is still valid, and the counter relates to SIM PIN2.
at+clck="SC",0,456789	Second attempt to enter a wrong SIM PIN1.
CME ERROR: incorrect password	
at^spic	
^SPIC: 3	SIM PIN1 authentication is still valid, and the counter relates to SIM PIN2.
at+clck="SC",0,456789	Third attempt to enter a wrong SIM PIN1.
CME ERROR: incorrect password	
+CREG: 0	SIM PIN1 authentication is no longer valid.
at^spic	
^SPIC: 10	This time, after the SIM PIN1 code has been disabled, the counter indicates the status of SIM PIN1 and notifies that 10 attempts are left to enter the SIM PUK.

To avoid conflicts we recommend to use the AT^SPIC read and write commands rather than the execute command only. The read command clearly states the currently required password, and the write command may be used to get the counter for a specific <facility>, in this case for example "P2".

5.4 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.

Test Command Syntax: AT+CLCK=?

Response(s): +CLCK:list of supported <facility>s

OK

Write Command Syntax: AT+CLCK=<facility>, <mode>[, <password>][, <class>]

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

If error is related to ME functionality

+CME ERROR

Parameter Descriptions:

<facility>

Phone security locks set by client or factory

Primarily intended for the client to take safety precautions, "SC", "PS" and "FD" 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.

"PS"   Phone locked to SIM card. ME requests password when other than current SIM card is inserted.
"PS" lock is frequently referred to as "phone lock", or "device lock". Accordingly, the password may be called "phone code" or "device code". The "PS" password is not associated with the PUK of the SIM card. If incorrectly entered three times, the Master Phone Code is required to lift the lock. This is an 8-digit device code associated to the IMEI number of the mobile which can only by obtained from the manufacturer of the module. Once the Master Phone Code has been accepted, the mobile is operational, and the "PS" lock is no longer active. If needed it must be set once again.

Important Note: Multi-Tech does not lock SIM Cards.

<password>: User defined password. It is needed before the first use of <facility> "PS" and, therefore, must first be specified with AT+CPWD or AT^SPWD, if it has not been predefined by factory settings. If set by factory (e.g., for a prepaid mobile), the password is supplied by the provider or operator.

"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 voice and data calls can be made only to numbers stored in "FD" phonebook. Result for voice and data calls to numbers not stored in the "FD" phonebook is "+CME Error 257: Call barred".
- Access to defined Supplementary Services such as Call barring, Call waiting, Call forwarding, Call hold and Multiparty is possible only if the exact corresponding dialing numbers of the public MMI *# code (followed by the dialing number) for the desired service is stored in the "FD" phonebook and used with ATD. Using Supplementary Services ATD*#code without dialing number is possible.
AT commands for supplementary service control are barred while "FD" lock is active. Indication is "+CME Error 257: Call barred".
- Access to Unstructured Supplementary Services ("USSD") is possible only if the exact desired USSD string is stored in the "FD" phonebook and used with ATD.
AT commands for USSD are barred while "FD" lock is active. Indication is "+CME Error 257: Call barred".
- SMS can be sent only to phone numbers which are stored in the "fixed dialing numbers" phonebook "FD". Also, a valid Service Center Address (international format) must be present in "FD" to allow sending SMS at all.
Indication is "+CMS Error 302: operation not allowed".
- GPRS commands can be used only if the "fixed dialing numbers" phonebook "FD" contains an entry with phone number "*99#". This single entry enables all GPRS commands, including AT commands and modem compatibility commands like "ATD*99***1#" or "ATD*98***1#".
Indication is "+CME Error 257: Call barred".

Factory Defined SIM Locks:
Typical examples of factory set SIM locks are prepaid phones or network locks, used to restrict the operation of a mobile to a specific provider or operator. The client should be aware that each of these lock types can only be unlocked if the associated password is available. For example, a mobile can be locked to accept only SIM cards from the respective provider, or even one single SIM card. Once a different SIM card is inserted the ME will prompt the client to enter a specific code. This is not the PUK of the SIM card, but usually an 8-digit code which needs to be requested from the provider.

The locks can only be set by the manufacturer and need to be agreed upon between the parties concerned; e.g., provider, operator, distributor etc. on the one side and the manufacturer on the other side.

Parameter <class> is not applicable to SIM locks.

<password> and instructions for unlocking must be obtained from the network provider.

Important Note: Multi-Tech does not lock SIM Cards.

"PF"	lock Phone to the very First SIM card – Not applicable.
"PN"	Network Personalization
"PU"	Network subset Personalization
"PP"	Service Provider Personalization
"PC"	Corporate Personalization

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 (Bar Outgoing International Calls)
"OI"	BOIC (Bar Outgoing International Calls)
"OX"	BOIC-exHC (Bar Outgoing International Calls except to Home Country)
"AI"	BAIC (Bar All Incoming Calls)
"IR"	BIC-Roam (Bar Incoming Calls when Roaming outside the home country)
"AB"	All Barring services (applicable only for <mode>=0)
"AG"	All outGoing barring services (applicable only for <mode>=0)
"AC"	All inComing barring services (applicable only for <mode>=0)

<mode>
0   unlock
1   lock
2   query status

<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 or AT^SPWD.

<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".

1   voice
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 (voice, 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.
  Under the same conditions, an outgoing Voice call will be terminated with result code NO DIALTONE.
- 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 5.1.1, 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.
- In the airplane mode the write command version for the network related <facility> (AO, OI, OX, AI, IR, AB, AG and AC) is not supported. For remaining facilities the command is fully functional then.

Examples

Example 1: Lock SIM card (<facility>= "SC")

AT+CLCK="SC",1,"9999"	The "SC" parameter enables or disables the SIM PIN authentication (PIN 1) when you power up the GSM engine
OK	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"	Unlocks SIM card.
OK	When powered up, ME registers to the GSM network without requesting SIM PIN1. **Note:** Depending on the services offered by the provider, this feature is not supported by all SIM card types. If so, the command returns ERROR when you attempt to unlock the card.

To query the status of the SIM card lock:

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

Example 2: Phone Lock (<facility>="PS")

AT+CPIN?	Make sure that PIN1 authentication is valid.
OK	

To lock the ME to the currently inserted SIM card, first specify a password for <facility> "PS":

AT+CPWD="PS",,"1234"	If "PS" lock has not been set before: enter new password.
OK	

Optionally, if "PS" password was defined before, change existing password:

AT+CPWD="PS","1234","3333"	To replace existing "PS" password: Enter old and new password.
OK	

Then, activate the Phone Lock:

AT+CLCK="PS",1,"3333"	Locks the mobile to the current SIM card.
OK	

To operate the mobile with the SIM card for which "PS" lock was activated:

AT+CPIN?	
+CPIN: SIM PIN	
OK	
AT+CPIN="9999"	
OK	No additional password is required for operation (SIM recognized by mobile).

To operate the mobile with other SIM card than the one used for the "PS" lock:
Enter SIM PIN of present card, followed by "PS" lock password.

AT+CPIN?	
+CPIN: SIM PIN	
OK	
AT+CPIN="1111"	
OK	PIN authentication accepted.
AT+CPIN?	
+CPIN: PH-SIM PIN	"PS" lock password is required.
OK	
AT+CPIN="3333"	
OK	"PS" Lock password has been accepted. ME is fully operational now.

To deactivate the Phone Lock:

AT+CLCK="PS",0,"3333"	Phone Lock password has to be provided again.
OK	Now the mobile can be used with any SIM card, without the need of the phone lock password.

5.5 AT^SLCK   Facility Lock

Description: AT^SLCK provides the "Facility lock" function as defined for the GSM 07.07 command AT+CLCK. The command can be used to lock, unlock or interrogate a network or ME <facility>. AT^SLCK is, in every respect, identical with AT+CLCK, except that the command syntax and response prefix is "^SLCK" instead of "+CLCK". For further details please refer to AT+CLCK. The command can be aborted when network facilities are being set or interrogated.

Test Command Syntax: AT^SLCK=?
Response(s): ^SLCK:list of supported <facility>s,   OK
Write Command Syntax: AT^SLCK=<facility>, <mode>[, <password>][, <class>]
Response(s): if <mode> is not equal 2 and command successful: OK
if <mode>=2 and command successful: ^SLCK: <status>, <class>
[^SLCK: <status>, <class>]
[^SLCK: ...]
OK
If error is related to ME functionality: +CME ERROR

Note: In the airplane mode the write command version for the network related <facility> (AO, OI, OX, AI, IR, AB, AG and AC) is not supported. For remaining facilities the command is fully functional then.

5.6 AT+CPWD   Define and Change Password

Description: AT+CPWD allows to define 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 commands AT+CLCK and AT^SLCK for more information on the various lock features.
Specifically the command can be used to
- change PIN1 or PIN2,
- change the password supplied from your provider for the "call barring" supplementary service,
- set individual phone security passwords,
- enter the unblocking key (Master Phone Code) to restore a disabled "PS" password.
To delete a password use the following syntax: at+cpwd=<facility>,<old password>

Test Command Syntax: AT+CPWD=?
Response(s): +CPWD : (list of supported (<facility>, <password length>)
OK
Write Command Syntax: AT+CPWD=<facility>, <old password>[, <new password>]
Response(s): 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 error is related to ME functionality: +CME ERROR

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. The lock facility password "PS" may also be factory set.
    "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 5.1.1, What to do if PIN or password authentication fails?.
                   <password length>: 4 to 8 digits.
    "PS"   Phone locked to SIM card. ME requests password when other than current SIM card is inserted. "PS" lock is frequently referred to as "phone lock", or "device lock". Accordingly, the password may be called "phone code" or "device code". The "PS" password is not associated with the PUK of the SIM card. It must be defined before the first use of <facility> "PS" with AT+CLCK.
                   <password length>: 4 digits.
                   If incorrectly entered three times, the Master Phone Code is required to lift the lock. This Unblocking procedure is performed with AT+CPWD using the following parameters: <facility>="PS", <old password>=Master Phone Code (obtained from the module manufacturer) and <new password>= the new phone code ("PS" password for lock facility), if desired.
                   Remember that a successful PIN authentication is a prerequisite for use of AT command AT+CPWD. If Pin authentication has not been completed, input of the Master Phone code password is possible only with AT command AT+CPIN or ATD. For further detail please refer to Section 5.1.1, What to do if PIN or password authentication fails?

Once the Master Phone Code has been accepted, the mobile is operational and the "PS" lock is no longer active. If needed it must be set once again with AT+CLCK.

"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 5.1.1, What to do if PIN or password authentication fails?.
<password length>: 4 to 8 digits.

Factory-Defined SIM Locks:

Typical examples of factory set SIM locks are prepaid phones or network locks, used to restrict the operation of a mobile to a specific provider or operator. The client should be aware that each of these lock types can only be unlocked if the associated password is available. For example, a mobile can be locked to accept only SIM cards from the respective provider, or even one single SIM card. Once a different SIM card is inserted the ME will prompt the client to enter a specific code. This is not the PUK of the SIM card, but usually an 8-digit code which needs to be requested from the provider.

The locks can only be set by the manufacturer and need to be agreed upon between the parties concerned; e.g., provider, operator, distributor etc. on the one side and the manufacturer on the other side.

"PF"   Lock Phone to the very First SIM card – Not applicable.
"PN"   Network Personalization
"PU"   Network subset Personalization
"PP"   Service Provider Personalization
"PC"   Corporate Personalization

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>.

<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 (such as the Master Phone Code).

Notes:

- When changing PIN2 (<facility>="P2"), it is recommended to check the new state of PIN2 by using AT+CPIN2.
- In the airplane mode the write command version for the network related <facility> (AO, OI, OX, AI, IR, AB, AG and AC) is not supported. For remaining facilities the command is fully functional then.

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 "call barring".
OK	Usually this request will affect all barring services, even though the request is issued for Supplementary Service BAOC ("Barring of all outgoing calls") only. Refer to the respective network provider for detail.

Example 3: Handling of the "PS" lock password

AT+CMEE=2	Enable text output of CME Error information
AT+CPWD="PS","1111","2222"	(where "1111" = old password and "2222" = new password)
OK	Password for facility "PS" is now "2222"
AT+CPWD="PS","1111","2222"	Repeat command to provoke error "incorrect password"
+CME ERROR: incorrect password	("1111" is no longer the correct password)

Example 4: To specify a new "PS" lock password
To specify a new "PS" lock password, after the old password was disabled (e.g., after three failed attempts to change the "PS" password): use the master phone code.

CAUTION: THIS TEST SHOULD BE PERFORMED ONLY IF THE CORRECT MASTER PHONE CODE FOR THE INDIVIDUAL ME USED IS DEFINITELY AVAILABLE! Otherwise, the module used will be rendered useless until the correct master phone code is entered:

AT+CPWD="PS","12345678","1111"	where 12345678 is the Master Phone Code and 1111 is the new password. You may also use <new password> to restore the former disabled password.
OK	
Alternatively, without giving a new password: AT+CPWD="PS","12345678"	(where 12345678 is the Master Phone Code). Deactivates the present phone lock.
OK	

5.7 AT^SPWD   Change Password

Description: The AT^SPWD command comprises all functions of the AT+CPWD command. Apart from the different prefixes "^SPWD" and "+CPWD", the major difference is that the <facility> list of AT^SPWD includes the additional "CM" password dedicated to the Customer SIM Lock. Set with the command AT^SCSL, this type of lock allows the application manufacturer to lock a mobile to specific operators. However, at this time customer SIM locks are not supported.

The Customer SIM Lock feature is designed to be configurable during the production of the mobile application. Therefore, to program the "CM" password, the AT^SPWD write command can be used no matter whether the SIM is inserted or PIN authentication has been done. Opposite to that, passwords for all other facilities can only be edited if the SIM is present and PIN authentication completed.

IMPORTANT: Please note that, even though there is no need for a factory set Customer SIM Lock, you are strongly advised to specify at least a "CM" password, avoiding that end users ever have a chance to activate this lock type.

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 also AT commands AT+CLCK and AT^SLCK for more detail on the various lock features.

Test Command Syntax: AT^SPWD=?
Response: ^SPWD : list of supported (<facility>, <password length>)
                                           OK
Write Command Syntax: AT^SPWD=<facility>[,<old password>][, <new password>]
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 ...

When trying to set a "CM" password even though another type of factory set SIM lock is already active: +CME ERROR: Operation not supported.

If error is related to ME functionality: +CME ERROR

Parameter Description:
  <facility>
   "CM"   Password used as Customer Mastercode for Customer SIM Lock.
                                          Defining the "CM" password allows the application manufacturer to set a Customer SIM Lock by activating a Network Personalization ("PN") with the AT^SCSL command. The "CM" password is mandatory for each operation with AT^SCSL.
                                          <password length> of "CM": 8 digits.
                                          To delete the "CM" password use the following syntax: AT^SPWD=<facility>,<old password>. Please note that this action will delete all personalization data programmed by the manufacturer with AT^SCSL (including the operator list).

A description of all other passwords commonly supported by AT+CPWD and AT^SPWD can be found in Section 5.6, AT+CPWD. The "CM" password cannot be edited with AT+CPWD.

Notes
- When changing the PIN2 (<facility>="P2") it is recommended to check the new state of PIN2 using the AT+CPIN2 command.
- In airplane mode, the write command version for the network related <facility> (AO,

Examples

Example 1 – To specify the "CM" password required as Customer Mastercode for the Customer SIM Lock:

AT^SPWD="CM"	Check if the Customer Mastercode was already set.
ERROR	No, it was not.
AT^SPWD="CM", ,"12345678"	Specify a new Customer Mastercode (where <old password> is omitted and <new password>"12345678" = new Customer Mastercode)
OK	The Customer Mastercode has been set to "12345678".
AT^SPWD="CM"	Checking again.
OK	Yes, it is active now.

Example 2 – To change the Customer Mastercode:

AT^SPWD="CM","12345678","44444444"	(where "12345678" = old Customer Mastercode, and "44444444" = new Customer Mastercode).
OK	The Customer Mastercode has been changed from "12345678" to "44444444".

EXAMPLE 3 – To delete the Customer Mastercode:

AT^SPWD="CM","44444444"	Delete the Customer Mastercode by omitting <new password> and entering only the <old password> "44444444".
OK	The Customer Mastercode as well as all personalization data programmed by the manufacturer with AT^SCSL were deleted.

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.
Exec Command Syntax: ATI
Response: SIEMENS
                              MC75
                              REVISION xx.yy
                              OK
Exec Command Syntax: ATI[<value>]
Response: OK
Parameter Description: <value> Values are not support and only return OK.

6.2 AT+CGMI   Request Manufacturer Identification

Description: AT+CGMI returns a manufacturer identification text. See also: AT+GMI.
Test Command Syntax: AT+CGMI=?
Response: OK
Exec Command Syntax: AT+CGMI
Response: SIEMENS
                              OK

6.3 AT+GMI   Request Manufacturer Identification

Description: AT+GMI returns a manufacturer identification text. See also: AT+CGMI.
Test Command Syntax: AT+GMI=?
Response: OK
Exec Command Syntax: AT+GMI
Response: SIEMENS
                              OK

6.4 AT+CGMM   Request Model Identification

Description: AT+CGMM returns a product model identification text. Command is identical with
                              AT+GMM.
Test Command Syntax: AT+CGMM=?
Response: OK
Exec Command Syntax: AT+CGMM
Response: MC75
                              OK

6.5 AT+GMM   Request Model Identification

Description: This command is identical to AT+CGMM. AT+GMM returns product model identification
                              text.
Test Command Syntax: AT+GMM=?
Response: OK
Exec Command Syntax: AT+GMM
Response: MC75
                              OK

6.6 AT+CGMR   Request Revision Identification

Description: Command is identical to AT+GMR. AT+CGMR delivers the product firmware version
                          identification.
Test Command Syntax: AT+CGMR=?
Response: OK
Exec Command Syntax: AT+CGMR
Response: REVISION <xx.yy>
                          OK
Parameter Description:
   <xx.yy>
      Version xx and variant yy of software release.

6.7 AT+GMR   Request Revision Identification

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

Description: AT+CGSN delivers the International Mobile Equipment Identity (IMEI). Command is
                          identical to AT+GSN.
Test Command Syntax: AT+CGSN=?
Response: OK
Exec Command Syntax: AT+CGSN
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
Test Command Syntax: AT+GSN=?
Response: OK
Exec Command Syntax: AT+GSN
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.

Test Command Syntax: AT+CIMI=?

Response: OK

Exec Command Syntax: AT+CIMI

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 Call Status Information

For Circuit switched calls, including voice and data calls, call status information is available with URC "+CIEV: call" (configurable via AT commands AT+CIND and AT+CMER) or - in more detail - from the list of current calls. This list can be displayed on request via at commands AT+CLCC and AT^SLCC. It can also be issued by the ME in the form of an unsolicited result code "^SLCC" if configured with AT^SLCC and AT+CMER.

URC "+CIEV: call" and URC "^SLCC" can be configured using AT command AT^SCFG. An overview of the possible configurations and their consequences for the availability of call status information will be given here.

Generally speaking, the call status values recognized by the ME are as follows:

- active
- held
- dialing (MOC)
- alerting (MOC)
- incoming (MTC)
- waiting (MTC)
- terminating: The call is not active anymore, but inbound information is still available.
- dropped: The call has been suspended by the network, but may be resumed later.

The values "terminating" and "dropped" are not standardized for AT command AT+CLCC, and, therefore, only available for command AT^SLCC. A call in any of these two states will not appear in the list of current calls as displayed with AT+CLCC.

A call that is not recognized by the ME is considered to be in "unknown" state.

Some networks may schedule a traffic channel for a call that is not yet in the "active" state. This is reflected in parameter <traffic channel assigned> of AT command AT^SLCC and the corresponding URC.

Depending on the value of AT^SCFG setting <succ>, Indicator "+CIEV" will be issued (if configured with AT+CIND and AT+CMER)

- when a state transition ends in state "active" or in state "unknown"
  (if AT^SCFG setting <succ>="restricted").
- when any state transition (including transitions beginning or ending in state "unknown") occurs in the list of active calls, or when a traffic channel is established (if AT^SCFG setting <succ>="verbose").

The indicator value "+CIEV: call" will be "1" if at least one call is in states "held" or "active", and "0" otherwise.

Depending on the value of AT^SCFG setting <sucs>, indicator "^SLCC" will be issued (if configured with write command AT^SLCC and AT+CMER).

- when a state transition ends in state "active" or in state "unknown" (if AT^SCFG setting <sucs>="restricted")
- when any state transition (including transitions beginning or ending in state "unknown") occurs in the list of active calls, or when a voice channel is established (if AT^SCFG setting <sucs>="verbose").

Due to compatibility considerations, the power up default for AT^SCFG setting <succ> is "restricted", offering compatibility to the standard behavior of indicator "+CIEV: call", while the default for setting <sucs> is "verbose".

In order to see the URCs, event reporting for both indicators must be configured with the appropriate AT commands.

7.2   ATA   Answer a Call

Description: TA causes remote station to go off-hook (e.g., answer call).
Exec Command Syntax: ATA
Response: In case of data call, if successfully connected (TA switches to data mode):
                         CONNECT <text>
                         In case of voice call, if successfully connected: OK
                         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:
          300
          1200
          2400
          4800
          9600
          14400

Notes
- Any additional commands on the same command line are ignored.
- 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.
- The ATA command may be used also to accept a network request for a PDP context activation (see ATA).
- 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.

7.3   ATD   Mobile Originated Call to a Specified Number

Description: This command can be used to set up outgoing voice or data calls. It also serves to control Supplementary Services. The termination character ";" is mandatory to set up voice calls or to send *# codes for Supplementary Services. It must not be used for data calls.
                         Different call release indications:
- Upon termination, an outgoing data call may show a different result code than a voice call would show under identical conditions. In order to track down the actual reason for call termination, AT+CEER or ATS18 should be used for all applicable connections.

Using ATD during an active call:
- When a user originates a second voice call while there is already an active voice call, the first call will automatically put on hold. The second call attempt is acknowledged with "OK" immediately after dialing with ATD has completed, without relation to a successful call setup. In case of failure, the additional result codes "NO CARRIER", "NO DIAL TONE", "NO CARRIER" will be presented afterwards (see example below).

Exec Command Syntax: ATD<n>[<mgsm>][;]
Response: If no dial tone (parameter setting ATX2 or ATX4): NO DIALTONE
                        If busy (parameter setting ATX3 or ATX4): BUSY
                        If a connection cannot be set up: NO CARRIER
                                                  OK
                        If successfully connected and non-voice call (TA switches to online data mode):
                             CONNECT <text>
                        When TA returns to command mode after call release: OK
                        If successfully connected and voice call: 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 ,@

Emergency call : <n> = 112, 911 or 08, standardized GSM emergency number (no SIM needed).

<mgsm>

String of GSM modifiers:

I	Activates CLIR (disables presentation of own phone number to called party)
i	Deactivates CLIR (enables presentation of own phone number to called party)
G	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.
- Parameter "I" and "i" only if no *#-code is within the dial string.
- <mgsm> is not supported for data calls.
- <n> is default for last number that can be dialed by ATDL.
- See also ATX for <text>.
- If ATD is used with a USSD command (e.g., ATD*100#;) an AT+CUSD=1 is executed implicitly (see AT+CUSD).
- Parameter 'G' or 'g' will be ignored if Closed User Group was already activated, respectively deactivated with AT+CCUG command before. Call by call invocation of CUG uses the settings provisioned by the provider or, if available, the settings of the parameters <index> and <info> made with AT+CCUG.
- The ME is equipped with a "Blacklist" function according to GSM02.07 Annex A:

  After a predefined number of failed call attempts, the dialed number is entered into a read-only phonebook called "blacklist" (phonebook "BL"). Call attempts to numbers contained in the blacklist will be barred by ME and not signaled to the network.

  An attempt to start a voice call to a barred phone number will be stopped with a CME ERROR 257 "Call Barred".

  An attempt to start a data call to a barred phone number will be answered immediately with result code "NO CARRIER".

  The barred numbers are automatically removed from the blacklist according to the timing conditions specified in GSM02.07 Annex A.
- 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.

Example:

The following example shows the call setup procedure when a call is already active and a second call attempt fails because the line of the called party is busy:

atd03012345678	Dialing out the first party's number.
OK	The first call is established.
ATD03022222222	The number of the second party is dialed.
OK	The response "OK" is issued immediately though no call is established
BUSY	Line of the second called party is busy.

7.4 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. The termination character ";" is mandatory since dialing from a phonebook is only supported for voice calls and for sending *# codes of Supplementary Services or other functions.

Exec Command Syntax: ATD><mem><n>[<mgsm>];

Response(s):
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

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

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

<mgsm>
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)

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.
- There is no <mem> for emergency call ("EN").
- The command is not applicable to data calls. Any attempt to dial a data call number from <mem> causes the result code "NO CARRIER" to appear.
- Parameter <mgsm> only if no *# code is within the dialing string.
- See ATX for setting result code and call monitoring parameters.
- Any string after <mgsm> and before ',' are ignored.

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

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

Description: TA attempts to set up an outgoing call to the stored number. The termination character ";" is mandatory since dialing from a phonebook is only supported for voice calls and for sending *# codes of Supplementary Services or other functions.

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

Response(s):   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

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.

  <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)

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.
  - The command is not applicable to data calls. Attempting to dial a data call number from <n> causes the result code "NO CARRIER" to appear.
  - Parameter <mgsm> only if no *# code is within the dialing string.

7.6 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.
                     The termination character ";" is mandatory since dialing from a phonebook is only supported for voice calls and for sending *# codes of Supplementary Services or other functions.

Exec Command Syntax: ATD><str>[<mgsm>];

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

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".
    <str> must be wrapped in quotation marks (""), if escape sequences or parameter <mgsm> are used or if the alphanumeric strings contains a blank. If not, quotation marks are optional.
    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.

  <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)

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.
  - The command is not applicable to data calls. Any attempt to dial <str> without semicolon ";" causes the result code "NO CARRIER" to appear.
  - Parameter <mgsm> only if no *# code is within the dialing string.

7.7 ATDI Mobile Originated Call to ISDN Number

Description: TA attempts to set up an outgoing call to ISDN number. The termination character ";" is mandatory to set up voice calls or to send *# codes for Supplementary Services. It must not be used for data calls.

Exec Command Syntax: ATDI<n>[;]

Response: 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
All other error reasons: +CME ERROR
If successfully connected and non-voice call (TA switches to data state):
     CONNECT <text>
When TA returns to command mode after call release: OK
If successfully connected and voice call: OK

Parameter Description:

<n>
ISDN number String with maximum length of 20 characters. Allowed characters: +, 0-9, A, B, C.

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.

7.8 ATDL Redial Last Number Used

Description: This command redials the last voice and data call number used in the ATD command. If terminated with semicolon, ATDL dials the last voice call number stored in the "LD" phonebook. Otherwise, the last dialed data number will be used (not contained in the "LD" phonebook).

Exec Command: ATDL[;]

Response: If there is no last number or number is not valid: +CME ERROR
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
If successfully connected and non-voice call (TA switches to online data mode):
     CONNECT <text>
When TA returns to command mode after call release: OK
If successfully connected and voice call: OK

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.
- Parameter "I" and "i" only if no *#-code is within the dial string.

7.9 ATH Disconnect Existing Connection

Description: Disconnect existing call from command line by local TE and terminate call.

Exec Command Syntax: ATH[<n>]

Response: OK

Parameter Description:

<n>
0   disconnect from line and terminate call

Notes:
- OK is issued after circuit 109 (DCD) is turned off, if it was previously on.
- ATH terminates every circuit switched call (voice or data), even if it is issued via another interface. This behavior is in accordance with ITU-T V.250; (07/97, "Hook control": "ATH is terminating any call in progress.").
- ATH clears any active PDP context or terminates any existing PPP connection, but only if issued on the same interface where GPRS is used and if there is no pending network request for PDP context activation. It does not affect PDP contexts and PPP connections on other interfaces (see also "ATH Manual rejection of a network request for PDP context activation").

7.10   AT+CHUP   Hang Up Call

Description: Cancels all active and held calls.
Test Command Syntax: AT+CHUP=?
Response(s):   OK, ERROR, +CME ERROR
Exec Command Syntax: AT+CHUP
Response(s):   OK, ERROR, +CME ERROR
Note: AT+CHUP implements the same behavior as ATH.

7.11   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 voice and data calls in any call status (i.e., any calls listed by AT+CLCC).
Test Command Syntax: AT^SHUP=?
Response(s):   OK
Write Command Syntax: AT^SHUP=<cause>[, <cn>]
Response(s):   ERROR, OK
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 "
   27   send GSM04.08 release cause "Destination out of order "
   31   send GSM04.08 release cause "Normal, unspecified"

 <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.

7.12   ATS0   Set Number of Rings before Automatically Answering a Call

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

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

Notes:
- This command works for MT data calls.
- Auto answering of CSD data calls is supported on ASC0/Mux1 only.
- 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.
- Setting is local to the interface. It is allowed to have different settings on different interfaces. In such cases the interface 'wins', which is idle and uses the smallest <n> value.
- The ATS0 write command is PIN protected.
- According to "3GPP TS 27.007 (GSM 07.07): AT command set for User Equipment (UE)", ATS0 is also used as GPRS compatibility command to answer automatically to a network request for PDP context activation (see Section 11.21). Therefore, when the ATS0 write command is issued with <n> greater than 0, the ME will attempt to perform a GPRS attach if not yet attached and if configured to do so (due to the setting AT^SCFG="GPRS/ATS0/withAttach","on").
  If the automatic GPRS attach fails the ME keeps trying to attach for approx. 5 minutes, before ATS0 ends up with "ERROR" or "+CME ERROR: unknown", though the new <n> value takes effect. To avoid the risk of long response times to ATS0 in such case take care that the parameter AT^SCFG=<gs0aa> is off, if autoanswer mode is not needed for GPRS or if the mobile works in non-GPRS networks.
  The GPRS attach will not be performed on recalling a stored user profile with ATZ or on power up, even though a value <n> greater than 0 was stored in the user profile with AT&W.

7.13   ATS6   Set Pause before Blind Dialing

Description: No effect for GSM.
Read Command Syntax: ATS6?
Response(s):   <n>
                            OK
Write Command Syntax: ATS6=<n>
Response(s):   OK
                            ERROR

Parameter Description:
  <n>
    000 – 255 Default is 000

7.14   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.

Read Command Syntax: ATS7?
Response(s): <n>
OK
Write Command Syntax: ATS7=<n>
Response(s): OK
ERROR

Parameter Description:
   <n>
   Number of seconds to wait for connection completion 000...060 (Default is 060)
Notes:
   • Command ATS7 is applicable only to data calls.
   • Values greater than 60 (maximum 255) cause no error, but <n> will be restored to the maximum value of 60.
   • 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.

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

Description: No effect for GSM. 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.

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

Parameter Description:
   <n>
   0   DCE does not pause when "," encountered in dial string. Default.
   1...255   Number of seconds to pause

7.16   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.

Read Command Syntax: ATS10?
Response: <n>
OK
Write Command Syntax: ATS10=<n>
Response: OK
ERROR

Parameter Description:
   <n>
   number of tenths of seconds of delay
   001 - 254 Default is 2.

7.17   ATO   Switch from Command Mode to Data Mode / PPP Online Mode

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

Exec Command Syntax: ATO[<n>]

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.

7.18   +++ 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.

Exec Command Syntax: +++

Response: OK

Note: To return from command mode to data or PPP online mode: Enter ATO.

7.19 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, especially when single numbering scheme calls or calls from analog devices are received (see AT+CSNS). See GSM 02.02 for a list of allowed combinations of subparameters.

Test Command Syntax: AT+CBST=?
Response(s):   +CBST: (list of supported<speed>s), (list of supported<name>s), (list of supported<ce>s)
                          OK

Read Command Syntax: AT+CBST?
Response(s):   +CBST: <speed>, <name>, <ce>
                          OK

Write Command Syntax: AT+CBST=<speed>[, <name>[, <ce>]]
Response(s):   OK, ERROR
Parameter Descriptions:

  <speed>
     0   Autobauding
     1   300 bps (V.21)
     2   1200 bps (V.22)
     4   2400 bps (V.22bis)
     6   4800 bps (V.32)
     7   9600 bps (V.32) Default
     14   14400 bps (V.34)
     65   300 bps (V.110)
     66   1200 bps (v.110)
     68   2400 bps (V.110)
     70   4800 bps (V.110)
     71   9600 bps (V.110)
     75   14400 bps (V.110)

  <name>
     0   Asynchronous modem. Default

  <ce>
     Transparent mode is not supported.
     1   Non-transparent. Default

Note: If problems are encountered with CSD connections at 14.4 kbit/s, you may be required to change the Fixed Network User Rate depending on the network. See AT^SFNUR for details.

7.20 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.

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

Read Command Syntax: AT+CRLP?
Response(s):   +CRLP: <iws>, <mws>, <T1>, <N2>
                          OK

Write Command Syntax: AT+CRLP=[<iws>[, <mws>[, <T1>[, <N2>]]]]
Response(s):   OK, ERROR, +CME ERROR: <err>
Parameter Descriptions:

  <iws>
     Interworking window size (IWF to MS)
     0...61 Default is 61

  <mws>
     Mobile window size (MS to IWF)
     0...61   Default is 61

  <T1>
     Acknowledgement timer (T1 in 10 ms units)
     39 (The number had been 48) - 255   Default is 78

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

7.21 AT+CLCC List Current Calls of ME

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.

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

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
0   Voice
1   Data
3   Voice followed by data, voice mode (only in connection with single numbering scheme AT+CSNS)
4   Alternating voice/data, voice mode (only in connection with single numbering scheme AT+CSNS)
6   Voice followed by data, data mode (only in connection with single numbering scheme AT+CSNS)
7   Alternating voice/data, data mode (only in connection with single numbering scheme AT+CSNS)
9   Unknown

<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
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 16 characters. If <alpha> has more than 16 characters, only the first 15 characters are displayed. To indicate an overflow, a special character will be used as the 16th character. This is a space if the character set selected with AT+CSCS is 'GSM', or 'E400' if the character set is 'UCS2'.
Due to time constraints on the necessary evaluation of the phonebook, this parameter may show a default value in early call phases (e.g., for <stat>= "dialing", "incoming" or "alerting"), even if a phonebook entry is present for the number concerned.

Note:
Teleservices other than voice and data are not fully supported by ME. They are used only in connection with the handling for AT+CSNS, and may therefore occur in parameter <mode> for mobile terminated calls.

7.22 AT^SLCC Extended List of Current Calls

Description: AT^SLCC covers essentially the same information as AT+CLCC, with the following additions:

- The execute command response contains an additional parameter <traffic channel assigned> indicating whether the call has been assigned a traffic channel by the network and transmission of DTMF tones is possible.

- The additional write command allows to activate Event reporting for the list of current calls. If event reporting is active for an interface, a call status transition (see Call Status Information) and (if desired) the assignment of a traffic channel will generate an event report indication to this interface. In order to receive this event report as an URC, the URC presentation mode for this interface has to be configured with AT+CMER.
  The frequency of event report generation can be configured with AT command AT^SCFG.
  Refer to Call Status Information for further detail on the configuration options.

Notes About the Commands:

- The read command allows to determine the event reporting mode <n> which indicates whether the interface receives event report indications for the list of current calls. Remember that the URC will be displayed only if the URC presentation mode for the interface concerned has been configured with AT+CMER.

- The read command returns an indication whether event reporting is active for the current interface.

- The exec command returns a list of current calls of ME. If command is successful, but no calls are available, no information response is sent to TE.

- Use the write command to activate or deactivate event reporting for URC "^SLCC". Event reporting can be enabled separately for each interface. Interface settings are saved with AT&W and can be displayed with AT&V.

Test Command Syntax:	AT^SLCC=?
Response:	^SLCC: (list of supported<n>s)
	OK
Read Command Syntax:	AT^SLCC?
Response:	^SLCC: <n>
	OK
Exec Command Syntax:	AT^SLCC
Response:	[^SLCC:<idx>, <dir>, <stat>, <mode>, <mpty>, <traffic channel assigned>[, <number>,<type>[, <alpha>]]]
	[^SLCC:<idx>, <dir>, <stat>, <mode>, <mpty>, <traffic channel assigned>[, <number>,<type>[, <alpha>]]]
	[^SLCC:...]
	OK
	ERROR
	+CME ERROR
Write Command Syntax:	AT^SLCC=[<n>]
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>, <traffic channel assigned>[, <number>, <type>[, <alpha>]]
    [^SLCC: <idx>, <dir>, <stat>, <mode>, <mpty>, <traffic channel assigned>[, <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.
Please refer to Call Status Information and AT^SCFG for further information about the configuration of this URC.
Event reporting can be enabled separately for each interface. Interface settings are saved with AT&W and can be displayed with AT&V. Additionally, The URC presentation mode for the interface must be configured with AT+CMER.
Depending on the value of AT^SCFG setting <sucs>, Indicator "^SLCC" will be issued (if configured with write command AT^SLCC and AT+CMER):

- when a state transition ends in state "active" or in state "unknown" (if AT^SCFG setting <sucs>="restricted")
- when any state transition (including transitions beginning or ending in state "unknown") occurs in the list of active calls, or when a traffic channel is established (if AT^SCFG setting <sucs>="verbose").

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	presentation of URC "^SLCC" disabled. Default.
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
0	voice
1	data
3	voice followed by data, voice mode (only in connection with single numbering scheme AT+CSNS)
4	alternating voice/data, voice mode (only in connection with single numbering scheme AT+CSNS)
6	voice followed by data, data mode (only in connection with single numbering scheme AT+CSNS)
7	alternating voice/data, data mode (only in connection with single numbering scheme AT+CSNS)
9	unknown

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

<traffic channel assigned>
0	No traffic channel is available to the call
1	Traffic channel is assigned and the progress indicator IE has been received (call setup) or a voice connection has an active state. The parameter indicates that the audio path is activated. DTMF tones can be sent with AT+VTS. See also note below.

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

<type>
type of address octect
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 16 characters. If <alpha> has more than 16 characters, only the first 15 characters will be displayed. To indicate an overflow, a special character will be used as the 16th character. This will be a space if the character set selected with AT+CSCS is 'GSM', or 'E400' if the character set is 'UCS2'.

Due to time constraints on the necessary evaluation of the phonebook, this parameter may show a default value during early call phases (e.g., for <stat>= "dialing", "incoming" or "alerting"), even if a phonebook entry is present for the number concerned.

Notes:
- Teleservices other than voice and data are not fully supported by ME. They are used only in connection with the handling for AT+CSNS, and may therefore occur in parameter <mode> for mobile terminated calls.
- If a URC "^SLCC" in verbose mode (see AT^SCFG) has been buffered while the interface was in dedicated mode (depending on the settings of AT+CMER parameter <bfr>), each buffered event indicator will be output as a separate URC after the interface returns to idle mode.
  However, the output will deliver the list of current calls in the "current" state (at the time when the output is generated), possibly leading to multiple displays of identical list configurations.
- 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.
- It is advisable to receive URC "^SLCC" on an interface that is not used for call initiation, if verbose output is configured.

Examples

Example 1

^SYSSTART	
at+cpin=9999	
OK	
+CREG: 2	
+CREG: 1,"0145","0016"	We are now registered
OK	
atd"1234567";	We start a voice call.
^SLCC:	MO call starts, paging B-party
1,0,2,0,0,0,"1234567",129,"Called Party"	
^SLCC:	End of current list
^SLCC:	Traffic channel established,
1,0,2,0,0,1,"1234567",129,"Called Party"	network may now transmit network announcements, ME may now transmit DTMF tones.
^SLCC:	End of current list
^SLCC:	Call is now ringing at B-Party
1,0,3,0,0,1,"1234567",129,"Called Party"	
^SLCC:	End of current list
^SLCC:	B-Party has accepted the call, connection established
1,0,0,0,0,1,"1234567",129,"Called Party"	
^SLCC:	End of current list
atd23456;	We start a second voice call.
OK	"OK" response issued immediately because another call is already active (ATD)
^SLCC:	The active call is automatically put on hold, triggering the display of the list
1,0,1,0,0,0,"1234567",129,"Called Party"	
^SLCC: 2,0,2,0,0,1,"23456",129	The second call has already started before the indication for the held call could be displayed
^SLCC:	End of current list
^SLCC:	Identical list is displayed again, triggered by the start of the second voice call
^SLCC: 2,0,2,0,0,1,"23456",129	Status of the second list entry has already been displayed with the previous URC
^SLCC:	End of current list
^SLCC:	The held call doesn't change status right now
1,0,1,0,0,0,"1234567",129,"Called Party"	
^SLCC: 2,0,3,0,0,1,"23456",129	The second call is now alerting the B-Party
^SLCC:	End of current list
^SLCC:	The held call doesn't change status right now
1,0,0,0,0,1,"1234567",129,"Called Party"	
^SLCC:	End of current list: the B-Party of the second call has not accepted the call in time, the second call has ended.
NO CARRIER	The second call has ended
^SLCC:	list is now empty: B-Party has ended the first call
NO CARRIER	The first call has ended

Example 2

^SLCC: 1,1,4,0,0,1,"1234567",129	Incoming call is signaled. Display is triggered by the incoming call, but the current status of the call at the time of display already comprises an active traffic channel.
^SLCC:	End of current list
RING	Incoming call is signaled.
^SLCC: 1,1,4,0,0,1,"1234567",129	The incoming call had a traffic channel assigned from the start. This second identical display is triggered by the traffic channel assignment. Since the traffic channel was already indicated in the previous URC, both instances of the URC contain identical information.
^SLCC:	End of current list
RING	Incoming call is signaled.
ata	Incoming call is accepted.
OK	Call is established.
^SLCC: 1,1,0,0,0,1,"1234567",129	The call is now active.
^SLCC:	End of current list
ath	Hang up the call.
OK	Hang up complete.
^SLCC:	The list of current calls is empty again

7.23   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.

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

Read Command Syntax: AT+CR?
Response: +CR: <mode>
OK
ERROR

Write Command Syntax: AT+CR=<mode>
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>

7.24 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 (e.g., WinFax) waits for the default URC.

Test Command Syntax: AT+CRC=?
Response: +CRC: (list of supported<mode>s)
OK
ERROR

Read Command Syntax: AT+CRC?
Response: +CRC: <mode>
OK
ERROR

Write Command Syntax: AT+CRC=[<mode>]
Response: OK
ERROR

Parameter Descriptions:

<mode>
0	Disable extended format. Default.
1	Enable extended format

<type>
"REL ASYNC"	Asynchronous non-transparent
"VOICE"	Voice
"GPRS"	<PDP_type>, <PDP_addr> [,[<L2P>][,<APN>]] GPRS network request for PDP context activation

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.

7.25 AT+CSNS   Single Numbering Scheme

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

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

Read Command Syntax: AT+CSNS?
Response: +CSNS: <mode>
OK

Write Command Syntax: AT+CSNS=[<mode>]
Response: OK
ERROR
+CME ERROR

Parameter Description:

<mode>
0	Voice: Each call received without bearer element is assumed to be speech. Default.
4	Data: Each call received without bearer element is assumed to be a data call.
	Please take into account that the bearer service parameters set with AT+CBST apply to all data calls including those received without bearer capability.

Notes:

- The command must be set before the call comes. By default, when you do not modify the settings, all calls received without bearer element are assumed to be voice.
- If problems are encountered with CSD connections at 14.4 kbit/s you may be required to change the Fixed Network User Rate depending on the network. See AT^SFNUR for details.

7.26 AT^SCNI List Call Number Information

Description: TA returns a list of current calls of ME.
Test Command Syntax: AT^SCNI=?
Response: OK
Exec Command Syntax: AT^SCNI
Response: ^SCNI: <id>1[,<cs>[,<number>,<type>]]
                          ^SCNI: <id>2[,<cs>[,<number>,<type>]]
                          [...]
                          OK
                          ERROR
                          +CME ERROR: <err>
Parameter Descriptions:
  <id>
    Call identification number; this number can be used in AT+CHLD command operations.
    1...7
  <cs>
    Call status of respective call number (first parameter)
    0   call hold
    1   call in progress
    2   waiting call
  <number>
    string type phone number in format specified by <type>
  <type>
    type of address octet in integer format; 145 when dialing string includes international access code character "+";
    otherwise 129
Note: See also AT+CLCC

7.27 AT^SLCD Display Last Call Duration

Description: TA returns last call duration or current call duration.
Test Command Syntax: AT^SLCD=?
Response: OK
                          ERROR
                          +CME ERROR
Exec Command Syntax: AT^SLCD
Response: ^SLCD: <time>
                          OK
                          ERROR
                          +CME ERROR
Parameter Description:
  <time>
    Format is "hh:mm:ss", where characters indicate hours, minutes, seconds; e.g., 22:10:00 "22:10:00"
    Max value is 9999:59:59
Note: The proper working of that command is network dependent.

7.28 AT^STCD Display Total Call Duration

Description: TA returns total call duration (accumulated duration of all calls).
Test Command Syntax: AT^STCD=?
Response: OK
                          ERROR
                          +CME ERROR
Exec Command Syntax: AT^STCD
Response: ^STCD: <time>
                          OK
                          ERROR
                          +CME ERROR
Parameter Description:
  <time>
    Format is "hh:mm:ss", where characters indicate hours, minutes, seconds; e.g., 22:10:00 "22:10:00"
    Max value is 9999:59:59
Notes:
  • The Total Call Duration will not be reset by power off or other means.
  • The proper working of that command is network dependant and only for MO calls.

7.29   ATP   Select Pulse Dialing

Exec Command Syntax: ATP
Response: OK
Note: No effect for GSM.

7.30   ATT   Select Tone Dialing

Exec Command: ATT
Response: OK
Note: No effect for GSM.

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. See also: AT^SPLM.
Test Command Syntax:	AT+COPN=?
Response:	OK
	ERROR
	+CME ERROR
Exec Command Syntax:	AT+COPN
Response:	+COPN: <numericn>, <alphan>
	+COPN: ...
	OK
	ERROR
	+CME ERROR

Parameter Descriptions:

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

  <alphan>
    Operator in long alphanumeric format; can contain 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 it is able to register to this operator, it enters the manual operator selection mode. If the ME cannot find this operator or fails to register to this operator, then it enters the automatic operator selection mode and starts to select the home operators network or another (permitted) one.
  If the ME is registered and the manually selected network is not available, the ME will remain registered without further result code notification.

The most recently entered operator selection mode is still valid after the ME was restarted. (power-off/on).

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 and
- 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. 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.
If the test command is used during an ongoing GPRS transfer, traffic will be interrupted for up to one minute.
The AT+COPS read command returns the current <mode> and the currently selected operator. If no operator is selected, <format> and <oper> are omitted.

The AT+COPS write command forces an attempt to select and register to the GSM 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.

Test Command Syntax: AT+COPS=?
Response: +COPS: [list of present operators (<opStatus>, long alphanumeric <oper>s,,numeric <oper>s] , , (list of supported <mode>s), (list of supported <format>s)
OK
ERROR
+CME ERROR: <err>
Read Command Syntax: AT+COPS?
+COPS:<mode>[, <format>[, <oper>]]
OK
Response: ERROR
+CME ERROR: <err>
Write Command Syntax: AT+COPS=<mode>[, <format>[, <oper>]]
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 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	Automatic mode; <oper> field is ignored. Default.
1	Manual operator selection
	Write command requires <oper> in numeric format; i.e., <format> shall be 2.
	Read command returns the current <mode> and the currently selected <oper>. If no operator is selected, <format> and <oper> are omitted.
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).

<format>
0	Long alphanumeric format of <oper>. Can be up to 16 characters long. Default.
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+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.
- It's possible to apply a 5- or 6-digit LAI for numeric format of <oper> parameter. Please use the correct 2- or 3-digit Mobile Network Code. Otherwise an unintended PLMN could be selected.

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.

Test Command Syntax: AT^SOPS=?
Response: ^SOPS:[list of present operator(<opStatus>, <eonsType>, <eonsOperator>, <servProvider>, <opName>)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$_{SST}$).

<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.

<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+SNWS   Manual Network Selection

Description: The AT^SNWS command is similar to AT+COPS. The major advantage of AT^SNWS is the ability to scan all frequency bands supported, while AT+COPS is always determined by the band most recently used and, therefore, starts searching either across the GSM 900 / GSM 1800 bands or across the GSM 850 / GSM 1900 bands. So AT^SNWS allows the subscriber to manually select a specific provider from all these bands.

This means the AT^SNWS **write command** forces an attempt to select and register to the given operator. The procedure may take a few seconds depending on the amount of visible networks. If the selected operator is not found, the ME returns an error.

The AT^SNWS **test command** enforces a multiple band scan in order to find all available networks. The scanning procedure may take a few seconds depending on the amount of visible 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

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

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

Write Command Syntax: AT^SNWS=<mode>[, <format>[, <oper>]]
  Responses: 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.

<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.
- As stated above the AT^SNWS test and write commands cause the ME to deregister and re-register during scanning. Therefore, if Unsolicited Result Code presentation is activated with AT+CREG adequate "+CREG:" URCs will be generated each time the registration state changes. If URC presentation is enabled on the same interface where AT^SNWS is running all URCs will be output after the execution of AT^SNWS has finished. If URC presentation is enabled on another interface the URCs will be output in parallel to AT^SNWS command execution.

- The AT^SNWS parameters <mode>, <format> and <oper> are identical with the parameters <mode>, <format> and <oper> in AT+COPS. This implies that the AT^SNWS write command may influence the settings of AT+COPS. So, after manually selecting a network with AT^SNWS you may use the AT+COPS read command to check the result.
- If the selected PLMN necessitates a radio band switch the AT^SNWS write command may automatically change the configured values of the preferred radio band(s) <rbp> and allowed radio band(s) <rba>. After using the AT^SNWS write command you may therefore want to check the radio band settings with AT^SCFG and set your preferred values where necessary.
- Notes specific to the AT^SNWS test command:
  As stated above the ME reverts to the network used before starting the AT^SNWS test command. Yet, in some cases, it is possible that the AT^SNWS test command response indicates a current operator (<opStatus> equals 2), which is not identical with the previously used operator. This may happen only if, during the scan procedure, the ME finds a home or roaming network and quickly registers to this network for a very short time before it reverts to the previously used network. In such case, the AT^SNWS test command response reflects only the interim value set during the scan procedure, but not the final value set after scanning has completed.
  To check the correct result, please use the AT+COPS read command.
- It is not recommended to use the AT^SNWS command when an active connection is established.

8.5 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 location information elements <lac> and <ci> are returned only when <n>=2 and ME is registered to the network.

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

Read Command Syntax: AT+CREG?
Response(s): +CREG: <n>, <stat>[, <lac>, <ci>]
OK
ERROR
+CME ERROR: <err>

Write Command Syntax: AT+CREG=[<n>]
Response(s): 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.

Normally, status 0 occurs temporarily between two network search phases (Status 2). However, if it persists, one of the following reasons may apply:
- Automatic network selection is active, but probably there is:
  * No SIM card available
  * No PIN entered
  * No valid Home PLMN entry found on the SIM
- Manual network selection is active, and the selected network is available, 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

In either case, user intervention is required. Yet, emergency calls can be made if any network is available.

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.

Note
After the "+CREG: 1" (or "+CREG: 5") URC and before the "^SSIM READY" URC it is not sure that outgoing and incoming calls can be made and short message functions executed. Emergency calls are possible.
Outgoing and incoming calls are always possible AFTER having received the "+CREG: 1" (or "+CREG: 5") and "^SSIM READY" URCs.
See also Section 20.1, Restricted access to SIM data after SIM PIN authentication.

Example:

AT+CREG=2	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,"0145","291A"	URC reports that operator has been found.

8.6 AT+CSQ Signal Quality

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

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

Exec Command Syntax: AT+CSQ
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>

0..7	as RXQUAL values in the table in GSM 05.08 section 8.2.4.
99	not known or not detectable

Note: After using network related commands such as AT+CCWA, AT+CCFC, AT+CLCK, 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.

8.7 AT^SMONC   Cell Monitoring

Description: The AT^SMONC execute command delivers cell information containing 9 values from a maximum of 7 base stations.
The first base station is the serving cell.

Test Command Syntax: AT^SMONC=?

Response:
OK
ERROR
+CME ERROR

Exec Command Syntax: AT^SMONC

Response:
^SMONC: <MCC>1, <MNC>1, <LAC>1, <cell>1, <BSIC>1, <chann>1, <RSSI>1, <C1>1, <C2>1, <MCC>2, <MNC>2, <LAC>2, <cell>2, <BSIC>2, <chann>2, <RSSI>2, <C1>2, <C2>2, ...
OK
ERROR
+CME ERROR

Parameter Descriptions:

<MCC>
Mobile country code
3 digits; e.g., 232

000	Not decoded

<MNC>
Mobile network code
2 digits or 3 digits; e.g., 07 or 003

000	Not decoded

<LAC>
Location area code
4 hexadecimal digits; e.g., 4EED

0000	Not decoded

<cell>
Cell identifier
4 hexadecimal digits; e.g., 4EAF

0000	Not decoded
FFFF	Cell ID currently not available because the cell ID information is not yet read from the Sysinfo 3 transmitted by the base station.

<BSIC>
Base station identity code
2 digits; e.g., 32

00	Not decoded

<chann>
ARFCN (Absolute Frequency Channel Number)

0	Not decoded. In this case, all remaining parameters related to the same channel are neither decoded. For example, a non-existing cell appears as follows: 000,000,0000,0000,00,0,0,-,-

<RSSI>
Received signal level of the BCCH carrier (0..63). The indicated value is composed of the measured value in dBm plus an offset. This is in accordance with a formula specified in 3GPP TS 05.08

<C1>
Coefficient for base station reselection; e.g., 30. In dedicated mode, under certain conditions the parameter cannot be updated. In such cases a '-' is presented.

<C2>
Coefficient for base station reselection; e.g., 30. In dedicated mode, under certain conditions the parameter cannot be updated. In such cases a '-' is presented.

Note: To some extent, the cell monitoring commands AT^MONI, AT^MONP and AT^SMONC cover the same parameters. The receiving level, for example, can be queried with all three commands. Yet the resulting values may be slightly different, even though obtained over a time period of a few seconds. This is quite normal and nothing to worry about, as the cell information is permanently updated.

8.8   AT^SMOND   Cell Monitoring

Description: The AT^SMOND execute command can be used to obtain status information of the service cell and up to six neighbor cells. The advantage over other cell monitoring commands is that AT^SMOND delivers more detailed information about the received signal strength.

Test Command: AT^SMOND=?
Response(s):   OK,   ERROR,   +CME ERROR
Exec Command: AT^SMOND
Response(s):   ^SMOND: [<sci>][, <nci>][, <TA>][, <rssiber>]
OK,   ERROR,   +CME ERROR

Parameter Description:

<sci>
Serving cell information (comma-separated, no cr/lf included)
<MCC>,<MNC>,<LAC>,<cell>,<BSIC>,<chann>,<RxLev>,<RxLev>Full,<RxLev>Sub,<RxQual>,<RxQual>Full,<RxQual>Sub,<Timeslot>
If no serving cell is found, unavailable values are omitted:" ,,,,,,<RxLev>,,,0,,,0"

<nci>
Neighbor cell information for neighbor cell 1 through 6 (comma-separated, no cr/lf included)
<MCC>1,<MNC>1,<LAC>1,<cell>1,<BSIC>1,<chann>1,<RxLev>1, (these parameters repeated for neighbor cells 2 through 6 with no CR/LF): ... <MCC>$_6$,<MNC>$_6$,<LAC>$_6$,<cell>$_6$,<BSIC>$_6$,<chann>$_6$,<RxLev>$_6$
An unavailable cell appears as follows: " ,,,,,,0"

<rssiber>
Values for RSSI and BER (comma-separated, no cr/lf included)
<RSSI>,<BER>

<MCC>
Mobile country code
3 digits, e.g. 232

000	Not decoded

<MNC>
Mobile network code
2 digits or 3 digits, e.g. 07 or 003

000	Not decoded

<LAC>
Location area code
4 hexadecimal digits, e.g. 4EED

0000	Not decoded

<cell>
Cell identifier
4 hexadecimal digits, e.g. 4EAF

0000	Not decoded
FFFF	Cell ID currently not available because the cell ID information is not yet read from the Sysinfo 3 transmitted by the base station.

<BSIC>
Base station identity code
2 digits, e.g. 32

00	Not decoded

<chann>
ARFCN (Absolute Frequency Channel Number)

<RxLev>
Received signal level in dBm

<RxQual>
Received signal quality as defined in GSM05.08

<Timeslot>
Assigned timeslot. If mobile is in idle mode, timeslot 0 (BCCH timeslot) will be indicated.

0...8	Assigned timeslot

<TA>
Timing advance for the serving cell, in bits.

<RSSI>
Receive Level, with value 99 indicating "not known or not detectable"

0...31	Signifies the RSSI range from -113dBm or less ("0") to -51dBm or greater ("31") in steps of -2dBm (e.g. "1" = -111 dBm, "2" = -109 dBm ..., "30" = - 53dBm)

<BER>
Bit Error rate, with value 99 indicating "not known or not detectable"

0...7	as RXQUAL values RXQUAL0 to RXQUAL7 in GSM 05.08 section 8.2.4

Notes
- To some extent, the cell monitoring commands AT^SMOND, AT^MONI, AT^MONP and AT^SMONC cover the same parameters. The receiving level, for example, can be queried with all three commands. Yet the resulting values may be slightly different, even though obtained over a time period of a few seconds. This is quite normal and nothing to worry about, as the cell information is permanently updated.
- During a connection, not all of the neighbor cell information can be decoded. The following restrictions apply:
  * Information is updated only for neighbor cells that have already been visible at connection setup, and continue to be included in the list of cells.
  * New neighbor cells added to the list, for example after handover, cannot be displayed until the connection is released.

Example

at^smond	Execute command
^SMOND:262,01,3008,6060,32,100,66,,,0,,,0,	Line breaks inserted for readability in print
262,01,3008,DDD1,35,92,80,	
262,01,3008,,31,96,83,	
262,01,3008,BFBE,35,27,86,	
262,01,3008,,32,98,88,	
262,01,3008,BB44,32,90,89,	
262,01,3008,8307,31,22,93,	
2,23,99	

8.9 AT^SFNUR   Select the Fixed Network User Rate

Description: The AT^SFNUR command specifies the Fixed Network User Rate (FNUR) parameter. This parameter is important only for mobile originated 14.4 kbit/s UDI calls (AT+CBST=75) and mobile terminated data calls if the bearer capability information element is delivered without data bearer service (see AT+CSNS and AT+CBST commands).

Changes are recommended only if a CSD call fails. The choice as to which of the values to use depends on the GSM network and the location. Users should be aware that even the same operator may apply varying FNUR configurations in different regions.

The AT^SFNUR command has no effect on CSD connections controlled by the Internet Service commands. If needed for the Internet Services the Fixed Network User Rate can be set in the connection profile. For details see AT^SICS, parameter <conParmValue> "fnur".

Test Command: AT^SFNUR=?
Responses: ^SFNUR:(list of supported <value>s)
OK

Read Command: AT^SFNUR?
Responses: ^SFNUR: <value>
OK
ERROR
+CME ERROR: <err>

Write Command: AT^SFNUR=<value>
Responses: OK
ERROR
+CME ERROR: <err>

Parameters:
  <value>

0	not applicable
1	9.6 kbit/s
2	14.4 kbit/s Default
3	19.2 kbit/s
4	28.8 kbit/s
5	38.4 kbit/s
6	48.0 kbit/s
7	56.7 kbit/s
8	64.0 kbit/s

8.10 AT^MONI Monitor Idle Mode and Dedicated Mode

Description: The AT^MONI command supplies information of the serving/dedicated cell. There are two ways to retrieve the information: once on request by using the execute command or automatically every <period> seconds by using the write command. To stop the periodic presentation type "AT" or "at".

Test Command: AT^MONI=?

Response: ^MONI:(list of supported <period>s)
OK

Exec Command: AT^MONI

Response: See: Section 8.10.1, AT^MONI responses
OK

Write Command: AT^MONI=<period>

Response: See: Section 8.10.1, AT^MONI responses
OK
ERROR
+CME ERROR

Parameter Description:

  <period>
    Display period in seconds
    1...254

Notes:

- The two header lines (see Section 8.10.1, AT^MONI responses) are output after every ten data lines.
- The length of following output lines exceeds 80 characters. Therefore a terminal program may draw a carriage return on a screen. However, this is not part of the response.
- The parameters LAC and cell are presented as hexadecimal digits, the remaining parameters are composed of decimal digits.
  If the radio cell changes during a connection, the parameters PWR, RXLev and C1 of the 'Serving Cell' part cannot be updated under certain conditions.
- If the BS supports frequency hopping during a connection, the dedicated channel (parameter chann) is not stable. This mode is indicated by chann = 'h'.
- To some extent, the cell monitoring command AT^SMONC covers the same parameters. The receiving level, for example, can be queried with both commands. Yet the resulting values may be slightly different, even though obtained over a time period of a few seconds. This is quite normal and nothing to worry about, as the cell information is permanently updated.
- For compatibility with earlier products and to support legacy applications, any input character may be used to stop the output in certain cases (depending on the settings of AT+IPR).

8.10.1 AT^MONI Responses

ME is not connected:

a)   ME is camping on a cell and registered to the network:
```
Serving Cell                                          I Dedicated channel
chann rs dBm MCC MNC LAC cell NCC BCC PWR RXLev C1    I chann TS timAdv PWR dBm Q ChMod
1013 21 -71 001 01 1001 0103 7 7 33 -105 33           I No connection
```

b)   ME is camping on a cell but not registered to the network (only emergency call allowed):
```
Serving Cell                                          I Dedicated channel
chann rs dBm MCC MNC LAC cell NCC BCC PWR RXLev C1    I chann TS timAdv PWR dBm Q ChMod
1013 21 -71 001 01 1001 0103 7 7 33 -105 33           I Limited Service
```

c) ME camping on a cell, but searching for a better cell (cell reselection):
```
Serving Cell                                          I Dedicated channel
chann rs dBm MCC MNC LAC cell NCC BCC PWR RXLev C1    I chann TS timAdv PWR dBm Q ChMod
1013 21 -71 001 01 1001 0103 7 7 33 -105 33           I Cell Reselection
```

d) ME is searching and could not (yet) find a suitable cell:
```
Serving Cell                                          I Dedicated channel
chann rs dBm MCC MNC LAC cell NCC BCC PWR RXLev C1    I chann TS timAdv PWR dBm Q ChMod
Searching
```

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

Columns for Serving Cell:

Column	*Description*
chann	ARFCN (Absolute Frequency Channel Number) of the BCCH carrier
rs	RSSI value 0 - 63 (RSSI = Received signal strength indication)
dBm	Receiving level of the BCCH carrier in dBm
MCC	Mobile Country Code (first part of the PLMN code)
MNC	Mobile Network Code (second part of the PLMN code)
LAC	Location area code, see note below
cell	Cell ID, see note below
NCC	PLMN color code
BCC	Base station color code
PWR	maximal power level used on RACH channel in dBm
RXLev	minimal receiving level (in dBm) to allow registration
C1	coefficient for base station selection

Columns for Dedicated Channel:

Column	*Description*
chann	ARFCN (Absolute Frequency Channel Number) of the TCH carrier Note: <chann> = h indicates frequency hopping.
TS	Timeslot number
timAdv	Timing advance in bits
PWR	Current power level
dBm	Receiving level of the traffic channel carrier in dBm
Q	Receiving quality (0-7)
ChMod	Channel mode (--: Signaling, S_HR: Half rate, S_FR: Full rate, S_EFR: Enhanced Full Rate, A_HR: AMR Half rate, A_FR: AMR Full rate)

8.10.2 Service States

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

- 'Searching' - The MS is searching, but could not (yet) find a suitable cell. This output appears after restart of the MS or after loss of coverage.
- 'No connection' - The MS is camping on a cell and registered to the network. The service state is *idle*; i.e., there is no connection established or a dedicated channel in use.
- 'Cell Reselection' - The MS has not yet lost coverage but is searching for a better cell, since the cell reselection criterion is fulfilled.
- 'Limited Service' - The MS is camping on a cell but not registered to the network. Only emergency calls are allowed. The MS enters this state, for example, when
  - ∗ no SIM card is inserted, or PIN has not been given,
  - ∗ neither Home PLMN nor any other allowed PLMN are found,
  - ∗ registration request was not answered or denied by the network (use command AT+CREG to query the registration status),
  - ∗ authentication failed.

8.11 AT^MONP   Monitor Neighbor Cells

Description:	The AT^MONP supplies information for up to six neighbor cells. There are two ways to retrieve the information: 1) by request using the execute command or 2) automatically every <period> seconds by using the write command. To stop the periodic presentation type "AT" or "at".
Test Command Syntax:	AT^MONP=?
Response:	^MONP:(list of supported <period>s) OK
Exec Command Syntax:	AT^MONP
Response:	See: Section 8.11.1, AT^MONP responses OK
Write Command Syntax:	AT^MONP=<period>
Response:	See: Section 8.11.1, AT^MONP responses OK ERROR +CME ERROR

Parameter Description:

<period>
Display period in seconds
1...254

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.
- To some extent, the cell monitoring command AT^SMONC covers the same parameters. The receiving level, for example, can be queried with both commands. Yet the resulting values may be slightly different, even though obtained over a time period of a few seconds. This is quite normal and nothing to worry about, as the cell information is permanently updated.
- For compatibility with earlier products and to support legacy applications, any input character may be used to stop the output in certain cases (depending on the settings of AT+IPR).

8.11.1 AT^MONP Responses

Response of AT^MONP (Example):

chann	rs	dBm	MCC	MNC	BCC	C1	C2
653	26	-84	262	07	0	22	22
660	20	-90	262	07	3	16	16
687	19	-91	262	07	1	15	15
678	14	-96	262	07	3	10	10
671	14	-96	262	07	1	10	10
643	10	-100	262	07	7	6	6

Column	Description
Chann	ARFCN (Absolute Radio Frequency Channel Number) of the BCCH carrier
rs	RSSI value 0 - 63 (RSSI = Received signal strength indication)
dBm	Receiving level in dBm
MCC	Mobile Country Code (first part of the PLMN code)
MNC	Mobile Network Code (second part of the PLMN code)
BCC	Base Station color code
C1	cell selection criterion
C2	cell reselection criterion

8.12 AT^SMONG GPRS Monitor

Description: The AT^SMONG command supplies GPRS specific cell information. There are two ways to retrieve the information: once on request by using the execute command or automatically every <period> seconds by using the write command. To stop the periodic presentation type "AT" or "at".

Test Command Syntax: AT^SMONG=?
Response: ^SMONG:(list of supported <table>s), (list of supported <period>s)
OK
ERROR
+CME ERROR

Exec Command Syntax: AT^SMONG
Response: GPRS Monitor
Cell Info Table (see: Section 8.12.1, AT^SMONG Cell Info Table)
OK
ERROR
+CME ERROR

Write Command Syntax: AT^SMONG=<table>[, <period>]
Response: ^SMONG: GPRS Monitor
Cell Info Table (see: Section 8.12.1, AT^SMONG Cell Info Table)
OK
ERROR
+CME ERROR

Parameter Descriptions:
  <table>
    1 Cell Info Table
  <period>
    Display period in seconds
    If <period> is omitted the cell data will be presented only once on a single line (as if Execute command was issued).
    If <period> is given, the cell data will be listed repeatedly on 10 data lines. Every 10th data line is followed by the header, simply to repeat the column titles.
    1...100

Note: For compatibility with earlier products and to support legacy applications, often any input character will stop the periodic output of the write command. But since this applies only in certain cases (depending on the settings of AT+IPR), it is recommended to always use "at" or "AT".

8.12.1 AT^SMONG Cell Info Table

Example output for AT^SMONG:

```
GPRS Monitor
BCCH   G   PBCCH   PAT   MCC   MNC   NOM   TA    RAC       # Cell #
0637   1   -       4     234   05    2     00    0B
```

Columns of the cell info table:

Column	Description
BCCH	ARFCN of BCCH carrier
G	G GPRS / EDGE status: 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 Note: During a voice call or CSD connection, GPRS services are not available; and, consequently, G=0 is displayed.
PBCCH	If PBCCH is present, indication of ARFCN, else "-" or if Frequency Hopping is used "H"
PAT	Priority Access Threshold (GSM Rec. 04.08 / 10.5.2.37b) 0 Packet access is not allowed in the cell 1 Spare, shall be interpreted as "000" (packet access not allowed) 2 Spare, shall be interpreted as "000" (packet access not allowed) 3 Packet access is allowed for priority level 1 4 Packet access is allowed for priority level 1 to 2
MCC	Mobile Country Code
MNC	Mobile Network Code
NOM	Network Operation Mode (1...3)
TA	Timing Advance Value
RAC	Routing Area Code (as hexadecimal value)

8.13 AT^SALS   Alternate Line Service

Description: The AT^SALS command is designed to support Alternate Line Service. This allows the subscriber to use two voice numbers on the same SIM card (service requires a dual line SIM card).

The write command enables or disables the presentation of <view> and specifies the <line> used for outgoing calls.

The read command returns the presentation mode of <view> and the currently selected <line>.

Test Command Syntax: AT^SALS=?
Response: ^SALS:(list of supported <view>s), (list of supported <line>s)
OK
Read Command Syntax: AT^SALS?
Response: ^SALS: <view>, <line>
OK
ERROR
Write Command Syntax: AT^SALS=<view>[, <line>]
Response: OK
ERROR

Parameter Descriptions:

  <view>
    Controls the presentation mode of the URC "^SALS" which indicates the line number used by an incoming call:
    0   Disables indication of the called line. Default.
    1   Enables indication of the called line
  <line>
    Selects the line to be used for outgoing calls.
    1   ALS Line 1. Default.
    2   ALS Line 2

Unsolicited Result Code:
  If switched on with <view>=1:
  ^SALS: <line>
  Indicates the line used by an incoming call.

Note:
  If a non ALS SIM is inserted, the <line> will be reset to line 1 as well.

Example:
  AT^SALS=1,1   Line 1 has been selected for outgoing calls. "^SALS" URC is enabled.
  RING   You receive a notification that you have an incoming call on line 2.
  ^SALS: 2

8.14 AT^SHOM   Display Homezone

Description: The AT^SHOM returns the homezone state. The result is valid only, if network registration state <stat> is 1 (registered) (see AT+CREG).
The feature is available only for supported network operators (02 Germany) and requires a suitable SIM card. If the homezone feature is not supported by the network operator or SIM card, result is always 0.

Test Command Syntax: AT^SHOM=?
Response: OK
Exec Command Syntax: AT^SHOM
Response: ^SHOM: <homezonestate>
OK
ERROR
+CME ERROR: <err>

Parameter Description:

  <homezonestate>
    0   ME is out of Homezone
    1   ME is within the Homezone
    2   ME is within Cityzone

8.15   AT^SPLM   Read the PLMN List

Description: The AT^SPLM execute command returns the list of operators from the ME. Each operator code <numeric> that has an alphanumeric equivalent <alpha> in the ME memory is returned. The list is sorted by operator codes. See also AT+COPN, AT+COPS

Test Command Syntax: AT^SPLM=?
Response: OK
If error is related to ME functionality:
ERROR
+CME ERROR: <err>

Exec Command Syntax: AT^SPLM
Response: ^SPLM:<numeric>, long <alpha>
^SPLM:[...]
OK
If error is related to ME functionality:
ERROR
+CME ERROR

Parameter Descriptions:

<numeric>
Operator in numeric form; GSM location area identification number

<alpha>
Operator in long alphanumeric format; can contain up to 16 characters

8.16   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.

Test Command: AT+CPOL=?
Response: +CPOL:(list of supported <index>s), (list of supported <format>s)
OK
ERROR
+CME ERROR

Read Command: AT+CPOL?
Response: +CPOL: <index>, <format>, <operator>
+CPOL: ...
OK
ERROR
+CME ERROR

Write Command: AT+CPOL=<index>[, <format>, <operator>]
Response: OK
ERROR
+CME ERROR:

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.

8.17 AT^SPLR   Read Entry from the Preferred Operators List

Description: The AT^SPLR write command returns used entries from the SIM list of preferred operators with <indexa> between <index1> and <index2>. If <index2> is not given, only entry at <index1> is returned. The test command returns the whole index range supported by the SIM.
See also AT+CPOL

Test Command Syntax: AT^SPLR=?
Response: ^SPLR:(list of supported) <indexa>s
OK
ERROR
+CME ERROR: <err>

Write Command Syntax: AT^SPLR=<index1>[, <index2>]
Response: ^SPLR: <index1><oper>
^SPLR: <index2><oper>
OK
ERROR
+CME ERROR: <err>

Parameter Descriptions:
  <index1>
    Location number to start reading from
  <index2>
    Location number where to stop reading
  <indexa>
    Index range supported by the SIM card (between <index1> and <index2>)
  <oper>
    Operator in numeric form; GSM location area identification number

8.18 AT^SPLW   Write an Entry to the Preferred Operators List

Description: The AT^SPLW write command writes an entry to the SIM list of preferred operators at location number <index>.
If <index> is given but <oper> is left out, the entry is deleted. An operator can be only once in the list. Test command returns the whole index range supported by the SIM.
See also AT+CPOL

Test Command Syntax: AT^SPLW=?
Response: ^SPLW:(list of supported) <index>s
OK
ERROR
+CME ERROR:

Write Command Syntax: AT^SPLW=<index>[, <oper>]
Response: OK
ERROR
+CME ERROR: <err>

Parameter Descriptions:
  <index>
    location number
  <oper>
    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).

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.

Test Command Syntax: AT+CACM=?
Response: OK
Read Command Syntax: The read command returns the current ACM value. AT+CACM?
Response: +CACM: <acm>
OK
ERROR
+CME ERROR: <err>
Write Command Syntax: AT+CACM=[<passwd>]
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^SACM   Advice of Charge and Query of ACM and ACMmax

Description: The **execute command** can be used to query the current mode of the Advice of Charge supplementary service, the SIM values of the accumulated call meter (ACM), and the accumulated call meter maximum (ACMmax).
The **write command** enables or disables the presentation of unsolicited result codes to report the call charges.

Test Command Syntax: AT^SACM=?
Response: ^SACM:(list of supported <n>s)
OK
Exec Command Syntax: AT^SACM.
Response: ^SACM: <n>, <acm>, <acmMax>
OK
ERROR
+CME ERROR: <err>
Write Command Syntax: AT^SACM=<n>.
Response: OK
ERROR
+CME ERROR: <err>

Parameter Descriptions:
  <n>
    0   Suppress unsolicited result code. Default.
    1   Display unsolicited result code
  <acm>
    Three bytes of the current ACM value in hexadecimal format (e.g., "00001E" indicates decimal value 30) 000000-FFFFFF
  <acmMax>
    Three bytes of the max. ACM value in hexadecimal format (e.g., "00001E" indicates decimal value 30) 000000 disable ACMmax feature 000001-FFFFFF
  <ccm>
    Three bytes of the current CCM value in hexadecimal format (e.g., "00001E" indicates decimal value 30); bytes are coded in the same way as ACMmax value in the SIM 000000-FFFFFF

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.

Notes:
- When you power down or reset the ME with AT+CFUN=1,1 the URC presentation mode will be reset to its default. To benefit from the URC it is recommended to have the setting included in the user profile saved with AT&W, or to select <n>=1 every time you reboot the ME.
- See also AT+CACM, AT+CAMM, AT+CAOC.

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

Description: The **read command** returns the current ACMmax value. ACMmax contains the maximum number of home units allowed to be consumed by the subscriber.
The **write command** sets the Advice of Charge related to the accumulated call meter maximum value in SIM file EF (ACMmax).

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

9.4   AT+CAOC   Advice of Charge Information

Description: The **Execute command** returns the current call meter value. The **write command** sets the Advice of Charge supplementary service function mode.

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

Parameter Descriptions:

  <mode>
    0 query 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.

9.5 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.

Test Command Syntax: AT+CCUG=?
Response: +CCUG:list of supported <n>, range of supported <index>, range of supported <info>
OK
ERROR
+CME ERROR
Read Command Syntax: AT+CCUG?
Response: +CCUG:<n>, <index>, <info>
OK
ERROR
+CME ERROR
Write Command Syntax: AT+CCUG=[[<n>][, <index>][, <info>]]
Response: OK
ERROR
+CME ERROR

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.

9.6 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.

Test Command Syntax: AT+CCFC=?

Response: +CCFC:(list/range of supported <reason>s)

OK

Write Command Syntax: AT+CCFC=<reason>, <mode>[, <number>[, <type>[, <class>[, <time>]]]]

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>]

OK

If <mode>= 2, <reason>= 2 and command successful:

+CCFC: <status>, <class>[, <number>, <type>, <time>]

OK

If error is related to ME functionality: +CME ERROR

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"

1	voice
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 voice and data). The value 255 covers all classes. If the <class> parameter is omitted, the default value 7 is used.

<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:
- 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 ("CME error: Operation not supported"). As an alternative, you may use the ATD command followed by *'# codes to check the status of these two reasons. See Star-Hash (*#) Network Commands for a complete list of *# GSM codes. See examples below.
- 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 applicability of SS "call forwarding" to a specific service/service group, 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.

Examples: 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 voice and 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: 1,2,"+493012345678",145
  +CCFC: 1,4,"+493012345678",145
  OK
  ```
- **To deactivate CFU without specifying <class>:**
  ```
  at+ccfc=0,0
  OK
  ```
  To check whether CFU was successfully deactivated (note: destination number remains registered in the network when you disable CFU):
  ```
  at+ccfc=0,2
  +CCFC: 0,1,"+493012345678",145
  +CCFC: 0,2,"+493012345678",145
  +CCFC: 0,4,"+493012345678",145
  OK
  ```
- **To erase the registered CFU destination number:**
  ```
  at+ccfc=0,4
  OK
  ```
  Now, when you check the status, no destination number will be indicated:
  ```
  at+ccfc=0,2
  +CCFC: 0,1
  +CCFC: 0,2
  +CCFC: 0,4
  OK
  ```
- **To query the status of CFU for all classes:**
  ```
  at+ccfc=0,2,,,255
  +CCFC: 0,1
  +CCFC: 0,2
  +CCFC: 0,4
  +CCFC: 0,8
  +CCFC: 0,16
  +CCFC: 0,32
  +CCFC: 0,64
  +CCFC: 0,128
  OK
  ```
- **<Reason> 4 or 5 cannot be used to query the status of all call forwarding reasons (see notes above):**
  ```
  at+ccfc=4,2
  +CME error: operation not supported
  at+ccfc=5,2
  +CME error: operation not supported
  ```

9.7 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>.

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

Read Command Syntax: AT+CCWA?
Response: +CCWA:<n>
OK

Write Command Syntax: AT+CCWA=[[<n>][, <mode>][, <class>]]
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: +CME ERROR

Parameter Descriptions:

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

<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.
1   Voice
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   Voice, data (1+2). Default.
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 voice and 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:

URC 1

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.

URC 2

Indication of a call that has been waiting.

^SCWA

If <n>=1 and the call waiting supplementary service is enabled in the network, this URC indicates that a waiting call rang when the ME was in online mode during a CSD call, but the calling party hung up before the ME went back to command mode.

Notes

- If the active call is a CSD call, and a waiting call is received, then the ME produces a BREAK while still in online mode, and displays
  - ∗ the +CCWA URC (as above) when the ME goes back to command mode while the waiting call is still active and can be accepted;
  - ∗ or the ^SCWA URC (as above) when the ME goes back to command mode after the waiting call has ended.
- With the AT+CHLD command, it is possible to establish a multiparty call or to set the active voice call on hold and then accept a waiting voice call (not possible with data calls). See also AT+CHLD
- 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. Thus, the only reliable way to receive or prevent a call waiting indication under any circumstances and in any network is to activate or deactivate call waiting for all tele- and bearer services (<class> 255).

Examples

Example 1

Parameter <n>

at+ccwa=1	To enable the presentation of the URC
OK	

Example 2

Parameter <mode>

at+ccwa=,1	To activate the supplementary service in the network for voice and data calls. (default classes). Note that parameter <n> is left out. In this case, the current value of <n> will be retained.
OK	
at+ccwa=,2	To query the network status of call waiting for default classes
at+ccwa=1,1	Call Waiting is activated during voice calls.
at+ccwa=1,2	Call Waiting is activated during data calls.
OK	

Example 3

Parameter <class>

AT+CCWA=,0,1	To deactivate call waiting for voice calls.
OK	

9.8 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.

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

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.).
- The handling of the supplementary service Call hold and Multiparty varies with the types of calls. This is because only voice calls can be put on hold, while data calls cannot. The following procedures apply:
With AT+CHLD=2 the user can simultaneously place a voice call on hold and accept another waiting voice or data call. If the waiting call is a data call, it is also possible to put the voice call on hold. To switch back from the active data call to the held voice call the active call must be terminated with AT+CHLD=1. If all active and held calls are voice calls it is possible to switch back and forth with AT+CHLD=2.
- 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.

See the Example on the next page.

Example
```
^SYSSTART
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.
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                                 The active data call is terminated and the held voice call becomes
                                          active.

OK
at+clcc
+CLCC: 1,0,0,0,0,"03038639268",129
OK
```

9.9 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.

Test Command Syntax: AT+CLIP=?

Response: +CLIP: (list of supported<n>s)
OK

Read Command Syntax: AT+CLIP? 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>).
If no SIM card is available or SIM-Pin isn't entered, the command response is "ERROR".

Response: +CLIP: <n>, <m>
OK
ERROR
+CME ERROR: <err>

Write Command: AT+CLIP=<n> 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.

Response: OK
ERROR
+CME ERROR: <err>

Parameter Descriptions:

  <n>
   0   Suppress unsolicited result codes. Default
   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.

  <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 not be significant. Nevertheless, TA shall return the recommended value 128 for <type> (TON/NPI unknown in accordance with GSM 04.08 subclause 10.5.4.7).

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

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.

9.10 AT+CLIR   Calling Line Identification Restriction

Description: The AT+CLIR command refers to the GSM supplementary service CLIR. 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.

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

Read Command Syntax: AT+CLIR?
Response: +CLIR<n>, <m>
OK
ERROR
+CME ERROR: <err>

Write Command Syntax: AT+CLIR=[<n>]
Response: OK
ERROR
+CME ERROR: <err>

Parameter Descriptions:

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

9.11 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.

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

Read Command Syntax: AT+COLP?
Response: +COLP: <n>, <m>
OK
ERROR
+CME ERROR: <err>

Write Command Syntax: AT+COLP=[<n>]
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.

Unsolicited Result Code:
  Call response format: +COLP: <number>, <type>

9.12 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.

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

Example:
Two ways to change currency and/or price per unit:
1. You can enter PIN2 along with the AT+CPUC command:
   AT+CPUC="EUR","0.10","8888"   (where "8888" = PIN2)
   OK
2. Alternatively, you can first use the AT+CPIN2 command to enter PIN2. When you execute the AT+CPUC command, subsequently, take into account that PIN2 authentication expires after 300ms (see notes in AT+CPIN2).
   AT+CPUC="EUR","0.10"
   OK   Successful
   AT+CPUC="EUR","0.10"
   +CME ERROR: SIM PIN2 required   Attempt not successful. PIN2 authentication has expired.

9.13 AT+CSSN Supplementary Service Notifications

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

Test Command Syntax: AT+CSSN=?

Response: +CSSN: (list of supported<n>s), (list of supported<m>s)

OK

Read Command Syntax: AT+CSSN?

Response: +CSSN: <n>, <m>

OK

Write Command Syntax: AT+CSSN=<n>[, <m>]

Response: OK

ERROR

+CME ERROR

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

<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: URCs will be displayed only if the call concerned is a voice call, but some URCs will be displayed as well as for data calls (like "+CSSU"=0).

9.14 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"

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

Read Command Syntax: AT+CUSD? The **read command** returns the current <n> value.
Response: +CUSD: <n>
OK

Write Command Syntax: AT+CUSD=<n>[, <str>[, <dcs>]]
The **write command parameter** <n> is used to disable/enable the presentation of an unsolicited result code (USSD response from the network, or network initiated operation) "+CUSD: <m>[<str>[<dcs>]]" to the TE.
When <str> is given, a mobile initiated USSD string or a response USSD string to a network initiated operation is sent to the network. The response USSD string from the network is returned in a subsequent unsolicited result code "+CUSD"

Response: OK
+CME ERROR

Parameter Descriptions:

<n>
0	Disable the result code presentation in the TA. Default.
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.	Operation not supported.
4.	Network time out.

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

Notes:
- For the write command, only <dcs>= 15 is supported.
- 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 – Internet Service Commands

The Multi-Tech Wireless EDGE modem has an embedded TCP/IP stack that is driven by AT commands and enables the host application to easily access the Internet. The advantage of this solution is that it eliminates the need for the application manufacturer to implement its own TCP/IP and PPP stacks, thus minimizing cost and time to integrate Internet connectivity into a new or existing host application. This chapter is a reference guide to all the AT commands and responses defined for use with the TCP/IP stack.

Access is provided to the following Internet Services:
1. Socket Client and Server for TCP, Client for UDP
2. FTP Client
3. HTTP Client
4. SMTP Client
5. POP3 Client

Two design strategies for using Internet Service AT commands - URC mode or polling mode:
Two modes of controlling an Internet session opened with AT^SISO are available. To select the mode that best suits the preferences of your application design use the AT^SCFG command, parameter "Tcp/WithURCs" (refer to <tcpWithUrc>).

- **URC mode (delivery default):**
  The progress of an Internet session is URC driven. The URCs notify the host whether data can be sent or received, whether data transfer has completed, whether the service can be closed or whether an error has occurred. This mechanism eliminates the need to poll the service until the necessary progress information is received.
  To enable the URC mode select: AT^SCFG="Tcp/WithURCs",on.

- **Polling mode:**
  In polling mode, the presentation of URCs related to the Internet Services is disabled. The host is responsible to retrieve all the status information needed for controlling the Internet session. This is done by polling, where the host application keeps sending the commands AT^SISR, AT^SISW, AT^SISI.
  To enable the polling mode select: AT^SCFG="Tcp/WithURCs",off.
  The disabled URCs are the following: "^SISR" URC, "^SISW" URC and "^SIS" URC for parameter <urc-Cause>=0 (Internet service events), but not for <urcCause>=1 or 2 (needed for Socket listener and always enabled).

Step-by-step instructions on how to configure and use TCP/IP communications with Multi-Tech Wireless EDGE modem:
- Select URC mode or polling mode as described above.
- First of all, create a CSD or GPRS connection profile with AT^SICS. The connection profile is a set of basic parameters that determine the type of connection to use for an Internet service. Up to 6 connection profiles can be defined, each identified by the <conProfileId>.
- Secondly, use AT^SISS to create a service profile based on one of the connection profiles. Up to 10 service profiles can be defined, each identified by the <srvProfileId>. The service profile specifies the type of Internet service to use, i.e. Socket, FTP, HTTP, or one of the email services SMTP or POP3. To assign a connection profile to a service profile, the <conProfileId> of AT^SICS must be entered as "conId" value of the AT^SISS parameter <srvParmTag>.
  This offers great flexibility to combine connection profiles and service profiles. For example, you may have one connection profile (CSD or GPRS) specified with AT^SICS which can be associated with an SMTP service profile for sending emails and a POP3 service profile for retrieving emails.
- Once the connection profile and the service profile are created, an Internet session can be opened by entering the AT^SISO write command and the desired <srvProfileId>.
  In URC mode, the "^SISR" or "^SISW" URC indicates whether the service is ready to receive or send data. This means that the AT^SISR or AT^SISW command shall be entered after the URC was received. If an error occurs the "^SIS" URC is delivered instead.
  In polling mode, you can enter the AT^SISR or AT^SISW command straight after AT^SISO though you may need to do so several times until the service confirms that data can be sent or received.
- The first parameter of the AT^SISR or AT^SISW commands is always the <srvProfileId>, the second parameter is the number of bytes which the host either wants to send to or is able to receive from the module. The way the module handles the data transfer follows the rules of the ordinary socket interface and is aware that a host may be limited by its input buffer size. The maximum data size supported by MC75 is 1500 bytes in both directions (read or write). To send or receive more than 1500 bytes, the read or write action shall be repeated until the data transfer has completed. Each read or write action requires that the command response (of AT^SISR or AT^SISW) confirms that the service is ready to send or receive data. To end an upload data stream set the <eodFlag> in the last AT^SISW command.

- The AT^SISI command shall be used to monitor the progress of the session. The command reports the service state of the used service profile and indicates the number of bytes received, the number of bytes sent and, in the case of sending, the number of bytes acknowledged or unacknowledged at TCP layer.
- • If an error occurs during a session you can enter the AT^SISE command and the <srvProfileId> to identify the reason. This is especially important in polling mode.
- Finally, to end a session, enter the AT^SISC write command and the <srvProfileId>.

Additional AT commands designed for controlling and monitoring the connection profiles (bearers):
- The AT^SICI command can be used any time to query the current status of one or all connection profile(s).
- The AT^SICO command opens a connection and keeps it open until closed with AT^SICC or disconnected
- by the network.
- The AT^SICC command closes a connection set up with AT^SICO.
- The AT^SISX command sends ICMP (Internet Control Message Protocol) Echo Requests to a target IP address or host name to verify the TCP/IP network connection.

Maximum number of profiles defined / used:
- Up to 6 connection profiles can be created (with AT^SICS).
- Up to 10 service profiles can be created (with AT^SISS), but the number of parallel profiles of the same service type is limited as listed below. If the maximum number of a service profile type is already defined, any attempt to set up another profile for the same type will be denied with "+CME ERROR: operation of service temporarily not allowed".
  * - Maximum 3 HTTP profiles
  * - Maximum 6 socket profiles: Only two instances can be opened for the listener. This means that if two listeners are established another four instances can be opened for clients. Also, the socket service can accept an incoming connection only when at least one service profile is still free (not yet created with AT^SISS); otherwise, the incoming connection will be closed to the listener. If there is no listener established, all six socket profiles can be configured as Client.
  * - 1 FTP profile
  * - 1 POP3 profile
  * - 1 SMTP profile
- The TCP/IP stack of Multi-Tech Wireless EDGE modem supports using several service profiles at the same time, provided all of them are running on the same connection profile. For example, it is possible to download files from an FTP server, while sending and receiving emails at the same time.

Address Notation:
Server addresses must be provided as IP addresses in standard dot-format (e.g., "192.168.1.2") or as server address names resolvable by a DNS server (e.g., "smtp.myserver.de" or "pop3.myserver.de").

Inactivity Timeouts:
Inactivity timeouts are not part of the Internet AT command functionality implemented with Multi-Tech wireless modem and, if desired, are the responsibility of the host application. It is recommended that the host application validates URCs and AT command responses and reacts adequately. Example: Sending a close message or a starting timer.

Socket service used with UDP protocol
The significant differences between the TCP and UDP protocols imply that UDP sometimes requires particular procedures or even specific parameters. Details on how to handle UDP services can be found in extra notes or are included in the general parameter descriptions.

The EDGE wireless modem offers two kinds of Socket service with UDP protocol. One is referred to as UDP client intended for connections to a given remote host. In this case the IP address and the UDP port of the remote host are set as a fixed parameter in the service profile. The other type is referred to as UDP endpoint where IP address and UDP port of the remote hosts are handled in each read (AT^SISR) and write (AT^SISW) request. This enables the host application to communicate with different remote hosts.

Using the DCD line to detect the connection status of Internet services
With AT&C you can configure the DCD line of the used serial interface to indicate whether an Internet service is active. For Socket, HTTP, SMTP and POP3 the states "Up" or "Connecting" are indicated, for FTP only the state "Up".

10.1 AT^SICS Internet Connection Setup Profile

Description: AT^SICS serves to create and edit Internet connection profiles. A connection profile can be assigned to one or more service profiles defined with AT^SISS, and thus, determines which type of connection is to be established when opening a service profile with AT^SISO.

The AT^SICS read command requests the current settings of all Internet connection profiles. One line is issued for every possible parameter of a given <conParmTag> "conType" value.

The AT^SICS write command specifies all parameters of a connection profile identified by <conProfileId>. At first, the type of Internet connection needs to be selected via <conParmTag> value "conType". This determines the applicability of all other <conParmTag> values related to this "conType" and automatically sets their defaults. An exception to the <conParmValue-alphabet> which can be set before or after selecting "con-Type". To change the settings the write command needs to be executed for each single <conParmTag>.

All profile parameters set with AT^SICS are volatile.

Table 10.1: Applicability of AT^SICS <conParmTag> values

<conParmTag> value	CSD	GPRS0
"conType"	mandatory	mandatory
"user"	optional	optional
"passwd"	optional	optional
"apn"	ø	mandatory
"inactTO"	optional	optional
"calledNum"	mandatory	ø
"dataRate"	mandatory	ø
"dataType"	mandatory	ø
"authMode"	mandatory	optional
"fnur"	optional	optional
"dns1"	optional	optional
"dns2"	optional	optional
"alphabet"	optional	optional

Test Command Syntax: AT^SICS=?
Response: OK
Read Command Syntax: AT^SICS?
Response: ^SICS: <conProfileId>, <conParmTag>, <conParmValue>
OK
Write Command Syntax: AT^SICS=<conProfileId>, <conParmTag>, <conParmValue>
Response: OK
ERROR
+CME ERROR: <err>

Parameter Descriptions:

<conProfileId>

0...5 Internet connection profile identifier.
The <conProfileId> identifies all parameters of a connection profile, and, when a service profile is created with AT^SISS the <conProfileId> needs to be set as "conId" value of the AT^SISS parameter <srv-ParmTag>.

<conParmTag>

Internet connection parameter.

"conType"	Type of Internet connection. For supported values of <conParmValue> refer to <conParmValue-con-Type>.
"alphabet"	Selects the character set for input and output of string parameters within a profile. The selected value is bound to the specific profile. This means that different profiles may use different alphabets. Unlike other parameters, the alphabet can be changed whether or not <conParmTag> value "conType" has been set. For supported values of <conParmValue> refer to <conParmValuealphabet>.
"user"	User name string: maximum 32 characters (where "" is default).
"passwd"	Password string: maximum 32 characters (where "" is default). If the <conParmValue-authMode> is "MsChapV1", then the maximum password length is 16 characters.
"apn"	Access point name string value: maximum 100 characters (where "" is default).
"inactTO"	Inactivity timeout value in seconds: 0 ... 2^{16}-1. Default = 20 Number of seconds the bearer remains open although the service no longer needs the bearer connection. Do not set the timeout value below 3 sec. This may result in problems when using the <eodFlag> (set in the last AT^SISW command to terminate an upload data stream). The value -1 indicates that, after opening the bearer with AT^SICO, the inactivity timeout is currently disabled. Closing the bearer with AT^SICC restores the previously set "inactTO" value of the concerned connection profile.
"calledNum"	Called BCD number.
"dataRate"	Data rate. For supported values of <conParmValue> refer to <conParmValue-dataRate>.
"dataType"	Data call type. For supported values of <conParmValue> refer to <conParmValuedataType>.
"authMode"	Authentication mode. For supported values of <conParmValue> refer to <conParmValue-auth-Mode>.
"fnur"	Fixed Network User Rate. For supported values of <conParmValue> refer to <conParmValue-fnur>.
"dns1"	Primary DNS server address (IP address in dotted-four-byte format). This value determines whether to use the DNS server addresses dynamically assigned by the network or a specific DNS server address given by the user. "dns1" = "0.0.0.0" (default) means that the CSD or GPRS connection profile uses dynamic DNS assignment. Any other address means that the Primary DNS is manually set. The default value applies automatically if no other address is set. Note that the AT^SICS read command only returns a manually configured IP address, while the value "0.0.0.0" is not indicated at all, no matter whether assumed by default or explicitly specified.
"dns2"	Secondary DNS server address (IP address in dotted-four-byte format). If "dns1" = "0.0.0.0" this setting will be ignored. Otherwise this value can be used to manually configure an alternate server for the DNS1. If "dns1" is not equal "0.0.0.0" and no "dns2" address is given, then "dns2"="0.0.0.0" will be assumed automatically. The AT^SICS read command only returns a manually configured IP address, while the value "0.0.0.0" is not indicated at all, no matter whether assumed by default or explicitly specified.

<conParmValue>

Parameter value; type and supported content depend on related <conParmTag>.

<conParmValue-conType>

Supported connection type values in <conParmValue> for <conParmTag> value "conType".

"CSD"	Circuit-switched data call.
"GPRS0"	GPRS connection. Settings of GPRS related commands are not used, e.g. AT+CGDCONT. When a service that is based on a GPRS connection profile is started after entering AT^SISO, the wireless modem automatically tries to attach to the GPRS. Yet, the only exception is AT+CGATT which can be used anytime to detach from the GPRS and, thus, disconnect the bearer opened with AT^SISO.
"none"	Clears the connection profile.

<conParmValue-alphabet>

Character set selectable with <conParmValue> for <conParmTag> value "alphabet".

"0"	Character set determined with AT+CSCS applies. Default.
"1"	International Reference Alphabet (IRA, seven bit ASCII) applies.

<conParmValue-dataRate>
Supported data rate values in <conParmValue> for <conParmTag> value "dataRate".

"0"	14.4 KBaud
"1"	9.6 KBaud. Default.

<conParmValue-dataType>
Supported data call type values in <conParmValue> for <conParmTag> value "dataType".

"0"	ISDN
"1"	Analog. Default,

<conParmValue-authMode>
Supported authentication mode values in <conParmValue> for <conParmTag> value "authMode". Changing the <conParmValue-authMode> will restore the password to its default (*****).

"none"
"PAP" (Default)
"CHAP"
"MsChapV1"

<conParmValue-fnur>
Fixed Network User Rate (FNUR) set with <conParmValue>.
This parameter is only required for 14.4 kbit/s UDI calls (Unrestricted Digital Information). Changes are recommended only if an originated CSD call fails. The choice as to which of the values to use depends on the GSM network and the location. Users should be aware that even the same operator may apply varying FNUR configurations in different regions.
See also AT^SFNUR command.

0	not applicable
1	9.6 kbit/s Default
2	14.4 kbit/s
3	19.2 kbit/s
4	28.8 kbit/s
5	38.4 kbit/s
6	48.0 kbit/s
7	56.7 kbit/s
8	64.0 kbit/s

Notes
- Before opening a service profile based on a connection profile recently used, check with AT^SICI that the previous connection was properly closed. If AT^SICI confirms that the connection profile is in <conState> 0 (Down) the connection profile may be used again.
- If a GPRS network does not support or is not correctly configured for automatic DNS address assignment the TCP/IP stack cannot resolve fully qualified domain names. In this case, a warning message will be returned when trying to open an Internet service configured for automatic DNS address assignment.

10.1.1 Example: Default Values of a CSD Connection Profile

As stated earlier, the "conType" selected with AT^SICS determines all other matching profile parameters related to this "conType". Once "conType" is set in a new profile, the default values of all other related parameters are assumed. To view the default settings you can use the read command AT^SICS?

at^sics=1,conType,CSD	Select connection type CSD, identified by <con-ProfileId>1
OK	
at^sics?	Query current profiles.
^SICS: 0, "conType", ""	Profile with <conProfileId> 0 is still empty.
^SICS: 1, "conType", "CSD"	The new CSD profile just created is indicated with all related parameters set to their default.
^SICS: 1, "alphabet", "0"	Character set determined with AT+CSCS applies when string parameters are input with AT^SICS.
^SICS: 1, "user", ""	No user name set.
^SICS: 1, "passwd", ""	No password set.
^SICS: 1, "authMode", "PAP"	Authentication protocol PAP is assumed as default.
^SICS: 1, "inactTO", "0"	No inactivity timeout set.
^SICS: 1, "calledNum", ""	No destination set.
^SICS: 1, "dataRate", "1"	Data rate set to 9.6 kbaud.
^SICS: 1, "dataType", "1"	Remote device is analog, e.g. an analog modem.
^SICS: 2, "conType", ""	Profile with <conProfileId> 2 is still empty.
^SICS: 3, "conType", ""	Profile with <conProfileId> 3 is still empty.
^SICS: 4, "conType", ""	Profile with <conProfileId> 4 is still empty.
^SICS: 5, "conType", ""	Profile with <conProfileId> 5 is still empty.
OK	

10.1.2 Example: GPRS Connection Profile

at^sics=0,conType,GPRS0 OK	Select connection type GPRS0.
AT^SICS=0,inactTO,"0" OK	Inactivity timeout = 0 (default).
AT^SICS=0,dns1,"193.254.160.1" OK	IP address of Primary DNS server.
AT^SICS=0,authMode,"PAP" OK	Authentication protocol PAP (default).
AT^SICS=0,passwd,t-d1 OK	GPRS services password provided by the German operator T-D1.
AT^SICS=0,apn,"internet.t-d1.de" OK	APN to access the GPRS services provided by the German operator T-D1.

10.2 AT^SICI Internet Connection Information

New command

Description: The AT^SICI read command requests the current status of the Internet connection profiles currently defined with AT^SICS.

The AT^SICI write command displays the status of the specified Internet connection profile. If the connection profile is not defined yet, the command returns a "+CME ERROR" response.

Test Command Syntax: AT^SICI=?
Response: [^SICI: (list of defined <conProfileId>s)]
OK

Read Command Syntax: AT^SICI?
Response: [^SICI: <conProfileId>, <conState>, <numServices>, <conAddr>]
[^SICI: ...]
OK

Write Command Syntax: AT^SICI=<conProfileId>
Response: ^SICI: <conProfileId>, <conState>, <numServices>, <conAddr>
OK
ERROR
+CME ERROR: <err>

Parameter Description:

<conProfileId>
Internet connection profile identifier as defined by AT^SICS (<conProfileId>).
0...5

<conState>
State of the Internet connection profile.
0	Down - Internet connection is defined but not connected.
1	Connecting - A service has been opened and so the Internet connection is initiated.
2	Up - Internet connection is established and usable by one or more services.
3	Limited Up - Internet connection is established, but temporarily no network coverage. This state applies only to GPRS profiles (it does not occur with CSD).
4	Closing - Internet connection is terminating.

<numServices>
Number of services using this Internet connection profile.
0...9

<conAddr>
Local IP address of the Internet connection profile (empty if no address is associated yet).

Note
Before opening a service profile based on a connection profile recently used, check with AT^SICI that the previous connection was properly closed. If AT^SICI confirms that the connection profile is in <conState> 0 (Down) the connection profile may be used again.

10.2.1 Checking Connection Profile Status

at^sici? ^SICI: 1,2,1,"10.10.0.161" OK	Query the current status of the connection profile. One connection profile has been created at <con-ProfileId>=1, and one service is opened using this connection profile. The Internet connection is in <conState>=2 ("Up").

Assume the network connection is temporarily not available. (If URC presentation mode of network registration is enabled, the state is shown by the URC "+CREG: 2").

at^sici? ^SICI: 1,3,1,"10.10.0.161" OK	Query once again the current status of the connection profile. Parameter <conState> has changed to state "Limited up".

The network connection is temporarily not available, but the Internet connection is still established, so the host may decide to stop the data transfer to minimize the risk of losing data due to memory limitations.

at^sici? ^SICI: 1,2,1,"10.10.0.161" OK	Query once again the current status of the connection profile. After re-establishing the network connection, <con-State> reverts to state "Up".

After closing the service with AT^SISC:

at^sici? ^SICI: 1,2,0,"10.10.0.161" OK	Query once again the current status of the connection profile. Parameter <numServices> has decreased. The bearer is still open because the service was closed before expiry of the inactivity timeout "inactTO" of AT^SICS.
at^sici? ^SICI: 1,0,0,"0.0.0.0" OK	Query again the current status. The inactivity timeout "inactTO" of AT^SICS has expired, therefore the bearer is closed now.

10.3 AT^SISS Internet Service Setup Profile

Description: AT^SISS serves to set up the necessary parameters in the Internet service profiles. Any service profile can then be used to control a data link in conjunction with AT^SISI, AT^SISO, AT^SISC, AT^SISR, AT^SISW, and AT^SISE.

The **read command** requests the current settings of all Internet service profiles. One line is issued for every possible parameter of a given <srvParmTag> "srvType" value.

The **write command** specifies the parameters for a service profile identified by <srvProfileId>. At first the type of Internet service needs to be selected via <srvParmTag> value "srvType". This determines the applicability of all other <srvParmTag> values related to this "srvType" and sets their defaults. Changing the <srvParmTag> "srvType" of an existing service profile will reset all <srvParmTag> default values to suit the new "srvType". An exception is <srvParmTag-alphabet> which can be set before or after selecting "srvType" and is not reset when "srvType" changes.

To change the settings, the write command needs to be executed for each single <srvParmTag>. All parameters with AT^SISS are volatile.

The list below shows which <srvParmTag> parameters apply to each Internet service and which of them are mandatory or optional.

Table 10.2: Applicability of AT^SISS <srvParmTag> values

<srvParmTag>	Mandatory or Optional
Socket service	
"srvType"	mandatory
"conId"	mandatory
"alphabet"	optional
"address"	mandatory
"tcpMR"	optional
"tcpOT"	optional
FTP service	
"srvType"	mandatory
"conId"	mandatory
"alphabet"	optional
"address"	mandatory
"tcpMR"	optional
"tcpOT"	optional

HTTP service

"srvType"	mandatory
"conId"	mandatory
"alphabet"	optional
"address"	mandatory
"user"	optional
"password"	optional
"hcContent"	optional
"hcContLen"	optional
"hcUserAgent"	optional
"hcMethod"	mandatory
"hcProp"	optional
"hcRedir"	optional
"hcAuth"	optional
"tcpMR"	optional
"tcpOT"	optional

SMTP service

"srvType"	mandatory
"conId"	mandatory
"alphabet"	optional
"address"	mandatory
"user"	optional
"password"	optional
"tcpPort"	optional
"smFrom"	mandatory
"smRcpt"	mandatory
"smCC"	optional
"smSubj"	optional
"smHdr"	optional
"smAuth"	optional
"tcpMR"	optional
"tcpOT"	optional

POP3 service

"srvType"	mandatory
"conId"	mandatory
"alphabet"	optional
"address"	mandatory
"user"	mandatory
"password"	mandatory
"tcpPort"	optional
"pCmd"	mandatory
"pNumber"	optional
"pLength"	optional
"pDelFlag"	optional
"tcpMR"	optional
"tcpOT"	optional

Test Command Syntax:	AT^SISS=?
Response:	OK
Read Command Syntax:	AT^SISS?
Response:	^SISS: <srvProfileId>, <srvParmTag>, <srvParmValue>
	OK
Write Command Syntax:	AT^SISS=<srvProfileId>, <srvParmTag>, <srvParmValue>
Response:	OK
	ERROR
	+CME ERROR: <err>

Parameter Description:

<srvProfileID>

Internet service profile identifier.

The <srvProfileId> is used to reference all parameters related to the same service profile. Furthermore, when using the AT commands AT^SISO, AT^SISR, AT^SISW, and AT^SISC, the <srvProfileId> is needed to select a specific service profile.

0...9

<srvParmTag>

Internet service profile parameter.

"srvType"   Type of Internet service to be configured with consecutive usage of AT^SISS.
For supported values of <srvParmValue>, refer to <srvParmValue-srv-Type>.

"alphabet"	Selects the character set for input/output of string parameters within a profile. The selected value is bound to the specific profile. This means that different profiles may use different alphabets. Unlike other parameters, the alphabet can be changed regardless of whether the <srvParmTag> value "srvType" has been set. For supported values of <srvParmValue>, refer to <srvParmValuealphabet>.

"user"	User name string
	  1. **Socket**
	     Not applicable.
	  2. **FTP**
	     Not applicable; set within "address" parameter.
	  3. **HTTP**
	     Length 2…31
	     User name for the HTTP authentication mechanism. Currently only HTTP simple authentication is supported.
	  4. **SMTP**
	     User name to be used for SMTP authentication (string).
	     Length: 4...64.
	     If SMTP authentication is disabled; i.e., "smAuth" flag not set, user name parameter will be ignored.
	  5. **POP3**
	     User name identifying a mailbox; i.e., mailbox name (string)
	     Length: 1...64.
	     Used to perform authentication with a POP3 server, e.g. "john.smith".

"passwd"	Password string
	  1. **Socket**
	     Not applicable.
	  2. **FTP**
	     Not applicable; set within "address" parameter.
	  3. **HTTP**
	     Password for the HTTP authentication mechanism. Currently HTTP simple authentication is supported only.
	  4. **SMTP**
	     Password to be used for SMTP authentication (string).
	     Length 4...64
	     If SMTP authentication is disabled; i.e., "smAuth" flag not set; password parameter will be ignored.
	  5. **POP3**
	     Server/mailbox-specific password (string).
	     Length: 1...64.
	     Used to perform authentication with a POP3 server.

"conId"	Internet connection profile to be used, for details refer AT^SICS.

"tcpPort"	TCP Port Number
	  1. **Socket**
	     Not applicable; set within "address" parameter.
	  2. **FTP**
	     Not applicable; set within "address" parameter.
	  3. **HTTP**
	     Not applicable; set within "address" parameter.
	     If parameter is omitted, the service connects to HTTP default port 80.
	  4. **SMTP**
	     SMTP server TCP port number (numeric).
	     Length: $0...2^{16} - 1$
	     If this parameter is not set, SMTP default port number 25 is used.
	  5. **POP3**
	     POP3 server TCP port number (numeric).
	     Length: $0...2^{16} - 1$
	     If this parameter is not set, POP3 default port number 110 is used.

"address"	String value, depending on the service type either a URL in the case of Socket, FTP and HTTP or an address in the case of SMTP and POP3:
	  1. **Socket**
	    • Socket type TCP client URL
	      "socktcp://'host':'remote tcpPort'[;disnagle='0|1'] "
	      "disnagle" is optional for disabling the TCP Nagle algorithm.
	      0: Nagle algorithm is enabled. Default.
	      1: Nagle algorithm is disabled.
	    • Socket type TCP server URL
	      "socktcp://listener:'local tcpPort' "

- Socket type UDP endpoint URL
  "sockudp://'host':'local udpPort''
- Socket type UDP client URL
  "sockudp://'host':'remote udpPort'[;size='byte'][;port='word']"
  Parameter "size" (optional):
  0: PDU size is variable (default).
  1 ... 1500: Fixed PDU size in bytes.
  Parameter "port" (optional):
  0: Port number will be assigned from service (default).
  $1...2^{16} - 1$: defines the local port number of the UDP client.

2. **FTP**
   - FTP client URL (get)
     "ftp://'user':'password'@'host':'tcpPort'/'url-path' [;type='a|i|d'] "
     Refer "IETF-RFC 1738".
   - FTP client URL (put)
     "ftpput://'user':'password'@'host':'tcpPort'/'url-path'/'element name'
     [;type='a|i'][;mode='u|a|d'] "

     Used parameters:
     "host" is mandatory; all other parameters are optional.
     If "password" is set, then "user" must be set as well.
     If "user" is omitted, the string "anonymous" is selected for "user" and
       "password".
     If "password" is omitted, the password request is served by an empty
       string.
     If "tcpPort" is omitted, the service connects to the FTP default port 21.
     If "url-path" contains only the IP address, a directory listing is
       requested.
     If "url-path" contains only the IP address and has a slash '/'
       appended, a detailed directory listing is requested.
     "type": [a)scii | i)mage | d)irectory]
     "mode": [u)nique | a)ppend | d)elete]
     "u)nique" selects the FTP Store Unique command to create a file
       name unique to the current directory. If the file name is assigned by
       the server then the "^SIS" URC will appear, indicating <urcInfoId>
       2100 and the file name.
     "d)elete" clears given 'element name'.
     If "mode" is omitted "replace mode" is default setting.

3. HTTP
   HTTP client URL
   Length: 6…255
   "http://'server'/'path':'tcpPort' "
   "server": FQDN or IP-address
   "path": path of file or directory
   "tcpPort": If parameter is omitted, the service connects to HTTP default port
     80.
   Refer to "IETF-RFC 2616".

4. SMTP
   SMTP server address (string).
   Length 4...256.

5. POP3
   POP3 server address (string).
   Length 4...256.

hcContent	Optional parameter for HTTP method "Post". Length: 0…127 Can be used to transfer a small amount of data. The content of this string will only be sent if "hcContLen" = 0. The maximum length of "hcContent" is 127 bytes. To transmit a larger amount of data "hcContLen" must be set to a non-zero value. In this case the "hcContent" string will be ignored, and data transmission from the client to the server is done with AT^SISW.
hcContLen	Mandatory parameter for HTTP method "Post". Length: 0…2^{31}-1 The content length shall be set in the header of the HTTP "Post" request before the data part is transferred. If "hcContLen" = 0 then the data given in the "hcContent" string will be posted. If "hcContLen" > 0 then the AT^SISW command will be used to send data from the client to the server. In this case, "hcContLen" specifies the total amount of data to be sent. The data can be sent in one or several parts. For each part, the transmission is triggered by the URC "^SISW: x, 1", then the AT^SISW write command can be executed. After the exact number of bytes are transferred via the serial interface, the HTTP client will go from service state "Up" to service state "Closing" (see parameters <srvState> and <srvState> for detail). Finally, the URC. "^SISW: x, 2" indicates that all data have been transferred and the service can be closed with AT^SISC.
hcUsrAgent	The user agent string must be set by the application to identify the mobile. Usually operation system and software version info is set with this browser identifier. Length: 0…63
hcMethod	HTTP method specification: 0=GET, 1=POST, 2=HEAD.
hcProp	Parameter for several HTTP settings. Length: 0…127 The general format is 'key': <space> 'value' "\0d\0a". Multiple settings can be given separated by "\0d\0a" sequences within the string. Possible 'key' values are defined at HTTP/1.1 Standard RFC 2616.
hcRedir	This flag controls the redirection mechanism of the Multi-Tech Wireless EDGE modem acting as an HTTP client (numeric). If "hcRedir" = 0: No redirection. If "hcRedir" = 1: The client automatically sends a new HTTP request if the server answers with a redirect code (range 30x). Default = 1
hcAuth	If set ("hcAuth" = 1), this flag determines that the HTTP client will automatically answer on authentication requests from the server with the current "passwd" and "user" parameter settings. If these parameters are not specified, the Multi-Tech Wireless EDGE modem will terminate the HTTP connection and send an indication to the TA. Default = 1
smFrom	Email sender address; i.e., "MAIL FROM" address (string). Length: 6...256. A valid address parameter consists of local part and domain name delimited by a '@' character; e.g., "john.smith@somedomain.de".
smRcpt	Recipient address of the email; i.e., "RCPT TO" address (string). Length: 6...256. If multiple recipient addresses are to be supplied the comma character is used as delimiter to separate individual address values; e.g., "john.smith@somedomain.de,tom.meier@somedomain.de".
smCC	CC recipient address of the email (string). Length: 6...256. If multiple CC recipient addresses are to be supplied, the comma character is used as a delimiter to separate address values; e.g., "john.smith@somedomain.de,tom.meier@somedomain.de".
smSubj	Subject content of the email (string). Length: 0...256. If no subject is supplied the email will be sent with an empty subject.
smHdr	This parameter, if set, will be appended at the end of the email header section (string). Length: 0...256. Hence, it serves as a generic header field parameter which allows the user to provide any email header field. It is the user's responsibility to provide correct header fields!

	String of max. 512 characters.
	Example for multipart MIME messages: *"Content-Type: multipart/mixed"*.
smAuth	SMTP authentication control flag (numeric).
	If disabled (<srvParmValue> "0" by default), the Multi-Tech Wireless EDGE modem performs action without SMTP authentication.
	If enabled (<srvParmValue> "1"), authentication procedure with the SMTP server will be performed by means of supported authentication methods, using values of "user" and "passwd" parameters. If the Multi-Tech Wireless EDGE modem and SMTP server are not able to negotiate an authentication mechanism supported by both parties, the Multi-Tech Wireless EDGE modem continues action without authentication.
	Multi-Tech Wireless EDGE modem supports SMTP authentication.
pCmd	POP3 user command to be executed by the POP3 service (numeric).
	For supported values of <srvParmValue> refer to <srvParmValue-pCmd>.
pNumber	Optional message number argument used by the POP3 commands List ("2"), Retrieve ("3") and Delete ("4"). For POP3 commands see <srvParmTag> value "pCmd".
	Length: $0...2^{31} - 1$.
	If no specific value is set in the service profile, the value "0" is assumed by default; i.e., "pNumber" is disabled.
pLength	Maximum message length (string, optional).
	Length: $0...2^{31} - 1$
	"pLength" can be used to specify the length of the message(s) to be retrieved from or deleted on the POP3 server. If no specific value is set in the service profile, the default value "0" is assumed, which means that there is no limit on the message size.
	A warning will be issued in the following cases:
	• If "pNumber" > 0 and a specific message to be retrieved from / deleted on the server is longer than "pLength".
	• If "pNumber" = 0 and all messages to be retrieved from / deleted on the server are longer than "pLength".
	No warning will be issued in the following cases:
	• If there are no messages at all on the server.
	• If the server has message(s) below *and* above the "pLength" specified. In this case, the message(s) within the range of "pLength" can be successfully retrieved or deleted, but the message(s) above "pLength" remain on the server without any further notification given to the user.
	• Therefore, after retrieving / deleting messages, it is recommended to check the message status on the server. This can be done by adding a further POP3 service profile using the POP3 user command List "2".
pDelFlag	Flag to be used with the POP3 user command Retrieve ("3"). Specifies whether or not to delete retrieved emails on the server (optional).
	For supported values of <srvParmValue> refer to <srvParmValuepDelFlag>.
tcpMR	Parameter can be used to overwrite the global AT^SCFG parameter "Tcp/MaxRetransmissions" <tcpMr> for a specific Internet Service connection profile. If the parameter is not specified the value specified with AT^SCFG will be used.
	Supported values <srvParmValue> for this parameter are the same as described for <tcpMr>.
	Setting is not relevant for Internet Service "Socket" with type "UDP".
tcpOT	Parameter can be used to overwrite the global AT^SCFG parameter "Tcp/OverallTimeout" <tcpOt> for a specific Internet Service connection profile. If the parameter is not specified the value specified with AT^SCFG will be used.
	Supported values <srvParmValue> for this parameter are the same as described for <tcpOt>.
	Setting is not relevant for Internet Service "Socket" with type "UDP".

<srvParmValue>
Parameter value; type and supported content depend on related <srvParmTag>.

<srvParmValue-servType>
Supported Internet service type values in <srvParmValue> for <srvParmTag> value "srvType".
Before changing the "srvType" of an existing service profile be sure that the profile is closed. To verify the connection state of the service profile enter the read command AT^SISO. Only when <srvState>=2 is returned for this specific service profile you can change its server type.

"Socket"	The Multi-Tech wireless modem acting as client or server (listener) for TCP, or as client for UDP. If the wireless modem is TCP listener, at least two service profiles are required. The first socket profile must be configured as listener. The second

<table>
<tr><td></td><td>service profile will be dynamically assigned when a socket connection request from a remote client is incoming.
For this purpose, one service profile must be left free (= not configured with AT^SISS). An incoming socket connection request will be indicated by the "^SIS" URC, with the next free <srvProfileId> shown inside the URC as parameter <urcInfoId>. The connection request can be accepted or rejected by using AT^SISO or AT^SISC and the ID retrieved from the "^SIS".</td></tr>
<tr><td>"FTP"</td><td>Multi-Tech Wireless EDGE modem acting as FTP client.</td></tr>
<tr><td>"HTTP"</td><td>Multi-Tech Wireless EDGE modem acting as HTTP client.</td></tr>
<tr><td>"SMTP"</td><td>Multi-Tech Wireless EDGE modem acting as SMTP client.</td></tr>
<tr><td>"POP3"</td><td>Multi-Tech Wireless EDGE modem acting as POP3 client.</td></tr>
<tr><td>"none"</td><td>Reset Internet service profile settings. Operation is not allowed if profile is in use; i.e., it was activated via AT^SISO.</td></tr>
</table>

<srvParmValue-alphabet>

Supported string parameter character set selections in <srvParmValue> for <srvParmTag> value "alphabet".

"0"   Applicable character set is determined by current setting of AT+CSCS. Default.

"1"   International Reference Alphabet (IRA, seven bit ASCII).

<srvParmValue-pCmd>

Supported POP3 user command values in <srvParmValue> for <srvParmTag> value "pCmd".

"1"   Status command.

This command retrieves the "drop listing" of a POP3 server. A "drop listing" consists of a single line containing the number of messages in the mail drop list followed by the total size of the mail drop list in bytes. Each drop listing will be finished by a so-called "dotline", i.e. a new line with just a single dot.

"2"   List command.

If <srvParmTag> value "pNumber" is set to a non-zero value, the "List" command returns the "scan listing" consisting of a single line which contains the message number and the message size in bytes if the specified message exists in the mail drop list on the POP3 server.

If no such message exists on the server than the POP3 service issues an error response to the user.

If <srvParmTag> value "pNumber" is zero, the "List" command returns a multi-line "scan listing". For each message on the mail drop list of the server the POP3 service returns a line containing the message number and its size in bytes. A final "dotline" will be printed at the end of the "scan listing".

If there are no messages on the mail drop list of the server, the POP3 service returns a positive response, i.e. it doesn't issue an error response, but the "scan listing" will be empty.

In either case, each scan listing will be finished by a so-called "dotline"; i.e., a new line with just a single dot.

"3"   Retrieve command.

If <srvParmTag> value "pNumber" is set to a non-zero value, this command retrieves the related message from the POP3 server's mail drop list.

If no such message exists on the server the POP3 service issues an error response to the user. It depends on the parameter "pDelFlag" if the message will be deleted from the POP3 server upon successful retrieval.

If <srvParmTag> value "pNumber" is zero, the "Retrieve" command returns all messages pending in the POP3 server's mail drop.

If there are no messages on the mail drop list of the server the POP3 service returns with a positive response, i.e. it doesn't issue an error response, but the returned list will be empty.

Each email will be finished by a so-called "dotline"; i.e., a new line with just a single dot.

"4"   Delete command.

If <srvParmTag> value "pNumber" is set to a non-zero value, the command deletes the related message from the POP3 server's mail drop list. In fact, the message is marked as deleted on the server and will be deleted permanently if the POP3 service command executes successfully. In case an error has occurred; e.g., network loss, the message will not be deleted on the server even though the POP3 service command has been finished.

If <srvParmTag> value "pNumber" is zero, the "Delete" command deletes all message from the POP3 server's mail drop list. In fact, the messages are marked as deleted on the server and will be deleted permanently if the POP3 service command executes successfully. In case an error has occurred, the messages will not be deleted on the server even though the POP3 service command has been finished.

<srvParmValue-pDelFlag>

Supported flag values in <srvParmValue> for <srvParmTag> value "pDelFlag". Only applicable if the profile contains the POP3 user command Retrieve ("3").

"0"   Messages will not be deleted on the server. Default.

"1"   Delete messages on the server which have been retrieved successfully.

Note: String parameters are truncated if greater than the maximum length specified above.

10.4 AT^SISI Internet Service Information

Description: AT^SISI serves to monitor the status of Internet service profiles defined with AT^SISS.
The AT^SISI read command requests the current status of all defined Internet service profiles.
The AT^SISI write command requests the status of the specified Internet service profile. If the
specified service profile is not defined yet, "+CME ERROR" is returned.

Test Command Syntax: AT^SISI=?
Response: [^SISI:(list of defined <srvProfileId>s)]
OK

Read Command Syntax: AT^SISI?
Response: If response is related to service profile(s) created / opened on this interface:
[^SISI: <srvProfileId>, <srvState>, <rxCount>, <txCount>, <ackData>, <unackData>]
[^SISI: ...]
If response is related to service profile(s) created / opened on other interface(s):
[^SISI: <srvProfileId>, <srvParmTag>value "srvType"]
[^SISI: ...]
OK
ERROR

Write Command Syntax: AT^SISI=<srvProfileId>
Response: ^SISI: <srvProfileId>, <srvState>, <rxCount>, <txCount>,   <ackData>, <unackData>
OK
ERROR
+CME ERROR: <err>

Parameter Description

<srvProfileId>
Internet service profile identifier as defined by AT^SISS (<srvProfileId>).
0...9

<srvState>
Internet service state (for details see AT^SISO parameter <srvState>).
2   Allocated
3   Connecting
4   Up
5   Closing
6   Down

<rxCount>
Number of bytes received via AT^SISR since last successful AT^SISO write command.
This is the same value as displayed by the AT^SISO read command with the parameter <rxCount>.

<txCount>
Number of bytes sent via AT^SISW since last successful AT^SISO write command.
This is the same value as displayed by the AT^SISO read command with the parameter <txCount>.

<ackData>
Number of data bytes already sent and acknowledged at TCP layer. Value 0 indicates that no sent data is
acknowledged yet.
Parameter is not applicable to HTTP, POP3, SMTP and Socket with UDP. For these services the counter is
always set to 0.

<unackData>
Number of data bytes already sent but not yet acknowledged at TCP layer. A value 0 indicates that all sent
data is already acknowledged.
This is the same value as displayed in the response of the AT^SISW write command with the parameter
<unackData>.
Parameter is not applicable to HTTP, POP3, SMTP and Socket with UDP. For these services the counter is
always set to 0.

Note
• If a service is in state "Down" the responses for <rxCount>, <txCount>, <ackData> and <unackData> are the
last known values for the service in the states "Connecting", "Up" and "Closing".

10.5 AT^SISO   Internet Service Open

Description: The AT^SISO write command starts the Internet session configured by the service profile. All further steps needed to control the session depend on whether you are using URC mode or polling mode. The AT^SISO read command returns the current status of all services.

URC mode:
If the service opens successfully, the URCs "^SISW" and "^SISR" will trigger the action to follow, either writing data with AT^SISW or reading data with AT^SISR. To terminate an upload data stream set the <eodFlag> within the last AT^SISW command. If the URCs notify that a data transfer has been successful ("^SISR: x, 2" or "^SISW: x, 2"), the service can be closed with AT^SISC. If a special event occurs, e.g. an error or a warning, after opening or while using a service then the URC type "^SIS" will be delivered.

Polling mode:
After opening the service, all progress information needed to control the session shall be explicitly requested by the host application. The particular sequence of AT commands varies depending on the service used. The following list summarizes, by way of an example, the steps normally involved in managing an upload or download job.

- Upload (Socket, FTP, HTTP, SMTP):
    - Enter the AT^SISO command, e.g. AT^SISO=9.
    - Enter AT^SISW, specify <reqWriteLength>, e.g. AT^SISW=9,20. Check resulting response for <cnf-WriteLength>. Optionally, check error with AT^SISE, e.g. AT^SISE=9. If necessary, repeat the sequence several times.
    - Enter last AT^SISW command and enable <eodFlag>, e.g. AT^SISW=9,0,1.
      If Socket service: Query available data with AT^SISR, e.g. AT^SISR=9,1430.
    - Check service state with AT^SISI, e.g. AT^SISI=9, if necessary several times until <srvState>=6 ("Down").
    - Check error with AT^SISE, e.g. AT^SISE=9.
    - Close service with AT^SISC, e.g. AT^SISC=9.
- Download (Socket, FTP, HTTP, POP3):
    - Enter the AT^SISO command, e.g. AT^SISO=9.
    - Enter AT^SISR, specify <reqReadLength>, e.g. AT^SISR=9,1000. Check resulting response for <cnfReadLength>. If necessary, repeat the sequence several times until <cnfReadLength>= -2 (end of data) or ERROR.
    - Check error with AT^SISE, e.g. AT^SISE=9.
    - Close service with AT^SISC, e.g. AT^SISC=9.

- Socket service (upload and download possible in one session):
    - Recommended: Set AT+CMEE=2 to enable extended error text.
    - Enter the AT^SISO command, e.g. AT^SISO=9.
    - Enter AT^SISR or AT^SISW, specifying <reqReadLength> or <reqWriteLength>; e.g., AT^SISR=9,20 or AT^SISW=9,20. Check resulting response for <cnfReadLength> or <cnfWrite-Length>. If necessary, repeat the sequence several times.
    - Check error with AT^SISE, e.g. AT^SISE=9.
    - If write action: Enter last AT^SISW command and enable <eodFlag>; e.g., AT^SISW=9,0,1.
      If Socket service: Query available data with AT^SISR, e.g. AT^SISR=9,1430.
    - Close service with AT^SISC, e.g. AT^SISC=9.

Test Command Syntax:	AT^SISO=?
Response:	OK
Read Command Syntax:	AT^SISO?
Response:	^SISO: <srvProfileId>, <srvParmTag>value "srvType" [, <srvState>, <socketState>, <rxCount>, <txCount>, <locAddr>, <remAddr>]
	[^SISO: …]
	OK
Write Command Syntax:	AT^SISO=<srvProfileId>
Response:	OK
	ERROR
	+CME ERROR: <err>

Parameter Descriptions:

<srvProfileId>
   <srvProfileId> 0 ... 9 specified with AT^SISS.

<srvState>
Internet service state.
Please note, that the state of an Internet service may influence the state of the serial DCD line. For details see description of value 2 for parameter <value> of command AT&C.

2	Allocated. Service profile resources are allocated; i.e., at least the service type has been set (parameter <srvParmTag>, value "srvType" of AT^SISS). The service is not opened, but ready for configuration.
3	Connecting: State after opening a service with AT^SISO where the connection is being established. If connection setup is successful the service proceeds to the state "4" (Up) and one of the URCs "^SISW" and "^SISR" may follow. If connection setup is not successful, the "^SIS" URC may appear and the service enters <srvState> 6 (Down). In the case of FTP, <srvState>=3 means that the command channel is being established. If the service profile is configured as Socket listener, then the listener always stays at <srvState>=3 and <socketState>=3 (LISTENER), while the <srvState> and <socketState> of the dynamically assigned service profile may change. See examples in Section 10.5.1.
4	Up The service performs its purpose. The data transfer process is the major function at this state. FTP: Data channel is up. SMTP: The SMTP service will not enter <srvState>=4 until the host has written the first data packet with AT^SISW.
5	Closing Internet Service is closing the network connection. FTP: Command channel is released.
6	Down This state is entered if - the service has successfully finished its session (see note on Socket), - the remote peer has reset the connection or - the IP connection has been closed because of an error (see note below on service or network errors). If a service in this state be sure to close it with AT^SISC before reopening it.

<socketState>
Socket state identifier.

1	Socket not assigned; i.e., no TCP/UDP connection active.
2	Socket assigned as CLIENT.
3	Socket assigned as LISTENER.
4	Socket assigned as SERVER.

<rxCount>
Number of bytes received via AT^SISR since last successful AT^SISO write command.

<txCount>
Number of bytes sent via AT^SISW since last successful AT^SISO write command.

<locAddr>
Recently used local IP address in dotted-four-byte format and TCP port, separated by colon; e.g., "192.60.10.10:80".

<remAddr>
Remote IP address in dotted-four-byte format and TCP port, separated by colon; e.g., "192.60.10.10:80".

Notes:
- If the bearer cannot be established and AT^SISO returns an error there might be a general GSM/GPRS problem. To identify the reason you can take advantage of the AT+CEER command. Using AT+CEER is especially recommended when the <infoID> parameter of the AT^SISE command equals 0.

- If a service or network error occurs during an IP session and the "^SIS" URC or the AT^SISE command display an error message, the service enters <srvState>=5 and then 6, i.e. the IP connection is closed. In this case, the service still allows reading the data stored in the buffer, but writing data is denied. After reading, close the service and open it again.

- As in polling mode no error URCs are available you are advised to integrate the commands AT^SISI and AT^SISE into the command sequences for upload and download jobs. So, the AT^SISO command may be followed by AT^SISI to check that the service has entered the <srvState>=4 before sending AT^SISR or AT^SISW. This helps you to detect errors even though the "^SIS" URCs are disabled. A typical example is that the service fails to be opened because the service profile contains a wrong destination address. In such a case, after opening with AT^SISO and OK response, the service quickly enters the states <srvState>=2, 4 and 6, with an error being returned no earlier than after sending the first AT^SISR or AT^SISW command. In URC mode, an error URC, such as "Host not found" would be received in this situation, but in polling mode the only way to detect the state is using AT^SISI or, alternatively, AT^SISO.
- If the user rapidly closes and opens TCP/IP connections based on the embedded TCP/IP stack the service may display the error "No buffer space available", meaning that all TCP/IP socket resources are exhausted.
- In the worst case, opening further TCP/IP connections is locked for up to 60 seconds.
- The Socket Listener may not work properly if the service is re-opened shortly after having closed the Socket Listener. To ensure that the service works correctly the host is required to wait at least two minutes before reopening a Listener.

10.5.1   Example: Accepting/Rejecting Socket Connection Request from Remote Client

Host 1 configured as Socket listener with IP address 10.10.0.187 at port 65534 is receiving a connection request from the remote client 10.10.0.185 (at port 1024). The example assumes that connection and service profiles have been created as stated earlier.

Start the Socket service in listener mode, then query the IP address dynamically assigned to the Socket listener:

at^siso=4	Host 1 opens the Socket service.
at^siso?	Query the current status of all services. All service profiles are unused, except for service profile 4 which is running in listener mode, where <srvState>=3 (listening) and <socketState>=3 (LISTENER). The response also indicates the IP address dynamically assigned to the listener. The listener's access data (IP address and TCP port number) shall be passed on to the client.
^SISO: 0, ""	
^SISO: 1, ""	
^SISO: 2, ""	
^SISO: 3, ""	
^SISO: 4, "Socket","3","3","0","0","10.10.0.187:65534","0.0.0.0:0"	
^SISO: 6, ""	
^SISO: 7, ""	
^SISO: 8, ""	
^SISO: 9, ""	
OK	

Indication of incoming Socket connection request:

^SIS: 4, 1, 0	The URC indicates that the listener configured on service profile 4 is receiving a Socket connection request (<urcCause>=1) from the remote client. The last URC parameter <urcInfoId> represents the ID of the dynamically assigned service profile, here 0.
at^siso?	Query the current status of services.
^SISO: 0, "Socket","2","4","0","0","10.10.0.187:0","10.10.0.185:1024"	Indication on host 1 that the connection request from the remote client has been dynamically assigned to service profile 0 which is set to Server mode (<socketState>=4).
^SISO: 1, ""	
^SISO: 2, ""	
^SISO: 3, ""	
^SISO: 4, "Socket","3","3","0","0", "10.10.0.187:65534","0.0.0.0:0"	
^SISO: 6, ""	
^SISO: 7, ""	
^SISO: 8, ""	
^SISO: 9, ""	
OK	

Host 1 accepts the Socket connection request:

at^siso=0	Host 1 accepts the connection request, where 0 is the ID of the dynamically assigned service profile.
OK	
^SISW: 0, 1	The URC indicates that data transmission to the remote client is possible. If the remote client has already sent some data the additional URC ^SISR: 0,1 is displayed.
at^siso?	Query the current status of services.
^SISO: 0, "Socket","4","4","0","0","10.10.0.187:65534","10.10.0.185:1024"	The socket connection between host 1 and remote client is successfully established.
^SISO: 1, ""	
^SISO: 2, ""	
^SISO: 3, ""	
^SISO: 4, "Socket","3","3","0","0","10.10.0.187:65534","0.0.0.0:0"	
^SISO: 6, ""	
^SISO: 7, ""	
^SISO: 8, ""	
^SISO: 9, ""	
OK	

Host 1 rejects the Socket connection request:

at^sisc=0	Host 1 rejects the connection request, where 0 is the ID of the dynamically assigned service profile.
OK	
at^siso?	Query the current status of services.
^SISO: 0, ""	The dynamically assigned service profile is free again. The Socket listener stays at <srvState>=3 (listening) and <socketState>=3 (LISTENER).
^SISO: 1, ""	
^SISO: 2, ""	
^SISO: 3, ""	
^SISO: 4, "Socket","3","3","0","0","10.10.0.187:65534","0.0.0.0:0"	
^SISO: 6, ""	
^SISO: 7, ""	
^SISO: 8, ""	
^SISO: 9, ""	
OK	

10.6   AT^SISC   Internet Service Close

Description: The AT^SISC write command closes the TCP/IP connection to the remote peer which was opened with AT^SISO. All resources are released, all status information parameters, e.g. <srvState>, <unackData>, <ackData>, <rxCount> and <txCount> counters, are reset. Only the initial configuration settings are preserved. The service can be restarted any time, using the same configuration or a new one.

Test Command Syntax: AT^SISC=?
Response: OK
Write Command Syntax: AT^SISC=<srvProfileId>
Response: OK
                               ERROR
                               +CME ERROR: <err>

Parameter Descriptions:

  <srvProfileId>
    <srvProfileId>
    0 ... 9   specified with AT^SISS.

10.7 AT^SISR Internet Service Read Data

Description: The AT^SISR command either triggers a read operation (download) or queries the number of bytes in the internal buffer.

The AT^SISR write command may return the following errors:

- "+CME ERROR: operation failed" if there is a problem on application, socket, PPP or GPRS/GSM level. The   AT^SISE command and the "^SIS" URC offer additional error information.
- "+CME ERROR: operation temporary not allowed" e.g. if the service has not network resources allocated.
- "+CME ERROR: operation not allowed" e.g. if the service is not configured.

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

Write Command Syntax: AT^SISR=<srvProfileId>, <reqReadLength>
Response: ^SISR: <srvProfileId>, <cnfReadLength>[, <remainUdpPacketLength>[, <optServParm>]]

Number of data bytes are sent as specified by <cnfReadLength>. If peek operator was used no data bytes are sent.

Unsolicited Result Code: ^SISR: <srvProfileId>, <urcCauseId>

Data availability status of the Internet service configured with AT^SISS has changed. The URC is issued when:

- Data is available after opening an Internet service or
- less data was confirmed (in <cnfReadLength>) than requested (with <reqReadLength>) during the last "Read Data" operation and new data is available.

The URC is disabled in polling mode. See AT^SCFG, parameter "Tcp/WithURCs", <tcpWithUrc>.

Parameter Descriptions:

<srvProfileId>
<srvProfileId> 0 ... 9 specified with AT^SISS.

<reqReadLength>
0   Peek Operator: Query number of received bytes within internal buffers.
             The behavior of the peek operator depends on the selected Internet service, i.e. it may not be supported by all IP Services.
             For "Socket" service configured for UDP the size of the next available UDP packet is returned.
1...1500   Requested number of data bytes to be read via the Internet service configured in <srvProfileId>.

<cnfReadLength>
-2   Indicates end of data. Data transfer has been finished (all data have been read) and the service can be closed with AT^SISC.
-1   Applies only to HTTP: Querying number of available bytes is not supported by the HTTP service.
0   Indicates that no further data is available at the moment.
>0   Number of available data bytes. The range is determined by <reqReadLength>:
             If <reqReadLength> was greater than 0, then <cnfReadLength> may be less or equal to the value requested with <reqReadLength>.
             If <reqReadLength> equals 0 (peek operator) the value indicated by <cnfReadLength> may be greater than 1500.

<urcCauseId>
Indicates whether or not data is available for reading with AT^SISR.
1   Data is available and can be read by sending the AT^SISR command. The URC appears when less data was confirmed (in <cnfReadLength>) than requested (with <reqReadLength>) during the last "Read Data" operation and new data is available.
2   End of data. Data transfer has completed (all data read). The service can be closed with AT^SISC.

<remainUdpPacketLength>
Optional third parameter of the AT^SISR write command response displayed only if the Socket service uses the UDP protocol.

The reception of each datagram must be completed before the next datagram can be received. This may be a problem if the buffer of the host application is limited and not designed to handle the maximum packet size of 1500 bytes. To compensate this, the host is advised to request, via <reqReadLength>, an amount less or equal its maximum buffer capacity and wait for the resulting AT^SISR write command response with parameter <remainUdpPacketLength>. The benefit of this approach is that the host may properly receive all parts of a UDP datagram, as after each received data part the number of remaining bytes is synchronized, until reading the datagram is finished.

If the currently read datagram is smaller than the number of bytes requested by the host, the <remainUdpPacketLength> parameter is omitted.

Further write attempts with AT^SISR are denied as long as the <remainUdpPacketLength> is unequal 0 or is not omitted. In this case the service returns "+CME ERROR: operation of service temporary not allowed".

0	Indicates that all bytes of the current UDP datagram are read.
1...(max. data size)-1	Indicates that the currently read UDP datagram is not yet complete. The displayed value is the remaining number of bytes.
	<remainUdpPacketLength> is unequal 0 until reading all parts of the current datagram is finished.

<optServParm>.

Service specific parameter of the AT^SISR write command response. If the Socket service is configured as UDP endpoint this parameter returns the IP address and the UDP port of the remote host that has sent the current UDP data.

10.7.1 Example: Socket Host Reads Small Amounts of UDP Data Packets (URC Mode)

This section applies only to the Socket service using the UDP protocol. The example shows how to read UDP packets if the buffer of the host application can handle only a few bytes. There are two datagrams available for reading.
Buffer size: 6 bytes
Datagram A = 18 bytes (content "THIS_IS_DATAGRAM_A")
Datagram B = 3 bytes (content "NEW")

^SISR: 0,1	Service profile 0 is configured for Socket service and UDP. The URC notifies host that data are available for reading.
at^sisr=0,6	The host requests to read 6 bytes.
^SISR: 0,6,12 THIS_I OK	The first 6 bytes of datagram A are confirmed and transmitted. Another 12 bytes are still available.
at^sisr=0,6	The host requests to read the next part of 6 bytes.
^SISR: 0,6,6 S_DATA OK	The next 6 bytes of datagram A are confirmed and transmitted. Another 6 bytes are still available.
at^sisr=0,6	The host requests to read the next part of 6 bytes.
^SISR: 0,6,0 GRAM_A OK	Last part of datagram A was received, no remainder is left.
at^sisr=0,6	Again, the host requests to read 6 bytes. This time, the request refers to datagram B which has only 3 bytes. As the read datagram is smaller than the size requested by the host, the response does not include the <remainUdpPacketLength>.
^SISR: 0,3 NEW OK	3 bytes are confirmed and transmitted. Datagram B was properly received.

10.8 AT^SISW   Internet Service Write Data

Description: The AT^SISW command triggers a write operation (upload) and queries the amount of data already sent, but not acknowledged at the TCP layer. The write operation may be run in binary mode, or in interactive text mode.
The AT^SISW write command may return the following errors:

- "+CME ERROR: operation failed" if there is a problem on application, socket, PPP or GPRS/GSM level. The AT^SISE command and the "^SIS" URC offer additional error information.
- "+CME ERROR: operation temporary not allowed" e.g. if the service has not network resources allocated.
- "+CME ERROR: operation not allowed" e.g. if the service is not configured.

Test Command Syntax: AT^SISW=?
Response: OK
Write Command Syntax: AT^SISW=<srvProfileId>, <reqWriteLength>[, <eodFlag>[, <mode>[, <optServParam>]]]
Response: ^SISW: <srvProfileId>, <cnfWriteLength>, <unackData>
Number of data bytes as specified by <cnfWriteLength>.
OK
ERROR
+CME ERROR: <err>

Unsolicited Result Code:
^SISW: <srvProfileId>, <urcCauseId>
Data availability status of the Internet service configured with AT^SISS has changed. The URC is issued when the service is ready to accept new user data.
The URC is disabled in polling mode. See AT^SCFG, parameter "Tcp/WithURCs", <tcpWithUrc>.

Parameter Descriptions:

<srvProfileId>
<srvProfileId> 0 ... 9 specified with AT^SISS.

<reqWriteLength>
0...1500
Specifies the number of bytes to be sent with AT^SISW or, if set to 0, requests the amount of data already sent with AT^SISW but not yet acknowledged:

- Parameter <reqWriteLength> may be 1...1500 bytes to specify the amount of data to be sent with AT^SISW.
- If parameter <reqWriteLength> equals 0, AT^SISW does not expect any data, but a normal query is perfumed. This allows the application to explicitly request, in particular at the end of an upload job, the amount of unacknowledged data at the TCP layer indicated by <unackData>.
- In interactive text mode, <reqWriteLength> must be set to any value greater than 0 (but not necessarily the precise number of bytes). If set to 0 in interactive text mode, <reqWriteLength> would be interpreted as query for unacknowledged data and, thus, prevent data transfer.
- • If Socket service is selected with UDP protocol
    - <reqWriteLength>=0 can be used to send an empty UDP packet;
    - it is recommended that the size of each data packet be limited to 1472 bytes. Otherwise, it is possible that the following URC occurs: "^SIS: <id>, 0, 9, The supplied buffer was too small / large".

<eodFlag>
End of data indication flag.
Parameter is ignored for HTTP, POP3, FTP download, Socket with UDP protocol.
0   No end of data. Other data may follow to be transmitted via the Internet service. Default.
1   End of data is signaled to the Internet Service. Further AT^SISW write commands return an error response. However, reading data may be possible. The <eodFlag> is effective only if the <reqWriteLength> equals <cnfWrite-Length>, in particular if the <reqWriteLength> equals 0.
If <mode> equals 1 the <eodFlag> is effective only if the write operation has been finished with CTRL-Z.

<mode>
Control how the application provides the data bytes to be sent.
0   Binary mode. Default.
This mode allows sending a number of bytes defined with parameter <reqWriteLength>.
1   Interactive text mode
This mode allows the user to type and send 8-bit ASCII characters while the service is open. Ctrl-Z terminates data input and causes the data to be transferred.
Interactive text mode requires that the <reqWriteLength> is set to any value greater than 0 (though it is not necessary to specify the precise number of bytes). In this case the <cnfWriteLength> parameter indicates the maximum length of the data stream without control character CTRL-Z. The <txCount> counter is incremented only by the portion of data actually transmitted.
In interactive text mode, the following characters are predefined as control codes:
• BACKSPACE ("\x08") deletes the last given character,

• CTRL-Z ("\x1a") terminates the input,

• ESC ("\x1b") aborts the command. An <eodFlag> is ignored in this case.

The V.25 command ATE also controls the echo mode of the interactive text mode. If echo is enabled (ATE1) all characters are echoed until <cnfWrite-Length> is reached. Any attempt to input further data ends up with the warning message 4001 indicated after the data stream has been completed with CTRL-Z, nevertheless all data within the range of <cnfWriteLength> will be sent. See also Section 10.13, Internet Service URC "^SIS". ATE0 disables the echo mode generally.

<optServParm>

Service specific parameter of the AT^SISW write command. If the Socket service is configured as UDP endpoint this parameter is mandatory and specifies the IP address (in dotted format) and the UDP port of the remote host. For each write request another IP address and UDP port may be given.

<cnfWriteLength>

0…1500   Confirmed number of data bytes which can be transmitted via the Internet service configured in <srvProfileId>. In binary mode (see <mode>) this number may be less or equal to the value requested with <reqWriteLength>.

The application has to deliver exactly the number of bytes indicated by <cnf-WriteLength>. A 0 value means that no data can be written at this time; i.e., it serves as a flow control mechanism.

In interactive text mode, <cnfWriteLength> indicates the maximum number of bytes it can process. Characters above the indicated number are ignored.

<unackData>

Number of data bytes already sent but not yet acknowledged at the TCP layer.

The value is constantly changing until the entire upload job has completed. If the value equals 0 all data sent so far is acknowledged.

In binary mode, <unackData> includes the <cnfWriteLength> value of the pending write operation. Therefore, the very first write operation of an upload job returns identical values for <cnfWriteLength> and <unackData>.

This mechanism allows the host application to easily verify whether or not the remote host has successfully received the data.

Parameter is not applicable to HTTP, POP3, SMTP and Socket with UDP protocol. For these services the counter is always set to 0.

<urcCauseId>

1   The service is ready to accept new user data.

2   Data transfer has been finished successfully, and Internet service may be closed without loss of data.

Notes

- The AT^SISW write command must be terminated only with the ASCII character set with ATS3. The factory default for S3 is #13 (Carriage Return). Do not send any further characters after the S3 end-of-line identifier, until the response "^SISW" is received. This is necessary to avoid that any characters related to the AT command can be interpreted as being part of the data stream to be transferred. Also refer to Section 1.4, AT Command Syntax.

- If the Socket service is configured for use as UDP client and fixed size and the interactive text mode is active, the PDU length always equals the specified fixed length. If the input characters exceed the specified fixed length, then all surplus characters will be ignored. If the input characters are less than the specified fixed length, then the remaining range will be filled with "\0" bytes.

10.8.1 Usage of Parameter <eodFlag>

Service Type	
Socket	After the service accepts the end-of-data flag the service state changes to "Closing". No further user data is accepted. After releasing the TCP link the service remains in state "Down". Parameter is not applicable to Socket with UDP protocol, i.e. value is ignored.
FTP	Parameter only applicable for FTP upload session. After the service accepts the end-of-data flag the service state changes to "Closing" and starts to end the running FTP session. No further user data is accepted After the FTP session is completed on FTP protocol level the service state switches to "Down". In case of successful completion the URC "^SISW: x,2" is generated.
SMTP	SMTP service sends some "closing" commands to the SMTP server which are necessary to mark the email as successfully sent on the server. The service enters "Closing" state and remains in it until the final protocol exchange with the SMTP server has been completed. The "OK" response following AT^SISW indicates that the SMTP service has accepted the last data – IT DOES NOT indicate the successful completion of the SMTP service. Successful completion will be indicated either by the appropriate URC "^SISW:x,2" or due to the fact that the SMTP service state changes to "Down" state without any error.
HTTP/POP3	Parameter not applicable, i.e. value is ignored.

10.9 AT^SICO Internet Connection Open

Description: The AT^SICO write command opens a connection profile (also referred to as bearer). Unlike the AT^SISO command, which starts a connection profile and the service profile bound to it, AT^SICO activates only the selected connection profile. Another difference over AT^SISO is that AT^SICO disables the inactivity timeout of the selected connection profile and, therefore, sets the "inactTO" value to -1 (see also AT^SICS). To release the connection use the close command AT^SICC. Closing the bearer restores the previously set "inactTO" value of the concerned connection profile.

The AT^SICO command may be used, for example, to keep a bearer open while no service is active (i.e. while no service has been opened with AT^SISO). Also, the AT^SICO command is necessary for running the Ping command AT^SISX when no service has been opened with AT^SISO.

A connection opened with AT^SICO remains open until closed with AT^SICC or, in case of inactivity, disconnected by the network after 25 hours usually. The network initiated disconnection can be avoided by sending AT^SISX at regular intervals (Ping). The Round Trip Time (RTT) of the AT^SISX command strongly depends on the data traffic of the IP services or DUN connections used at the same time.

Please note that after sending the AT^SICO write command the AT channel is blocked until the connection is established. The command may be aborted when receiving any character during execution, e.g. "AT" or "at".

The AT^SICO read command requests the current settings of all Internet connection profiles set with AT^SISC. The output is identical with the read command response of AT^SISC. One line is issued for every possible parameter of a given <conParmTag> value.

Test Command Syntax:	AT^SICO=?
Response:	[^SICO:(list of defined <conProfileId>s)]
	OK
Read Command Syntax:	AT^SICO?
Response:	[^SICO: <conProfileId>, <conParmTag>, <conParmValue>]
	[^SICO: ...]
	OK
Write Command Syntax:	AT^SICO=<conProfileId>
Response:	OK
	ERROR
	+CME ERROR: <err>

Parameter Description:

<conProfileId>

0...5   Internet connection profile identifier defined with parameter <conProfileId> of AT^SICS.

<conParmTag>

Internet connection profile identifier defined with parameter <conParmTag> of AT^SICS. See parameter description of AT^SICS.

<conParmValue>

Internet connection parameter set with <conParmValue> of AT^SICS. See parameter description of AT^SICS.

Note:

Be sure not to mix up the start and close commands for connection profiles and service profiles. It is allowed to use only the combinations AT^SICO / AT^SICC or AT^SISO / AT^SISC.

10.10   AT^SICC   Internet Connection Close

Description: The AT^SICC write command releases a connection opened with AT^SICO and restores the previously set inactivity timeout "inactTO" of the selected connection profile.
The command returns an error if any services are bound to this profile. Before using the AT^SICC write command be sure that all services were closed with AT^SISC.

Test Command Syntax: AT^SICC=?
Response: [^SICC:(list of defined <conProfileId>s)]
OK

Write Command Syntax: AT^SICC=<conProfileId>
Response: OK
ERROR
+CME ERROR: <err>

Parameter Description
  <conProfileId>
    0...5   Internet connection profile identifier defined with parameter <conProfileId> of AT^SICS.

Note
Be sure not to mix up the start and close commands connection profiles and service profiles. It is allowed to use only the combinations AT^SICO / AT^SICC or AT^SISO / AT^SISC.

10.11   AT^SISX   Internet Service Execution

Description: The AT^SISX command sends ICMP (Internet Control Message Protocol) Echo Requests to a target IP address or host name (also referred to as Ping command).

The AT^SISX command can be used any time while a connection profile, i.e. a bearer, is active. The bearer may have been started either with AT^SICO, or if a service is in use, with AT^SISO. If issued although no bearer is active or no connection profile created at all, AT^SISX returns ERROR.

The AT^SISX write command starts the available service type <service>, i.e. the ping command. The command returns one row for every ICMP Echo Request (max. 30 lines, see parameter <request>). The last Ping response line is followed by an empty line, then another two lines appear to report a statistic calculated from the Echo Request responses. To stop the periodic ping type any character, e.g. "AT" or "at". After calling the ping command the AT channel is blocked until all ICMP requests are executed.

Sending the Ping command does not restart the inactivity timeout "inactTO" of the used connection profile (see AT^SICS), i.e. if the bearer was opened with AT^SICO the "inactTO" value remains "-1" (= inactivity timeout disabled), and if the bearer was opened with AT^SISO the "inactTO" value set with AT^SICS remains applicable. The Ping command can only be used to prevent that a network initiated inactivity timeout closes the bearer (see also description of AT^SICO).

Test Command Syntax: AT^SISX=?
Response: ^SISX:<service>, (list of supported <conProfileId>s), <address>, (range of <request>), (range of <timelimit>)
OK

Write Command Syntax: AT^SISX=<service>, <conProfileId>, <address>[, <request>, <timelimit>]
Response: In case of <pingInfoType>= 1: ICMP Echo Requests (1 - 30 rows)
^SISX:<service>, <pingInfoType>, <conProfileId>, <address>, <roundTripTime>
[...]
In case of <pingInfoType>= 2: Packet statistic (1 row)
^SISX:<service>, <pingInfoType>, <conProfileId>, <sent>, <received>, <lost>, <lostPercent>
In case of <pingInfoType>= 3: Time statistic (1 row)
^SISX:<service>, <pingInfoType>, <conProfileId>, <minRTT>, <maxRTT>, <meanRTT>
OK
ERROR
+CME ERROR: <err>

  Parameter Description

  <Service>
    "Ping"   "Ping" Service type.

<conProfileId>

0...5   Internet connection profile identifier defined with parameter <conProfileId> of AT^SICS.

<address>

Target host name or IP address for pinging (i.e. 192.168.1.3).

<request>

1...30   Number of ping requests (ICMP Echo Requests). Default = 1.

<timelimit>

200..10000   Amount of time, in milliseconds, to wait for an Echo Response message related to a sent Echo Request message. .Default = 5000.

<pingInfoType>

Marks the type and format of the information given in the command responses (see syntax of the AT^SISX write command above).

1   Ping response(s) received for the ICMP Echo Request(s). Depending on parameter <request> 1 - 30 rows. Address and Round Trip Time are returned for each request.

2   1-row packet statistic calculated from the ping response(s) received for <pingInfoType>=1.

3   1-row time statistics calculated from the ping response(s) received for <ping-InfoType>=1.

<roundTripTime>

Round Trip Time in milliseconds. If the Echo Response message is not received within the time specified by <timelimit> the value -1 is returned (e.g. when the bearer shuts down during command execution).

<sent>

Number of sent packets.

<received>

Number of received packets.

<lost>

Number of lost packets.

<lostPercent>

Lost packets in percent.

<minRTT>

Minimum Round Trip Time in milliseconds.

<maxRTT>

Maximum Round Trip Time in milliseconds.

<meanRTT>

Average Round Trip Time in milliseconds.

10.11.1 Example: Ping

The following example shows a Ping output:

```
AT^SICS=0,conType,GPRS0              Select connection type GPRS0.
OK
AT^SICS=0,apn,"GPRS02.point.de"
AT^SICO=0
OK
AT^SISX="Ping",0,192.168.1.2,4,2000
^SISX: "Ping",1,0,"192.168.1.2",1043
^SISX: "Ping",1,0,"192.168.1.2",586
^SISX: "Ping",1,0,"192.168.1.2",531
^SISX: "Ping",1,0,"192.168.1.2",415
^SISX: "Ping",2,1,4,4,0,0
^SISX: "Ping",3,1,415,1043,643
OK
```

10.12   AT^SISE   Internet Service Error Report

Description: The AT^SISE write command returns the current error status of the specified Internet service profile. If the service profile is not defined or the value is invalid "+CME ERROR" response is returned.
The error status is identical to the content of the "^SIS" URC last issued.
If a service fails the commands AT^SISR or AT^SISW will return an error response. However, if the AT^SISE command returns <infoID>=0 it is recommended to use the AT+CEER command because a general GSM/GPRS problem might be the reason.

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

Write Command Syntax: AT^SISE=<srvProfileId>
Response: ^SISE: <srvProfileId>, <infoID>[, <info>]
OK
ERROR
+CME ERROR: <err>

Parameter Description

<srvProfileId>
Internet service profile identifier as defined by AT^SISS <srvProfileId>.
0...9

<infoID>
Reason for Internet service error. This is a subset of the <urcInfoId>s which can be found in Section 10.13, Internet Service URC "^SIS".
The value 0 indicates there is no special Internet service error. In this case the application may use AT+CEER to check for general GSM/GPRS problems.

<info>
Information text related to <infoID>. This is a subset of the <urcInfoText>s which can be found in Section 10.13, Internet Service URC "^SIS".

Note
In particular cases, the AT^SISE command may deliver information and warnings. This applies the following services:
FTP: Information 2100
POP3: Warnings
SMTP: Warnings
If an error occurs the information and warning messages are overwritten by error messages.

10.13   ^SIS   Internet Service URC "^SIS"

Description: This section first describes the syntax and the parameters of the "^SIS" URC. The second part consists of tables listing the information elements delivered within the "^SIS" URC and the command response of AT^SISE.
The presentation of the "^SIS" URC containing the parameter <urcCause>=0 can be disabled or enabled depending on whether polling mode or URC mode is preferred. To do so, use the AT^SCFG command, parameter "Tcp/WithURCs" (refer to <tcpWithUrc>). However, if related to <urcCause>=1 or 2, the "^SIS" URC will always be delivered regardless of the setting made with AT^SCFG.

Unsolicited Result Code
Indicates an event, an error or an information element. The same information can be obtained via AT^SISE.
^SIS: <srvProfileId>, <urcCause>[, [<urcInfoId>][, <urcInfoText>]]

The URC may appear if an event or an error occurs, for example after opening an Internet service with AT^SISO or any time during operation. The URC also indicates a request for a mobile terminated Internet service client connection, or a failure if a mobile terminated request is rejected. Furthermore, the URC may deliver an information element resulting from a specific command given in the service profile.

A list of possible causes can be found in the tables below. The tables contain the <urcInfoId> and, if applicable, a specific <urcInfoText>. If marked with *) the precise text related to a <urcInfoId> varies greatly depending on the scenario and the implementation of the remote server. In these cases, only a brief explanation of the scenario can be found in the table column "Description".

Parameter Description

<urcCause>

URC cause identifier.

0	An event has occurred after opening or while using an Internet service. The event number is presented via <urcInfoId> and may be an error, a warning, an information element or a note. Optionally additional information may be supplied via <urcInfoText>.
1	Indicates that an opened Socket listener service is receiving a connection request from a remote client. The incoming socket connection is dynamically assigned to the next free Internet service profile. In this case, the parameter <urcInfoId> inside the "^SIS" URC equals the <srvProfileId> of the dynamically assigned service profile. This ID shall be used to accept the connection request with AT^SISO or to reject it with AT^SISC. The connection status may be requested by using the AT^SISI read or write command or the AT^SISO read command. Among other details, the response indicates the IP address of the remote client (parameter <remAddr>). This may be helpful to decide whether to accept or reject the request.
2	Incoming Socket service client connection has failed. The client request was rejected automatically because no free Internet service profile was available.

<urcInfoID>

Information identifier related to <urcCause>. See tables below for further detail. The <urcInfoId> number ranges indicate the type of information element:

0:	Service is working properly.
1 - 2000:	Error, service is aborted and enters <srvState>=6 (Down).
2001 - 4000:	Information related to progress of service.
4001 - 6000:	Warning, but no service abort.
6001 - 8000:	Notes

Additional information for Socket service: As stated above, if a Socket connection request from a remote client is received (see <urcCause>=1) the <urcInfoId> equals the <srvProfileId> of the dynamically assigned free service profile.

<urcInfoText>

Information text related to <urcCause>. See tables below for further detail.

10.13.1 Information Elements Related to the Service Application

The following table lists URC information elements which may be returned by all supported services within the "^SIS" URC and the command response of AT^SISE. It should be noted that TCP/IP socket problems may occur in all Internet service connections (Socket, FTP, HTTP, POP3 or SMTP).

<urcInfoId>	<urcInfoText>	Description
Information Elements Returned by the TCP/IP socket		
2	Invalid socket descriptor	Socket error
3	Bad access specified	Socket error
4	Invalid operation	Socket error
5	No free socket descriptors	Socket error
6	The operation would block	Socket error
7	A previous attempt at this operation is still ongoing	Socket error
8	Socket is not bound	Socket error
9	The supplied buffer is too small/large	Socket error
10	Flags not supported	Socket error
11	Operation not supported	Socket error
12	The address is already in use	Socket error
13	The network is unavailable	Socket error
14	An established connection was aborted (transmission time-out or protocol error)	Socket error
15	Remote host has reset the connection	Socket error
16	No buffer space available	Socket error
17	The socket is already connected	Socket error
18	For TCP/IP sockets, the socket is not connected	Socket error
19	Socket has been shut down	Socket error
20	Connection timed out	Socket error
21	Remote host has rejected the connection	Socket error
22	Remote host is unreachable	Socket error
23	An unexpected error occurred	Socket error
24	Host not found	DNS error
25	An error occurred that may be transient; a further attempt may succeed.	DNS error
26	An unrecoverable error occurred	DNS error

General URC Information Elements		
46	Fatal: The service has detected an unknown error	
47	*)	Indicates that the remote service has closed the connection. The host shall close the service.
48	Remote peer has closed the connection	Remote peer has closed the connection unexpectedly, and no data are available. The host shall close the service. Note that the "^SIS" URC only indicates the <urcInfoId>, but the AT^SISE command indicates both the <urcInfoId> and the <urcInfo-Text>.
49	Fatal: No memory is available for service action	
50	Fatal: Service hs detected an internal error.	
80		Connection profile not defined.
84	PPP LCP FAILED	PPP error
85	PAP Authentication failed	PPP error
86	CHAP Authentication failed	PPP error
87	IPCP failed	PPP error

Warnings		
4001		Applies only to interactive text mode: Indicates that number of input characters is greater than <cnfWriteLength>.
General Information Elements		
6001		General progress information for connection setup.

10.13.2 Information Elements Related to FTP Service

<urcInfoId>	<urcInfoText>	Description
100	FTP Server rejects session.	
101	FTP Server rejects USER command.	
102	FTP Server rejects PASS command.	
103	FTP Server rejects PASV command or client can't detect remote IP address.	
104	FTP Server rejects requested client action.	
105	The given path segment is wrong.	
106	*)	The FTP client requests the file size from the server before starting the download. During transmission phase the client adds the bytes which are sent via serial line. After transmission is done the client compares the amount of bytes transferred via serial line and socket.
2100	FILE: <filename>	File name assigned by FTP server if mode=u is used.

10.13.3 Information Elements Related to HTTP Service

<urcInfoId>	<urcInfoText>	Description
Error URCs		
200	HTTP-ERR: Not connected - cannot send request HTTP-ERR: failed on sending request	
201	<HTTP Response Str>	Client error
202	<HTTP Response Str> HTTP-ERR: Service unavailable	Server error
203	HTTP-ERR: Redirect failed - too many redirects HTTP-ERR: Redirect failed - not allowed HTTP-ERR: Redirect failed - location missing	Max. number of allowed redirects: 6

204	HTTP-ERR: auth failed - user name or password
	  missing
	HTTP-ERR: auth failed - user name or password
	  wrong
	HTTP-ERR: Authority required for this URL
	HTTP-ERR: No access to this URL allowed	

Info URCs		
2200	HTTP Redirect to: <Host>:<Port> <Path>	
2201	HTTP Response <Response code> Example: ^SIS: 2,3,2201, "HTTP Response: HTTP/1.1 200 OK"	

10.13.4 Information Elements Related to POP3 Service

<urcInfoId>	<urcInfoText>	Description
Errors		
300	*)	Indicates that the POP3 User Command could not be executed successfully.
Warnings		
4300	*)	POP3 specific warning

10.13.5 Information Elements Related to SMTP Service

<urcInfoId>	<urcInfoText>	Description
Errors		
400	*)	Indicates that the SMTP service could not be executed successfully..
Warnings		
4400	*)	SMTP specific warning

*) Text varies depending on scenario.

10.14   Examples of How to Configure and Use Internet Service Profiles

Below you can find selective examples of how to configure and use Internet service profiles. To visualize the difference between URC mode and polling mode the operation of services (after opening with AT^SISO) is explained in separate examples for either mode.

10.14.1   Selecting URC Mode or Polling Mode

To enable or disable the presentation of URCs for the Internet services use the AT^SCFG command, type "TCP/IP/WithURCs" and select "on" or "off" for parameter <tcpWithUrc>.

at^scfg=tcp/withurcs	Query the current setting.
^SCFG: "Tcp/WithURCs","on"	URC mode is enabled (delivery default).
OK	
at^scfg=tcp/withurcs,off	Select polling mode (by switching off URC mode).
^SCFG: "Tcp/WithURCs","off"	Polling mode is accepted.
OK	

10.14.2   Configuring Socket Listener

The example assumes that a connection profile has been created as explained in Section 10.1.1 or Section 10.1.2. Keep in mind that if the host is configured as listener another service profile must be left free to be dynamically assigned as Server when the listener receives a connection request from a remote client.

Configure the service profile 4 for use as Socket listener:

at^siss=4,srvType,socket	Select service type Socket.
OK	
at^siss=4,conId,0	Select connection profile 0.
OK	
at^siss=4,address,"socktcp://listener:65534"	The host specifies its local port 65534 to be used for the Socket listener service. The local IP address will be dynamically assigned when the service is opened with AT^SISO.
OK	

Open the Socket service and query the IP address dynamically assigned to the Socket listener:

at^siso=4	Open the Socket service.
OK	
at^siso?	Query the current status of services. All service profiles are unused, except for service profile 4 which is running in listener mode, where <srvState>=3 (listening) and <socketState>=3 (LISTENER). The response also indicates the IP address dynamically assigned to the listener.
^SISO: 0, ""	
^SISO: 1, ""	
^SISO: 2, ""	
^SISO: 3, ""	
^SISO: 4, "Socket","3","3","0","0","10.10.0.187:65534","0.0.0.0:0"	
^SISO: 6, ""	
^SISO: 7, ""	
^SISO: 8, ""	
^SISO: 9, ""	
OK	

10.14.3 Configuring Socket Client for Calling a Socket Listener on Another Host

The example assumes that a connection profile has been created as explained in Section 10.1.1 or Section 10.1.2. Configure the client's service profile 1 for calling a Socket listener on another host:

at^siss=1,srvType,socket OK	Select service type Socket.
at^siss=1,conId,0 OK	Select connection profile 0.
at^siss=1,address,"socktcp://10.10.0.187:65534" OK	The service profile of the client contains the IP address and the TCP port of the remote host.

10.14.4 Socket Client Sends Data via TCP Connection (Polling Mode)

The example uses service profile 0 configured for Socket service and TCP.

AT^SISO=0 OK	The host opens service profile 0. Note: URC ^SISW:0, 1 does not appear! The host must poll the service state by means of AT^SISI until the service is in <srvState> "Up".
AT^SISI=0 ^SISI: 0,3,0,0,0,0 OK	The service is still in <srvState> "Connecting".
AT^SISI=0 ^SISI: 0,4,0,0,0,0 OK	The service is now in <srvState> "Up" and is ready to accept data.
AT^SISW=0,10 ^SISW: 0,10,10 0123456789 OK	The host requests to write 10 bytes. Response that 10 bytes can be sent and are unacknowledged.
AT^SISW=0,10,1 ^SISW: 0,0,10 OK	The host requests to write next 10 bytes and enables the end-of-data flag. But the service refuses the request, even the end-of data flag remains without effect.
AT^SISW=0,10,1 ^SISW: 0,10,20 0123456789 OK	Next try (polling). Response that the service accepts 10 bytes and this data and the previously sent data are unacknowledged.
AT^SISW=0,0,0 ^SISW: 0,0,10 OK	Polling to request unacknowledged data. There are 10 bytes still unacknowledged.
AT^SISI=0 ^SISI: 0,5,0,20,10,10 OK	Polling for <srvState> change ("Closing" - Down> 20 bytes are transferred via serial interface, 10 bytes are acknowledged by remote peer, 10 bytes are on the way.
AT^SISI=0 ^SISI: 0,6,0,20,20,0 OK	Polling for <srvState> change ("Closing" -> "Down"). The Service is in state "Down" and all data is confirmed by the remote peer.
AT^SISC=0 OK	Closing the Socket service.

10.14.5 Socket Client Sends Data via TCP Connection with URCs

The example uses service profile 0 configured for Socket service and TCP.

AT^SISO=0	The host opens service profile 0.
OK	
^SISW: 0,1	Socket service is ready for upload.
AT^SISW=0,10	The host requests to write 10 bytes.
^SISW: 0,10,10	Response that 10 bytes can be sent and are unacknowledged.
0123456789	
OK	
^SISW: 0,1	The URC indicates that the Socket service is ready to transfer more data. Data of the last AT^SISW command are transferred to the remote host.
AT^SISW=0,10,1	The host requests to write next 10 bytes and enables the end-of-data flag to notify that these are the last 10 bytes of the session.
^SISW: 0,10,20	Response that the service accepts 10 bytes and this data and the previously sent data are unacknowledged.
0123456789	
OK	
------	Waiting for URC.
^SISW: 0,2	Data transfer has been finished.
AT^SISC=0	Closing the Socket service.
OK	

10.14.6 Socket Scenario with UDUP Endpoint

The following example shows a communication between a UDP endpoint (host 1) and a UDP client (host 2).

The first part of the example refers to the UDP endpoint and shows the configuration which allows the UDP endpoint to communicate with any UDP client.

The second part shows the settings of a UDP client.

The third and the fourth part are running in parallel: The third part shows the procedures on the UDP endpoint side done when communicating with a UDP client.

The fourth part shows the equivalent steps done by the UDP client when communicating with the UDP endpoint.

Part 1 - host 1 is configured for use as UDP endpoint:

AT^SISS=0,srvtype,socket	Select service type Socket.
OK	
AT^SISS=0,conid,1	Select connection profile 1.
OK	
AT^SISS=0,alphabet,1	Choose ASCII alphabet.
OK	
AT^SISS=0,address,"sockudp://:6666"	Specify the local UDP port.
OK	

Part 2 - host 2 is configured for use as UDP client:

AT^SISS=0,srvtype,socket	Select service type Socket.
OK	
AT^SISS=0,conid,1	Select connection profile 1.
OK	
AT^SISS=0,alphabet,1	Choose ASCII alphabet.
OK	
AT^SISS=0,address,"sockudp://	
10.10.0.219:6666"	Specify the address of host 1.
OK	

Part 3 - host 1 opens the service and communicates with host 2:

AT^SISO=0	Open the service.
OK	
^SISW: 0, 1	The URC indicates that host 1 is waiting on UDP port 6666 and can send data to any UDP client.
^SISR: 0, 1	The URC indicates that host 2 has opened the connection to host 1 and has sent some data.
AT^SISR=0, 100	Host 1 requests to read 100 bytes.
OK	
^SISR: 0, 23, 0, 10.10.0.22:6561	Host 1 is reading the text string received from host 2 and gets information about the remote client, i.e. the address of host 2.
Hello, I'm the client!	
OK	
AT^SISW=0,1,0,1,"10.10.0.22:6561"	Host 1 starts sending a text string to host 2.
^SISW: 0, 1500, 0	Host 1 is sending a text string to host 2. As a result, host 2 is receiving the URC "^SISR: 0, 1" shown below in part 4 of the example.
Hi, I'm the UDP endpoint!	
OK	
^SISW: 0, 1	The URC confirms that host 1 can send data again.
AT^SISC=0	Close the service.
OK	

Part 4 - host 2 opens the service and communicates with host 1:

AT^SISO=0	Open the service.
OK	
^SISW: 0, 1	The URC indicates that the service is ready.
AT^SISW=0,1,0,1	Host 2 has entered interactive text mode and starts to write.
^SISW: 0, 1500, 0	Host 2 is writing a text string. As a result, host 1 is receiving the URC shown above in part 3 of this example.
"^SISR: 0, 1"	
Hello, I'm the client!	
OK	
^SISW: 0, 1	The URC confirms that there is no further data available.
^SISR: 0, 1	The URC indicates that data has been received.
AT^SISR=0,100	Host 1 requests to read 100 bytes.
OK	
^SISR: 0, 26	The response indicates that host 2 has received 26 characters from host 1.
Hi, I'm the UDP endpoint.	
OK	
AT^SISC=0	Close the service.
OK	

10.14.7 Configuring and Using FTP Download (URC Mode)

First set up a connection profile as explained in Section 10.1.1 or Section 10.1.2. Enter at least all parameters that are mandatory for the connection profile.

Configure the service profile 1 for FTP:

at^siss=1,srvType,ftp	Select service type FTP.
OK	
at^siss=1,conId,0	Select connection profile 0.
OK	
at^siss=1,address,ftp://192.168.1.2;type=d	Specify FTP address with user and password anonymous.
OK	

Make an FTP connection:

```
at^siso=1                               Open the service.
OK                                      Bearer is established, service is getting started.
^SISR: 1, 1                             Data are available.
at^sisr=1,1500                          Request to read 1500 bytes.
^SISR: 1, 50                            50 bytes are now available.
hardware
in test
software
support
system test
OK
^SISR: 1, 2                             Data transfer finished. No more data available. The
                                        connection to the FTP server is closed.
at^sisc=1                               Close the service.
OK
```

10.14.8   Configuring and Using FTP Upload (URC Mode)

First set up a connection profile as explained in Section 10.1.1 or Section 10.1.2. Enter at least all parameters that are mandatory for the connection profile.

Configure the service profile 1 for FTP:

```
at^siss=1,srvType,ftp                   Select service type FTP.
OK
at^siss=1,conId,0                       Select connection profile 0.
OK
at^siss=1,address,"ftpput://
myname:mypasswd@192.168.1.2/
upload/example.bin;type=i"              Specify FTP address with individual user name and
                                        password. The file "example.bin" shall be created on the
                                        FTP server.
OK
```

Make an FTP connection:

```
at^siso=1                               Open the service.
OK                                      Bearer is established, service is getting started.
^SISW: 1, 1                             FTP service is ready for upload.
at^sisw=1,100                           Client requests to send 100 bytes.
^SISW: 1, 100                           The write command response confirms: 100 bytes must be
                                        transferred now.
012345678901234567890123456789012      User data are transferred.
345678901234567890123456789012345
67890123456789
OK
^SISW: 1, 1                             URC indicates that the FTP service is ready to transfer more data.
                                        Data of the last AT^SISW command are transferred to the remote
                                        host.
at^sisc=1,0,1                           No more data available. The file "example.bin" shall be closed on
                                        the FTP server.
OK
^SISW: 1, 2                             Data transfer finished. The connection to the FTP server is closed.
at^sisc=1                               Close the FTP service.
```

10.14.9 Configuring SMTP Service Profile

First set up a connection profile as explained in Section 10.1.1 or Section 10.1.2. Enter at least all parameters which are mandatory for a CSD or GPRS profile. The example uses the connection profile ID 1 and the service profile ID 9.

at^siss=9,srvType,"Smtp" OK	Select service type SMTP.
at^siss=9,alphabet,"1" OK	Choose ASCII alphabet.
at^siss=9,conId,"1" OK	Select connection profile 1.
at^siss=9,address,"192.168.1.2" OK	Specify SMTP server address.
at^siss=9,user,"subscriber1" OK	Specify sender's user name required for SMTP authentication.
at^siss=9,passwd,"subscr1" OK	Specify password used by the sender for SMTP authentication.
at^siss=9,smFrom,subscriber1@testdomain.com OK	Sender's email address.
at^siss=9,smRcpt,"subscriber2@testdomain.com OK	Recipient's email address.
at^siss=9,smSubj,"Meeting Request Sunday Morning" OK	Enter text for subject field.
at^siss=9,smAuth,"1" OK	Sender name and password can be used for SMTP authentication.
at^siss? ^SISS: 0, "srvType", "" ^SISS: 1, "srvType", "" ^SISS: 2, "srvType", "" ^SISS: 3, "srvType", "" ^SISS: 4, "srvType", "" ^SISS: 6, "srvType", "" ^SISS:7, "srvType", "" ^SISS: 8, "srvType", "" ^SISS: 9, "srvType", "Smtp" ^SISS: 9, "conId", "1" ^SISS: 9, "alphabet", "1" ^SISS: 9, "address", "192.168.1.2" ^SISS: 9, "user", "subscriber1" ^SISS: 9, "passwd", "*******" ^SISS: 9, "smFrom", "subscriber1@testdomain.com" ^SISS: 9, "smRcpt", "subscriber2@testdomain.com" ^SISS: 9, "smCC", "" ^SISS: 9, "smSubj", "Meeting Request Sunday Morning" ^SISS: 9, "smHdr", "" ^SISS: 9, "tcPort", "25" ^SISS: 9, "smAuth", "1" ^SISS: 9, "tcpMR", "10" ^SISS: 9, "tcpOT", "6000" OK	To check the profile enter the AT^SISS read command. The response includes the values of all 10 connection profiles. In this example, no values are set for the profiles 0 through 8. Service profile 9 contains the values specified above and the values automatically assumed by default. Default: TCP port number commonly used for SMTP. Default: Number of retransmission attempts for TCP packets is 10 (= default of AT^SCFG). Default: Timeout before closing outstanding TCP connection is 6000 sec (= default of AT^SCFG).

10.14.10 Sending Email (URC Mode)
This example uses the service profile described in Section 10.14.9.

at^siso=9 OK	Open the service, i.e. start to send the email.
^SISW: 9, 1	The "^SISW" URC indicates that email data can be transferred.
at^sisw=9,87	The email to be sent has 87 bytes.
^SISW: 9,87,87	The write command response confirms that 87 bytes are available for transmission.
Good Morning everyone, we are delighted to announce our next meeting on Sunday morning. OK	Write the message text.
at^sisw=9,0,1	Set the <eodFlag> to mark the end of the email body.
^SISW: 9,0,0	The <eodFlag> is accepted by the service.
^SISW: 9,2	The "^SISW" URC confirms that all data is sent successfully.
at^sisi=9	Check the connection state of the service profile 9.
^SISI: 9,6,0,87,0,0	The command response confirms that the SMTP service is in state "6" (Down) and that 87 bytes have been transferred.
at^sisc=9 OK	Close the service.

10.14.11 Sending Email (Polling Mode)

This example uses the service profile described in Section 10.14.9.

at^siso=9	Open the service, i.e. start to send the email.
OK	
at^sisw=9,10	Try to write 10 bytes.
^SISW: 9, 10, 0	The service response indicates that 10 bytes can be written.
Hello Tom!	Write 10 bytes.
OK	
at^sisw=9,10	Try to write 10 bytes.
^SISW: 9, 0, 0	The service response indicates that the service refuses to accept any data at the moment.
OK	
at^sisw0=9,12	Try to write 12 bytes.
^SISW: 9, 12, 0	The service response indicates that 12 bytes can be written.
Bye Bye Tom!	Write 12 bytes.
OK	
at^sisw=9,0,1	Set the <eodFlag> to mark the end of the email body.
^SISW: 9,0,0	The <eodFlag> is accepted by the service.
OK	
at^sisi=9	Check the connection state of service profile 9.
^SISI: 9,5,0,22,0,0	The command response confirms that the SMTP service is in state "5" (Closing) and that 22 bytes have been written.
OK	
at^sisi=9	Check the connection state of service profile 9.
^SISI: 9,6,0,22,0,0	The command response confirms that the SMTP service is in state "6" (Down) and that 22 bytes have been written.
OK	
at^sise=9	Check error status of service profile 9.
^SISE: 9,0	The command response confirms that no error occurred.
OK	
at^sisc=9	Close the service.
OK	

10.14.12 Configuring POP3 Service Profile

First set up a connection profile as explained in Section 10.1.1 or Section 10.1.2. Enter at least all parameters which are mandatory for a GPRS profile. The example uses the connection profile ID 1 and the service profile ID 1. The service profile is set up to retrieve a specific email (email number 2).

at^siss=1,srvType,"Pop3"	Select service type POP3.
OK	
at^siss=1,conId,"1"	Select connection profile 1.
OK	
at^siss=1,address,"192.168.1.2"	Specify POP3 server address.
OK	
at^siss=1,user,"subscriber1"	Specify recipient's mailbox name.
OK	
at^siss=1,passwd,"subscr1"	Password used by recipient for authentication to OK POP3 server.
at^siss=1,pCmd,"3"	Command used to retrieve emails.
OK	
at^siss=1,pNumber,"2"	Email message number 2 shall be retrieved.
OK	
at^siss?	To check the profile enter the AT^SISS read command.
^SISS: 0, "srvType", ""	The response includes the values of all 10 connection profiles. Service
^SISS: 1, "srvType", "Pop3"	profile 1 contains the values specified above and the values
^SISS: 1, "conId", "1"	automatically assumed by default.
^SISS: 1, "alphabet", "0"	Default: Character set enabled with AT+CSCS shall be used.
^SISS: 1, "address", "192.168.1.2"	
^SISS: 1, "user", "subscriber1"	
^SISS: 1, "passwd", "*******"	
^SISS: 1, "pCmd", "3"	
^SISS: 1, "tcPort", "110"	Default: TCP port number commonly used for POP3.
^SISS: 1, "pNumber", "2"	
^SISS: 1, "pLength", "0"	Default: Message size shall not be limited.
^SISS: 1, "pDelFlag", "0"	Default: Retrieved message shall not be deleted on POP3 server.
^SISS: 1, "tcpMR", "10"	Default: Number of retransmission attempts for TCP packets is 10 (= default of AT^SCFG).

^SISS: 1, "tcpOT", "6000" ^SISS: 2, "srvType", "" ^SISS: 3, "srvType", "" ^SISS: 4, "srvType", "" ^SISS: 6, "srvType", "" ^SISS: 7, "srvType", "" ^SISS: 8, "srvType", "" ^SISS: 9, "srvType", "" OK	Default: Timeout before closing outstanding TCP connection is 6000 sec (= default of AT^SCFG).

10.14.13 Retrieving Email (URC Mode)

This example uses the service profile described in Section 10.14.12.

at^siso=1 OK	Open the service that was created to retrieve email number 2 from the POP3 server.
^SISR: 1, 1	The "^SISR" indicates that data is available for reading.
at^sisr=1,500	Try to read 500 bytes.
^SISR: 1, 500	Command response indicates that 500 bytes will be transferred, i.e. there will be no other URC since the requested length equals the confirmed length.
Return-Path: <subscriber1@testdomain.com> X-Original-To: subscriber1@testdomain.com Delivered-To: subscriber2@testdomain.com Received: from 10.10.0.132 (unknown [10.10.0.132]) by testdomain.com (Postfix) with SMTP id 379321D004 for <subscriber1@testdomain.com>; Tue, 20 Dec 2005 08:00:07 +0100 (CET) To: subscriber2@testdomain.com Cc: From: subscriber1@testdomain.com Subject: Test Mail Message-Id: <20051220070007.379321D004@testdomain.com > Date: Tue, 20 Dec 2005 08:00:07 +0100 OK	
at^sisr=1,500	Try to read another 500 bytes.
at^sisr=1,78	Command response indicates that only 78 bytes will transferred.
(CET) X-UIDL: &IL"!(Z6"!^cI!!1+%"! Status: RO Hello Tom! Bye Bye Tom!	
. OK	Dot indicates end of mail according to RFC 2821.
^SISR: 1, 2	Parameter <urcCauseId> of the "^SISR" URC confirms that all data is transferred successfully.
at^sisc=1 OK	Close the service.

10.14.14 Retrieving Email (Polling Mode)

This example uses the service profile described in Section 10.14.12.

at^siso=1 OK	Open the service that was created to retrieve email number 2 from the POP3 server.
at^sisr=1,1000	Try to read 1000 bytes.
^SISR: 1, 0 OK	Command response indicates that currently no data is available.
at^sisr=1,1000	Again, try to read 1000 bytes.
^SISR: 1, 0 OK	Command response indicates that currently no data is available.
at^sisr=1,1000	Again, try to read 1000 bytes.
^SISR: 1, 578 Return-Path: <subscriber1@testdomain.com> X-Original-To: subscriber1@testdomain.com Delivered-To: subscriber2@testdomain.com Received: from 10.10.0.132 (unknown [10.10.0.132]) by testdomain.com (Postfix) with SMTP id 379321D004 for <subscriber1@testdomain.com>; Tue, 20 Dec 2005 08:00:07 +0100 (CET)	Command response indicates that 578 bytes are available for reading.

```
To: subscriber2@testdomain.com
Cc:
From: subscriber1@testdomain.com
Subject: TestMail
Message-Id: <20051220070007.379321D004@testdomain.com >
Date: Tue, 20 Dec 2005 08:00:07 +0100 (CET)
X-UIDL: &IL"!(Z6"!^cl!!1+%"!
Status: RO

Hello Tom! Bye Bye Tom!
.                                          Dot indicates end of mail according to RFC 2821.
OK
at^sisr=1,1000                             Try to read 1000 bytes once again.
^SISR: 1,-2                                No more data available to read, i.e. the service has finished.
OK

at^sisi=1                                  Check the connection state of service profile 1.
^SISI: 1,6,578,0,0,0                       The command response indicates that the POP3 service is in state "6"
                                           (Down) and that 578 bytes have been retrieved.
OK

at^sise=1                                  Check error status of service profile 1.
^SISE: 1,0                                 The command response confirms that no error occurred.
OK
at^sisc=1                                  Close the service.
OK
```

10.14.15   HTTP POST (Polling Mode)

```
at^siss=1,srvType,"Http"                   Select service type HTTP.
OK
at^siss=1,conId,1                          Select connection profile 1.
OK
at^siss=1,hcMethod,1                       Select "Post" method.
OK
at^siss=1,address,"http://192.168.1.3/datafiles/dummy/dummy.txt"
OK
at^siss=1,hcContLen,180                    Try to upload 180 bytes.
OK
at^siso=1                                  Open the service.
OK
at^sisw=1,100                              Send the first 100 bytes.
^SISW: 1, 100, 0
OK
at^sisw=1,100                              Try to send again 100 bytes.
^SISW: 1, 80, 0                            80 bytes are sent.
OK
at^sisw=1,40                               Try to write data once again.
^SISW: 1, 0, 0                             No further data available, i.e. the service has finished.
OK

at^sisi?
^SISI: 1,6,0,180,0,0                       The command response indicates that HTTP service is in state "6"
                                           (Down) and that 180 bytes have been sent.
OK

at^sise=1                                  Check error status of service profile 1.
^SISE: 1,0                                 The command response confirms that no error occurred.
OK

at^sisc=1                                  Close the service.
OK
```

10.14.16   HTTP GET (Polling Mode)

at^siss=0,srvType,"Http" OK	Select service type HTTP.
at^siss=0,conId,1 OK	Select connection profile 1.
at^siss=0,hcMethod,0 OK	
at^siss=0,address,http://192.168.1.4/ OK	
at^siso=0 OK	
at^sisr=0,1500 ^SISR: 0, 1264 ...DATA... OK	Start reading data in polling mode.
at^sisr=0,1500 ^SISR: 0, 1500 ...DATA... OK	
at^sisr=0,1500 ^SISR: 0, 602 ...DATA... OK	
at^sisr=0,1500 ^SISR: 0, -2 OK	Again, try to read 1500 bytes. No more data to read, i.e. the service has finished.
at^sisi? ^SISI: 0,6,0,3366,0,0 OK	The command response indicates that the HTTP service is in state "6" (Down) and that 3366 bytes have been read.
at^sise=0 ^SISE: 0,0 OK	Check error status of service profile 0. The command response confirms that no error occurred.
at^sisc=0 OK	Close the service.

Chapter 11 – 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). Please use "Using GPRS AT Commands (Examples)" as a first guidance.

11.1 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.

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

Parameter Descriptions:

  <state>
  Indicates the state of PDP context activation.
  0   deactivated
  1   activated. Default.

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

Notes:
- ATH will deactivate any PDP context.
- If the MT is in dedicated mode, the write command returns "+CME ERROR: operation temporary not allowed".
- A maximum of 2 contexts can be activated at the same time, no matter on which interface. Trying to activate more than 2 contexts will cause "+CME ERROR: operation temporary not allowed". Note that, depending on the provider, the number of activated contexts may be further restricted.
  Remember that contexts may be activated implicitly by using the ATD*98# or ATD*99# GPRS compatibility commands without specifying a <cid>.
- If an activated context will be deactivated without using the command AT+CGACT, then the result code "NO CARRIER" will be issued to indicate the context deactivation. This happens for example if the context deactivation is forced by the network or if deactivation results from a network deregistration with AT+COPS=2.

11.2 AT+CGANS   Manual Response to a Network Request for PDP Context Activation

Description: The **write command** requests the MT to respond to a network request for GPRS PDP context activation which has been signaled to the TE by the RING or CRING unsolicited result code. The <response> parameter allows the TE to accept or reject the request.

Test Command Syntax: AT+CGANS=?

Response: +CGANS: (list of supported <response>s), (list of supported <L2P>s)
OK

Write Command Syntax: AT+CGANS=[<response>[, <L2P>[, <cid>]]]

Response: CONNECT
NO CARRIER
ERROR
+CME ERROR

Parameter Descriptions:

  <response>

    0   The request is rejected and the MT returns OK to the TE. Default.

    1   Accept and request that the PDP context be activated

  <L2P>   A string parameter which indicates the layer 2 protocol to be used (see AT+CGDATA command).

  <cid>   A numeric parameter which specifies a particular PDP context definition (see AT+CGDCONT command).

Note:

If <response> is 1, the following procedure is followed by the MT:

If the <L2P> parameter value is unacceptable to the MT, the MT will return an ERROR or +CME ERROR response. Otherwise, the MT issues the intermediate result code CONNECT and enters V.250 online data state.

A <cid> may be specified for use in the context activation request.

During the PDP startup procedure the MT has the PDP type and the PDP address provided by the network in the Request PDP context activation message. If this is in conflict with the information provided by a specified <cid>, the command will fail. There will be no conflict, if the PDP type matches exactly and the PDP address given by the context definition for <cid> is empty or matches exactly with the address specified with the network PDP context activation message.

The context will be activated using the values for PDP type and address provided by the network, together with all other information found in the PDP context definition. An APN may or may not be required, depending on the application.

If no <cid> is given or if there is no matching context definition, the MT will attempt to activate the context using the values for PDP type and address provided by the network. The other parameters will be set to their default values (see AT+CGDCONT).

If activation is successful, data transfer may proceed.

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

In the event of an erroneous termination or a failure to start up, the V.250 command state is re-entered and the MT returns the final result code NO CARRIER, or if enabled, +CME ERROR. Attach, activate and other errors may be reported. It is also an error to issue the AT+CGANS command when there is no pending network request.

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

11.3 AT+CGATT GPRS Attach or Detach

Description: The **test command** is used for requesting information on the supported GPRS service states.
The **read command** returns the current GPRS service state.
The **write command** is used to attach the MT to, or detach the MT from the GPRS service. After the command has completed, the MT remains in V.250 command state. If the MT is already in the requested state, the command is ignored and the OK response is returned. Any active PDP contexts will be automatically deactivated when the attachment state changes to detached.

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

Parameter Descriptions:

<state>
Indicates the state of GPRS attachment.
0   detached
1   attached. Default.

Notes:
- If the MT is in dedicated mode, write command returns "+CME ERROR: operation temporary not allowed".
- When the module is GPRS attached and a PLMN reselection occurs to a non-GPRS network or to a network where the SIM is not subscribed to for using GPRS, the resulting GMM (GPRS mobility management) state according to GSM 24.008 is REGISTERED/NO CELL, meaning that the read command will still show <state>=1.
- Under some network conditions the GPRS attach command fails, if entered immediately after a "+CREG: 1" URC. This can be avoided by waiting at least 1s before entering the GPRS attach command.

11.4 AT+CGAUTO Automatic Response to a Network Request for PDP Context Activation

Description: The **test command** returns the values of <n> supported by the MT as a compound value. The **write command** disables or enables an automatic positive response (auto-answer) to the receipt of a Request PDP Context Activation message from the network. It also provides control over the use of the V.250 basic commands ATS0, ATA and ATH for handling network requests for PDP context activation.

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

Response: OK
ERROR
+CME ERROR

Parameter Descriptions:

<n>

0	Disable automatic response for network requests for GPRS PDP context activation. GPRS network requests are manually accepted or rejected by the AT+CGANS command.
1	Enable automatic response for network requests for GPRS PDP context activation. GPRS requests are automatically accepted according to the description below.
3	Default. Modem compatibility mode. The automatic acceptance of both GPRS and incoming CSD calls is controlled by the ATS0 command. Manual control uses the ATA and ATH commands, respectively, to accept or reject GPRS network requests or incoming CSD calls.

Notes:
- It is allowed to have different AT+CGAUTO settings on different interfaces.
- When the AT+CGAUTO=0 command is received, the MT will not perform a GPRS detach if it is attached. Subsequently, when the MT announces a network request for PDP context activation by issuing the URC RING or CRING, the TE may manually accept or reject the request by issuing the AT+CGANS command or may simply ignore the network request.
- When the AT+CGAUTO=1 command is received, the MT will attempt to perform a GPRS attach if it is not yet attached. Failure will result in ERROR or, if enabled +CME ERROR being returned to the TE. Subsequently, the MT announces a network request for PDP context activation by issuing the URC RING to the TE, followed by the intermediate result code CONNECT. The MT then enters V.250 online data state and follows the same procedure as it would after having received a +CGANS=1 with no <L2P> or <cid> values specified.
- If a GPRS attach will be initiated by this command and the MT is not able to attach for more than 385 seconds (timer T3310 expired), command returns with "ERROR" or "+CME ERROR: unknown", but MT is still trying to attach and the requested automatic mode <n> is in use.
- If a network request for PDP context activation is answered automatically and if another AT command is issued at the same time on the same interface, then this AT command is not executed. Any response belongs to the automatic context activation procedure. If the AT command which caused the collision was a circuit switched data call, the CONNECT response does not belong to this data call but to the GPRS. This can be detected if ATX is not set to 0. CS data call will issue CONNECT <text>, GPRS will issue CONNECT only.

11.5 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 no <cid> is given or if there is no matching context definition, the MT will attempt to activate the context with PDP type IP and all other context parameters set to their default values (see AT+CGDCONT, AT+CGQREQ, AT+CGQMIN).

If the <L2P> parameter is omitted, the layer 2 protocol is unspecified and PPP will be used. If the write command is successful, the MT issues the intermediate result code CONNECT and enters V.250 online data 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.

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

Write Command Syntax: AT+CGDATA=[<L2P>[, <cid>[, <cid>[,...]]]]

Response: CONNECT
NO CARRIER
ERROR
+CME ERROR

Parameter Descriptions:

<L2P>
Layer 2 protocol to be used between the TE and MT.
"PPP"   layer 2 protocol PPP. Default.

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

Notes:

- If the MT is in dedicated mode, write command returns "+CME ERROR: operation temporary not allowed".
- It is possible to leave the GPRS data mode and enter the command mode by using the V.250 command +++. By using the command AT+CGDATA again, the data mode is reentered. Which context is used to return to data mode, depends on the supplied parameter <cid>.
If no <cid> is specified, this is equivalent to using the V.250 command ATO, which is usable for GPRS connections too. In this case the first context will be used, which is active and already in data mode since it has been activated.
It is possible to use AT+CGDATA to enter the data mode for a context, which is not yet in data mode since it has been activated. With ATO this is not possible.

11.5.1 Automatic Deactivation of PDP Context During Dial-up PPP

When using the AT+CGDATA write command or ATD*99# or ATD*98# 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.

During the implicit PDP context deactivation procedure after LCP termination the TE may change into V.250 command state (e.g., by using +++ or by toggling DTR if AT&D is set to 1) before the result NO CARRIER occurs.

In this case the application should not try to deactivate the PDP context by using the commands AT+CGACT or ATH. 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.

11.6 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.

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

Parameter Descriptions:

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

  <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.

  <d_comp>
    Data Compression
    Controls the PDP data compression (applicable for Subnetwork Dependent Convergence Protocol (SNDCP)
    only) 3GPP TS 44.065
    0   off

  <h_comp>(num)
    Header Compression
    Controls the PDP header compression 3GPP TS 44.065, 3GPP TS 25.323
    0   off (Default)
    1   on

Notes:
  • The MT supports PDP type IP only.
  • All context definitions will be stored non volatile if the ME is configured accordingly (see AT^SCFG parameter
    "GPRS/PersistentContexts" (<gpc>)).
  • If the non volatile storage of CGDCONT settings is not activated by the AT^SCFG parameter,
    "GPRS/PersistentContexts", then AT&F and ATZ will remove the definition of every context which is not active
    or not online.

11.7 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.

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.

AT&F and ATZ will remove the definition of the QoS profiles of every context which is not active or not online.

Test Command Syntax: AT+CGEQMIN=?

Response(s): +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 Syntax: AT+CGEQMIN?

Response(s): [+CGEQMIN: <cid>, (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)] [+CGEQMIN: ...]

Write Command Syntax: 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>]]]]]]]]]]]]]

Response(s): OK

ERROR

+CME ERROR

Parameter Descriptions:

<cid>

Parameter specifies a particular PDP context definition. The parameter is local to the TE-MT interface and is used in other PDP context-related commands.

1...2

<Traffic class>

0	conversational
1	streaming
2	interactive
3	background
4	subscribed value. Default

<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	subscribed value. Default.
1...63	
64...128	(value needs to be divisible by 8 without remainder)
256	
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	subscribed value. Default.
1...63	
64...256	(value needs to be divisible by 8 without remainder)
512	

<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	subscribed value. Default.
1...63	
64...128	(value needs to be divisible by 8 without remainder)

<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	subscribed value Default.
1...63	
64...256	(value needs to be divisible by 8 without remainder)

<Delivery order>
This parameter indicates whether the UMTS bearer shall provide in-sequence SDU delivery or not.

0	no
1	yes
2	subscribed value. Default.

<Maximum SDU size>
This parameter indicates the maximum allowed SDU size in octets.

0	subscribed value. Default.
10...1520	(value needs to be divisible by 10 without remainder)
1502	

<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"	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+CGEQMIN=...,"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	subscribed value. Default
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"

Notes:
- If parameters are not defined, the parameter default values depend on the HLR-stored subscribed default values.
- Definitions of parameters can be found in 3GPP TS 23.107

11.8 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.
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.
AT&F and ATZ will not define the QoS profiles of every context which is not active or not online.

Test Command Syntax: AT+CGEQREQ=?
Response(s): +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 Syntax: AT+CGEQREQ?
Response(s): [+CGEQREQ: <cid>, (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)]
[+CGEQREQ: ...]

Write Command Syntax: 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>]]]]]]]]]]]]]
Response(s): OK
ERROR
+CME ERROR

Parameter Descriptions:

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

<Traffic class>
   0   conversational
   1   streaming
   2   interactive
   3   background
   4   subscribed value. Default

<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   subscribed value. Default.
   1...63
   64...128   (value needs to be divisible by 8 without remainder)
   256
   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   subscribed value. Default
   1...63
   64...256   (value needs to be divisible by 8 without remainder)
   512

<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	subscribed value. Default
1...63	
64...128	(value needs to be divisible by 8 without remainder)

<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	subscribed value. Default
1...63	
64...256	(value needs to be divisible by 8 without remainder)

<Delivery order>
This parameter indicates whether the UMTS bearer shall provide in-sequence SDU delivery or not.

0	no
1	yes
2	subscribed value. Default

<Maximum SDU size>
This parameter indicates the maximum allowed SDU size in octets.

0	subscribed value. Default
10...1520	(value needs to be divisible by 10 without remainder)
1502	

<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]	subscribed value. Default
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"

Notes:

- If parameters are not defined, the parameter default values depend on the HLR-stored subscribed default values.
- Definitions of parameters can be found in 3GPP TS 23.107

11.9   AT+CGPADDR   Show PDP Address

Description: The **test command** returns a list of defined <cid>s.
The **write command** returns a list of PDP addresses for the specified context identifiers. If no <cid> is specified, the addresses for all defined contexts are returned.

Test Command Syntax: AT+CGPADDR=?
Response: [+CGPADDR: (list of defined <cid>s)]
OK
Write Command Syntax: AT+CGPADDR=[<cid>[,<cid>]]
Response: [+CGPADDR: <cid>, <PDP_address>]
[+CGPADDR: <cid>, <PDP_address>]
OK
ERROR
+CME ERROR

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.

Note:
If no <cid> is specified, the write command will return a list of all defined contexts.

11.10 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.
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.
AT&F and ATZ will not define the minimum QoS profiles of every context which is not active or not online.

Test Command Syntax: AT+CGQMIN=?

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

Read Command Syntax: AT+CGQMIN?
Response: [+CGQMIN : <cid>, <precedence>, <delay>, <reliability>, <peak>, <mean>]
[+CGQMIN : ...]
OK
ERROR
+CME ERROR

Write Command: AT+CGQMIN=[<cid>[, <precedence>[, <delay>[, <reliability>[, <peak>[, <mean>]]]]]]
Response: OK
ERROR
+CME ERROR

Parameter Descriptions:

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

<precedence>
Precedence class
  0   Network subscribed value. Default.
  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>(num)
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"

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

Example:
If some of the QoS parameters are omitted, they will keep their current value (or the default value if not specified).
For example:

```
AT+CGDCONT=1,"IP"
OK
AT+CGQMIN=
OK
AT+CGQMIN?
+CGQMIN:1,0,0,0,0,0
OK
AT+CGQMIN=1,0
OK
AT+CGQMIN?
+CGQMIN:1,0,0,0,0,0
OK
AT+CGQMIN=1,0,0,0,1
OK
AT+CGQMIN?
+CGQMIN:1,0,0,0,1,0
OK
AT+CGQMIN=1,1
OK
AT+CGQMIN?
+CGQMIN:1,1,0,0,1,0
OK
```

11.11 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.
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.
AT&F and ATZ will not define the QoS profiles of every context which is not active or not online.

Test Command Syntax: AT+CGQREQ=?
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 Syntax: AT+CGQREQ?
Response: [+CGQREQ: <cid>, <precedence>, <delay>, <reliability>, <peak>, <mean>]
[+CGQREQ: ...]
Write Command: AT+CGQREQ=[<cid>[, <precedence>[, <delay>[, <reliability>[, <peak>[, <mean>]]]]]]
Response: OK
ERROR
+CME ERROR

Parameter Descriptions:

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

<precedence>
Precedence class
0   Network subscribed value. Default.
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   Network subscribed value. Default.
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   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>(str)
Packet Data Protocol type
"IP"

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

Example:
If some of the QoS parameters are omitted, they will keep their current value (or the default value if not specified so far). For example:

```
AT+CGDCONT=1,"IP"
OK
AT+CGQREQ=
OK
AT+CGQREQ?
+CGQREQ:1,0,0,0,0,0
OK
AT+CGQREQ=1,0
OK
AT+CGQMIN?
+CGQREQ:1,0,0,0,0,0
OK
AT+CGQREQ=1,0,0,0,1
OK
AT+CGQREQ?
+CGQREQ:1,0,0,0,1,0
OK
AT+CGQREQ=1,1
OK
AT+CGQREQ?
+CGQREQ:1,1,0,0,1,0
OK
```

11.12   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, or URC "+CGREG: <stat>, <lac>, <ci>" when <n>=2 and the current network cell changes.

AT+CGREG read command queries the current URC presentation status and <stat> which shows whether the network has currently indicated the registration of the ME. Location information elements <lac> and <ci> are returned only if <n>=2 and ME is registered to the network.

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

Response: +CGREG: <n>, <stat>
   OK
Write Command Syntax: +CGREG: <n>, <stat>[, <lac>, <ci>]
Response: OK
   ERROR
   +CME ERROR

Parameter Descriptions:

<n>

0	Default. Disable network registration unsolicited result code
1	Enable network registration unsolicited result code "+CGREG: <stat>"
2	Enable network registration unsolicited result code "+CGREG: <stat>, <lac>, <ci>"

<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.

<lac>
   Two-byte location area code in hexadecimal format.

<ci>
   Two-byte cell ID in hexadecimal format.

Unsolicited Result Code:

URC 1
   +CGREG: <stat>
   Indicates a change in the MT's GPRS network registration status.

URC 2
   +CGREG: <stat>, <lac>, <ci>
   Indicates a change in the MT's GPRS network registration status and a change in of the network cell including location information.

Note:
   When the module is GPRS attached and a PLMN reselection occurs to a non-GPRS network or to a network where the SIM is not subscribed to for using GPRS, the resulting GMM (GPRS mobility management) state according to GSM 24.008 is REGISTERED/NO CELL, meaning that the read command will still show <stat>=1 or <stat>=5.

11.13   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.

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

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	GPRS preferred (use circuit-switched SMS transfer if GPRS SMS transfer is not possible; for example, when the mobile is not GPRS attached or the network does not support SMS over GPRS).
3	Circuit switched preferred (use GPRS if circuit switched is not available). Default.

Note:
  Sending SMS via GPRS is only possible when mobile is attached using AT+CGATT.

11.14 AT^SGACT   Query All PDP Context Activations

Description: The **test command** returns supported interfaces and states.

The **read command** lists the activation states for all activated PDP contexts of the ME. Contexts, which are created internally by the GPRS modem compatibility commands, will displayed only, if they are activated. The Output of this command is unsorted.

The **exec command** returns the sum of all activated PDP contexts of the ME.

Test Command Syntax: AT^SGACT=?

Response(s):   ^SGACT: (range of supported <ifc>s) , (range of supported <state>s)

OK

Read Command Syntax: AT^SGACT?

Response(s):   [^SGACT: <ifc>, <cid>, <state>]

[^SGACT: <ifc>, <cid>, <state>]

[^SGACT: ...]

OK

Exec Command Syntax: AT^SGACT

Response(s):   ^SGACT: <sum>

OK

Parameter Descriptions:

<ifc>

Interface

Indicates the interface on which a particular PDP context was defined. Every PDP context defined with the command AT+CGDCONT or internally by the GPRS modem compatibility commands is identified one-to-one by its (local) context identifier and the interface on which it was defined. The range of supported interfaces is returned by the test command.

0   ASC0

<cid>

PDP context identifier

The interface local identifier which was used to define a PDP context using the command AT+CGDCONT or which was created internally by using the GPRS modem compatibility commands ATD*98# or ATD*99#. The range of supported values is returned by the AT+CGDCONT test command. Values 3 and 4 will be used by the GPRS modem compatibility commands ATD*98# or ATD*99# if no context identifier was specified as the command was invoked.

<state>

PDP context activation state

Indicates the state of the PDP context activation.

0   Deactivated

1   Activated

<sum>

The sum of all activated PDP contexts of the ME.

11.15   AT^SGAUTH   Set Type of Authentication for PPP Connection

Test Command Syntax: AT^SGAUTH=?
Response: ^SGAUTH: (list of supported <auth>s)
                                 OK
                                 ERROR
                                 +CME ERROR
Read Command Syntax: AT^SGAUTH?
Response: ^SGAUTH: <auth>
                                 OK
                                 ERROR
                                 +CME ERROR
Write Command Syntax: AT^SGAUTH=<auth>
Response: OK
                                 ERROR
                                 +CME ERROR

Parameter Descriptions:
   <auth> Indicates types of supported authentication.
        0   none
        1   PAP Default
        2   CHAP
        3   MS-CHAP-V1, CHAP and PAP

11.16   AT^SGCONF   Configuration of GPRS-Related Parameters

Test Command Syntax: AT^SGCONF=?
Response: ^SGCONF : (list of supported <llc_pdu_length>_U>s), (list of supported
                                 <llc_pdu_length>_I>s), (list of supported <GPRS msclass>es), (list of supported <EGPRS
                                 msclass>es)
                                 OK
Read Command Syntax: AT^SGCONF?
Response: ^SGCONF: <llc_pdu_length_U>, <llc_pdu_length>_I>, <GPRS msclass>, <EGPRS
                                 msclass>
                                 OK
Write Command Syntax: AT^SGCONF=[<llc_pdu_length_U>][, [<llc_pdu_length>_I>][, [<GPRS
                                 msclass>][<EGPRS msclass>]]]]
Response: OK
                                 ERROR
                                 +CME ERROR

Parameter Descriptions:
   <llc_pdu_length_U>
   The maximum number of octets in an information field of Unnumbered (U) frames. Parameter is non-volatile.
       0   No negotiation with network (500 will be used)
       140...1520   Lower values diminish performance. Default = 500.
   <llc_pdu_length_I>
   The maximum number of octets in an information field of Combined (I) frames. Parameter is non-volatile.
       0   No negotiation with network (500 will be used)
       140...1520   Lower values diminish performance. Default = 500.
   <GPRS msclass>
   GPRS Multislot Class. The value can be one of the classes indicated with the Test command. The value set is
   volatile and power up value is the maximum allowed.
   <EGPRS msclass>
   EGPRS Multislot Class. The value can be one of the classes indicated with the Test command. The value set is
   volatile and power up value is the maximum allowed.

Notes:
   - +CME ERROR: invalid index: Parameter is out of range
   - +CME ERROR: operation temporary not allowed: The command is blocked as long as GPRS is already in use
     (as long as mobile is GPRS attached).
   - Writing to user profile with AT&W and restoring with AT&F are not supported.

11.17   ATA   Manual Response to a Network Request for PDP Context Activation

Description: The V.250 ATA command may be used to accept a network request for a PDP context activation announced by the unsolicited result codes "RING" or "+CRING: GPRS". The MT responds with CONNECT, enters V.250 online data state and follows the same procedure as it would after having received a AT+CGANS=1 with no <L2P> or <cid> values specified.

If you try to answer a request which is no longer present or which is already answered by another instance, NO CARRIER is returned.

Exec Command Syntax: ATA
Response: CONNECT
NO CARRIER

11.18   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.

See command examples in Section 11.22, "Using GPRS AT commands examples".

To confirm acceptance of the command before entering the V.250 online data state command will respond with CONNECT.

When the layer 2 protocol has terminated, either as a result of an orderly shut down of the PDP or an error, the MT enters V.250 command state and returns NO CARRIER (for details refer to Section 11.5.1, Automatic deactivation of PDP context during dial-up PPP).

Exec Command Syntax: ATD*99[* [<called_address>][* [<L2P>][* [<cid>]]]]#
Response: CONNECT
NO CARRIER

Parameter Descriptions:
  <called_address>
  This parameter is currently not used and needs not to be specified.
  <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). If no context is specified, an internal context with default properties is used (see AT+CGDCONT, AT+CGQREQ and AT+CGQMIN).
  1...2

Notes:
  - If the Multi-Tech wireless modem is in dedicated mode, command returns the result code BUSY.
  - ATD is used as a standard V.250 AT command, too.

11.19   ATD*98#   Request GPRS IP 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 layer 2 protocol.
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 AT+CGATT and AT+CGACT.
To confirm acceptance of the command before entering the V.250 online data state, command will respond with CONNECT.
When the layer 2 protocol has terminated, either as a result of an orderly shut down of the PDP or an error, the MT enters V.250 command state and returns NO CARRIER (for details refer to Section 11.5.1, Automatic deactivation of PDP context during dial-up PPP).

Exec Command Syntax: ATD*98[* <cid>]#
Response: CONNECT
NO CARRIER

Parameter Descriptions:
  <cid>
   Parameter specifies a particular PDP context definition (see AT+CGDCONT command). If no context is specified, an internal context with default properties is used (see AT+CGDCONT, AT+CGQREQ and AT+CGQMIN).
   1...2

Notes:
  • If the Multi-Tech wireless modem is in dedicated mode, command returns the result code BUSY.
  • ATD is used as a standard V.250 AT command, too.

11.20   ATH   Manual Rejection of a Network Request for PDP Context Activation

Description: The V.250 ATH command may be used to deactivate all PDP contexts which are active or online on the same interface. This command should not be used to deactivate PDP contexts during the implicit PDP context deactivation procedure which is started automatically after LCP termination or by dropping the DTR line (if AT&D2 is configured). For details refer to Section 11.5.1, "Automatic deactivation of PDP context during dial-up PPP".
The ATH command may also be used to reject a network request for PDP context activation announced by the unsolicited result codes "RING: GPRS" or "+CRING: GPRS".

Exec Command Syntax: ATH
Response: OK

Notes:
  • In contrast to GSM 07.07 it is possible to cancel a connection with ATH after a break. This is done for compatibility reasons due to the "dial-up network" drivers of Microsoft Windows.
  • ATH is used as a standard V.250 AT command, too.
  • If ATH is used to reject a network request for PDP context activation, then other PDP contexts on the same interface which are active or online will not be deactivated.

11.21   ATS0   Automatic Response to a Network Request for PDP Context Activation

Description: The V.250 ATS0=<n> (Automatic answer) command may be used to turn off (n=0) and on (n>0) the automatic response to a network request for a PDP context activation.

When the ATS0=<n> (<n> > 0) command is received, the MT will attempt to perform a GPRS attach if not yet attached and if configured to do so (see AT^SCFG, parameter <gs0aa>). Failure will result in ERROR being returned to the TE. Subsequently, the MT will announce a network request for PDP context activation by issuing the URC RING or CRING to the TE, followed by the intermediate result code CONNECT. The MT then enters V.250 online data state and follows the same procedure as it would after having received a AT+CGANS=1 command with no <L2P> or <cid> values specified.

ATS0=0 does not perform an automatic GPRS detach.

Read Command Syntax: ATS0?
Response: <n>
                                          OK
Write Command Syntax: ATS0=<n>
Response: OK

Parameter Description:

<n>
  000   Disables automatic answer mode. Default.
  001-255   Enables automatic answering after specified number of rings.

Notes:
- If different settings are used on each interface, and a request for PDP context activation is received, the interface 'wins' which is idle and uses the smallest ATS0 value.
- If a network request for PDP context activation is answered automatically and another AT command is issued at the same time on the same interface then this AT command will not be executed. Any response belongs to the automatic context activation procedure. If the AT command which caused the collision was a CS data call, the CONNECT response does not belong to this data call but to the GPRS. This can be detected if ATX is not set to 0. CS data call will issue CONNECT <text>, GPRS will issue CONNECT only.
- A network request for PDP context activation has a maximum duration of approximately 40 seconds (for details see GSM 04.08). A RING/CRING URC is issued every 5 seconds, so setting parameter <n> to values greater than 7 will not allow a successful context activation and is not recommended.
- The automatic GPRS attach will not be performed on recalling a stored user profile with ATZ or on power up, if a n > 0 setting was stored in the user profile with AT&W.
- If the automatic GPRS attach fails (e.g., the network rejects the attach request), the write command returns error, though the new value takes effect. This is necessary because ATS0 is used for circuit switched calls too.
- ATS0 write command is PIN protected.

11.22   Using GPRS AT Commands Examples

Example 1 – Defining and Using a Context Definition ID (CID):

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

```
AT+CGDCONT?
OK                          There is no CID defined
```

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

Define CID 1 and set the PDP type to IP, access point name and IP address are not set:

```
AT+CGDCONT=1,"IP"
OK
```

Define CID 2 and sets PDP type, APN and IP addr:

```
AT+CGDCONT=2,"IP", "internet.t-d1.gprs", 111.222.123.234
OK
```

A following read command will respond:

```
AT+CGDCONT?
+CGDCONT:1,"IP","","",0,0
+CGDCONT:2,"IP","internet.t-d1.gprs",111.222.123.234
OK
```

Set the CID 1 to be undefined:

```
AT+CGDCONT=1
OK
```

A following read command will respond:

```
AT+CGDCONT?
+CGDCONT:2,"IP","internet.t-d1.gprs",111.222.123.234
OK
```

Example 2 – Quality of Service (QoS) is a special CID parameter that consists of several parameters itself.
The QoS consists of:

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

It is also divided in "requested QoS" and "minimum acceptable QoS".

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

Overwrite the precedence class of QoS of CID 1 and set the QoS of CID 1 to be present:

```
AT+CGQREQ=1,2
OK
```

A following read command will respond:

```
AT+CGQREQ?
+CGQREQ: 1,2,0,0,0,0
OK
```

All QoS values of CID 1 are set to network subscribed now, except precedence class which is set to 2. Now set the QoS of CID 1 to not present:

```
AT+CGQREQ=1
OK
```

Once defined, the CID it can be activated. To activate CID 2 use:

```
AT+CGACT=1,2
OK
```

If the CID is already active, the mobile responds OK at once.
If no CID and no STATE is given, all defined CIDs will be activated by:

```
AT+CGACT=
OK
```

If no CID is defined the mobile responds +CME ERROR: invalid index.
Remark: If the mobile is NOT attached by AT+CGATT=1 before activating, the attach is automatically done by the AT+CGACT command.

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

AT+CGDATA="PPP",1	
CONNECT	The mobile is connected using the parameters of CID 1.
AT+CGDATA=	
CONNECT	The mobile is connected using default parameters (<L2P>="PPP" and <cid> as described for command AT+CGDATA).

The mobile supports Layer 2 Protocol (L2P) PPP only.
Remark: If the mobile is NOT attached by AT+CGATT=1 and the CID is NOT activated before connecting, attaching and activating is automatically done by the AT+CGDATA command.

11.23   Using the GPRS Dial Command ATD (Example)

In addition to the GPRS AT commands you can use the "D" command to dial into to the GPRS network.
There are two GPRS Service Codes for the ATD command: Values 98 and 99.

Examples:

ATD*99#	
CONNECT '	Establish a connection by service code 99.
ATD*99*123.124.125.126*PPP*1#	
CONNECT	Establish a connection by service code 99, IP address 123 and L2P = PPP and using CID 1. The CID has to be defined by AT+CGDCONT.
ATD*99**PPP#	
CONNECT	Establish a connection by service code 99 and L2P = PPP.
ATD*99***1#	
CONNECT	Establish a connection by service code 99 and using CID 1.
ATD*99**PPP*1#	
CONNECT	Establish a connection by service code 99 and L2P = PPP and using CID 1. The CID has to be defined by AT+CGDCONT.
ATD*98#	
CONNECT	Establish a connection by service code 98.
ATD*98*1#	
CONNECT	Establish an IP connection by service code 98 using CID 1. The CID has to be defined by AT+CGDCONT.

Chapter 12 – 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.

12.1 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.

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

<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"

<ieia>
IEIa (Information Element Identifier octet) of the concatenated SMS.
8   Concatenated short messages, 8-bit reference number.
16   Concatenated short messages, 16-bit reference number.

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

\<length>

Message Length

Integer type value indicating in the text mode (AT+CMGF=1) the length of the message body <data> (or <cdata>) in characters; or 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) In text mode, the maximum length of an SMS depends on the used coding scheme: It is 160 characters if the 7 bit GSM coding scheme is used, and 140 characters according to the 8 bit GSM coding scheme.

If the SMS message format is "text mode" (AT+CMGF=1) and the character set is set to "UCS2" with AT+CSCS and the SMS is also coded as "UCS2" (see <dcs> of AT+CSMP), then the length is in octets instead of characters.

For concatenated SMS messages the maximum length will be reduced by the length of the user data header with respect to <ieia> (6 bytes for <ieia>=8 and 7 bytes for <ieia>=16). In the case of 8-bit data, the maximum length of the short message field is: 140 octets - (6 or 7) = 134 or 133. In the case of GSM 7 bit default alphabet data, the maximum length of the short message is (140 - (6 or 7))*8/7 = 153 or 152 characters. In the case of 16 bit UC2 data, the maximum length of the short message is: (140 - (6 or 7))/2)= 67 or 66 characters.

\<max>

Maximum number of all segments to be concatenated into one SMS, beginning with 1.
<max>=0 means: ignore the value. This will result in a non-concatenated SMS.
0...255

\<mem1>

Memory to be used when listing, reading and deleting messages:
"SM"   SIM message storage
"ME"   Mobile Equipment message storage
"MT"   Sum of "SM" and "ME" storages. Default.

\<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
"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 Ad-dress-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\>.

\<ref\>
Reference Number
Reference number to identify all segments of the concatenated SMS (i.e., the number needs to be the same for each segment). If \<ieia\>=8, then max=255; otherwise, 65535.
0...255
0...65535

\<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\>)

\<seq\>
Sequence Number
Sequence number of the concatenated SMS beginning with 1. The number must be incremented by one for each segment of the concatenated short message.
\<seq\>=0 means: ignore the value. This will result in a non-concatenated SMS.
0...255

\<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\>).

12.2 AT+CMGC   Send an SMS Command

Test Command Syntax:	AT+CMGC=?
Response:	OK
Write Command Syntax:	If text mode (see AT+CMGF=1)
	AT+CMGC=<fo>, <ct>[, <pid>[, <mn>[, <da>[, <toda>]]]]<CR> Text can be entered <CTRL-Z>/<ESC>
Response:	+CMGC: <mr>[, <scts>]
	If sending fails
	ERROR
	+CMS ERROR
Write Command Syntax:	If PDU mode (see AT+CMGF=0)
	AT+CMGC=<length><CR> PDU can be entered <CTRL-Z>/<ESC>
Response:	+CMGC: <mr>[, <ackpdu>]
	OK
	If sending fails
	ERROR
	+CMS ERROR

Notes:
- 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.
- At baud rates below 19200 it is recommended to use the line termination character only (refer to ATS3, default **<CR>**) before entering the text or PDU. Use of the line termination character followed by the response formatting character (refer to ATS4, default **<LF>** can cause problems.

12.3 AT+CMGD   Delete SMS Message

Description:	Write command deletes a short message from preferred message storage <mem1> location <index>.
Test Command Syntax:	AT+CMGD=?
Response:	OK
Write Command Syntax:	AT+CMGD=<index>
Response:	OK
	ERROR
	+CMS ERROR

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, 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*.

12.4 AT+CMGF   Select SMS Message Format

Description:	The write command specifies the input and output format of the short messages.
Test Command Syntax:	AT+CMGF=?
Response:	+CMGF: (list of supported<mode>s)
	OK
Read Command Syntax:	AT+CMGF?
Response:	+CMGF: <mode>
	OK
Write Command Syntax:	AT+CMGF=<mode>
Response:	OK

Parameter Description:
  <mode>
0	PDU mode. Default.
1	Text mode

12.5 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>.

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

Exec Command Syntax: AT+CMGL
Response: +CMGL: (see write command for default of <stat>)
OK

Write Command Syntax: AT+CMGL=<stat>
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.
- The parameters <ra> and <tora> will only display if parameter <ra> of the AT^SSCONF command is set to 1.
- 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*.

12.6 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'.
Test Command Syntax:	AT+CMGR=?
Response:	OK
Write Command Syntax:	AT+CMGR=<index>
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

Notes:
- Response if AT+CMGR is used to read an empty record index: +CMGR: 0,,0.
- Response if AT+CMGR is used to read a non-existent record index: +CMS ERROR: invalid memory index
- The parameters <ra> and <tora> will only be displayed if parameter <ra> of the AT^SSCONF command is set to 1.
- 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.*

12.7 AT+CMGS Send SMS 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.

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

Write Command Syntax: If text mode (see AT+CMGF=1)
AT+CMGS=<da>[, <toda>]<CR> Text can be entered. <CTRL-Z>/<ESC>
Response: +CMGS: <mr>[, <scts>]
OK
If sending fails see notes below.

Write Command Syntax: If PDU mode (see AT+CMGF=0)
AT+CMGS=<length><CR> PDU can be entered. <CTRL-Z>/<ESC>
Response: +CMGS: <mr>[, <ackpdu>]
OK
If sending 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).
- All characters entered behind the prompt ">" will be recognized as GSM characters. For example, "Backspace" (ASCII character 8) does not delete a character, but will be inserted into the short message as an additional physical character. As a result, the character you wanted to delete still appears in the text, plus the GSM code equivalent of the Backspace key.
- 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. In case UCS2 character set selected it is highly recommended to set Data Coding Scheme (<dcs> of AT+CSMP) to 16-bit data, otherwise the length of SMS user data is restricted to 88 octets. Even better for messages with UCS2 character set is the PDU Mode.
- At baud rates lower than 19200 it is recommended to use the line termination character only (refer to <n> of ATS3, default <CR>) before entering text or PDU. Use of the line termination character followed by the response formatting character (see <n> of ATS4, default <LF>) can cause problems.
- During a pending USSD user interaction the AT+CMGS write command returns "+CME ERROR: operation temporary not allowed" to prevent blocking situations.

12.8   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>. After the prompt a timer will be started to observe the input.

To abort writing use <ESC>. Abortion is acknowledged with "OK", though the message will not be saved.

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

Exec Command Syntax: If text mode (see AT+CMGF=1):
AT+CMGW
Response: <CR> Text can be entered. <CTRL-Z>/<ESC>
+CMGW: <index>
OK
If writing fails
ERROR
+CMS ERROR

Write Command Syntax: If text mode (see AT+CMGF=1):
AT+CMGW=<oa>/<da>[, [<tooa>/<toda>][, <stat>]]<CR> Text can be entered. <CTRL-Z>/<ESC>
Response: +CMGW: <index>
OK
If writing fails see notes below.

Write Command Syntax: If PDU mode (see AT+CMGF=0):
AT+CMGW=<length>[, <stat>]<CR> PDU can be entered. <CTRL-Z>/<ESC>
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).
- For baud rates lower than 19200 it is recommended to use the line termination character only (refer to ATS3= <n>, default <CR>) before entering the text or PDU. Use of the line termination character followed by the response formatting character (see ATS4= <n>, default <LF>) may cause problems.
- SMS-COMMANDs and SMS-STATUS-REPORTs cannot be stored in text mode.
- All characters entered behind the ">" prompt will be recognized as GSM characters. For example, "Backspace" (ASCII character 8) does not delete a character, but will be inserted into the short message as an additional physical character. As a result, the character you wanted to delete still appears in the text, plus the GSM code equivalent of the Backspace key.
- 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.
  In case UCS2 character set selected it is highly recommended to set Data Coding Scheme (<dcs> of AT+CSMP) to 16-bit data, otherwise the length of sms user data is restricted to 88 octets. Even better for messages with UCS2 character set is the PDU Mode.
- The length of 8-bit data coded short messages has to be greater than 0.

12.9   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>).

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

Write Command Syntax: If text mode (AT+CMGF=1):
AT+CMSS=<index>[, <da>[, <toda>]]
Response: +CMSS: <mr>[, <scts>]
OK
If sending fails
ERROR
+CMS ERROR

Write Command Syntax: If PDU mode (AT+CMGF=0):
AT+CMSS=<index>[, <da>[, <toda>]]
Response: +CMSS: <mr>[, <ackpdu>]
OK
If sending fails
ERROR
+CMS ERROR

12.10   AT+CNMA   New SMS Message Acknowledge to ME/TE Phase 2+

Description: The write / execute command confirms successful receipt of a new message (SMS-DELIVER or SMS-STATUSREPORT) routed directly to the TE. TA shall not send another +CMT or +CDS result code to TE until previous one is acknowledged. If ME does not receive acknowledgment within required time (network 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.

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

Exec Command Syntax: AT+CNMA
Response: OK
ERROR
+CMS ERROR

Write Command Syntax: AT+CNMA=<n>
Response: OK
ERROR
+CMS ERROR

Parameter Description:
  <n>
   0   Parameter is only required for PDU mode. Command operates similarly as in text mode.

Notes:
- The execute / write command shall only be used when AT+CSMS parameter <service> equals 1 (= phase 2+).
- Both the execute and the write command can be used no matter whether text mode or PDU mode is activated. The write command is designed for the PDU mode only.

12.11   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 (V.250 command AT&D), 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+.

Test Command Syntax: AT+CNMI=?
Response: +CNMI: (list of supported<mode>s), (list of supported <mt>s), (list of supported <bm>s), (list of supported <ds>s), (list of supported <bfr>s)
OK

Read Command Syntax: AT+CNMI?
Response: +CNMI: <mode>, <mt>, <bm>, <ds>, <bfr>
OK

Write Command Syntax: AT+CNMI=[<mode>][, <mt>][, <bm>][, <ds>][, <bfr>]
Response: OK
ERROR
+CMS ERROR

Parameter Descriptions:

<mode>
0   Buffer unsolicited result codes in the TA. If TA result code buffer is full, indications can be buffered in some other place or the oldest indications may be discarded and replaced with the new received indications. Default.
1   Discard indication and reject new received message unsolicited result codes when TA-TE link is reserved (e.g., in on-line data mode). Otherwise, forward them directly to the TE.
2   Buffer unsolicited result codes in the TA when TA-TE link is reserved (e.g., in on-line data mode) and flush them to the TE after reservation. Otherwise, forward them directly to the TE.
3   Forward unsolicited result codes directly to the TE. When TA-TE link is reserved (e.g., online data mode), the URCs are signaled according to the AT^SCFG parameters <uri>, <udri>, and <urat>.

<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.
Note: If AT command interface is acting as the only display device, the ME must support storage of class 0 messages and messages in the message waiting indication group (discard message)
0   Default. No SMS-DELIVER indications are routed to the TE.
1   If SMS-DELIVER is stored in ME/TA, indication of the memory location is routed to the TE using unsolicited result code:
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 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   No CBM indications are routed to the TE. Default.
2   New CBMs are routed directly to the TE using unsolicited result code:
3   Class 3 CBMs are routed directly to TE using unsolicited result codes defined in <bm>=2.

<ds>
0   No SMS-STATUS-REPORTs are routed to the TE. 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   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.

Unsolicited Result Codes:

URC 1
<mt>=1:
+CMTI: <mem3>, <index>
Indicates that new message has been received

URC 2
<mt>=2 (PDU mode enabled):
+CMT: <length><CR><LF><pdu>
Indicates that new message has been received

URC 3
<mt>=2 (text mode enabled):
+CMT: <oa>, <scts>[, <tooa>, <fo>, <pid>, <dcs>, <sca>, <tosca>, <length>]<CR><LF><data>
Indicates that new message has been received

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:
- Parameters <mt>=2,3 and <ds>=1 are only available with GSM phase 2+ (see AT+CSMS=1). Incoming SMs or Status Reports have to be acknowledged with AT+CNMA=0 when using these phase 2+ parameters.
- Handling of Class 0 short messages:
  If the host application is provided with a display and AT^SSDA=1 has been set Class 0 short messages can be displayed immediately.
  If the host application does not include a display, ME handles Class 0 short messages as though there was no message class; i.e., it will ignore bits 0 and 1 in the <dcs> and normal rules for exceeded memory capacity shall apply. This approach is compliant with GSM 03.38 .
- The parameters <ra> and <tora> will only be displayed if <ra> of the AT^SSCONF command is set to 1.
- If either a SM or a Status Report is not acknowledged, all AT+CNMI parameter in all channels will be set to zero.

12.12   AT+CPMS   Preferred SMS Message Storage

Description: The **write command** selects memory storages <mem1>,<mem2>, <mem3> to be used for reading, writing, etc.

Test Command Syntax: AT+CPMS=?
Response: +CPMS: (list of supported <mem1>s), (list of supported <mem2>s), (list of supported <mem3>s)
OK

Read Command Syntax: AT+CPMS?
Response: +CPMS: <mem1>, <used1>, <total1>, <mem2>, <used2>, <total2>, <mem3>, <used3>, <total3>
OK
ERROR
+CMS ERROR

Write Command Syntax: AT+CPMS=<mem1>[, <mem2>[, <mem3>]]
Response: +CPMS: <used1>, <total1>, <used2>, <total2>, <used3>, <total3>
OK
ERROR
ERROR
+CMS ERROR

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 25 short messages, see <mem1>.
- "MT" is the sum of "ME" (= 25 locations) and "SM" (capacity varies with SIM card). The indices <index> of the "MT" storage are dependent on the order selected with AT^SSMSS
- The <mem1>, <mem2> and <mem3> parameter will be stored in non-volatile memory.
- The user should be aware that the setting "MT" involves "ME" and "SM", with "ME" being filled up first. If the "ME" storage is full, the Multi-Tech wireless modem will proceed with the "SM" storage.
  Incoming Class 1 short messages (ME specific) will be preferably stored to "ME" and may be transferred to the "SM" storage if "ME" is used up.
  Incoming Class 2 messages (SIM specific) will be stored to the SIM card only, no matter whether or not there is free "ME" space. As a result, the ^SMGO: 2 indication (see AT^SMGO) may be presented without prior indication of ^SMGO: 1. For more information regarding SIM and ME specific message classes refer to <dcs> and the following specifications: GSM 03.38 and 3GPP 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 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.
- The indexes <index> of the storage are dependent on the order selected with AT^SSMSS.

12.13   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.

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

Read Command Syntax: AT+CSCA?
Response: +CSCA: <sca>, <tosca>
                        OK

Write Command Syntax: AT+CSCA=<sca>[, <tosca>]
Response: OK

Notes:
- In case of using no parameter after AT+CSCA= the content of <sca> will be deleted.
- 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.

12.14   AT+CSCB   Select Cell Broadcast Message Indication

Description: The **Test command** returns supported modes as a compound value.
                     The **Write command** selects which types of CBMs are to be received by the ME.

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

Read Command Syntax: AT+CSCB?
Response: +CSCB: <mode>, <mids>, <dcss>
                        OK

Write Command Syntax: AT+CSCB=[<mode>[, <mids>[, <dcss>]]]
Response: OK

Parameter Descriptions:

<mode>
Message mode
0   Accept messages that are defined in <mids> and <dcss>. Default.
1   Forbid messages that are defined in <mids> and <dcss>

<mids>
Cell Broadcast Message ID specification
""   Default value of this parameter is empty string, and it means that no CBM identifiers are specified.
- For <mode>=0: Six different possible combinations of CBM IDs (e.g., "0,1,5,320-478,922,2000-3000"), default is empty string.
  In certain configurations, such as using SIMs that contain data in Elementary File EF-CBMID (Cell Broadcast Message Identifier for Data download), less than six combinations may be available.
  To access a SIM's Elementary File data refer to command AT+CRSM.
- For <mode>=1: One CBM ID or range of IDs (e.g., "320-478") default is empty string.

<dcss>
CBM data coding scheme specification
""   Default value of this parameter is empty string.
All different possible combinations of CBM data coding schemes (e.g., "0-3,5"). Using default empty string leads to get all CBMs independent of their dcss.
A given <dcss> replaces any former value and is used for consecutive requests.

12.15   AT+CSDH   Show SMS Text Mode Parameters

Description: The **write command** sets whether or not detailed header information is shown in text mode result codes.

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

Read Command Syntax: AT+CSDH?
Response: +CSDH:<show>
OK

Write Command Syntax: AT+CSDH=<show>
Response: +CSDH: <show>
OK

Parameter Description:

<show>

0   Do not show header values defined in commands AT+CSCA and AT+CSMP (<sca>, <tosca>,<fo>,<vp>, <pid> and <dcs>) nor <length>, <toda> or <tooa> in "+CMTI", AT+CMGL, AT+CMGR result codes for SMS-DELIVERs and SMS-SUBMITs in text mode; for SMS-COMMANDs in +CMGR result code, do not show <pid>,<mn>,<da>, <toda>, <length> or <cdata>. Default.

1   Show the values in result codes.

12.16   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.

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

Read Command Syntax: AT+CSMP?
Response: +CSMP:<fo>, <vp>/ <scts>, <pid>, <dcs>
OK

Write Command Syntax: AT+CSMP=<fo>[, <vp>/<scts>[, <pid>[, <dcs>]]]
Response: +CSMP: <index>
OK
If sending fails: ERROR or +CMS ERROR

Parameter Descriptions:

<fo>
First Octet
Depending on the command or result code: first octet of GSM 03.40 SMS-DELIVER, SMS-SUBMIT (default 17), SMS-STATUS-REPORT, or SMS-COMMAND (default 2) in integer format.
0....255   Default = 17.

<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   Default = 167.

<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.

12.17 AT+CSMS Select Message Service

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

Read Command Syntax: AT+CSMS?
Response: +CSMS: <service>, <mt>, <mo>, <bm>
OK

Write Command Syntax: AT+CSMS=<service>
Response: +CSMS: <mt>, <mo>, <bm>
OK
ERROR
+CMS ERROR

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

Notes:
- If CSMS mode is switched from Phase 2+ to Phase 2 and one or more AT+CNMI Parameter are Phase 2+ specific a '+CMS ERROR: unknown error' will appear. It is recommended to switch the AT+CNMI Parameters to Phase 2 specific values before entering Phase 2.
- Phase 2+ (<service>=1) must be set before the following features can be used:
  * Configuring procedures for indicating received short messages with the AT+CNMI parameters <mt>=2 or <mt>=3 and <ds>=1.
  * Acknowledging incoming short messages with AT+CNMA.
  * Receiving Status Reports and acknowledging them with AT+CNMA.

12.18 AT^SCML List Concatenated Short Messages from Preferred Store

Description: The **execute command** is the same as the write command with the given default for <stat>. See the Notes section of the AT+CMGL command.

The **write command** returns messages with status value <stat> from message storage <mem1> to the TE. If status of the message is 'received unread', status in the storage changes to 'received read'.

Test Command Syntax: AT^SCML=?
Response(s): ^SCML: (list of supported <stat>s)
OK

Exec Command Syntax: AT^SCML
Response(s): ^SCML: (see write command for default of <stat>)
OK

Write Command Syntax: AT^SCML=<stat>
Response(s): **Output if text mode (AT+CMGF=1) and command successful:**

For SMS-SUBMITs and/or SMS-DELIVERs
^SCML: <index>, <stat>, <oa>/<da>, [<alpha>], [<scts>][, <tooa>/<toda>, <length>][, <seq>, <max>, <ieia>, <ref>]
<data>
[...]
OK
For SMS-STATUS-REPORTs
^SCML: <index>, <stat>, <fo>, <mr>, [<ra>], [<tora>], <scts>, <dt>, <st>
[...]
OK
For SMS-Commands
^SCML: <index>, <stat>, <fo>, <ct>
[...]
OK
Output if PDU mode (AT+CMGF=0) and command successful:

For SMS- SUBMITs and/or SMS-DELIVERs
^SCML: <index>, <stat>, [<alpha>], <length>
<pdu>
[...]
OK
If error is related to ME functionality
ERROR
+CMS ERROR

12.19 AT^SCMR Read Concatenated Short Messages

Description: The write command returns the 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'. See notes of AT+CMGR.

Test Command Syntax: AT^SCMR=?
Response(s): OK

Write Command: AT^SCMR=<index>
Response(s): **Output if text mode (AT+CMGF=1) and command successful:**

For SMS-DELIVER
^SCMR: <stat>, <oa>, [<alpha>], <scts>[, <tooa>, <fo>, <pid>, <dcs>, <sca>, <tosca>, <length>][, <seq>, <max>, <ieia>, <ref>]
<data>
[...]
OK
For SMS-SUBMIT
^SCMR: <stat>, <da>, [<alpha>][, <toda>, <fo>, <pid>, <dcs>, [<vp>], <sca>, <tosca>, <length>][, <seq>, <max>, <ieia>, <ref>]
<data>
[...]
OK
For SMS-STATUS-REPORT
^SCMR: <stat>, <fo>, <mr>, [<ra>], [<tora>], <scts>, <dt>, <st>
<data>
[...]
OK
For SMS-Commands
^SCMR: <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
^SCMR: <stat>, [<alpha>], <length>
<pdu>
[...]
OK
ERROR
+CMS ERROR

12.20   AT^SCMS   Send Concatenated Short Messages

Description: Sending a concatenated message is similar to sending a "normal" message, except that each segment of the concatenated message must be identified by the additional parameters <seq>, <ieia> and <ref>. To send all segments of the message one by one, the AT^SCMS write command must be executed for each segment.

The **write command** transmits one segment of a concatenated 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.

Test Command Syntax: AT^SCMS=?
Response(s):   OK

Write Command Syntax: Command syntax for text mode (see AT+CMGF=1):
AT^SCMS=<da>[, <toda>], <seq>, <max>, <ieia>, <ref>**<CR>** Text can be entered **<CTRL-Z>/<ESC>**
Response(s):   +CMGS: <mr>[, <scts>]
OK
If sending fails: ERROR or +CMS ERROR

Notes:
- See notes provided for AT+CMGS.
- Command is only available if AT+CMGF=1.

12.21   AT^SCMW   Write Concatenated Short Messages to Memory

Description: Writing a concatenated message to the memory is similar to writing a "normal" message, except that each segment of the concatenated message must be identified by the additional parameters <seq>, <ieia> and <ref>.

To store all segments of the message one by one, the AT^SCMW write command must be executed for each segment.

The **write command** transmits one segment of a concatenated SMS (either SMS-DELIVER or SMS-SUBMIT) from TE to memory storage <mem2>. Memory location <index> of the stored message is returned. Message status will be set to 'stored unsent' unless otherwise given in parameter <stat>.

Test Command Syntax: AT^SCMW=?
Response(s):   OK

Write Command Syntax: If text mode (see AT+CMGF=1)
AT^SCMW=<oa>/<da>, [<tooa>/<toda>][, <stat>], <seq>, <max>, <ieia>, <ref>**<CR>** Text can be entered. **<CTRL-Z>/<ESC>**
Response(s):   ^SCMW: <index>
OK
If writing fails: ERROR or +CMS ERROR

Notes:
- Command is only available if AT+CMGF=1.
- To send or delete a concatenated short message please use the known SMS commands, see AT+CMSS for sending and AT+CMGD for deleting.
- See notes provided for AT+CMGW.

12.22   AT^SLMS   List SMS Memory Storage

Description: AT^SLMS indicates the maximum capacity of each SMS storage type and the number of locations currently used.

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

Exec Command Syntax: AT^SLMS
Response: ^SLMS: "MT",<total3>, <used3>
^SLMS: "SM",<total1>, <used1>
^SLMS: "ME",<total2>, <used2>
OK
ERROR
+CMS ERROR

Parameter Descriptions:

<total1>
Maximum number of messages storable in the SMS memory of the SIM (physical storage "SM").

<total2>
Maximum number of messages storable in the SMS memory of the Mobile Equipment (physical storage "ME").

<total3>
Sum of "SM" and "ME", indicated as "MT". Maximum number of all messages storable in the SIM memory and the Mobile Equipment memory.

<used1>
Number of messages currently stored in the SMS memory of the SIM (physical storage "SM").

<used2>
Number of messages currently stored in the SMS memory of the Mobile Equipment (physical storage "ME").

<used3>
Concatenated logical SMS storages of SIM ("SM") and Mobile Equipment ("ME"). Sum of all messages currently stored, indicated as "MT".

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.

12.23   AT^SMGL   List Short Messages from Preferred Store without Setting Status to REC READ

Description: The **execute command** is the same as the write command, but uses the given default of <stat>.
The **write command** allows to select a status type and lists, from the message storage <mem1>, all messages that currently have the specified <stat>. The major difference over the standard command AT+CMGL is that the status of the listed messages remains unchanged (unread remains unread).

Test Command Syntax: AT^SMGL=?
Response: same as AT+CMGL

Exec Command Syntax: AT^SMGL
Response: ^SMGL: (For default values of <stat>, see Section 12.1 "SMS Parameters".)
OK

Write Command Syntax: AT^SMGL=<stat>
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, 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.

12.24   AT^SMGO   Set/Query SMS Overflow Presentation Mode or Query SMS Overflow

Description: The **read command** returns overflow presentation mode and SMS overflow status.
The **write command** sets overflow presentation mode.

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

Read Command: AT^SMGO?
Response: ^SMGO: <n>, <mode>
OK
ERROR
+CMS ERROR

Write Command: AT^SMGO=<n>
Response: OK
ERROR
CME ERROR

Parameter Descriptions:

<n>
SMS overflow presentation mode.
| 0 | Disable. Default. |
| 1 | Enable |

<mode>
SMS overflow status
0	Space available.
1	SMS buffer full. The buffer for received short messages is <mem3>. See AT+CPMS.
2	Buffer full and new message waiting in SC for delivery to phone.

Unsolicited Result Code:
SMS buffer change:
^SMGO: <mode>
Status of SMS buffer has changed.

Notes:
- Incoming short messages with message class 1 (ME specific short messages) or class 2 (SM specific short messages), see <dcs> in GSM 03.38, will be stored either in "ME" or in "SM" storage. Therefore the "^SMGO: 2" indication could occur, without issuing the indication "^SMGO: 1" before. The indication "^SMGO: 1" means that both buffers ("ME" and "SM") are full.
- For more information regarding SIM and ME specific message classes refer to <dcs> and the following specifications: GSM 03.38 and 3GPP TS 23.038.

12.25   AT^SMGR   Read Short Message without Setting Status to REC READ

Description: The AT^SMGR command is a specific command which has the same syntax as AT+CMGR. The only functional difference is that the status "REC UNREAD" of a short message is not overwritten to "REC READ".

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

Write Command Syntax: AT^SMGR=<index>
Response: see AT+CMGR

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.

12.26   AT^SSCONF   SMS Command Configuration

Description: AT^SSCONF controls details of some SMS related commands. Please note that AT^SSCONF settings are stored volatile; i.e., after restart or reset the default values will be restored.

Test Command Syntax: AT^SSCONF=?
Response: ^SSCONF:list of supported <ra>s
OK

Read Command Syntax: AT^SSCONF?
Response: ^SSCONF:<ra>
OK

Write Command Syntax: AT^SSCONF=<ra>
Response: OK

Parameter Description:
<ra>
Display recipient address
0	The Multi-Tech wireless modem does not display <ra> and <tora>. These parameters are used with the result codes of AT+CMGL, AT^SMGL, AT+CMGR, AT^SMGR and the URC "+CDS". Default.
1	Multi-Tech wireless modem displays <ra> and <tora>.

12.27   AT^SSDA   Set SMS Display Availability

Description: This command allows to notify the Multi-Tech wireless modem of its controlling application's capability to immediately display incoming SMS on a display.
If the application is able to display incoming short messages, a class 0 message shall be displayed immediately.
However, if it does not, class 0 messages shall be treated as if no message class is determined (GSM 03.38[17]).
The effect of this command if <da>=1 is to determine the behavior of parameter <mt> of AT+CNMI:

Test Command Syntax: AT^SSDA=?
Response: ^SSDA:list of supported <da>s
OK

Read Command Syntax: AT^SSDA?
Response: ^SSDA:<da>
OK

Write Command Syntax: AT^SSDA=<da>
Response: OK

Parameter Description:
<da>
Display Availability
0	Application is not able to display incoming short message. Default.
1	Application is able to display incoming short message.

Note: If the ME operates on different instances (MUX channels 1, 2, 3 or ASC0) avoid different settings for routing and indicating short messages. For example, if messages shall be routed directly to one instance of the TE (set with AT+CNMI, AT^SSDA), it is not possible to activate the presentation of URCs with AT+CMER or AT+CNMI on another instance. Any attempt to activate settings that conflict with existing settings on another interface, will result in CME ERROR, or accordingly CMS ERROR.

12.28 AT^SSMSS   Set Short Message Storage Sequence

Description: The short message storage "MT" (see AT+CPMS) is a logical storage. It consists of two physical storages "ME" and "SM". This command allows to select the sequence of addressing this storage.

Test Command Syntax: AT^SSMSS=?
Response: ^SSMSS: (list of supported) <seq>s

Read Command Syntax: AT^SSMSS?
Response: ^SSMSS: <seq>
                          OK

Write Command Syntax: AT^SSMSS=<seq>
Response: OK

Parameter Description:
  <seq>
    MT sequence
    0   "MT" storage is "ME" then "SM". Default.
    1   "MT" storage is "SM" then "ME"

Note: The <seq> parameter will be stored in non-volatile memory.

Chapter 13 – 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.

13.1 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.

AT+CRSM requires PIN authentication. However, using <command> "READ BINARY" and <command> "READ RECORD" is possible before PIN authentication and if the SIM is blocked (state after three failed PIN authentication attempts) to access the contents of the following Elementary Files:

EF Symbol	EF Name	EF ID (hex.)	EF ID (dec.)
EF$_{ICCID}$	ICC identification	2FE2	12258
EF$_{ELP}$	Extended language preference	2F05	12037
EF$_{LP}$	Language preference	6F05	28421
EF$_{SPN}$	Service provider name	6F46	28486
EF$_{AD}$	Administrative data	6FAD	28589
EF$_{Phase}$	Phase identification	6FAE	28590
EF$_{ECC}$	Emergency call codes	6FB7	28599

Please beware of possible changes to Elementary Files by the network at any time, refer to Chapter 13, SIM-Related Commands.

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

Write Command Syntax: AT+CRSM=<command>[, <fileID>[, <P1>, <P2>, <P3>[, <data>]]]
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).

<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.

13.2 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.

For parameter and SIM result coding please refer GSM 11.11 [23].

However, only the following SIM commands are supported by AT+CSIM: SELECT, STATUS, READ BINARY, UPDATE BINARY, READ RECORD, UPDATE RECORD, SEEK, INCREASE and GET RESPONSE.

The SIM interface design requires that some actions need more than one command, e.g. access to an Elementary File's data requires a prior SELECT command. To ensure that two commands related to the same action are sent to the SIM consecutively, i.e. without being interrupted by other software entities, each SELECT command will be buffered in an internal directory path. Before performing new commands the internal directory path will be checked to enable the retransmission of the buffered SELECT command's (explicit selection).

The directory path can be used to queue up to 20 Files e.g. 19 Dedicated Files (DF's) and 1 Elementary File (EF).

After each AT+CSIM execution the Master File (MF) which acts as a logical root will be selected to guarantee that other software entities are not affected.

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

Write Command Syntax: AT+CSIM=<length>, <command>
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.

<response>
Response data of the command returned by the SIM.

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
```

13.3 AT^SXSM   Extended SIM Access

Description: AT^SXSM extends AT+CRSM with additional SIM commands.
All parameters of AT^SXSM are used as specified by GSM 11.11. The Multi-Tech wireless modem handles internally all required SIM interface locking and file selection routines.
The Multi-Tech wireless modem may return error result code "+CME ERROR" if the command cannot be passed to the SIM; e.g., if no SIM is inserted. However, errors related to SIM action are reported in <sw1> and <sw2> parameters as defined in GSM 11.11.

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

Write Command Syntax: AT^SXSM=<command>[, <fileID>[, <P1>, <P2>, <P3>[, <data>]]]
Response: ^SXSM: <sw1>, <sw2>[,<response>]
OK
ERROR
+CME ERROR: <err>

Parameter Descriptions:

<command>
  136   RUN GSM ALGORITHM
               Start the authentication mechanism and cipher key generation on the SIM. It runs the algorithms A3 and A8 using a 16 byte random number and the subscriber authentication key Ki, which is stored in the SIM.

<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.

<data>
  If <command>=136 (RUN GSM ALGORITHM):
  16 byte random number.

<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 in case of a successful completion of the previously issued SIM command.

  If <command>=136 (RUN GSM ALGORITHM):
  The Multi-Tech wireless modem returns SRES and cipher key Kc as calculated by the SIM.

Byte(s)	Description	Length
1 - 4	SRES - Signed Response	4
5 - 12	Kc - Cipher Key	8

Example:
Use <command>=136 (RUN GSM ALGORITHM) to obtain SRES and cipher key Kc values as calculated by the SIM.

at^sxsm=136,,0,0,16,"0011223 3445566778899AABBCCDDEEFF"	Start SIM command "RUN GSM ALGORITHM" with 16 byte random number.
^SXSM: 144,0,00112233445566778899AA BB OK	SRES (bytes 1-4) and Cypher Key Kc (bytes 5-12) values as returned by the SIM.

13.4 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 query can be used for the locally attached and remote SIM's as well. For details regarding Remote SIM Access refer to AT^SRSA.

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 or may be saved in the user profile (AT&W).

Test Command Syntax: AT^SCKS=?
Response: ^SCKS:(list of supported <mode>s)
OK

Read Command Syntax: AT^SCKS?
Response: ^SCKS: <mode>, <SimStatus>
OK
ERROR
+CME ERROR: <err>

Write Command Style: AT^SCKS=<mode>
Response: OK
ERROR
+CME ERROR: <err>

Parameter Descriptions:
  <mode>
  0   Suppress unsolicited result codes. Default.
  1   Output unsolicited result codes
  <SimStatus>
  0   Card holder tray removed or SIM connection error
  1   SIM inserted(refer to note)
  2   The SIM interface HW has been deactivated to prevent possible damage (e.g., if a SIM with invalid or unsupported electrical specifications has been detected).
The SIM interface can be reactivated only with a restart of the module; e.g., with "AT+CFUN= n,1".
If the Remote SIM Access feature is activated (refer to AT^SRSA) and a SIM card error occurs while accessing the remote SIM, the MC75 switches to its local SIM, if any. If the SIM card error occurs while local SIM access, use of the remote SIM is still possible.

Unsolicited Result Code:
  ^SCKS: <SimStatus>   During startup, and if the Multi-Tech wireless modem's SIM connection status has changed an unsolicited result code (URC) is issued.

Note: <SimStatus> reflects the status of the SIM and the cardholder tray. Therefore, if an empty SIM card tray is inserted, two URCs will be presented, indicating status 1 followed by 0; i.e., a SIM is inserted into the cardholder tray but no SIM connection could be established.

Example:

AT^SCKS=1	Activates the presentation of unsolicited result codes
OK	

Now, after inserting an empty card tray, the following URCs appear:

^SCKS: 1	Tray connected
^SCKS: 0	No SIM card found

13.5   AT^SSET   Indicate SIM Data Ready

Description: After power-up and personalization (PIN entry if required) the ME starts reading data from SIM. The AT^SSET command controls the presentation of the "^SSIM READY" URC that indicates on the corresponding serial channel when the ME has finished reading SIM data. See Section 20.1, Restricted Access to SIM Data after SIM Authentication.

Test Command Syntax: AT^SSET=?
Response(s):   ^SSET: (list of supported <n>s)
OK

Read Command Syntax: AT^SSET?
Response(s):   ^SSET: <n>
OK
ERROR
+CME ERROR: <err>

Write Command Syntax: AT^SSET=[<n>]
Response(s):   OK
ERROR
+CME ERROR: <err>

Unsolicited Result Code:
  ^SSIM READY   The URC acknowledges to the user that SIM data is accessible.

Parameter Description:
<n>
   URC presentation mode
   0   Disable URC "^SSIM READY" indication. Default.
   1   Enable URC "^SSIM READY" indication.

13.6   AT^SCID   Display SIM Card Identification Number

Description: TA returns the card identification number in SIM (SIM file EF_{ICCID}) as string type.

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

Exec Command Syntax: AT^SCID
Response: ^SCID: <cid>
OK
ERROR
+CME ERROR: <err>

Parameter Description:
  <cid>   Card identification number of SIM card.

13.7   AT+CXXCID   Display SIM Card Identification Number

Description: TA returns the card identification number in SIM (SIM file EF_{ICCID}) as string type. This is the same command as AT^SCID.

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

Exec Command Syntax: AT+CXXCID
Response: +CXXCID: <cid>
OK
ERROR
+CME ERROR: <err>

Chapter 14 – 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 MC75 and the SIM Application running on the SIM:

- Proactive commands are sent from the SIM application to the EDGE modem's SAT, such as "DISPLAY TEXT".
- Envelope Commands are sent from the EDGE modem's SAT to the SIM Application, such as "MENU SELECTION".

14.1 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.

Test Command Syntax: AT^SSTA=?
Response: ^SSTA:(list of supported <state>s), (list of supported <Alphabet>s)
OK

Read Command Syntax: AT^SSTA?
Response: ^SSTA: <state>, <Alphabet>, <allowedInstance>, <SatProfile>
OK

Write Command Syntax: AT^SSTA=<mode>[, <Alphabet>]
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>

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	SAT is already used on another instance. Only test and read commands can be used.
1	SAT may be started on this instance via the write version of this command.

<SatProfile>
SAT profile according to GSM 11.14. The profile tells the SIM Application which features (e.g., proactive commands) are supported by the SIM Application Toolkit implementation of the Multi-Tech wireless modem.

<mode>

1	Activate Remote-SAT

14.2 ^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.

14.3   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.

Test Command Syntax: AT^SSTGI=?
Response: ^SSTGI:(list of supported <state>s), (list of supported <cmdType>s)
OK

Read Command Syntax: AT^SSTGI?
Response: ^SSTGI: <state>, <cmdType>
OK

Write Command Syntax: AT^SSTGI=<cmdType>
Response: OK

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

14.4   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.

Test Command Syntax: AT^SSTR=?
Response: ^SSTR:(list of supported <state>s), (list of supported <cmdType>s)
OK

Read Command Syntax: AT^SSTR?
Response: ^SSTR: <state>, <cmdType>
OK

Write Command Syntax: AT^SSTR=<cmdType>, <status>[, <inputNumber>][, <inputString>]
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 15 – 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).

15.1   Sort Order for Phonebooks

Due to the support of UCS2 for the <text> part of phonebook entries, the sort order for phonebook records follows the algorithm published as Unicode Technical Standard #10, "Unicode Collation Algorithm".

A memory-optimized version of the proposed collation tables "[AllKeys]" from Unicode Technical Standard #10 is used in order to determine collation weights for Code points between 0000 and 06FF, and composed keys are used for Code points from ranges 0700 to 33FF, A000 to D7FF and E000 to FFFD. Code Points not referenced in these tables will be assigned a default collation weight with their unicode value as level 1 weight. Decomposition is not supported.

Phonebook entries whose names contain only characters from the GSM07.07 default alphabet are converted internally into their UCS2 equivalents in order to achieve consistent sorting results.

For the user, this means that:

- Punctuation marks and other non-alphabetical characters from the common Latin-based character sets, and from the standard GSM character set, will be sorted before any alphabetical characters. The ordering in which these marks appear as compared to other non-alphabetical characters from the same group is determined by their collation weights and does not reflect their code values in the UCS2 or GSM alphabet tables above. Please refer to www.unicode.org for detail.
- Alphabetical characters from the common Latin-based character sets, and from the standard GSM character set, will be sorted according to their underlying base characters, plus the collation weights of their accent signs.
- Only collation levels 1 and 2 are regarded, so sorting is not case-sensitive.
  Example: the European letters "Å" (GSM 0EH, UCS2 00C5h), "æ" (GSM 1DH, UCS2 00E6h), "ç" (GSM09h, UCS2 00E7h), "a" (GSM 61H, UCS2 0061h) and "b" (GSM 62H, UCS2 0062h) will be sorted in order "a", "Å", "æ" "b","ç" although their numerical values in GSM and UCS2 suggest a different ordering.

15.2 AT+CNUM   Read Own Numbers

Description: AT+CNUM returns the subscribers own number(s) from the SIM.

Test Command Syntax: AT+CNUM=?
Response(s):   OK
Exec Command Syntax: AT+CNUM
Response(s):   [+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>.

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.

15.3 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.

Test Command Syntax: AT+CPBR=?
Response: +CPBR: (1-<maxloc>), <nlength>, <tlength>
                         OK
                         +CME ERROR
Write Command Syntax: AT+CPBR=<location1>[, <location2>]

Response: [+CPBR: <location1>, <number>, <type>, <text>]
                         [+CPBR: <location2>, <number>, <type>, <text>]
                         OK
                         +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".
    Note: The maximum value of <location2> is 255, regardless of the phonebook type and its range indicated by <maxloc>. If a value greater than 255 is used the query returns no phonebook records, and only "+CME ERROR: invalid index" is shown.

  <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:

145	Dialing string <number> includes international access code character '+'
161	National number. Network support of this type is optional.
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 1.5, 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.

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.

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"	

15.4 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.

Test Command Syntax: AT+CPBS=?
Response: +CPBS: (list of supported <storage>s)
OK
+CME ERROR

Read Command Syntax: AT+CPBS?
Response: +CPBS: <storage>, <used>, <total>
OK
+CME ERROR

Write Command Syntax: AT+CPBS=<storage>
Response: OK
+CME ERROR:

Parameter Descriptions:

  <storage>(str)

"FD"	**Fixed Dialing Phonebook** Capacity: depends on SIM card; Location: SIM
"SM"	**SIM Phonebook. Default.** Capacity: depends on SIM card; Location: SIM
"ON"	**MSISDN List** Capacity: depends on SIM card; Location: SIM
"ME"	**Mobile Equipment Phonebook** Capacity: max. 250 entries; Location: ME
"LD"	**Last Number Dialed Phonebook** Last number dialed phonebook. Stores all voice call numbers dialed with ATD, but no data call numbers. Capacity: max. 10 entries Location: ME AT+CPBW command is not applicable to this storage. The LD list can be deleted with AT^SDLD or with AT^SPBD.
"MC"	**Missed (unanswered received) Calls List** AT+CPBW command is not applicable to this storage. The MC list can be deleted with AT^SPBD. Capacity: max. 10 entries; Location: ME
"RC"	**Received Calls List** AT+CPBW command is not applicable to this storage. The RC list can be deleted with AT^SPBD. Capacity: max. 10 entries; Location: ME
"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. See Section 20.1, Restricted Access to SIM Data after SIM PIN Authentication.
- If the SIM card is changed, all records of the "MC", "RC" and "LD" phonebooks stored on the ME will be deleted automatically. If the same SIM is removed and reinserted, no automatic deletion is performed. Calls made after last switch-on will be lost from "MC", "RC" and "LD" phonebook, if the SIM is removed and reinserted during normal operation.

- The following call history rule applies to the phonebook types "LD", "MC" and "RC": When the same number is dialed several times in direct succession the "LD" phonebook will store one single entry. When dialed several times, but in a row with different numbers, the same number will be logged each time after dialing, resulting in double or multiple "LD" phonebook entries related to this number.
  Likewise, the "MC" or "RC" phonebook will store only a single entry when calls from the same number are received in direct succession, and double or multiple entries when calls from the same number are received several times, but amongst other incoming calls from different numbers.

15.5 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.

Test Command Syntax: AT+CPBW=?
Response: +CPBW: (1-<maxloc>), <nlength>, (list of supported <type>s), <tlength>
OK
ERROR
+CME ERROR

Write Command Syntax: AT+CPBW=[<location>][, <number>[[, <type>][, <text>]]]
Response: OK
ERROR
+CME ERROR

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:

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 1.5, 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 260: INVALID DIAL STRING.

<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.

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"

15.6 AT^SPBW   Write into Phonebook with Location Report

Description: The AT^SPBW write command can be used to create, edit and delete a phonebook entry at a <location> of the active storage selected with AT+CPBS. After having written the phonebook entry <location> is shown.

If <storage>="FD" (SIM fixed dialing numbers) is selected, PIN2 authentication has to be performed prior to any write access.

The AT^SPBW 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.

Note: The length may not be available while SIM storage is selected. If storage does not offer format information, the format list contains empty parenthesizes.

Test Command Syntax: AT^SPBW=?
Response: ^SPBW: (1-<maxloc>), <nlength>, (list of supported <type>s), <tlength>
OK
ERROR
+CME ERROR

Write Command Syntax: AT^SPBW=[<location>][, <number>[[, <type>][, <text>]]]
Response: ^SPBW: <location>
OK
ERROR
+CME ERROR

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:
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 1.5, 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 260: INVALID DIAL STRING.

<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.

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 further detail.

Examples

Example 1
Make a new phonebook entry at the first free location (here location 3)
```
AT^SPBW=,"+431234567",145,"international"
^SPBW: 3
```

Example 2
Delete entry at location 3
AT^SPBW=3

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^SPBW=5,"12345678",,"Arthur"
^SPBW: 5
AT^SPBW=6,"432!+-765()&54*654#",,"John"
^SPBW: 6
AT^SPBW=7,"432!+-765()&54*654#",129,"Eve"
^SPBW: 7
AT^SPBW=8,"432!+-765()&54*654#",145,"Tom"
^SPBW: 8
AT^SPBW=9,"432!+-765()&54*654#",209,"Richard"
^SPBW: 9
```

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"
```

15.7 AT^SDLD   Delete the 'Last Number Redial' Memory

Description: AT^SDLD deletes all numbers stored in the "LD" memory.

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

Exec Command Syntax: AT^SDLD
Response: OK
        ERROR
        +CME ERROR: <err>

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.

15.8   AT^SPBC   Find First Matching Entry in Sorted Phonebook

Description: The **write command** searches the current phonebook for the index number of the first (lowest) entry that matches the character specified with <schar>. The AT^SPBC test command returns the list of phonebooks which can be searched through with AT^SPBC.

CAUTION: Please note that AT^SPBC is assigned the same index as AT^SPBG or AT^SPBS which is not identical with the physical location numbers used in the various phonebooks. Therefore, do not use the index numbers retrieved with AT^SPBC to dial out or modify phonebook entries.

Test Command Syntax: AT^SPBC=?
Response: ^SPBC: "FD","SM","ME"
OK
ERROR
+CME ERROR

Write Command Syntax: AT^SPBC=<schar>
Response: ^spbc: <index>
OK
ERROR
+CME ERROR

Parameter Description:
  <schar>
    First character of the entry to be searched in the sorted list of phonebook entries.
  <index>
    In the active phonebook, the first (lowest) index number of an entry beginning with <schar>. As stated above, the retrieved index number shall not be used to dial out or edit phonebook entries. If no matching phonebook entry is found, <index>=0 will be returned.

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.

15.9 AT^SPBD Purge Phonebook Memory Storage

Description: AT^SPBD can be used to purge the selected phonebook <storage> manually, i.e. all entries stored in the selected phonebook storage will be deleted. CAUTION! The operation cannot be stopped nor reversed! The AT^SPBD test command returns the list of phonebooks which can be deleted with AT^SPBD.

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

Test Command Syntax: AT^SPBD=?
Response: ^SPBD: list of supported <storage>s
OK
+CME ERROR

Write Command Syntax: AT^SPBD=<storage>
Response: OK
+CME ERROR

Parameter Description:

<storage>
If test command: List of phonebooks which can be deleted by AT^SPBD.
If write command: Phonebook to be deleted.
For a detailed description of storages see AT+CPBS.
"LD"   Last number dialed phonebook
"MC"   Missed (unanswered received) calls list
"RC"   Received calls list

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.

15.10 AT^SPBG   Display Phonebook Entries in Alphabetical Order

Description: AT^SPBG sorts the entries of the current phonebook in alphabetical order by name (the first six characters matter). The sort order is described in Section 15.1, Sort Order for Phonebooks. There are two ways to use AT^SPBG:

- If the optional parameter <RealLocReq> equals 0 or is omitted, the sorted entries will be sequentially numbered. As these numbers are not identical with the location numbers stored in the various phonebooks, AT^SPBG can be used for reading only. For example, it helps you find entries starting with matching characters. Do not use the serial numbers to dial out or modify entries.
- If parameter <RealLocReq>=1 is given by the **write command**, the response parameter <location> additionally appended to each entry indicates the actual location number. This number can be used for editing with AT+CPBW or dialing with ATD><mem><n>. The first index number of each entry is only the serial number of the sorted list.

Before using the **write command,** it is recommended to query the number of records currently stored in the active phonebook (refer to test command <used>). The **test command** also includes the <nlength> and <tlength>. Note that if SIM storage is selected, the length may not be available. If storage does not offer format information, the format list shows empty parentheses.

Test Command Syntax: AT^SPBG=?
Response: ^SPBG: (1-<used>), <nlength>, <tlength>
OK
ERROR
+CME ERROR

Write Command Syntax: AT^SPBG=<index1>[, <index2>][, <RealLocReq>]
Response: [^SPBG: <index1>, <number>, <type>, <text>[, <location>]]
[^SPBG: <index2>, <number>, <type>, <text>[, <location>]]
OK
ERROR
+CME ERROR

Parameter Description:

<index1>
First index number in the sorted list where reading starts. See the test command response for supported range.
If <index 1> exceeds the upper bound <used>, "+CME ERROR: "invalid index" will be returned.

<index2>
Last index number in the sorted list where to stop reading. See the test command response for supported range.
If <index2> is not given via write command, only the entry located at <index1> will be displayed.
If both <index1> and <index2> are in the range indicated by the test command parameter <used>, the list of entries will be output and terminated with OK.
If <index2> exceeds the range indicated by the test command parameter <used>, the list of entries will be output but terminated with a "+CME ERROR: "invalid index".
Note: The maximum value of <index2> is 255, regardless of the phonebook type and its range indicated by the parameter <used>. If a value greater than 255 is used the query returns no phonebook records, and only "+CME ERROR: invalid index" is shown.

<RealLocReq>
Is a display of the "real" <location> of the entry required?
0   Do not show an entry's "real" location number. Parameter <location> will not be displayed. Default.
1   Show the "real" location number as parameter <location> at the end of each entry.

<number>
String type phone number in format specified by <type>.
The number parameter may be an empty string.

<type>
Type of address octet that defines the type of number (ton) and the numbering plan identification (npi) used.
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 AT+CPBW <type>. Possible values are:
145   Dialing string <number> includes international access code character '+'
161   National number. Network support of this type is optional.
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 the phone number. The maximum length for this parameter is given in test command response <tlength>.

<used>
Value indicating the number of used locations in selected memory storage.

<location>
The location within phonebook memory at which the corresponding entry is located.
This location may be used for other commands (e.g., AT+CPBR or ATD><mem><n>)

<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. Please refer to AT command AT+CPBW for detail.

<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 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:
- The command can be used for the phonebooks "SM", "FD", "ME" (cf. AT+CPBS).
- 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.

Examples:
Example 1 – Using AT^SPBG without <RealLocReq>:
The numbers at the beginning of each line are not the memory locations in the phonebook, but only serial numbers assigned to the entries' positions in the alphabetical list.

AT^SPBG=?	First run the AT^SPBG test command to find out the range of entries stored in the current phonebook.
^SPBG: (1-33),20,17	TA returns the range, where 33 is the number of entries stored in the current phonebook.
AT^SPBG=1,33	Now, enter the write command. To obtain best results it is recommended to query the full range of entries. TA returns phonebook entries in alphabetical order.
^SPBG:1,"+999999",145,"Arthur" ^SPBG:2,"+777777",145,"Bill" ^SPBG:3,"+888888",145,"Charlie"	

Example 2 – Using AT^SPBG with <RealLocReq>:

AT^SPBG=?	First run the AT^SPBG test command to find out the range of entries stored in the current phonebook.
^SPBG: (1-33),20,17	TA returns the range, where 33 is the number of entries stored in the current phonebook.
AT^SPBG=1,33,1	Now, enter the write command including parameter <RealLocReq>=1 to get the actual location numbers.
^SPBG:1,"+999999",145,"Arthur",27 ^SPBG:2,"+777777",145,"Bill",6 ^SPBG:3,"+888888",145,"Charlie",15	

The numbers at the end of each line are the memory locations in the phonebook and can be used for dialing or editing phonebook entries:

AT+CPBR=27 +CPBR: 27,"+999999",145,"Arthur"	Read out phonebook location 27. This entry can be edited with AT+CPBW or used for dialing with ATD><mem><n>.

15.11 AT^SPBS   Step Through the Selected Phonebook Alphabetically

Description: AT^SPBS can be used to scroll sequentially through the active phonebook records in alphabetical order by name. Three entries will be displayed at a time.

Every time the **write command** is executed, 3 rows of phonebook records are returned. Each triplet overlaps with the next one. The actual index depends on parameter <value>. This parameter determines whether the index will be increased or decreased. If the index in one output line reaches the last index in the alphabetical list, the next output line will display the first list entry. After the last record of the phonebook has been reached (see parameter AT^SPBG <used>), the <internal-counter> switches over to the first.

There are two ways to use AT^SPBS:
- If the optional parameter <RealLocReq> is omitted or (0) the sorted entries will be sequentially numbered. As these numbers are not identical with the location numbers stored in the various phonebooks AT^SPBS can be used for reading only. For example, it helps you find entries starting with matching characters. Do not use the serial numbers to dial out or modify entries.
- If parameter <RealLocReq>=1 is given by the write command, the response parameter <location> additionally appended to each entry indicates the actual location number. This number can be used for editing with AT+CPBW or dialing with ATD><mem><n>. The first index number of each entry is only the serial number of the sorted list.

Test Command Syntax: AT^SPBS=?
Response: ^SPBS: (list of supported <value>)
OK

Write Command Syntax: AT^SPBS=<value>[, <RealLocReq>]
Response: ^SPBS: <index-a>, <number>, <type>, <text>[, <location>]
^SPBS: <index-b>, <number>, <type>, <text>[, <location>]
^SPBS: <index-c>, <number>, <type>, <text>[, <location>]
OK
+CME ERROR

Parameter Description:

<value>
1   To make a step forward in the alphabetically sorted phonebook.
2   To make a step backward in the alphabetically sorted phonebook.

<index-a>
1...maxindex   The index in the sorted list of phonebook entries that identifies the first entry displayed.
The value of <index-a> is determined by the value of the <internalcounter> and by <value>.
After a write command has terminated successfully with "OK", the value from <index-a> is saved and retained as the new <internalcounter> value.
Note: After the last record in the phonebook, the first entry follows.

<index-b>
1...maxindex   The index in the sorted list of phonebook entries that identifies the second entry displayed.
<index-b>= (<index-a>+1).
Note: After the last record in the phonebook, the first entry follows.

<index-c>
1...maxindex   The index in the sorted list of phonebook entries that identifies the third entry displayed.
<index-c>= (<index-b>+1).
Note: After the last record in the phonebook, the first entry follows.

<number>
String type phone number in format specified by <type>.
The number parameter may be an empty string.

<type>
Type of address octet that defines the type of number (ton) and the numbering plan identification (npi) used.
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 <type> of AT+CPBW. Possible values are:
145   Dialing string <number> includes international access code character '+'
161   National number. Network support of this type is optional.
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 the phone number.

<RealLocReq>
Is a display of the "real" <location> of the entry required?

0	Do not show an entry's "real" location number. Parameter <location> will not be displayed. Default.
1	Show the "real" location number as parameter <location> at the end of the entry

<location>
The location within the phonebook memory at which the corresponding entry is located.
This location may be used for other phonebook commands (e.g., AT+CPBR, AT+CPBW, ATD><mem><n>).

<internal-counter>

0...maxindex	This parameter is only an internal parameter and cannot modified directly. Default = 0. The internal counter will be reset to index 0 after a call to ATZ or AT&F.

Notes:
- The complete list of sorted entries can be retrieved using AT command AT^SPBG.
- The command can be used for the phonebooks "SM", "FD", "ME" (cf. AT+CPBS).
- 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.

Examples

Example 1 – This example illustrates how to search down and up again using AT^SPBS=1 and 2:

at&f	First, AT&F is issued to make sure that AT^SPBS=1 starts from the first character in alphabetical order.
OK	
at^spbs=1	
^SPBS:1,"+999999",145,"Arthur"	
^SPBS:2,"+777777",145,"Bill"	
^SPBS:3,"+888888",145,"Charlie"	
OK	
at^spbs=1	
^SPBS:2,"+777777",145,"Bill"	
^SPBS:3,"+888888",145,"Charlie"	
^SPBS:4,"0304444444",129,"Esther"	
OK	
at^spbs=1	
^SPBS:3,"+888888",145,"Charlie"	
^SPBS:4,"0304444444",129,"Esther"	
^SPBS:5,"03033333333",129,"Harry"	
OK	
at^spbs=2	
^SPBS:2,"+777777",145,"Bill"	
^SPBS:3,"+888888",145,"Charlie"	
^SPBS:4,"0304444444",129,"Esther"	
OK	

Example 2 – This example shows that when the last index in the sorted list has been reached, the internal counter overflows to the first index.

at&f	Reset internal counter to 0.
OK	
at^spbs=2	Step down one entry starting from (internal counter)=0 - overflow occurs.
^SPBS:33,"+49301234567",145,"TomTailor"	
^SPBS:1,"+999999",145,"Arthur"	
^SPBS:2,"+777777",145,"Bill"	
OK	

Example 3 – Using AT^SPBS with <RealLocReq>=1 in order to obtain the entries' location numbers:

at^spbs=1,1	
^SPBS:1,"+999999",145,"Arthur",27	
^SPBS:2,"+777777",145,"Bill",6	
^SPBS:3,"+888888",145,"Charlie",15	

The numbers at the end of each line are the memory locations in the phonebook and can be used for dialing or editing phonebook entries:

at+cpbr=27	Read out phonebook location 27.
+CPBR: 27,"+999999",145,"Arthur"	His entry can be edited with AT+CPBW or used for dialing with ATD><mem><n>.

Chapter 16 – Audio Commands

The AT Commands described in this chapter are related to the Multi-Tech wireless modem's audio interface.

16.1 Audio Programming Model

The following figure illustrates how the signal path can be adjusted with the parameters <inCalibrate>, <inBbcGain>, <outBbcGain>, <outCalibrate> and <sideTone>, as well as <io>, <mic> and <ep>.
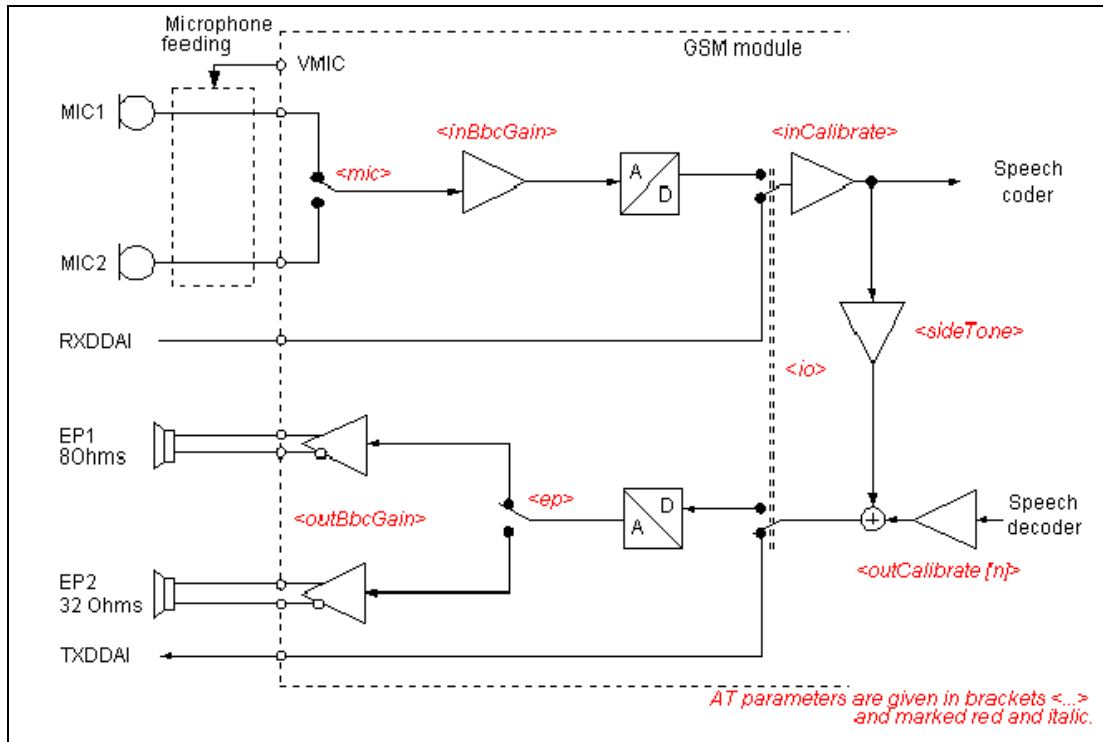
Figure 16.1: Audio programming model

16.2 ATL   Set Monitor Speaker Loudness

Description: ATL is implemented for V.250ter compatibility reasons only and has no effect.
Exec Command Syntax: ATL[<val>]
Response: OK
Parameter Description:
    <val>

16.3 ATM   Set Monitor Speaker Mode

Description: ATL is implemented for V.250ter compatibility reasons only and has no effect.
Exec Command Syntax: ATM[<val>]
Response: OK
Parameter Description:
    <val>

16.4 AT+CLVL   Loudspeaker Volume Level

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

Read Command Syntax:	AT+CLVL?
Response:	+CLVL: <level>
	OK
	ERROR
	+CME ERROR: <err>

Write Command Syntax:	AT+CLVL=<level>
Response:	OK
	ERROR
	+CME ERROR: <err>

Parameter Description:

<level>
Loudspeaker Volume Level
0...4 Default = 4

Notes:
- The write command can only be used in audio mode 2 - 6.
- The values of the volume steps are specified with the parameters <outCalibrate>[0],...<outCalibrate>[4] of the AT^SNFO command.
- As an alternative to AT+CLVL, you can use AT^SNFO and AT^SNFV. The parameter <level> is identical with <outStep> used by both commands.
- Any change to <level> (or <outStep>) takes effect in audio modes 2 to 6. That is, when you change <level> (or <outStep>) and then select another mode with AT^SNFS, the same step will be applied.
  The only exception is audio mode 1 which is fixed to <level>=4 (or accordingly <outStep>=4).
- <level> (or <outStep>) is stored non-volatile when the ME is powered down with AT^SMSO or reset with AT+CFUN=1,1.

16.5 AT+CMUT   Mute Control

Description:	The AT+CMUT command mutes the microphone input. The command can be used in all audio modes (1 to 6) and during a voice call only. See AT^SNFS for more details on the various audio modes. As alternative, you can use the AT^SNFM command.
During an active call, users should be aware that when they switch back and forth between different audio modes (for example handsfree on/off) the value of <mute> does not change; i.e., the microphone mode is retained until explicitly changed.

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

Read Command Syntax:	AT+CMUT?
Response:	+CMUT: <mute>
	OK
	ERROR
	+CME ERROR: <err>

Write Command Syntax:	AT+CMUT=<mute>
Response:	OK
	ERROR
	+CME ERROR: <err>

Parameter Description:

<mute>
0   Mute off. Default.
1   Mute on

16.6   AT+VTD   Tone Duration

Description: This command refers to an integer <duration> that defines the length of tones transmitted with the AT+VTS command.

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

Read Command Syntax: AT+VTD?
Response: <duration>
                          OK

Write Command Syntax: AT+VTD=<duration>
Response: OK

Parameter Description:
  <duration>
    Duration of the DTMF signal in 1/10 seconds with tolerance.
    The minimum duration of DTMF signals is 300ms.
    1...255 Default = 1

16.7   AT+VTS   DTMF and Tone Generation

Description: AT+VTS is intended to send ASCII characters or strings which cause the Mobile Switching Center (MSC) to transmit DTMF tones to a remote subscriber. The command can only be used during active voice calls and offers the following variants:
  - AT+VTS=<dtmfString> allows to send a sequence of DTMF tones with a duration defined with AT+VTD.
  - AT+VTS=<dtmf>[,<duration>] allows to send a single DTMF tone. In this case, the duration can be individually determined during the call.

Test Command Syntax: AT+VTS=?
Response: +VTS: (list of supported<dtmf>s), (list of supported<duration>s)
                          OK

Write Command Syntax: AT+VTS=<dtmfString>
Response: OK

Write Command Syntax: AT+VTS=<dtmf>[, <duration>]
Response: OK

Parameter Description:

  <dtmfString>   String of ASCII characters in the set 0-9,#,*,A, B, C, D. Maximal length of the string is 29. The string must be enclosed in quotation marks ("...").

  <dtmf>   ASCII character in the set 0...9,#,*, A, B, C, D.

  <duration>   Tone duration in 1/10 second. If not specified current setting of AT+VTD is used.
                          1...255

16.8 AT^SAIC Audio Interface Configuration

Description: AT^SAIC configures the interface connections of the active audio mode. The **write command** is usable in audio modes 2 to 6 only.

If AT^SNFS=1, any attempt to use the AT^SAIC write command is rejected with and returns an error response. This is because all default parameters in audio mode 1 are determined for type approval and are not adjustable.

To allocate a specific audio mode to one of the audio interfaces, first select the audio mode with AT^SNFS and then choose the interface using AT^SAIC.

Important Note: Multi-Tech supports only the following setting: AT^SAIC=2,1,1

Test Command Syntax: AT^SAIC=?
Response: ^SAIC:(list of supported <io>s), (list of supported<mic>s), (list of supported<ep>s), (list of supported<clock>s), (list of supported<mode>s), (list of supported<frame_mode>s)
OK

Read Command Syntax: AT^SAIC?
Response: ^SAIC: <io>, <mic>, <ep>, <clock>, <mode>, <frame_mode>
OK

Write Command Syntax: AT^SAIC=<io>[, <mic>[, <ep>][, <clock>, <mode>, <frame_mode>]]
Response: OK
ERROR
+CME ERROR: operation not allowed

Parameter Description:

<io>	**Input and output selection**
1	Digital input and output
2	Analog input and output

<mic>	**Microphone selection**
1	Microphone 1
2	Microphone 2

<ep>	**Select differential earpiece amplifier**
1	Selects the earpiece amplifier 1

<clock>	**Parameter is mandatory if <io>=1 (digital).**
0	256kHz clock
1	512kHz clock

<mode>	**Parameter is mandatory if <io>=1 (digital).**
0	Master mode
1	Slave mode

<frame_mode>	**Parameter is mandatory if <io>=1 (digital).**
0	Short frame
1	Long frame

Notes:
- The factory defaults of AT^SAIC vary with the selected audio mode.
  If AT^SNFS=1 or 4 or 5, then AT^SAIC=2,1,1.
  If AT^SNFS=2 or 3 or 6, then AT^SAIC=2,2,2.
  AT^SNFD can be used to reset the factory defaults.
- For use after restart of the ME, you are advised to store the settings of AT^SAIC and AT^SNFS to the audio profile saved with AT^SNFW. Otherwise, audio mode 1 (AT^SNFS=1) and audio interface 2 (AT^SAIC=2,1,1,0,0,0) will be active each time the ME is powered up.
- The parameters <clock>, <mode> and <frame_mode> are mandatory, if parameter <io> is set to 1 (digital). These parameters can be used to configure the PCM functionality over the digital audio interface (DAI). The PCM interface supports master or slave mode, short frame or long frame synchronization and 256 kHz or 512 kHz bit clock frequency. In slave mode the clock frequency setting has no influence, because of the BCLKIN signal being directly used for data shifting. The setting may therefore be either 0 or 1. The table below lists possible configuration combinations.
- Only audio interface 1 is supported. Always use AT^SAIC=1.

Configuration	<clock>	<mode>	<framemode>
Master, 256kHz, short frame	0	0	0
Master, 256kHz, long frame	0	0	1
Master, 512kHz, short frame	1	0	0
Master, 512kHz, long frame	1	0	1
Slave, 256kHz, short frame	0 or 1	1	0
Slave, 256kHz, long frame	0 or 1	1	1
Slave, 512kHz, short frame	0 or 1	1	0
Slave, 512kHz, long frame	0 or 1	1	1

16.9   AT^SNFA   Set or Query of Microphone Attenuation

Description: AT^SNFA specifies the large-scale attenuation on the microphone path of the audio device currently selected with AT^SNFS. The write command is only available in audio modes 2 to 6.

Test Command: AT^SNFA=?
Response: ^SNFA: (list of supported <atten>s)
OK

Read Command: AT^SNFA?
Response: ^SNFA: <atten>
OK

Write Command: AT^SNFA=<atten>
Response: OK
ERROR
CME ERROR: <err>

Parameter Description:

<atten>
Multiplication factor for input samples. Parameter <atten> is identical with <inCalibrate> of AT^SNFI.
Formula used to calculate microphone attenuation (negative gain):
Gain in dB = 20 * log(<atten>/32768)

0.....65535   Default = 32767

0   Microphone is muted.
Please note that AT^SNFA cannot be used to mute the microphone. Therefore, any attempt to enter 0 will be rejected and an error response will be given. Value 0 is returned only by the read command AT^SNFA? after the microphone was muted with AT^SNFM=0 during an active call.

32767   No attenuation on the microphone path.
Values greater than 32767 will be suppressed to 32767.

Notes:
- This command is provided for compatibility with former products and is a subset of AT^SNFI. The parameter <inCalibrate> of AT^SNFI is identical with <atten> of AT^SNFA.
- To make the changes persistent use AT^SNFW.

Example:
```
^SYSSTART
at^snfa=?
^SNFA: (0-65535)
OK
at^snfa?
^SNFA: 32767
OK
at^snfs=4
OK
at^snfa=1
OK
at^snfa?
^SNFA: 1
OK
at^snfi?
^SNFI: 5,1
OK
at^snfi=5,45
OK
at^snfa?
^SNFA: 45
OK
```

16.10 AT^SNFD Set Audio Parameters to Manufacturer Default Values

Description: AT^SNFD sets the active audio parameters to manufacturer defined default values. These default values can be changed and stored by the user and also by download with a new set of parameters.
The restored values are:
> AT^SNFA: <atten>
> AT^SNFI: <inBbcGain>, <inCalibrate>
> AT^SNFO: <outBbcGain>, <outCalibrate>[0 to 4], <sideTone>
> AT^SAIC: <io>, <mic>, <ep>
> AT^SNFS: <audMode>

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

Exec Command Syntax: AT^SNFD
Response: OK

Note:
> Remember that the factory set audio mode 1 is fixed to <outStep>=4. Consequently, AT^SNFD restores <audMode> together with <outStep>=4, but does not affect the values of <outStep> currently selected in audio modes 2 - 6. This means, if <audMode>=1, the read commands AT^SNFO, AT^SNFV and AT+CLVL will always deliver <outStep>=4. In all other modes the <outStep> value is retained until explicitly changed.

16.11 AT^SNFI Set Microphone Path Parameters

Description: AT^SNFI controls the microphone path amplification. Read and write options of this command refer to the active audio mode. The write command works only in audio modes 2 to 6.

Test Command Syntax: AT^SNFI=?
Response: ^SNFI: (list of supported <inBbcGain>s) , (list of supported <inCalibrate>s)
OK

Read Command Syntax: AT^SNFI?
Response: ^SNFI: <inBbcGain>, <inCalibrate>
OK

Write Command Syntax: AT^SNFI=<inBbcGain>, <inCalibrate>
Response: OK

Parameter Descriptions:

<inBbcGain>
> ADC gain adjustable in eight 6 dB steps from 0 dB to 42 dB (0=0dB, 7=42dB, 8 steps of 6 dB).
> 0...7

<inCalibrate>
> Multiplication factor for input samples. Formula to calculate the negative gain (attenuation) of the input signal:
> Gain in dB = 20 * log (inCalibrate / 32768)
> 0...32767

Notes:
- The range of <inCalibrate> is up to 65535 but will be suppressed to 32767. Values above <inCalibrate>= 65535 will cause a failure.
- The parameter <inCalibrate> of AT^SNFI is identical with <atten> of AT^SNFA.
- For use after restart, changed values can be stored with AT^SNFW.
- Attention! When you adjust audio parameters avoid exceeding the maximum allowed level. Bear in mind that exposure to excessive levels of noise can cause physical damage to users!

16.12   AT^SNFM   Set Microphone Audio Path

Description: The **read command** returns the microphone mute and supply voltage status.
The **write command** can be used to switch the microphone's audio path (muted/ not muted) .
The microphone can be muted or activated by changing <MicSwitch> in all audio modes (1 to 6) and during a voice call only. As an alternative, you can use the AT+CMUT command to mute the microphone.

Test Command Syntax: AT^SNFM=?
Response: ^SNFM: (list of supported <MicSwitch>s)
OK

Read Command Syntax: AT^SNFM?
Response: ^SNFM: <MicSwitch>
OK

Write Command Syntax: AT^SNFM=[<MicSwitch>]
Response: OK
ERROR
+CME ERROR: <err>

Parameter Description:
 <MicSwitch>
   Microphone mute control parameter.
   Evaluated during voice calls and if <MicVccCtl> is omitted only (e.g., AT^SNFM=1).
   Command does not depend on audio mode.
   0   Mutes the microphone.
   1   Activates the microphone. Default.

16.13 AT^SNFO Set Audio Output (= Loudspeaker Path) Parameter

Description: AT^SNFO controls the earpiece path amplification. The read and write commands refer to the active audio mode.
The **write command** works only in audio modes 2 to 6.

Test Command Syntax: AT^SNFO=?
Response: ^SNFO: (list of supported <outBbcGain>s), (list of supported <outCalibrate>s), (list of supported <outStep>s), (list of supported <sideTone>s)
OK

Read Command Syntax: AT^SNFO?
Response: ^SNFO: <outBbcGain>, <outCalibrate>[0] , <outCalibrate>[1] , <outCalibrate>[2] , <outCalibrate>[3] , <outCalibrate>[4] , <outStep>, <sideTone>
OK

Write Command Syntax: AT^SNFO=<outBbcGain>, <outCalibrate>[0] , <outCalibrate>[1] , <outCalibrate>[2] , <outCalibrate>[3] , <outCalibrate>[4] , <outStep>, <sideTone>
Response: OK

Parameter Descriptions:

<outBbcGain>
Negative DAC gain (attenuation) adjustable in four 6 dB steps from 0 dB to -18 dB (0=0 dB, 3=-18 dB)
0...3

<outCalibrate>
Formula to calculate the value of the 5 volume steps selectable with parameter <outStep>:
Attenuation = 20 * log (2 * outCalibrate[n] / 32768)
0...32767

<outStep>
Volume steps 0 - 4, each defined with outCalibrate[n]
0...4 Default = 4

<sideTone>
Multiplication factor for the sidetone gain.
Formula to calculate how much of the original microphone signal is added to the earpiece signal:
Sidetone gain in dB = 20 * log (sideTone / 32768).
0...32767

Notes:
- <outCalibrate> specifies the amount of volume of each <outStep>. The range of each <outCalibrate> is up to 65535, but will be suppressed to 32767. A value above <outCalibrate>= 65535 will cause an error.
- The range of <sideTone> is up to 65535, but will be suppressed to 32767. A value above <sideTone>=65535 will cause an error.
- Any change to <outStep> takes effect in audio modes 2 to 6. That is, when you change <outStep> and then select another mode with AT^SNFS, the same step will be applied. Nevertheless, the sound quality and the amount of volume are not necessarily the same, since all remaining audio parameters can use different values in either mode.
- Audio mode 1 is fixed to <outStep>=4. In this mode, any attempt to change <outStep> or other parameters returns an error.
- The value of <outStep> is stored non-volatile when the ME is powered down with AT^SMSO or reset with AT+CFUN=x,1. Any other parameters changed with AT^SNFO need to be saved with AT^SNFW for use after restart. See also AT^SNFD for details on restoring factory defaults.
- The values of <outStep> can also be changed with AT^SNFV and AT+CLVL.
- CAUTION! When you adjust audio parameters avoid exceeding the maximum allowed level. Bear in mind that exposure to excessive levels of noise can cause physical damage to users!

16.14   AT^SNFPT   Set Progress Tones

Description: AT^SNFPT controls the Call Progress Tones generated at the beginning of a mobile originated call setup.
Please note that the setting is stored volatile; i.e., after restart or reset, the default value 1 will be restored.

Test Command Syntax: AT^SNFPT=?
Response: ^SNFPT: (list of supported <pt>s)
OK

Read Command Syntax: AT^SNFPT?
Response: ^SNFPT: <pt>
OK

Write Command Syntax: AT^SNFPT=<pt>
Response: OK

Parameter Description:
  <pt>
  0   Disables Call Progress Tones
  1   Enables Call Progress Tones (audible tones shortly heard on the phone when ME starts to set up a call.) Default.

16.15   AT^SNFS   Select Audio Hardware Set

Description: The **write command** serves to set the audio mode required for the connected equipment. AT^SNFS is used with AT^SAIC. Each audio mode needs to be assigned to interface 1 via the AT^SAIC command. To do so, first select the audio mode with AT^SNFS, and then activate the audio interface with AT^SAIC and, finally, enter AT^SNFW to store the settings to your audio profile. To switch back and forth it is sufficient to use AT^SNFS.
Important Note: Any changes made with this command will also require you to send the following: **AT^SAIC=2,1,1 <cr>**

Test Command Syntax: AT^SNFS=?
Response: ^SNFS: (list of supported <audMode>s)
OK

Read Command Syntax: AT^SNFS?
Response: ^SNFS: <audMode>
OK

Write Command Syntax: AT^SNFS=<audMode>
Response: OK
ERROR
CME ERROR: <err>

Parameter Description:
  <audMode>
  1   Audio mode 1: Standard mode optimized for the reference handset that can be connected to the analog interface 1. To adjust the volume use the knob of the reference handset. In audio mode 4, this handset can be used with user defined parameters.
This is the default if no value is entered.
Note: The default parameters are determined for type approval and are not adjustable with AT commands.
AT^SNFD restores <audMode> 1.
  2   Audio mode 2: Customer specific mode for a basic handsfree (speakerphone) device.
  3   Audio mode 3: Customer specific mode for a mono-headset.
  4   Audio mode 4: Customer specific mode for a user handset.
  5   Audio mode 5: Customer specific mode.
  6   Audio mode 6: Customer specific mode.

Notes:
  • The write command can be used during a voice call to switch back and forth between different modes. This allows the user, for example, to switch handsfree operation (speakerphone) on and off.
  • <outStep> is a global setting. This means that when another audio mode is selected during a call, the value of <outStep> does not change. This is also true for mute operation, which can be set with AT^SNFM or AT+CMUT: If the microphone is muted and the user selects another audio mode during the call, then the microphone remains muted until explicitly changed. Exception: In audio mode 1 <outStep>=4 is fix.
  • For use after restart of the module, you are advised to store the selected mode to the audio profile saved with AT^SNFW. Otherwise, audio mode 1 will be active each time the module is powered up.

16.16   AT^SNFTTY   Signal TTY/CTM Audio Mode Capability

Description: The Multi-Tech wireless modem offers basic support for equipment using the CTM standard (Cellular Text Telephone Modems). The benefit of CTM is that text characters typed on a TTY device (Text Telephone Type-writer) can be transformed into special audio burst signals for reliable transmission via the existing speech channels of a cellular phone system.

If CTM mode is activated, the ME will set the necessary bearer capability bit on outgoing (mobile originated) calls and incoming calls with this bearer capability bit set are accepted. The TE needs to decode the special audio burst signals.

If CTM mode is disabled, the ME will clear the bearer capability bit on mobile originated calls and incoming calls with the bearer capability bit set are rejected because the Multi-Tech wireless modem expects that CTM coded speech data cannot be decoded by the TE.

Designed to set the module's speech system into CTM mode, the AT^SNFTTY command allows a CTM device to be connected to one of the three audio interfaces of the Multi-Tech wireless modem. Traditional TTY devices that do not incorporate CTM functionality can be connected through an external TTY-to-CTM adapter.

Requirements for using TTY/CTM features:

- TTY/CTM functionality requires audio mode 5 or 6 with all audio parameters set to their factory default.

  To activate TTY/CTM mode, first enter the AT^SNFS command to select audio mode 5 or 6, then use AT^SNFI and AT^SNFO to restore the default values. Alternatively, factory defaults of all audio parameters in audio modes 2 - 6 can easily be set with AT^SNFD. To deactivate TTY/CTM mode make sure that either audio mode 5 or 6 is set. Keep in mind that the TTY/CTM mode is non-volatile. The audio mode, however, is volatile (power-up default is audio mode 1) unless stored to the user defined profile with AT^SNFW. Therefore, if restarted while in TTY/CTM mode the ME may need to be reconfigured for audio mode 5 or 6 before the TTY/CTM mode is selectable again after the reboot.

- Depending on which audio interface the CTM device is connected to select the according settings via AT^SAIC.

Test Command Syntax: AT^SNFTTY=?
Response: ^SNFTTY: (list of supported <audioState>s)
OK

Read Command Syntax: AT^SNFTTY?
Response: ^SNFTTY: <audioState>
OK

Write Command Syntax: AT^SNFTTY=<audioState>
Response: OK
ERROR
+CME ERROR: <err>

Parameter Description:
  <audioState>
  This parameter is non-volatile.

0	Audio path is in normal speech mode.
1	Audio path is in TTY/CTM mode.

16.17   AT^SNFV   Set Loudspeaker Volume

Description: AT^SNFV can be used to set the volume of the loudspeaker to the value <outCalibrate> addressed by <out-Step>. The read and write commands refer to the active audio mode. The write command works only in audio modes 2 to 6.

Test Command Syntax: AT^SNFV=?
Response: ^SNFV: (list of supported <outStep>s)
OK

Read Command Syntax: AT^SNFV?
Response: ^SNFV: <outStep>
OK

Write Command Syntax: AT^SNFV=<outStep>
Response: OK
ERROR
+CME ERROR

Parameter Description:
<outStep>
The actual volume of each step is defined by the parameter <outCalibrate>, which can be set with AT^SNFO. 0...4 Default = 4.

Notes:
- Any change to <outStep> takes effect in audio modes 2 to 6. That is, when you change <outStep> and then select another mode with AT^SNFS, the same step will be applied. Nevertheless, the actual volume can be quite different, depending on the values of <outCalibrate> set in each mode. The only exception is audio mode 1 which is fixed to <outStep>=4.
- <outStep> is stored non-volatile when the ME is powered down with AT^SMSO or reset with AT+CFUN=1,1. <outStep> is not stored by AT^SNFW.
- <outStep> can also be changed by AT^SNFO (Section 16.13) and AT+CLVL (Section 16.4).
- Users should be aware that when using this AT command quickly after "^SYSSTART" a "+CME ERROR: operation temporary not allowed" is received. The audio data may not yet be accessible, resulting in a short delay (less than 400ms) before the requested AT command response is returned.

16.18   AT^SNFW   Write Audio Setting in Non-Volatile Store

Description: AT^SNFW causes the TA to write the currently selected audio parameters to non-volatile store. The saved audio profile includes the following parameters:
AT^SNFA: <atten>
AT^SNFI: <inBbcGain>, <inCalibrate>
AT^SNFO: <outBbcGain>, <outCalibrate>[0 to 4], <sideTone>
AT^SNFS: <audMode>
AT^SAIC: <io>, <mic>, <ep>.

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

Exec Command Syntax: AT^SNFW
Response: OK
ERROR
CME ERROR: <err>

16.19 AT^SRTC   Ring Tone Configuration

Description: The AT^SRTC **read command** returns the current <type> and current <volume>. It can be used while test playback is off or on. In the latter case, see execute command for details.

The AT^SRTC **execute command** is intended for testing. It starts to play a melody from the audio output currently selected with AT^SNFS. To deactivate test playback use AT^SRTC again. During test playback, you can enter the **write command** to select another melody and adjust the volume. Also, you can enter the read command to check the type and volume of the current ring tone and to view the status of playback (on / off). The test ringing signal cannot be activated when an MTC is ringing (ERROR).
Selecting <volume>=0 during the test, immediately stops playback. After this, ring tones will be muted until you change <volume> using the write command.

The AT^SRTC **write command** chooses the type and volume of ring tones. The settings can be changed no matter whether or not the ME is ringing. The selected type and volume are saved in the non-volatile Flash memory and, thus, are retained after Power Down. However, bear in mind that the selected melody does not take effect immediately if entered during an MTC call (see note below). Unlike all other ring tones, <type>=0 is not stored. This is because it is intended only to quickly mute the tone or melody currently played. So <type>=0 only stops immediately the audible ring tone, but does not terminate the RING URC.

Test Command: AT^SRTC=?
Response: ^SRTC:(list of supported) <type>s, (list of supported) <volume>s
OK

Read Command: AT^SRTC?
Response: ^SRTC: <type>, <volume>, <status>
OK

Exec Command: AT^SRTC
Response: OK This command is for testing.

Write Command: AT^SRTC=[<type>][, <volume>]
Response: ^SRTC: <type>, <volume>
OK
ERROR

Parameter Description:

<type>
Type of ring tone. You have a choice of 7 different ring tones and melodies. All will be played from the audio output selected with the AT^SNFS command. <type>=0 is only intended for muting.

0	Mutes the currently played tone immediately.
1	Sequence 1
2	Sequence 2
3	Sequence 3
4	Sequence 4
5	Sequence 5
6	Sequence 6
7	Sequence 7

<volume>
Volume of ring tone, varies from low to high

0	Mute
1	Very low
2	Identical with 1
3	Low
4	Identical with 3
5	Middle
6	Identical with 5
7	High

<status>
Status of test ringing. Indicates whether or not a melody is currently being played back for testing

0	Switched off
1	Switched on

Notes:
- Before first using ring tones note that the following settings apply:
  We have chosen to let you decide your own preferences when you start using ring tones. Therefore, factory setting is AT^SRTC=3,0,0 (ring tones are muted). To activate ring tones for the very first time, first enter the write command and simply change the volume. After applying a firmware update the volume and type selected before the firmware update will be preserved.
- The test ringing signal cannot be activated while an MTC is ringing (ERROR).
- If an MTC arrives during test playback, test ringing will be deactivated and "normal" ringing reactivated (RING). Likewise, an MOC will also stop test ringing.
- If no optional parameter is entered, the old value will be kept.

- If the <type> is changed while a call is ringing (RING URC) or active, the ME returns OK, but the new melody does not take effect until after the call has ended.
- Users should be aware that when using this AT command quickly after "^SYSSTART" a "+CME ERROR: operation temporary not allowed" is received. The audio data may not yet be accessible, resulting in a short delay (less than 400ms) before the requested AT command response is returned.

Chapter 17 – Hardware-Related Commands

The AT Commands described in this chapter are related to the Multi-Tech wireless modem's hardware interface.

17.1   AT+CCLK   Real Time Clock

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

Read Command Syntax: AT+CCLK?
Response: +CCLK: <time>
OK

Write Command Syntax: AT+CCLK=<time>
Response: +CME ERROR: <err>
ERROR
OK

Parameter Description:
   <time>
   Format is "yy/mm/dd,hh:mm:ss", where the characters indicate the two last digits of the year, followed by month, day, hour, minutes, seconds; for example 6th of July 2005, 22:10:00 hours equals to "05/07/06,22:10:00"
   Factory default is "02/01/01,00:00:00"

Notes:
- <time> is retained if the device enters the Power Down mode via AT^SMSO.
- <time> will be reset to its factory default if power is totally disconnected. In this case, the clock starts with <time>= "02/01/01,00:00:00" upon next power-up.
- Each time the Multi-Tech wireless modem is restarted it takes 2s to re-initialize the RTC and to update the current time. Therefore, it is recommended to wait 2s before using the commands AT+CCLK and AT+CALA (for example 2s after ^SYSSTART has been output).

17.2   AT+CALA   Set Alarm Time

Description: The **write command** sets an alarm time in the ME or clears a programmed alarm. When the alarm time is reached and the alarm is executed, the ME returns an Unsolicited Result Code (URC) and the alarm time is reset to "00/01/01,00:00:00".

The alarm can adopt two functions, depending on whether or not you switch the GSM engine off after setting the alarm:

- Reminder message: You can use the alarm function to generate reminder messages. For this purpose, set the alarm as described below and do not switch off or power down the ME. When executed, the message comes as an Unsolicited Result Code, which reads "+CALA".

- Airplane mode: The alarm function can be used to wake up the ME at a scheduled time. For this purpose, set the alarm as described below. Then power down the ME by entering the AT^SMSO command. When the alarm time is reached the ME enters the Airplane mode, notified to the user by the URC "^SYSSTART AIRPLANE MODE" and, if available, by a user defined text message (specified with <text>). In Airplane mode, the RF interface of the ME is shut down to prevent it from unintentionally logging into the GSM network. All AT commands whose execution requires a radio connection are disabled. A list of AT commands supported during Airplane mode can be found in Section 20.4, Availability of AT Commands Depending on Operating Mode of ME. To return from Airplane mode to Normal mode use the AT^SCFG command and set the parameter <map> to "off". This immediately activates the RF interface and restores access to all AT commands. The URC "^SYSSTART" notifies the user that the ME has returned to Normal mode. Please note that setting an alarm with AT+CALA is one method to wake up into Airplane mode. The second approach is using the AT^SCFG command, parameter <mapos>. For further detail on Airplane mode refer to Section 2.14, AT^SCFG.

The **test command** returns supported array index values <n>, alarm types <type>, and the maximum length of the text <tlength> to be output.

The **read command** returns the list of current alarm settings in the ME.

Test Command Syntax: AT+CALA=?

Response: +CALA: (list of supported<n>s), (list of supported<type>s), (list of supported<tlength>s)
OK
ERROR
+CME ERROR: <err>

Read Command Syntax: AT+CALA?
Response: +CALA: <time>[, <n>[, <type>[, <text>]]]
OK
ERROR
+CME ERROR: <err>

Write Command Syntax: AT+CALA=<time>[, <n>[, <type>[, <text>]]]
Response: OK
ERROR
+CME ERROR

Unsolicited Result Codes:

+CALA: <text>   Indicates reminder message.

After power-down and wake-up at the scheduled time, the following URC indicates that the ME has entered the Airplane mode:

"^SYSSTART AIRPLANE MODE"
+CALA: [<text>]

Parameter Descriptions:

<time>
Format is "yy/MM/dd,hh:mm:ss". For example, 6th of July 2005, 22:10:00 hours equals to "05/07/06,22:10:00" (see also AT+CCLK). Note: if <time> equals current date and time or is set to an earlier date, TA returns +CME ERROR: 21. To clear a given alarm before its scheduled time, simply enter an empty string for parameter <time>.

<n>
Integer type value indicating the array index of the alarm.
The ME allows to set only one alarm at a time. Therefore, the list of supported alarm events indicated by the test command AT+CALA=? is <n>=0. If a second alarm time is set, the previous alarm will be deleted. Therefore, the read command AT+CALA? will always return <n>=0.

<type>
Integer type value indicating the type of the alarm.
0   Alarm indication: text message via serial interface.

<text>
> String type value indicating the text to be displayed when alarm time is reached; maximum length is <tlength>. By factory default, <text> is undefined.
> Note: <text> will be stored to the non-volatile flash memory when the device enters the Power Down mode via AT^SMSO. Once saved, it will be available upon next power-up, until you overwrite it by typing another text. This eliminates the need to enter the full string when setting a fresh alarm.
> <text> should not contain characters which are coded differently in ASCII and GSM (e.g., umlauts). See also "Supported character sets" and "GSM alphabet tables".

<tlength>
> Integer type value indicating the maximum length of <text>. The maximum length is 16.

Notes:
- After the alarm was executed the parameter <time> of AT+CALA will be reset to "00/01/01,00:00:00", but <text> will be preserved as described above.
- If the Multi-Tech wireless modem is totally disconnected from power supply, the most recently saved configuration of +CALA:
  <time>[,<n>[,<type>[,<text>]]] will be presented when the Multi-Tech wireless modem is powered up.
- Each time the Multi-Tech wireless modem is restarted it takes 2s to re-initialize the RTC and to update the current time. Therefore, it is recommended to wait 2s before using the commands AT+CCLK and AT+CALA (for example 2s after ^SYSSTART has been output).
- Alarm settings on ASC0:
  - An individual <text> message can be stored, but only one time setting applies.
    The total number of alarm events returned by the read command AT+CALA? will always be <n>=0, no matter whether different text messages are stored.
  - When the alarm is timed out and executed, the ME sends the URC message. The alarm time will be reset to "00/01/01,00:00:00".

Examples:
Example 1
You may want to configure a reminder call for July 31, 2005, at 9.30h, including the message "Good Morning".
```
AT+CALA="05/07/31,09:30:00",0,0,"Good Morning"
OK
```
Do not switch off the GSM engine. When the alarm is executed the ME returns the following URC:
```
+CALA: Good Morning
```

Example 2
To set a fresh alarm using the same message as in Example 1, simply enter date and time. <n>, <type>, <text>, <tlength> can be omitted:
```
AT+CALA="05/07/31,08:50:00"
OK
```
When the alarm is executed the URC comes with the same message:
```
+CALA: Good Morning
```

Example 3
To enable the ME to wake up into Airplane mode; e.g., on July 20, 2005, at 8.30h, enter:
```
AT+CALA="05/07/20,08:30:00"
OK
```
Next, power down the ME:
```
AT^SMSO
^SMSO: MS OFF
OK
^SHUTDOWN
```
When the alarm is executed the ME wakes up to Airplane mode and displays a URC. If available, this line is followed by the individual <text> most recently saved. If no individual message was saved only the first line appears.
```
"^SYSSTART AIRPLANE MODE"
+CALA: Good Morning
```

Example 4
To delete an alarm before its scheduled time is reached, enter an empty string for the <time> parameter. This will restore the default time and clear any individual message defined with <text>.
```
AT+CALA=" "
OK
AT+CALA?
+CALA:  "00/01/01, 00:00:00" , 0,0, " "
OK
```

17.3 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.

Test Command Syntax: AT^SCTM=?
Response: ^SCTM:(list of supported <n>s)
OK

Read Command Syntax: AT^SCTM?
Response: ^SCTM: <n>, <m>
OK
ERROR
+CME ERROR

Write Command Syntax: AT^SCTM=<n>
Response: OK
ERROR
+CME ERROR

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)

Notes:
- Please refer to the "Hardware Interface Description" for specifications on critical temperature ranges.
- 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.

Unsolicited Result Codes:

URC 1

URCs will be automatically sent to the TA when the temperature reaches or exceeds the critical level or when it is back to normal.

URC 2

^SCTM_B: <m>
for module (board) temperature

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.

17.4   AT^SSYNC   Configure SYNC Pin

Description: The AT^SSYNC command serves to configure the SYNC pin of the application interface. Please note that the SYNC pin may be assigned different functions: Depending on the design of the host application, the pin can either be used to indicate the current consumption in a transmit burst or to drive a status LED connected to the specified pin. Before changing the mode of the SYNC pin, carefully read the technical specifications.

Test Command Syntax: AT^SSYNC=?
Response: ^SSYNC:list of supported <mode>s
OK

Read Command Syntax: AT^SSYNC?
Response: ^SSYNC:<mode>
OK

Write Command Syntax: AT^SSYNC=<mode>
Response: OK

Parameter Description:

<mode>   Operation mode of the SYNC pin.
0   Default. SYNC mode:
Enables the SYNC pin to indicate growing power consumption during a transmit burst. You can make use of the signal generated by the SYNC pin, if power consumption is your concern. To do so, ensure that your application is capable of processing the signal. Your platform design must be such that the incoming signal causes other components to draw less current. In short, this allows your application to accommodate current drain and thus, supply sufficient current to the GSM engine if required.
1   LED mode:
Enables the SYNC pin to drive a status LED installed in your application.
The coding of the LED is described in Section 17.6.1, ME status indicated by status LED patterns.
LED mode:
Like <mode>=1, but additionally, enables different LED signals in SLEEP mode depending on the status of PIN authentication and network registration. See AT+CFUN for SLEEP mode details.

17.4.1 ME Status Indicated by Status LED Patterns

The following table lists the possible patterns of status LED behavior and describes the ME operating status indicated by each pattern if AT^SSYNC parameter <mode>=1 and <mode>=2.
During the transition from one LED pattern to another the "on" and/or "off" periods of the LED may vary in length. This is because an event that triggers the change may occur any time and, thus, truncate the current LED pattern at any point.

Table 17.2: Modes of the LED and indicated ME functions.

LED Behavior	ME operating status if AT^SSYNC=1	ME operating status if AT^SSYNC=2
Permanently off	ME is in one of the following modes: POWER DOWN mode, AIRPLANE mode, NON-CYCLIC SLEEP mode - CYCLIC SLEEP mode with no temporary wake-up event in progress [1]	ME is in the following mode: POWER DOWN mode and AIRPLANE mode.
600 ms on / 600ms off	Limited Network Service: No SIM card inserted or no PIN entered, or network search in progress, or ongoing user authentication, or network login in progress.	Same as for AT^SSYNC=1
75 ms on / 3 s off	IDLE mode: The mobile is registered to the GSM network (monitoring control channels and user interactions). No call is in progress.	Same as for AT^SSYNC=1
75 ms on / 75 ms off / 75 ms on / 3 s off	One or more GPRS contexts activated.	Same as for AT^SSYNC=1
500 ms on / 25 ms off	Packet switched data transfer in progress.	Same as for AT^SSYNC=1
Permanently on	Depending on type of call: Voice call: Connected to remote party. Data call: Connected to remote party or exchange of parameters while setting up or disconnecting a call.	Same as for AT^SSYNC=1

LED Behavior	ME operating status if AT^SSYNC=1	ME operating status if AT^SSYNC=2
<n> ms on / <n> ms off [2]	Not possible: With AT^SSYNC=1, LED signal is disabled in SLEEP mode.	SLEEP mode is activated (AT+CFUN parameter <fun> $\neq$ 1), but the ME is not registered to the GSM network (e.g., SIM not inserted or PIN not entered, and therefore, either no network service or only Limited Network Service is available.
25 ms on / 4 * <n> ms off [2]	Not possible: With AT^SSYNC=1, LED signalization is disabled in SLEEP mode.	SLEEP mode is activated (AT+CFUN parameter <fun> $\neq$ 1) while the ME is registered to the GSM network.
25 ms on / <m> ms off / 25 ms on / 3 * <m> ms off[2]	Not possible: With AT^SSYNC=1, LED signalization is disabled in SLEEP mode.	SLEEP mode is activated (AT+CFUN parameter <fun> $\neq$ 1) while the ME is registered to the GSM network. Additionally, PDP context is activated.

[1] When a temporary wake-up event (for example a call, a URC, a packet switched transfer) occurs in CYCLIC SLEEP mode the LED flashes according to the patterns listed above. See Section 2.9.1, Wake up the ME from SLEEP mode for details on the various SLEEP modes and wake-up events.

[2] The duration of <n> and <m> depends on the network: In SLEEP mode, the module can only change its LED status during intermittent wake-up periods when listening to paging information from the base station. Therefore the values of <n> and <m> vary as follows:

    <n> = value from 471 ms to 2118 ms
    <m> = 3000 ms

Chapter 18 – Miscellaneous Commands

The AT Commands described in this chapter are related to various areas.

18.1   A/   Repeat Previous Command Line

Description: Repeat previous command line.
Exec Command Syntax: A/
Response: NA
Notes:
 - Line does not need to end with terminating character.
 - After beginning with the character "a" or "A" a second character "t", "T" or "/" has to follow. In case of using a wrong second character, it is necessary to start again with character "a" or "A".
 - If autobauding is active, the command A/ cannot be used (see AT+IPR).

18.2   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.
Read Command Syntax: ATS3?
Response: <n>
                                 OK
Write Command Syntax: ATS3=<n>
Response: OK
                                 ERROR

Parameter Description:
  <n>
    Command line termination character
    000.....127 Default = 13.
Notes:
 - Using a value other than the default 13 may cause problems when entering commands.
 - Whenever you change the setting, take into account that the new value has no effect on the URC "^SHUTDOWN".

18.3   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.
Read Command Syntax: ATS4?
Response: <n>
                                 OK
Write Command Syntax: ATS4=<n>
Response: OK
                                 ERROR

Parameter Description:
  <n>
    Response formatting character
    000....127   Default = 10
Note:
    Whenever you change the setting take into account that the new value has no effect on the URC "^SHUTDOWN".

18.4   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.

Read Command Syntax: ATS5?
Response: <n>
                                      OK

Write Command Syntax: ATS5=<n>
Response: OK
                                      ERROR

Parameter Description:
  <n>
     Command line editing character
     000....127   Default = 8

Chapter 19 – Summary Tables

19.1 Restricted Access to SIM Data after SIM PIN Authentication

Users should be aware that when using a phonebook, SMS or Remote SAT 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. This delay is due to the initial process of loading SIM data once after SIM PIN authentication. The duration of loading SIM data is dependent on the SIM card used and may take a couple of seconds.

The "^SSIM READY" URC enabled with AT^SSET 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. Of course, all phonebook and SMS commands may be issued before the URC is delivered. In this case the AT command response (for example the complete phonebook) will appear after the delay mentioned above, but before the AT^SSET is displayed. See example below.

In addition to or as an alternative to the "^SSIM READY" URC you can activate the "SIND: simstatus" URC provided by AT^SIND.

After the "+CREG: 1" (or "+CREG: 5") URC and before the "^SSIM READY" URC it is not sure that outgoing and incoming calls can be made and short message functions executed. Emergency calls are possible. Outgoing and incoming calls are always possible AFTER having received the "+CREG: 1" (or "+CREG: 5") and "^SSIM READY" URCs. See also Section 8.5, Network registration.

If SIM cards with EFOPL and EFPNN fields are inserted, it is possible that the initial process of reading EONS data causes an additional delay of 2 seconds (without Remote SIM Access) or approx. 10 seconds (if Remote SIM Access is activated) before the SIM is fully accessible. Therefore, trying to access the SIM during this time may cause the CME Error 14 or CMS Error 315 ("SIM busy") to occur even though the "^SSIM READY" URC was already output. For details please see the note appended to AT^SIND, "eons" indicator.

Example:

AT^SSET=1	Activate the "^SSIM READY" URC.
OK	
AT&W	Store the presentation mode of the "^SSIM READY" URC to the user profile.
OK	
AT+CFUN=1,1	Restart the ME.
OK	
^SYSSTART	The ME was restarted.
AT+CPIN	Enter the SIM PIN.
OK	
AT+CPBW=50,"+4030123456789",145,"Paul"	Write a new phonebook record.
OK	
^SSIM READY	The URC now confirms that the ME has finished reading data from the SIM.
AT+CPBR=50,50	Read the phonebook entered before.
+CPBR: 50,"+4030123456789",145,"Paul"	The phonebook entry was properly saved.

19.2   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 19.1 Star-Hash (*#) Overview (Abbreviations used in this table on defined on the following page)

Star-Hash Code	Functionality	Response, also refer to Table 19.3
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
*#0003*MasterPhoneCode#	Unlock "PS" lock with Master Phone Code	+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 : <n>,<m> OK (see AT+COLP)
*#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	^SCCFC : <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	^SCLCK : <fac>, <status>, <class> [, ...] like +CLCK *) (See 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

 *) Notes on ^SCCFC, +CCWA, ^SCLCK: The output depends on the affected basic service of the Star-Hash code. One line will be output for every tele- or bearer service coded in basic service code BS.
^SCCFC and ^SCLCK are modified by giving an additional <reason> or <fac> in front of the regular output string generated by the standard commands +CCFC and +CLCK.

Table 19.2 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: Voice 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	 13 12 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 19.3 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 19.4 Star-Hash Commands for Supplementary Services

Star-Hash Code	Abbreviations in Table 19.1	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

19.3   AT Commands and SIM PIN Dependency
Table 19.5: Available AT Commands and Dependency on SIM PIN.

⊘   AT Command not available
○   AT 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	○	⊘	⊘	⊘
AT&V	○	⊘	⊘	⊘
AT&W	○	⊘	⊘	⊘
ATQ	○	⊘	⊘	⊘
ATV	○	⊘	⊘	⊘
ATX	○	⊘	⊘	⊘
AT \ V	○	⊘	⊘	⊘
ATZ	○	⊘	⊘	⊘
AT+CFUN	⊘	○	○	○
AT^SMSO	○	○	⊘	⊘
AT+GCAP	○	○	⊘	⊘
AT+CMEE	⊘	○	○	○
AT+CSCS	⊘	○	○	○
AT^SCFG	⊘	○	○	○
Status Control Commands				
AT+CMER	⊘	○	○	○
AT+CIND	⊘	○	○	○
AT^SIND	⊘	○	○	○
AT+CEER	●	●	⊘	⊘
ATS18	⊘	⊘	○	○
AT+CPAS	○	○	⊘	⊘
AT+WS46	⊘	○	○	○
Serial Interface Control Commands				
AT\Q	○	⊘	⊘	⊘
AT&C	○	⊘	⊘	⊘
AT&D	○	⊘	⊘	⊘
AT&S	○	⊘	⊘	⊘
ATE	○	⊘	⊘	⊘
AT+ICF	⊘	○	○	○
AT+IFC	⊘	○	○	○
AT+ILRR	⊘	●	●	●
AT+IPR	⊘	○	○	○
AT+STPB	⊘	○	○	○
Security Commands				
AT+CPIN	⊘	○	○	○
AT+CPIN2	⊘	●	●	●
AT^SPIC	○	○	○	○
AT+CLCK	⊘	●	⊘	●
AT^SLCK	⊘	●	⊘	●
AT+CPWD	⊘	●	⊘	●
AT^SPWD	⊘	◉	⊘	◉
Identification Commands				
ATI	○	⊘	⊘	⊘
AT+CGMI	○	○	⊘	⊘
AT+GMI	○	○	⊘	⊘
AT+CGMM	○	○	⊘	⊘
AT+GMM	○	○	⊘	⊘
AT+CGMR	○	○	⊘	⊘
AT+GMR	○	○	⊘	⊘
AT+CGSN	○	○	⊘	⊘
AT+GSN	○	○	⊘	⊘
AT+CIMI	●	●	⊘	⊘

AT Command	Exec	Test	Read	Write
Call-Related Commands				
ATA	●	⊘	⊘	⊘
ATD	◉	⊘	⊘	⊘
ATD><mem><n>	●	⊘	⊘	⊘
ATD><n>	●	⊘	⊘	⊘
ATD><str>	●	⊘	⊘	⊘
ATDI	●	⊘	⊘	⊘
ATDL	●	⊘	⊘	⊘
ATH	O	⊘	⊘	⊘
AT+CHUP	●	●	⊘	⊘
AT+SHUP	⊘	●	⊘	●
ATS0	⊘	⊘	O	●
ATS6	⊘	⊘	O	O
ATS7	⊘	⊘	O	O
ATS8	⊘	⊘	O	O
ATS10	⊘	⊘	O	O
ATO	O	⊘	⊘	⊘
+++	O	⊘	⊘	⊘
AT+CBST	⊘	O	O	O
AT+CRLP	⊘	O	O	O
AT+CLCC	●	●	⊘	⊘
AT^SLCC	●	●	●	●
AT+CR	⊘	●	●	●
AT+CRC	⊘	O	O	O
AT+CSNS	⊘	O	O	O
AT^SCNI	●	●	⊘	⊘
AT^SLCD	●	●	⊘	⊘
AT^STCD	●	●	⊘	⊘
ATP	O	⊘	⊘	⊘
ATT	O	⊘	⊘	⊘
Network Service Commands				
AT+COPN	●	●	⊘	⊘
AT+COPS	⊘	O	◉	◉
AT^SFNUP	⊘	O	O	O
AT^SOPS	⊘	●	⊘	⊘
AT^SNWS	⊘	●	⊘	●
AT+CREG	⊘	O	O	O
AT+CSQ	O	O	⊘	⊘
AT^SMONC	●	●	⊘	⊘
AT^SMOND	●	●	⊘	⊘
AT^MONI	O	O	⊘	O
AT^MONP	O	O	⊘	O
AT^SMONG	●	●	⊘	●
AT^SALS	⊘	●	●	●
AT^SHOM	●	●	⊘	⊘
AT^SPLM	●	●	⊘	⊘
AT^CPOL	⊘	●	●	●
AT^SPLR	⊘	●	⊘	●
AT^SPLW	⊘	●	⊘	●
Supplementary Service Commands				
AT+CACM	⊘	●	●	●
AT^SACM	●	●	⊘	●
AT+CAMM	⊘	●	●	●
AT+CAOC	●	●	●	●
AT+CCUG	⊘	●	●	●
AT+CCFC	⊘	●	⊘	●
AT+CCWA	⊘	●	●	●
AT+CHLD	⊘	●	⊘	●
AT+CLIP	⊘	O	●	O
AT+CLIR	⊘	●	●	●
AT+COLP	⊘	●	●	●
AT+CPUC	⊘	●	●	●
AT+CSSN	⊘	O	O	O
AT+CUSD	⊘	●	●	●

AT Command	Exec	Test	Read	Write
Internet Service Commands				
AT^SICS	⊘	O	O	O
AT^SISS	⊘	O	O	O
AT^SISO	⊘	O	O	●
AT^SISC	⊘	O	⊘	●
AT^SISR	⊘	O	⊘	●
AT^SISW	⊘	O	⊘	●
AT^SICO	⊘	●	●	●
AT^SICC	⊘	●	⊘	●
AT^SISX	⊘	●	⊘	●
AT^SISE	⊘	O	⊘	O
GPRS Commands				
AT+CGACT	⊘	●	●	●
AT+CGANS	⊘	●	⊘	●
AT+CGATT	⊘	●	●	●
AT+CGAUTO	⊘	●	●	●
AT+CGDATA	⊘	●	⊘	●
AT+CGDCONT	⊘	●	●	●
AT+CGEQMIN	⊘	●	●	●
AT+CGEQREQ	⊘	●	●	●
AT+CGPADDR	⊘	●	⊘	●
AT+CGQMIN	⊘	●	●	●
AT+CGQREQ	⊘	●	●	●
AT+CGREG	⊘	●	●	●
AT+CGSMS	⊘	●	●	●
AT^SGACT	●	●	●	⊘
AT^SGAUTH	⊘	O	O	O
AT^SGCONF	⊘	O	O	O
ATA	●	⊘	⊘	⊘
ATD*99#	●	⊘	⊘	⊘
ATD*98#	O	⊘	⊘	⊘
ATH	●	⊘	⊘	⊘
ATS0	⊘	⊘	O	●
Short Message Service (SMS) Commands				
AT+CMGC	⊘	●	⊘	●
AT+CMGD	⊘	●	⊘	●
AT+CMGF	⊘	O	O	O
AT+CMGL	●	●	⊘	●
AT+CMGR	⊘	●	⊘	●
AT+CMGS	⊘	●	⊘	●
AT+CMGW	●	●	⊘	●
AT+CMSS	⊘	●	⊘	●
AT+CNMA	●	●	⊘	●
AT+CNMI	⊘	●	●	●
AT+CPMS	⊘	●	●	●
AT+CSCA	⊘	●	●	●
AT+CSCB	⊘	●	●	●
AT+CSDH	⊘	●	●	●
AT+CSMP	⊘	●	●	●
AT+CSMS	⊘	●	●	●
AT^SCML	●	●	⊘	●
AT^SCMR	⊘	●	⊘	●
AT^SCMS	⊘	●	⊘	●

AT Command	Exec	Test	Read	Write
Short Message Service (SMS) Commands Continued				
AT^SCMW	⊘	●	⊘	●
AT^SLMS	●	●	⊘	⊘
AT^SMGL	●	●	⊘	●
AT^SMGO	⊘	●	●	●
AT^SMGR	⊘	●	⊘	●
AT^SSCONF	⊘	O	O	O
AT^SSDA	⊘	O	O	O
AT^SSMSS	⊘	●	●	●
SIM-Related Commands				
AT+CRSM	⊘	◉	⊘	◉
AT+CSIM	⊘	O	⊘	O
AT^SXSM	⊘	●	⊘	●
AT^SCKS	⊘	O	O	O
AT^SSET	⊘	O	O	O
AT^SCID	O	O	⊘	⊘
AT+CXXCID	O	O	⊘	⊘
SIM Application Toolkit (SAT) Commands				
AT^SSTA	⊘	O	O	O
^SSTN	⊘	⊘	⊘	⊘
AT^SSTGI	⊘	O	O	O
AT^SSTR	⊘	O	O	O
Phonebook Commands				
AT+CNUM	●	●	⊘	⊘
AT+CPBR	⊘	●	⊘	●
AT+CPBS	⊘	●	●	●
AT+CPBW	⊘	●	⊘	●
AT+SPBW	⊘	●	⊘	●
AT^SDLD	●	●	⊘	⊘
AT^SPBC	⊘	●	⊘	●
AT^SPBD	⊘	●	⊘	●
AT^SPBG	⊘	●	⊘	●
AT^SPBS	⊘	●	⊘	●
Audio Commands				
ATL	O	⊘	⊘	⊘
ATM	O	⊘	⊘	⊘
AT+CLVL	⊘	O	O	O
AT+CMUT	⊘	O	O	O
AT+VTD	⊘	O	O	O
AT+VTS	⊘	O	⊘	O
AT^SAIC	⊘	O	O	O
AT^SNFA	⊘	O	O	O
AT^SNFD	O	O	⊘	⊘
AT^SNFI	⊘	O	O	O
AT^SNFM	⊘	O	O	O
AT^SNFO	⊘	O	O	O
AT^SNFPT	⊘	O	O	O
AT^SNFS	⊘	O	O	O
AT^SNFTTY	⊘	O	O	O
AT^SNFV	⊘	O	O	O
AT^SNFW	O	O	⊘	⊘
AT^SRTC	O	O	O	O
Hardware-Related Commands				
AT+CALA	⊘	O	O	O
AT+CCLK	⊘	O	O	O
AT^SCTM	⊘	O	O	O
AT^SSYNC	⊘	O	O	O
Miscellaneous Commands				
A/	O	⊘	⊘	⊘
ATS3	⊘	⊘	O	O
ATS4	⊘	⊘	O	O
ATS5	⊘	⊘	O	O

19.4 Availability of AT Commands Depending on Operating Mode of ME

Table 19.6: Availability of AT Commands Depending on Operating Mode of ME.

- ○ Command not supported
- ● Command supported
- ◉ Use in Airplane Mode depends on command type (test, read, execute, write). See description of AT command for details.

AT Command	Normal Mode	Airplane Mode
Configuration Commands		
AT&F	●	●
AT&V	●	●
AT&W	●	●
ATQ	●	●
ATV	●	●
ATX	●	●
AT \ V	●	●
ATZ	●	●
AT+CFUN	●	●
AT^SMSO	●	●
AT+GCAP	●	●
AT+CMEE	●	●
AT+CSCS	●	●
AT^SCFG	●	◉
Status Control Commands		
AT+CMER	●	●
AT+CIND	●	●
AT^SIND	●	●
AT+CEER	●	●
ATS18	●	●
AT+CPAS	●	●
AT+WS46	●	●
Serial Interface Control Commands		
AT\Q	●	●
AT&C	●	●
AT&D	●	●
AT&S	●	●
ATE	●	●
AT+ICF	●	●
AT+IFC	●	●
AT+ILRR	●	●
AT+IPR	●	●
AT+STPB	●	●
Security Commands		
AT+CPIN	●	●
AT+CPIN2	●	●
AT^SPIC	●	●
AT+CLCK	●	◉
AT^SLCK	●	◉
AT+CPWD	●	◉
AT^SPWD	●	◉
Identification Commands		
ATI	●	●
AT+CGMI	●	●
AT+GMI	●	●
AT+CGMM	●	●
AT+GMM	●	●
AT+CGMR	●	●
AT+GMR	●	●
AT+CGSN	●	●
AT+GSN	●	●
AT+CIMI	●	●

AT Command	Normal Mode	Airplane Mode
Call-Related Commands		
ATA	●	O
ATD	●	O
ATD><mem><n>	●	O
ATD><n>	●	O
ATD><str>	●	O
ATDI	●	O
ATDL	●	O
ATH	●	O
AT+CHUP	●	O
AT+SHUP	●	O
ATS0	●	O
ATS6	●	●
ATS7	●	●
ATS8	●	●
ATS10	●	●
ATO	●	O
+++	●	O
AT+CBST	●	●
AT+CRLP	●	●
AT+CLCC	●	O
AT^SLCC	●	O
AT+CR	●	●
AT+CRC	●	●
AT+CSNS	●	●
AT^SCNI	●	O
AT^SLCD	●	●
AT^STCD	●	●
ATP	●	O
ATT	●	O
Network Service Commands		
AT+COPN	●	●
AT+COPS	●	O
AT^SOPS	●	●
AT^SNWS	●	O
AT+CREG	●	O
AT+CSQ	●	O
AT^SMONC	●	O
AT^SMOND	●	O
AT^SFNUR	●	●
AT^MONI	●	O
AT^MONP	●	O
AT^SMONG	●	O
AT^SALS	●	O
AT^SHOM	●	O
AT^SPLM	●	●
AT^CPOL	●	●
AT^SPLR	●	●
AT^SPLW	●	●
Supplementary Service Commands		
AT+CACM	●	●
AT^SACM	●	●
AT+CAMM	●	●
AT+CAOC	●	●
AT+CCUG	●	●
AT+CCFC	●	O
AT+CCWA	●	O
AT+CHLD	●	O
AT+CLIP	●	O
AT+CLIR	●	O
AT+COLP	●	O
AT+CPUC	●	●
AT+CSSN	●	O
AT+CUSD	●	O

AT Command	Normal Mode	Airplane Mode
Internet Service Commands		
AT^SICI	●	●
AT^SISS	●	●
AT^SISI	●	●
AT^SISO	●	○
AT^SISC	●	○
AT^SISR	●	○
AT^SISW	●	○
AT^SICO	●	○
AT^SICC	●	○
AT^SISX	●	○
AT^SISE	●	○
GPRS Commands		
AT+CGACT	●	○
AT+CGANS	●	○
AT+CGATT	●	○
AT+CGAUTO	●	○
AT+CGDATA	●	○
AT+CGDCONT	●	●
AT+CGEQMIN	●	●
AT+CGEQREQ	●	●
AT+CGPADDR	●	●
AT+CGQMIN	●	●
AT+CGQREQ	●	●
AT+CGREG	●	●
AT+CGSMS	●	●
AT^SGACT	●	●
AT^SGAUTH	●	●
AT^SGCONF	●	●
ATA	●	○
ATD*99#	●	○
ATD*98#	●	○
ATH	●	○
ATS0	●	○
Short Message Service (SMS) Commands		
AT+CMGC	●	○
AT+CMGD	●	●
AT+CMGF	●	●
AT+CMGL	●	●
AT+CMGR	●	●
AT+CMGS	●	○
AT+CMGW	●	●
AT+CMSS	●	○
AT+CNMA	●	○
AT+CNMI	●	●
AT+CPMS	●	●
AT+CSCA	●	●
AT+CSCB	●	●
AT+CSDH	●	●
AT+CSMP	●	●
AT+CSMS	●	●
AT^SCML	●	●
AT^SCMR	●	●
AT^SCMS	●	○
AT^SCMW	●	●
AT^SLMS	●	●
AT^SMGL	●	●
AT^SMGO	●	●
AT^SMGR	●	●
AT^SSCONF	●	●
AT^SSDA	●	●
AT^SSMSS	●	●

AT Command	Normal Mode	Airplane Mode
SIM-Related Commands		
AT+CRSM	●	●
AT+CSIM	●	●
AT^SXSM	●	●
AT^SCKS	●	●
AT^SSET	●	●
AT^SCID	●	●
AT+CXXCID	●	●
SIM Application Toolkit (SAT) Commands		
AT^SSTA	●	●
^SSTN	●	●
AT^SSTGI	●	●
AT^SSTR	●	●
Phonebook Commands		
AT+CNUM	●	●
AT+CPBR	●	●
AT+CPBS	●	●
AT+CPBW	●	●
AT+SPBW	●	●
AT^SDLD	●	●
AT^SPBC	●	●
AT^SPBD	●	●
AT^SPBG	●	●
AT^SPBS	●	●
Audio Commands		
ATL	●	●
ATM	●	●
AT+CLVL	●	●
AT+CMUT	●	●
AT+VTD	●	○
AT+VTS	●	○
AT^SAIC	●	●
AT^SNFA	●	●
AT^SNFD	●	●
AT^SNFI	●	●
AT^SNFM	●	●
AT^SNFO	●	●
AT^SNFPT	●	●
AT^SNFS	●	●
AT^SNFTTY	●	○
AT^SNFV	●	●
AT^SNFW	●	●
AT^SRTC	●	●
Hardware-Related Commands		
AT+CALA	●	●
AT+CCLK	●	●
AT^SCTM	●	●
AT^SSYNC	●	○
Miscellaneous Commands		
A/	●	●
ATS3	●	●
ATS4	●	●
ATS5	●	●

19.5 AT Command Settings Storable with AT&W

Table 19.7: Settings Stored to User Profile on ASC0.

AT Command	Stored Parameters
Configuration Commands	
ATQ	\<n>
ATV	\<value>
ATX	\<value>
AT \ V	\<value>
AT+CMEE	\<errMode>
Status Control Commands	
ATS18	\<n>
Serial Interface Control Commands	
AT\Q	\<n>
AT&C	\<value>
AT&D	\<value>
AT&S	\<value>
ATE	\<value>
AT+ICF	\<format>, \<parity>
AT+IFC	\<TEflowcontrol>, \<TAflowcontrol>
AT+ILRR	\<value>
AT+STPB	\<n>
Call-Related Commands	
ATS0	\<n>
ATS6	\<n>
ATS7	\<n>
ATS8	\<n>
ATS10	\<n>
AT+CBST	\<speed>, \<name>, \<ce>
AT+CRLP	\<iws>, \<mws>, \<T1>, \<N2>
AT^SLCC	\<n>
AT+CR	\<mode>
AT+CRC	\<mode>
Network Service Commands	
AT+COPS	\<format>
AT+SNWS	\<format>
AT+CREG	\<n>
Supplementary Service Commands	
AT^SACM	\<n>
AT+CLIP	\<n>
GPRS Commands	
ATS0	\<n>
Short Message Service (SMS) Commands	
AT+CMGF	\<mode>
AT+CNMI	\<mode>, \<mt>, \<bm>, \<ds>
AT+CSCB	\<mode>
AT+CSMS	\<service>
AT^SMGO	\<n>
SIM-Related Commands	
AT^SCKS	\<mode>
AT^SSET	\<n>
Miscellaneous Commands	
ATS3	\<n>
ATS4	\<n>
ATS5	\<n>

19.6   Factory Defaults Restorable with AT&F

Table 19.8 AT Command	Factory Defaults
Configuration Commands	
ATQ	<n>=0
ATV	<value>=1
ATX	<value>=4
AT \ V	<value>=1
AT+CFUN	<fun>=1
AT+CMEE	<errMode>=0
AT+CSCS	<chset>="GSM"
AT^SCFG	<tcpBufSize>="5200", <tcpIrt>="3", <tcpMr>="10", <tcpOt>="6000", <tcpWithUrc>="on"
Status Control Commands	
AT+CMER	<mode>=0, <keyp>=0, <disp>=0, <ind>=0, <bfr>=0
AT+CIND	<mode>=1
ATS18	<n>=0
Serial Interface Control Commands	
AT\Q	<n>=0
AT&C	<value>=1
AT&D	<value>=2
AT&S	<value>=0
ATE	<value>=1
AT+IFC	<TEflowcontrol>=0, <TAflowcontrol>=0
AT+ILRR	<value>=0
AT+STPB	<n>=0
Call-Related Commands	
ATS0	<n>=000
ATS6	<n>=000
ATS7	<n>=060
ATS8	<n>=0
ATS10	<n>=002
AT+CBST	<speed>=7, <name>=0, <ce>=1
AT+CRLP	<iws>=61, <mws>=61, <T1>=78, <N2>=6
AT^SLCC	<n>=0
AT+CR	<mode>=0
AT+CRC	<mode>=0
Network Service Commands	
AT+COPS	<format>=0
AT+CREG	<n>=0
AT^SALS	<view>=0, <line>=1
Supplementary Service Commands	
AT^SACM	<n>=0
AT+CLIP	<n>=0
AT+CSSN	<n>=0, <m>=0
AT+CUSD	<n>=0
GPRS Commands	
AT+CGAUTO	<n>=3
AT+CGREG	<n>=0
AT+CGSMS	<service>=3
AT+SGAUTH	<auth>=1
ATS0	<n>=000
Short Message Service (SMS) Commands	
AT+CMGF	<mode>=0
AT+CNMI	<mode>=0, <mt>=0, <bm>=0, <ds>=0, <bfr>=1
AT+CSCB	<mode>=0, <mids>=" ", <dcss>=" "
AT+CSDH	<show>=0
AT+CSMP	<fo>=17, <vp>=167, <dcs>=0, <pid>=0
AT+CSMS	<service>=0
AT^SMGO	<n>=0
AT^SSCONF	<ra>=0
AT^SSDA	<da>=0
AT^SSMSS	<seq>=0

Table 19.8 AT Command Continued	Factory Defaults
SIM-Related Commands	
AT^SCKS	<mode>=0
AT^SSET	<n>=0
Phonebook Commands	
AT+CPBS	<storage>="SM"
AT^SPBS	<internal-counter>=0
Audio Commands	
AT+VTD	<duration>=1
Hardware-Related Commands	
AT^SCTM	<n>=0
Miscellaneous Commands	
ATS3	<n>=013
ATS4	<n>=010
ATS5	<n>=008

19.7 Summary of Unsolicited Result Codes (URC)

Table 19.9 Summary of Unsolicited Result Codes (URC)

AT Command	URC
Configuration Commands	
AT+CFUN	^SYSSTART
AT^SMSO	^SHUTDOWN
AT^SCFG	^SYSSTART AIRPLANE MODE
Status Control Commands	
AT+CMER	+CIEV: <indDescr>, <indValue>$_1$[, <indValue>$_2$][, <indValue>[,…]]
AT^SIND	+CIEV: <indDescr>, <indValue>
AT^SIND	+CIEV: <indDescr>, <adnEntry>, <adnNumber>, <adnType>, <adnText> +CIEV: <indDescr>, "READY"
AT^SIND	+CIEV: <indDescr>, <indValue>, <vmCounter>
AT^SIND	+CIEV: <indDescr>, <indValue>, <eonsOperator>, <servProvider>
AT^SIND	+CIEV: <indDescr>, <nitzUT>, <nitzTZ>, <nitzDST>
AT^SIND	+CIEV: <indDescr>, <indValue>, <indValue>
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>, <traffic channel
	　assigned>[, <number>, <type>[, <alpha>]]
	　[^SLCC: <idx>, <dir>, <stat>, <mode>, <mpty>, <traffic channel
	　assigned>[, <number>, <type>[, <alpha>]]]
	　[...]
	　^SLCC:

AT+CRC	RING
AT+CRC	+CRING: <type>
Network Service Commands	
AT+CREG	+CREG: <stat>
AT+CREG	+CREG: <stat>[, <lac>, <ci>]
AT^SALS	^SALS: <line>
Supplementary Service Commands	
AT^SACM	+CCCM: <ccm>
AT+CCWA	+CCWA: <calling number>, <type of number>, <class>, , <CLI validity>
AT+CCWA	^SCWA
AT+CLIP	+CLIP: <number>, <type>, , [, <alpha>][, <CLI validity>]
AT+COLP	+COLP: <number>, <type>
AT+CSSN	+CSSI: <code 1>
AT+CSSN	+CSSU: <code 2>
AT+CUSD	+CUSD: <m>[<str_urc>[<dcs>]]
Internet Service Commands	
AT^SISO	^SIS: <srvProfileId>, <urcCause>[, [<urcInfoId>][, <urcInfoText>]]
AT+SISR	^SISR: <srvProfileId>, <urcCauseId>[, <remainUdpPacketLength>]
AT+SISW	^SISW: <srvProfileId>, <urcCauseId>
Internet Service URC "^SIS"	^SIS: <srvProfileId>, <urcCause>[, [<urcInfoId>][, <urcInfoText>]]
GPRS Commands	
AT+CGREG	+CGREG: <stat>
AT+CGREG	+CGREG: <stat>, <lac>, <ci>
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>
AT^SMGO	^SMGO: <mode>
SIM-Related Commands	
AT^SCKS	^SCKS: <SimStatus>
AT^SSET	^SSIM READY

AT Command	URC
SIM Application Toolkit (SAT) Commands	
^SSTN	^SSTN: <cmdType>
^SSTN	^SSTN: <cmdTerminateValue>
^SSTN	^SSTN: 254
^SSTN	^SSTN: 255
Hardware-Related Commands	
AT+CALA	+CALA: [<text>]
AT^SBC	^SBC: Overvoltage warning
AT^SBC	^SBC: Overvoltage shutdown
AT^SCTM	^SCTM_A: <m>
AT^SCTM	^SCTM_B: <m>

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