THALES

Cinterion® EXS82-W

AT Command Set

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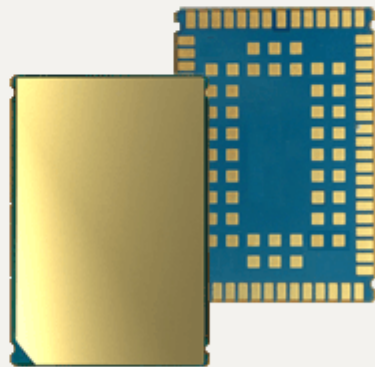
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1.   Introduction

1.1   Scope of the document

This document presents the AT Command Set for
   EXS82-W GSM/LTE Cat. M1/Cat. NB1 Engine, Release 01.100.

Before using the EXS82-W or upgrading to a new firmware version please read the latest product information provided in "EXS82-W Release Notes, Version 01.100".

DISCLAIMER:
AT commands or parameters not documented in this document are subject to change and reserved for future use. THALES DIS AIS Deutschland GmbH reserves the right to modify or even eliminate these options in later releases.

EXS82-W features packet switched (PS) data capability, but does not support circuit switched (CS) data transmission. Hoewever, for reasons of compatibility with other products, and for compliance with 3GPP TS specificatiions, some AT commands imply parameters or values related to CS data capability.

1.2   Related documents

[1] EXS82-W Release Notes, Version 01.100

[2] EXS82-W Hardware Interface Description, Version 01.100

[3] User's Guide: Getting Started with EXS82-W

[4] Application Note 16: Updating EXS82-W Firmware

[5] Application Note 37: GPS Antenna Integration for EXS82-W

[6] Application Note 39: USB Interface Description for EXS82-W

[7] Application Note 62: Transport Layer Security for Client TCP/IP Services

[8] Application Note 90: Controlling Functionality Levels of Cinterion® Modules

[9] MPSS.AT LTE RF Software Overview

[10] Controlling Rx Chains on LTE

[11] 3GPP TR 21.905 (descendant of 3GPP TR 01.04): Vocabulary for 3GPP Specifications

[12] Multiplexer User's Guide

[13] 3GPP TS 27.010 (descendant of 3GPP TS 07.10): Terminal Equipment to User Equipment (TE-UE) multiplexer protocol

[14] Multiplex Driver Developer's Guide

[15] International Organization for Standardization (ISO): ISO/IEC10646: Universal Multiple-Octet Coded Character Set (UCS) - Part 1: Architecture and Basic Multilingual Plane.
This international standard is closely related to the Unicode Standard published by the Unicode Consortium

[16] The Unicode Consortium: Mapping_of_ETSI_GSM_03.38_7-bit_default_alphabet_characters_into_Unicode [.TXT!]

[17] ITU-T V.24 List of definitions for interchange circuits between data terminal equipment (DTE) and data circuit-terminating equipment (DCE)

[18] ITU-T V.250 Serial asynchronous automatic dialling and control

[19] 3GPP TS 11.11: Specification of the Subscriber Identity Module - Mobile Equipment (SIM - ME) interface

[20] 3GPP TS 31.101: UICC-terminal interface; Physical and logical characteristics

[21] 3GPP TS 31.102: Characteristics of the Universal Subscriber Identity Module (USIM) application

[22] ETSI TS 102 221: Smart Cards; UICC-Terminal interface; Physical and logical characteristics

[23] 3GPP TS 11.14: Specification of the SIM Application Toolkit for the Subscriber Identity Module - Mobile Equipment (SIM - ME) interface

[24] 3GPP TS 31.111: Universal Subscriber Identity Module (USIM) Application Toolkit (USAT)

[25] ETSI TS 102 223: Smart Cards; Card Application Toolkit (CAT)

[26] 3GPP TS 31.124: Mobile Equipment (ME) conformance test specification - Universal Subscriber Identity Module Application Toolkit (USAT) conformance test specification

[27] 3GPP TS 22.002 (descendant of 3GPP TS 22.02): Circuit Bearer Services (BS) supported by a Public Land Mobile Network (PLMN)

[28] 3GPP TS 22.004 (descendant of 3GPP TS 02.04): General on supplementary services

[29] 3GPP TS 22.030 (descendant of 3GPP TS 02.30): Man-Machine Interface (MMI) of the Mobile Station (MS)

[30] 3GPP TS 22.060 (descendant of 3GPP TS 02.60): General Packet Radio Service (GPRS); Service description; Stage 1

[31] 3GPP TS 23.060 (descendant of 3GPP TS 03.60): General Packet Radio Service (GPRS); Service description; Stage 2

[32] 3GPP TS 22.081 (descendant of 3GPP TS 02.81): Line Identification Supplementary Services; Stage 1

[33] 3GPP TS 22.082 (descendant of 3GPP TS 02.82): Call Forwarding (CF) Supplementary Services; Stage 1

[34] 3GPP TS 22.083 (descendant of 3GPP TS 02.83): Call Waiting (CW) and Call Holding (HOLD); Supplementary Services; Stage 1

[35] 3GPP TS 22.085 (descendant of 3GPP TS 02.85): Closed User Group (CUG) supplementary services; Stage 1

[36] 3GPP TS 22.088 (descendant of 3GPP TS 02.88): Call Barring (CB) supplementary services; Stage 1

[37] 3GPP TS 22.090 (descendant of 3GPP TS 02.90): Unstructured Supplementary Service Data (USSD); Stage 1

[38] 3GPP TS 23.038 (descendant of 3GPP TS 03.38): Alphabets and language specific information

[39] 3GPP TS 23.040 (descendant of 3GPP TS 03.40): Technical realization of the Short Message Service (SMS)

[40] 3GPP TS 23.041 (descendant of 3GPP TS 03.41): Technical realization of Cell Broadcast Service (CBS)

[41] 3GPP TS 23.107: Quality of Service (QoS) concept and architecture

[42] 3GPP TS 24.011 (descendant of 3GPP TS 04.11): Point-to-Point (PP) Short Message Service (SMS) support on mobile radio interface

[43] 3GPP TS 24.008 (descendant of 3GPP TS 04.08): Mobile radio interface Layer 3 specification; Core network protocols; Stage 3

[44] 3GPP TS 24.080 (descendant of 3GPP TS 04.80): Mobile radio interface layer 3 supplementary services specification; Formats and coding

[45] 3GPP TS 24.301 Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS)

[46] 3GPP TS 25.133 Requirements for support of radio resource management

[47] 3GPP TS 25.304 User Equipment (UE) procedures in idle mode and procedures for cell reselection in connected mode

[48] 3GPP TS 27.005 (descendant of 3GPP TS 07.05): Use of Data Terminal Equipment - Data Circuit terminating Equipment (DTE - DCE) interface for Short Message Service (SMS) and Cell Broadcast Service (CBS)

[49] 3GPP TS 27.007 (descendant of 3GPP TS 07.07): AT command set for User Equipment (UE)

[50] 3GPP TS 27.060 (descendant of 3GPP TS 07.60): Mobile Station (MS) supporting Packet Switched Services

[51] 3GPP TS 22.101 (descendant of 3GPP TS 02.07 and 3GPP TS 02.40): Service principles

[52] Common PCN Handset Specification (CPHS) v4.2 [.ZIP!]

[53] 3GPP TS 45.008 (descendant of GSM 05.08): Radio subsystem link control

[54] 3GPP TS 36.101 Evolved Universal Terrestrial Radio Access (E-UTRA)

[55] 3GPP TS 36.133 Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management

[56] Documents posted on website of USB Implementers Forum

[57] USB Class Definitions for Communication Devices, Version 1.1 January 19, 1999

1.3 Document Conventions

Throughout this document EXS82-W is also referred to as GSM/LTE Cat. M1/Cat. NB1 Engine or short UE, ME (Mobile Engine), MS (Mobile Station) or Mobile Terminal (MT). In related documents the equivalent term DCE (Data Communication Equipment) may be found.
AT Commands are used to control the EXS82-W. The controlling device is referred to as Customer Application or short TE. Related documents may use the equivalent term DTE (Data Terminal Equipment).
All abbreviations and acronyms used throughout this document are based on GSM or 3GPP specifications. For additional definitions please refer to 3GPP TR 21.905 [11].

1.3.1 Quick Reference Table

Each AT command description includes a table similar to the example shown below. The table is intended as a quick reference to indicate the following functions:

PIN: Is the AT command PIN protected?
- **+**   Yes
- **-**   No
- **±**   Usage is dependent on conditions specified for the command, or not all command types are PIN protected (for example write command PIN protected, read command not).
- Note: The table provided in Section 18.1, `Available AT Commands and Dependency on SIM PIN` uses the same symbols.

✈   Is the AT command supported in AIRPLANE mode?
- **+**   Yes
- **-**   No
- **±**   In AIRPLANE mode, not all described functions are available. For example, the test or read command is usable, the write or execute command is not. Furthermore, only some of the listed parameters can be changed in AIRPLANE mode. A typical example is `AT^SCFG` that controls different features.

Last: If commands are concatenated, this AT command must be the last one.
- **+**   Yes
- **-**   No
- Note: See also Section 1.5, AT Command Syntax for details on concatenated AT commands.

Example:

PIN	✈	Last
-	-	-

1.3.2 Superscript Notation for Parameters And Values

Table 1.1: Symbols used to mark the type of parameters

Parameter type	Meaning
<param>(num)	Parameter value must be numeric type
<param>(str)	Parameter value must be string type enclosed in quotation marks.
<param>(text)	Parameter value is a string according to selected character set. Not enclosed in double quotes.
<param>(u)	Unspecified, i.e. parameter value may be numeric or string type.

Table 1.2: Symbols used to indicate storage options or correlations with other commands

Parameter option	Meaning
<param>(+CSCS)	Parameter value has to be (is) coded according to current setting of <charSet> (see AT+CSCS for details)
<param>(&W)	Parameter value is stored to user profile in non-volatile memory after executing AT&W
<param>(&V)	Parameter value is displayed by AT&V
<param>(NV)	Parameter is stored in non-volatile memory.

Table 1.3: Symbols used to mark different types of default values of parameters

Value option	Meaning
[x]	Default value set if parameter is omitted.
x(&F)	Factory value restored by AT&F
x(P)	Powerup value of a parameter not stored in non-volatile memory.
x(D)	Delivery value of a parameter which may be overridden from non-volatile setting (refer to symbol (NV) and symbol (&W) above).

1.4   AT Command Interpreter

EXS82-W features several AT command ports mapped to
- the serial interface ASC0 (AT command port 1)
- the serial interface ASC1 (AT command port 2)
- the USB serial ports 1 - 2 (AT command ports 3 - 4)

If Multiplex mode is started on any AT command port 1 - 4 the number of AT command ports is 1 - 6.
For more details see AT^SQPORT and AT+CMUX.

All AT command ports are independent and do not share configuration settings if not stated otherwise.
The AT command scanner has a 30s timeout. If after AT command input started the scanner does not receive the next character within 30s current AT command input is terminated with "ERROR". This will free the AT command port, and URCs will not be blocked any longer. Any received character will restart the 30s timeout. The timer is stopped when AT command input is finished (command line termination character detected). So to avoid the timeout error just send at least 1 character every 29s until you send the finishing command oline termination character.

If the AT parser detects an unknown AT command it will return "+CME ERROR: unknown".

Please note, that not all of the AT commands, which are described as mandatory in ITU-T V.250 [18], are implemented but only the ones described in this specification.

1.5 AT Command Syntax

The "AT" or "at" prefix must be set at the beginning of each command line. To terminate a command line enter <CR>. Commands are usually followed by a response that includes "<CR><LF><response><CR><LF>". Throughout this document, only the responses are presented, <CR><LF> are omitted intentionally.

Table 1.4: Types of AT commands and responses

AT command type	Syntax	Function
Test command	AT+CXXX=?	The test response returns supported parameters and supported values. Values can be shown as a list of single values or a range, for example, (1,2,3) or (1-3).
Read command	AT+CXXX?	This command returns the currently set value of the parameter or parameters.
Write command	AT+CXXX=<...>	This command sets user-definable parameter values.
Exec(ution) command	AT+CXXX	The execution command reads non-variable parameters determined by internal processes in the UE.

1.5.1 Using Parameters

- Parameters are separated by commas.
  Please note that throughout this document spaces behind commas may be added for better readability.
- Optional parameters are enclosed in square brackets. If optional parameters are omitted and no default value is explicitly specified, then 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 command string it must be replaced by a comma.
- A parameter value enclosed in square brackets represents the value that will be used if an optional parameter is omitted.
- When the parameter is a character string the string must be enclosed in quotation marks. 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 ITU-T V.250 command is omitted, its value is assumed to be 0.
- Hexadecimal numeric parameters consist of a sequence of one or more of the characters "0" through "9", inclusive, and "A" through "F" inclusive. The characters "A" through "F" represent the equivalent decimal values 10 through 15. A leading "0x" is not allowed.

1.5.2 Concatenating AT Commands

Concatenating AT commands on the same line is possible, though not recommended because of restrictions listed below (for more details see ITU-T V.250 [18]).
When concatenating AT commands you need to enter the "AT" or "at" prefix only once at the beginning of a command line. Basic commands (i.e., ITU-T V.250 commands) are concatenated without delimiter. Extended commands (i.e., commands starting with AT+ or AT^) use a semicolon as delimiter.

Disadvantages and restrictions:
- There is no way to control the minimum time to wait between finishing an AT command and sending the next one. Please refer to Section 1.6, Communication between Customer Application and EXS82-W for details about timing.
- The sequence of processing the AT commands may be different from the sequential order of command input.
- Many AT commands cannot be concatenated (see list below). Concatenating these commands might end up

with an error result code, or leads to an unexpected order of responses.

AT command type	Comment
3GPP TS 27.007 commands	Cannot be concatenated with extended commands (prefix AT^S)
3GPP TS 27.005 commands (SMS)	To be used standalone
Commands starting with AT&	To be used standalone
AT+IPR	To be used standalone

1.6   Communication between Customer Application and EXS82-W

After power-up or restart ensure that the UE is in ready state before trying to send any AT command or data. For detailed information on timing conditions, signal states and particularly the startup behavior of the EXS82-W's signal lines refer to the Hardware Interface Description [2].

Leaving hardware flow control unconsidered the Customer Application (TE) is coupled with the EXS82-W (UE) via a receive and a transmit line.

Since both lines are driven by independent devices collisions may (and will) happen. For example, if the TE issues an AT command and the EXS82-W starts sending a URC. This will probably cause the TE to misinterpret 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 ms before sending the next one.
  The pause between two AT commands gives the EXS82-W the opportunity to the transmission of pending URCs and get necessary service.
- The TE shall communicate with the EXS82-W using activated echo (ATE1), i.e. the EXS82-W 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.

Using Backspace at command line:
- As the standard GSM alphabet does not provide a backspace functionality the EXS82-W is designed to use the character "08" (hex 0x08) as backspace for command line input. This allows the user to easily erase the last character when writing an AT command. On the other hand, this solution requires entering the escape sequence \08 for writing the "ò" character in GSM character string parameters.
- If command echo is enabled (ATE1) Backspace may cause 08 - 32 - 08 (decimal) character sequence or no echo, depending on serial interface and speed of character input.

Software flow control:
- Regardless of the selected alphabet, keep in mind that, when using software flow control (AT\Q1), character values 17 and 19 (decimal) are interpreted as XON/XOFF control characters.

1.7 Supported character sets

EXS82-W supports two character sets: *GSM 7 bit*, also referred to as GSM alphabet or SMS alphabet (3GPP TS 23.038 [38]) and *UCS216 bit* (ISO-10646 [15]). See AT+CSCS for information about selecting the character set. Character tables can be found below.

Explanation of terms
- Escape Character
  There are two types of escape sequences which lead to an alternative interpretation on subsequent characters by the UE:
  - AT command interface
    Escape sequences starting with character value 0x5C are used for the UE's non-UCS2 input and output.
  - GSM 7 bit default alphabet
    The escape sequence used within a text coded in the GSM 7 bit default alphabet is starting with character value 0x1B and needs to be correctly interpreted by the TE, both for character input and output. To the EXS82-W, an escape sequence appears like any other byte received or sent.

  For SMS user data input after the prompt '>' in text mode (AT+CMGF)=1 and AT+CSCS="GSM" the character 0x1A is interpreted as 'CTRL-Z'. The character 0x1B (interpreted as 'ESC') as well as the escape character 0x5C (is interpreted as 'Ö'), therefore both escape mechanisms are not supported in this case.
- TE Character Set
  The character set currently used by the Customer Application is selected with AT+CSCS. It is recommended to select UCS2 setting.
- 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.
- International Reference Alphabet (IRA)
  The International Reference Alphabet is equivalent to ASCII (American Standard Code for Information Interchange) and ISO 646, i.e. it defines a 7-bit coded character set. The mapping can be obtained from the character set tables below (UCS2 values 0x0000 to 0x007F).

When you enter characters that are not valid characters of the supported alphabets the behavior is undefined. If GSM alphabet is selected, all characters sent over the serial line (between TE and UE) must be in the range from 0 to 127 (7 bit range).
Note: If the UE is configured for GSM alphabet, but the Customer Application (TE) uses ASCII, bear in mind that some characters have different code values, such as the following:
- "@" character with GSM alphabet value 0 is not displayable by an ASCII terminal program, e.g. Microsoft© Hyperterminal®.
- "@" character with GSM alphabet value 0 will terminate any C string! This is because value 0 is defined as C string end tag. Therefore, the GSM Null character will cause problems on application level when using 'C'-functions, e.g. "strlen()". Using an escape sequence as shown in the table below solves the problem. By the way, this may be the reason why even network providers sometimes replace '@' with "@=*" in their SIM application.
- Some other characters of the GSM alphabet may be 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 in both alphabets there are different characters assigned to value 7C (hexadecimal).

If the TE sends characters differently coded or undefined in ASCII or GSM (e.g. Ä, Ö, Ü) it is possible to use escape sequences. The UE's input parser translates the escape sequence to the corresponding GSM character value.

Note:
The UE also uses escape sequences for its non-UCS2 output: Quotation mark (") and the escape character itself (\, respectively Ö in GSM alphabet) are converted, as well as all characters with a value below 32 (hexadecimal 0x20).
Hence, the input parser of the Customer Application needs to be able to translate escape sequences back to the corresponding character of the currently used alphabet.
Unsupported characters are shown as a space (hexadecimal 0x20).

Table 1.5: Exemplary escape sequences generated by EXS82-W for its non-UCS2 output

Character Value	ASCII Character	GSM Character	UCS2 Character	Escape Sequence	Numeric Escape Sequence
0x5C	\	Ö	00D6	\5C	0x5C 0x35 0x43
0x22	"	"	0022	\22	0x5C 0x32 0x32
0x00	NULL	@	n/a	\00	0x5C 0x30 0x30

Usually terminal programs are not able to recognize escape sequences, and thus, handle them as normal characters.
To prevent misinterpretation of control characters or special characters it is recommended to always use UCS2 alphabet and PDU mode.

1.7.1　　GSM alphabet tables and UCS2 character values

This section provides tables for the GSM default alphabet (3GPP TS 23.038 [38]) supported by the EXS82-W. Below any GSM character find the corresponding two byte character value of the UCS2 alphabet. For details refer to "ETSI GSM 03.38 mapping into Unicode" [16].

Main character table of GSM 7 bit default 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 3)	Σ 03A3	(0028	8 0038	H 0048	X 0058	h 0068	x 0078
1	0	0	1	9	ç 00E7	Θ 0398	) 0029	9 0039	I 0049	Y 0059	i 0069	y 0079
1	0	1	0	10/A	LF [LF] 2)	Ξ 039E	* 002A	: 003A	J 004A	Z 005A	j 006A	z 007A
1	0	1	1	11/B	Ø 00D8	1)	+ 002B	; 003B	K 004B	Ä 00C4	k 006B	ä 00E4
1	1	0	0	12/C	ø 00F8	Æ 00C6	, 002C	< 003C	L 004C	Ö 00D6	l 006C	ö 00F6
1	1	0	1	13/D	CR [CR] 2)	æ 00E6	- 002D	= 003D	M 004D	Ñ 00D1	m 006D	ñ 00F1
1	1	1	0	14/E	Å 00C5	ß 00DF	. 002E	> 003E	N 004E	Ü 00DC	n 006E	ü 00FC
1	1	1	1	15/F	å 00E5	É 00C9	/ 002F	? 003F	O 004F	§ 00A7	o 006F	à 00E0

Figure 1.1: Main character table of GSM 7 bit default 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) See Section 1.6 for further details on using backspace and "ò" character.

Extension character table of GSM 7 bit default 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					€[2] 20AC	
0	1	0	1	5								
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	[LF][3]							
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 7 bit default 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.

If the Customer Application receives a code where a symbol is not represented in Figure 1.2, Extension character table of GSM 7 bit default alphabet it shall display the character shown in the main GSM 7 bit default alphabet table (see Figure 1.1, Main character table of GSM 7 bit default alphabet).

1.7.2 UCS2 and GSM character coding and conversion

This section provides basic information on how to handle input and output character conversion, e.g. for SMS text mode and Remote SAT, if the character representation of UE and Customer Application differ, i.e. if the Data Coding Scheme and the TE character set use different mappings.

1.7.2.1 Output of SIM data (UE 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 the 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 is sent to the TE as 2 IRA characters each representing a halfbyte.
Example: B8'H (184 decimal) → 42'H, 38'H, displayed as "B8"

Case 3
Every 16-bit UCS2 value is sent to the 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 UCS2 character

Case 4
Every GSM character is sent to the 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 the 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 the 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"

1.7.2.2   Input of SIM data (TE to UE)

Used characterset	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 UCS2 to GSM (4:1)	Case 5 UCS2 to 8 bit (4:1)	Case 6 UCS2 to 16 bit (4:2)

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 UE as GSM character (or ASCII with standard terminal emulation, e.g. 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 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 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 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.

1.8 Unsolicited Result Code Presentation

URC stands for Unsolicited Result Code and is a report message issued by the EXS82-W without being requested by the TE, i.e. a URC is issued automatically when a certain event occurs. Hence, a URC is not issued as part of the response related to an executed AT command.

Typical events leading to URCs are incoming calls ("RING"), waiting calls, received short messages, changes in temperature, network registration etc. For most of these messages, the UE needs to be configured whether or not to send a URC. Such URCs will be sent only on the AT channels for which they were enabled. Descriptions of these URCs are provided with the associated AT command.

Some URCs are not user definable and will be sent on all AT channels. These URCs are described in Section 1.8.1, Common URCs.

A summary of all URCs can be found in Section 18.5, Summary of Unsolicited Result Codes (URC).

1.8.1 Common URCs

This section lists URCs that cannot be disabled by the user and appear automatically when the required conditions described below occur.

- "^SYSSTART"
- "^SYSSTART AIRPLANE MODE"
- Voltage Monitoring:
  Please refer to [2] for specifications regarding the minimum and maximum operating voltage limits. The automatic shutdown procedure is usually equivalent to the Power-down initiated with the AT^SMSO command, except when the voltage threshold is exceeded very quickly.
  - "^SBC: Undervoltage Warning"
  - "^SBC: Undervoltage Shutdown"
  - "^SBC: Overvoltage Warning"
  - "^SBC: Overvoltage Shutdown"
- "^SHUTDOWN"

URC 1

^SBC: Undervoltage Warning

Supply voltage is close to the defined undervoltage threshold.

URC 2

^SBC: Undervoltage Shutdown

Undervoltage threshold exceeded. Module switches off within 5 seconds after sending the URC.

URC 3

^SBC: Overvoltage Warning

Supply voltage is close to overvoltage threshold. The URC is sent once.

URC 4

^SBC: Overvoltage Shutdown

Overvoltage threshold exceeded. Module switches off within 5 seconds after sending the URC.

URC 5

^SHUTDOWN

Indicates that the power-off procedure is finished and the module will be switched off in less than 1 second. In case of Fast Shutdown the "^SHUTDOWN" URC will not be issued.

1.9 Errors and Messages

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

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

A result error code terminates the execution of the command and prevents the execution of all remaining commands that may follow on the same command line.

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

See also:
- Section 2.8.1, CME/CMS Error Code Overview
- Section 2.5.1, Verbose and numeric result codes
- Section 3.1, AT+CEER

2.   Configuration Commands

The AT Commands described in this chapter allow the external application to determine the EXS82-W's behaviour under various conditions.

2.1   AT&F   Reset AT Command Settings to Factory Default Values

AT&F resets AT command settings to their factory default values. AT&W shall be used to retain these values effective for next power-up.
However, the command does not change the current bit rate of EXS82-W's asynchronous serial interface (UART).
For a list of affected parameters refer to Section 18.4, Factory Default Settings Restorable with AT&F.

Syntax

Exec Command
AT&F[<value>]
Response(s)
OK

PIN	✈	Last		Reference(s)
-	+	-		ITU-T V.250 [18]

Parameter Description

<value>(num)

[0]   Reset parameters in Section 18.4, Factory Default Settings Restorable with AT&F to their factory default values.

2.2   AT&V   Display current Configuration

AT&V returns the setting of several AT command parameters applicable to the current operating mode, including the single-letter AT command parameters which are not readable otherwise.
The response of AT&V varies depending on whether or not PIN authentication has been done.

Syntax

Exec Command
AT&V
Response(s)
ACTIVE PROFILE: ... (see Section 2.2.1, AT&V Response) OK

PIN	✈	Last
-	+	-

2.2.1   AT&V Response

Table 2.1:   AT&V Response

PIN authentication done	No PIN authentication
ACTIVE PROFILE: E1 Q0 V1 X0 &C1 &D2 &S0 \Q3 +CMGF: 0 +CSDH: 0 +CNMI: 0,0,0,0,1 +IPR: 115200 +ICF: 3[,<parity>] +CMEE: 2 +CSMS: 0,1,1,0 ^SCKS: 0,1 ^SSET: 0 +CREG: 0,1 +CGSMS: 1 +COPS: 0[,<format>,<opName>,<rat>] +CSCS: "GSM" ^SLED: 0 OK	ACTIVE PROFILE: E1 Q0 V1 &C1 &D2 &S0 \Q3 +IPR: 115200 +ICF: 3[,<parity>] +CMEE: 2 ^SCKS: 0,1 ^SSET: 0 +CREG: 0,1 +COPS: 0[,<format>,<opName>,<rat>] +CSCS: "GSM" ^SLED: 0 OK

2.3 AT&W Store AT Command Settings to User Defined Profile

AT&W stores the current AT command settings to a user defined profile in non-volatile memory of EXS82-W. The AT command settings will automatically be restored from the user defined profile during power-up or if ATZ is used. AT&F restores AT command factory default settings. Hence, until first use of AT&W, ATZ works as AT&F. A list of parameters stored to the user profile can be found at Section 18.3, AT Command Settings storable with AT&W.

Syntax

Exec Command
AT&W[<value>]

Response(s)
OK
ERROR
+CME ERROR: <err>

PIN	✈	Last		Reference(s)
-	+	-		V.250

Parameter Description

<value>(num)

[0]   User Profile Number

2.4　ATQ　Result Code Presentation Mode

ATQ controls if the EXS82-W transmits any result code to the TE. Other information text transmitted as response is not affected.

Syntax

Exec Command
ATQ[<n>]
Response(s)
If <n>=0:   OK   If <n>=1:   (none)

PIN	✈	Last		Reference(s)
-	+	-		V.250

Parameter Description

<n>(num)(&V)(&W)

Result Code Presentation Mode.
It is not recommended to change this value.

[0](&F)(D)　　　　　　　　　UE transmits result code.

1　　　　　　　　　　　　　Result codes are suppressed and not transmitted.

2.5 ATV Result code format mode

This command determines the contents of 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. Please note, that ATV does not affect numeric or verbose +CME ERROR responses. This means that if AT+CMEE parameter <errMode> is set to 1 or 2 and a command returns a CME or CMS error, than it is always printed verbose. A numeric result code is printed only if ATV0 and AT+CMEE=0 is set.

Syntax

Exec Command
ATV[<value>]
Response(s)
OK
ERROR

PIN	✈	Last		Reference(s)
-	+	-		ITU-T V.250 [18]

Parameter Description

<value>^{(num)(&V)(&W)}

$<value>^{(num)(\&V)(\&W)}$

[0]	Information response: <text><CR><LF> Short result code format: <numeric code><CR>
1^{(&F)(D)}	Information response: <CR><LF><text><CR><LF> Long result code format: <CR><LF><verbose code><CR><LF>

2.5.1 Verbose and numeric result codes

Verbose format	Numeric format	Meaning
OK	0	command executed, no errors
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, dialling impossible, wrong mode
BUSY	7	remote station busy
NO ANSWER	8	no answer

2.6 ATX Result Code Selection

ATX determines whether or not the EXS82-W transmits particular result codes to the TE.
ATX also controls whether or not the UE verifies the presence of a dial tone when it begins dialing, and if engaged tone (busy signal) detection is enabled.

Syntax

Exec Command
ATX[<value>]
Response(s)
OK
ERROR

PIN	✈	Last		Reference(s)
+	**+**	**-**		ITU-T V.250 [18]

Parameter Description

<value>(num)(&V)(&W)

[0](&F)(D)	CONNECT result code returned. Dial tone and busy detection are disabled.
1	CONNECT result code returned. Dial tone and busy detection are disabled.
2	CONNECT result code returned. Dial tone detection is enabled, busy detection is disabled.
3	CONNECT result code returned. Dial tone detection is disabled, busy detection is enabled.
4	CONNECT result code returned. Dial tone and busy detection are both enabled.

2.7　ATZ　Restore AT Command Settings from User Defined Profile

First ATZ resets the AT command settings to their factory default values, similar to AT&F. Afterwards the AT command settings are restored from a user defined profile in non-volatile memory of EXS82-W, if one was stored with AT&W before. Any additional AT command on the same command line may be ignored. A delay of 300 ms is required before next AT command is sent.
However, ATZ does not change the current bit rate of EXS82-W's asynchronous serial interface (UART).
ATZ does not change the PDP context profiles.

Syntax

Exec Command
ATZ[<value>]
Response(s)
OK

PIN	✈	Last		Reference(s)
+	**+**	**-**		V.250

Parameter Description

<value>(num)

[0]	User Profile Number

2.8 AT+CMEE Error Message Format

AT+CMEE controls the format of error result codes that indicates errors related to EXS82-W 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 2.2, General "CME ERROR" Codes (3GPP TS 27.007), Table 2.3, GPRS related "CME ERROR" Codes (3GPP TS 27.007) and Table 2.5, SMS related "CMS ERROR" Codes (3GPP TS 27.005).

The AT+CMEE exec command performs a write command with factory default parameter setting.

Syntax

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

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

Exec Command
AT+CMEE
Response(s)
OK
ERROR
+CME ERROR:<err>

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

PIN ✈ Last	Reference(s)
- + -	3GPP TS 27.007 [49], 3GPP TS 27.005 [48]

Parameter Description

<errMode>(num)(&V)(&W)

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

2.8.1 CME/CMS Error Code Overview

Table 2.2: General "CME ERROR" Codes (3GPP TS 27.007)

<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
100	unknown

Table 2.3: GPRS related "CME ERROR" Codes (3GPP TS 27.007)

<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
127	missing or unknown APN
132	service option not supported
133	requested service option not subscribed
134	service option temporary out of order
148	unspecified GPRS error
149	PDP authentication failure
150	invalid mobile class
273	minimum TFTs per PDP address violated
274	TFT precedence index not unique
275	invalid parameter combination

Table 2.4: Enhanced "CME ERROR" Codes

<err> Code	Text (if AT+CMEE=2)
256	operation temporary not allowed
257	network rejected request
258	retry operation
259	invalid deflected to number
260	deflected to own number
261	unknown subscriber
262	service not available
263	unknown class specified
264	unknown network message
300	resource limitation
301	subscription violation
302	TeleService not provisioned
303	error BearerService not provisioned
304	system failure
305	data missing
306	unknown alphabet
307	unexpected data value
308	unrecognized component
309	mistyped component
310	badly structured component
311	mistyped parameter
312	initiating release

<err> Code	Text (if AT+CMEE=2)
320	call barred
330	SMSC address unknown
331	network search aborted
332	could not camp on chosen cell
333	reselection to chosen cell failed
340	call index error
341	call state error
342	sys state error
343	parameters error
344	expired password
350	cancelled due to active call state
351	cancelled due to location update processing
352	cancelled due to packet transfer mode
353	cancelled due to radio resource connection establishment
354	cancelled due to ongoing SMS transfer
355	cancelled due to ongoing SS transaction
767	operation failed

Table 2.5: SMS related "CMS ERROR" Codes (3GPP TS 27.005)

<err> Code	Text (if AT+CMEE=2)
0	none
212	invalid parameter
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

<err> Code	Text (if AT+CMEE=2)
332	network timeout
340	no +CNMA acknowledgement expected
500	unknown error
512	user abort
538	invalid parameter

2.9 AT+CSCS Character Set

AT+CSCS write command informs the EXS82-W which character set is used by the TE. This enables the UE to convert character strings correctly between TE and UE character sets. Please also refer to Section 1.7, Supported character sets.

Note: If UE-TE interface is set to 8-bit operation (AT+ICF) and selected character set is <charSet>="GSM" (7-bit), the highest bit will be set to zero.

Syntax

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

Read Command
AT+CSCS?
Response(s)
+CSCS: <charSet>
OK

Write Command
AT+CSCS=<charSet>
Response(s)
OK
ERROR
+CME ERROR: <err>

PIN	✈	Last		Reference(s)
-	+	-		3GPP TS 27.007 [49]

Parameter Description

<charSet>(str)(&V)(&W)

"GSM"(&F)(P)   GSM default alphabet (3GPP TS 23.038 [38], subclause 6.2.1).
Note: This setting may cause software flow control problems since the codes used to stop and resume data flow (XOFF = decimal 19, XON = decimal 17) are interpreted as normal characters.

"UCS2"   16-bit universal multiple-octet coded character set (ISO/IEC10646 [32]). UCS2 character strings are converted to hexadecimal numbers in the range 0000 to FFFF; e.g. "004100620063" equates three 16-bit characters with decimal values 65, 98 and 99.

2.10   AT+CFUN   EXS82-W Functionality Level

AT+CFUN controls EXS82-W functionality levels "Normal Functionality Mode" and "Airplane Mode".
AT+CFUN can also be used to reset the UE.

In pure Airplane Mode (AT+CFUN parameter <fun>=4) the UE shuts down its radio interface (PA and receiver), what causes the UE to log off from network and disables AT commands whose execution requires a radio connection. In extended Airplane Mode (<fun>=0) the UE shuts down its radio and USIM interfaces.
The benefit of using Airplane Modes is that they allow to save power and, at locations where no RF emission is allowed (typically airplanes, hospitals etc.), the subscriber can continue network-independent activities rather than powering off the UE.

Syntax

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

PIN	✈	Last		Reference(s)
-	+	-		3GPP TS 27.007 [49]

Unsolicited Result Codes

URC 1

  ^SYSSTART

  URC indicates that the UE is running in Normal Functionality level.

URC 2

  ^SYSSTART AIRPLANE MODE

  URC indicates that the UE is running in Airplane Mode.

Parameter Description

<fun>(num)

This parameter determines the functionality level of the UE.

0	Switch UE into Minimum Functionality level. UE's RF (TX and RX) and USIM interfaces are shut down. Consequently, the UE logs off from network and enters extended Airplane Mode, which is indicated via "^SYSSTART AIRPLANE MODE" URC. Accordingly, AT commands whose execution requires a radio connection or USIM access either return an error result code or reflect the limited operating state. Direct switches between pure and extended Airplane Modes (and vice versa) are not supported. To return to Normal Functionality level use AT+CFUN=1 or AT+CFUN=1,1. After this, PIN authentication may be necessary if required by the USIM.
1(P)	Switch UE into Normal Functionality level, which is indicated via "^SYSSTART" URC.
4	Switch UE into pure Airplane Mode. UE's RF-interface (TX and RX) is shut down whereby it logs off from the network and enters Airplane mode, which is indicated via "^SYSSTART AIRPLANE MODE" URC. USIM remains accessible. Accordingly, AT commands whose execution requires a radio connection will return an error result code or reflect the limited operating state. Direct switches between pure and extended Airplane Modes (and vice versa) are not supported. To return to Normal Functionality level use AT+CFUN=1 or AT+CFUN=1,1. The UE may reregister to the network, e.g. if network service is available.

<rst>(num)

[0]	UE switches to <fun> level without reset.
1	Reset and restart the UE. Restart is only possible with <fun>=1; however, the current functionality level will be retained.

2.11 AT^SCFG Extended Configuration Settings

AT^SCFG can be used to query and configure various settings of the EXS82-W.
AT^SCFG read command returns a list of all supported parameters and their current values.
AT^SCFG write command queries a configuration parameter (if no value is entered) or sets its value(s).

Syntax

Test Command

AT^SCFG=?

Response(s)

^SCFG: "GPIO/Mode/Suspend", (list of supported <suspend>s)
^SCFG: "GPRS/AutoAttach", (list of supported <gaa>s)
^SCFG: "GPRS/MTU/Mode", (list of supported <nwmode>s)
^SCFG: "GPRS/MTU/Size", (range of supported <mtusize>s)
^SCFG: "Ident/Manufacturer", (max. string length of <manufacturer>)
^SCFG: "Ident/Product", (max. string length of <product>)
^SCFG: "MEopMode/CregRoam", (list of supported <mrs>s)
^SCFG: "MEopMode/PowerMgmt/Suspend", (list of supported <Suspend>s), (list of supported
<SuspendModeVolatility>s)
^SCFG: "MEopMode/Prov/AutoSelect", (list of supported <provAutoSelect>s)
^SCFG: "MEopMode/Prov/Cfg", (list of supported <provCfg>s)
^SCFG: "MEopMode/PwrSave", (list of supported <PwrSaveMode>s), (list of supported
<PwrSavePeriod>s), (list of supported <PwrSaveWakeup>s)
^SCFG: "MEopMode/RscMgmt/Rrc", (list of supported <order>s)
^SCFG: "MEopMode/RingOnData", (list of supported <ringlineSig>s)
^SCFG: "MEopMode/ShutdownOnCritTemp", (list of supported <sdoct>s)
^SCFG: "MEShutdown/sVsup/threshold", (list of supported <vthresh>s), (list of supported
<PowerSupplyDomain>s)
^SCFG: "Radio/Band/2G", (list of supported <rba2g>s)
^SCFG: "Radio/Band/CatM", (list of supported <rbacatm-1>s), (list of supported <rbacatm-2>s)
^SCFG: "Radio/Band/CatNB", (list of supported <rbacatnb-1>s), (list of supported <rbacatnb-2>s)
^SCFG: "Radio/Mtpl", (list of supported <PL_mode>s), (list of supported <PL_profile>s)
^SCFG: "Radio/Mtpl/2G", (list of supported <PL_mode>s), (list of supported <PL_profile>s), (list of
supported <PL_band2g>s), , (list of supported <PL_limit2g>s), (list of supported <PL_limit_psk>s)
^SCFG: "Radio/Mtpl/4G", (list of supported <PL_mode>s), (list of supported <PL_profile>s), (list of
supported <PL_band4g-1>s), (list of supported <PL_band4g-2>s), (list of supported <PL_limit4g>s)
^SCFG: "Radio/OutputPowerReduction", (list of supported <ropr>s)
^SCFG: "Radio/Suspend", (list of supported <SuspendMode>s)
^SCFG: "RemoteWakeUp/Ports", (list of supported <RemWakePortSet>s), (list of supported
<RemWakePort>s)
^SCFG: "SIM/CS", (list of supported <CS>s)
^SCFG: "SIM/DualMode", (list of supported <sdm>s)
^SCFG: "SMS/AutoAck", (list of supported <SmsAcknl>s)
^SCFG: "Tcp/MR", (list of supported <tcpMr>)
^SCFG: "Tcp/OT", (list of supported <tcpOt>)
^SCFG: "Tcp/IRT", (list of supported <tcpirt>)
^SCFG: "Tcp/WithURCs", (list of supported <tcpWithUrc>)
^SCFG: "Tcp/TLS/Version", (list of supported <TLS_min_version>s), (list of supported
<TLS_max_version>s)
^SCFG: "URC/Ringline", (list of supported <urcRinglineCfg>s)
^SCFG: "URC/Ringline/ActiveTime", (list of supported <urcRinglineDuration>s)
OK

Read Command

AT^SCFG?

Response(s)

^SCFG: "GPIO/Mode/Suspend", <suspend>
^SCFG: "GPRS/AutoAttach", <gaa>
^SCFG: "GPRS/MTU/Mode", <nwmode>
^SCFG: "GPRS/MTU/Size", <mtusize>
^SCFG: "Ident/Manufacturer", <manufacturer>
^SCFG: "Ident/Product", <product>
^SCFG: "MEopMode/CregRoam", <mrs>
^SCFG: "MEopMode/PowerMgmt/Suspend", <Suspend>, <SuspendModeVolatility>
^SCFG: "MEopMode/Prov/AutoSelect", <provAutoSelect>
^SCFG: "MEopMode/Prov/Cfg", <provCfg>
^SCFG: "MEopMode/PwrSave", <PwrSaveMode>, <PwrSavePeriod>, <PwrSaveWakeup>
^SCFG: "MEopMode/RingOnData", <ringlineSig>
^SCFG: "MEopMode/RscMgmt/Rrc", <order>
^SCFG: "MEopMode/ShutdownOnCritTemp", <sdoct>
^SCFG: "MEShutdown/sVsup/threshold", <vthresh_BB_curr>, <vthresh_BB_request>
^SCFG: "Radio/Band/2G", <rba2g>
^SCFG: "Radio/Band/CatM", <rbacatm-1>[, <rbacatm-2>]
^SCFG: "Radio/Band/CatNB", <rbacatnb-1>[, <rbacatnb-2>]
^SCFG: "Radio/Mtpl", <PL_mode>[, <PL_profile>]
^SCFG: "Radio/Mtpl/2G", <PL_mode>[, <PL_profile>]
^SCFG: "Radio/Mtpl/4G", <PL_mode>[, <PL_profile>]
^SCFG: "Radio/OutputPowerReduction", <ropr>
^SCFG: "Radio/Suspend", <SuspendMode>
^SCFG: "RemoteWakeUp/Ports", "current"[, <RemWakePort>$_1$[, <RemWakePort>$_2$[, ...]]]
^SCFG: "RemoteWakeUp/Ports", "powerup"[, <RemWakePort>$_1$[, <RemWakePort>$_2$[, ...]]]
^SCFG: "SIM/CS", <CS>
^SCFG: "SIM/DualMode" , <sdm>
^SCFG: "SMS/AutoAck", <SmsAcknl>
^SCFG: "Tcp/MR", <tcpMr>
^SCFG: "Tcp/OT", <tcpOt>
^SCFG: "Tcp/IRT", <tcpirt>
^SCFG: "Tcp/WithURCs", <tcpWithUrc>
^SCFG: "Tcp/TLS/Version", <TLS_min_version>, <TLS_max_version>
^SCFG: "URC/Ringline", <urcRinglineCfg>
^SCFG: "URC/Ringline/ActiveTime", <urcRinglineDuration>
OK

Write Command

Configure Suspend Indication.

AT^SCFG="GPIO/Mode/Suspend"[, <suspend>]

Response(s)

^SCFG: "GPIO/Mode/Suspend", <suspend>
OK
ERROR
+CME ERROR: <err>

Write Command

PS Domain auto attach.

AT^SCFG="GPRS/AutoAttach"[, <gaa>]

Response(s)

^SCFG: "GPRS/AutoAttach", <gaa>
OK

Write Command

(Continued)

PS Domain auto attach.

AT^SCFG="GPRS/AutoAttach"[, <gaa>]

Response(s)

ERROR
+CME ERROR: <err>

Write Command

Use pre-configured MTU Mode.

AT^SCFG="GPRS/MTU/Mode", <nwmode>

Response(s)

^SCFG: "GPRS/MTU/Mode", <nwmode>
OK
ERROR
+CME ERROR: <err>

Write Command

Use pre-configured MTU size.

AT^SCFG="GPRS/MTU/Size", <mtusize>

Response(s)

^SCFG: "GPRS/MTU/Size", <mtusize>
OK
ERROR
+CME ERROR: <err>

Write Command

Configure manufacturer name.

AT^SCFG="Ident/Manufacturer"[, <manufacturer>]

Response(s)

^SCFG: "Ident/Manufacturer", <manufacturer>
OK
ERROR
+CME ERROR: <err>

Write Command

Configure product name.

AT^SCFG="Ident/Product"[, <product>]

Response(s)

^SCFG: "Ident/Product", <product>
OK
ERROR
+CME ERROR: <err>

Write Command

AT^SCFG="MEopMode/CregRoam"[, <mrs>]

Response(s)

^SCFG: "MEopMode/CregRoam", <mrs>
OK
ERROR
+CME ERROR: <err>

Write Command

Enable-disable suspend mode.

AT^SCFG="MEopMode/PowerMgmt/Suspend"[, <Suspend>][, <SuspendModeVolatility>]

Response(s)

^SCFG: "MEopMode/PowerMgmt/Suspend", <Suspend>[, <SuspendModeVolatility>]
OK
ERROR
+CME ERROR: <err>

Write Command

Auto select provider profile.

AT^SCFG="MEopMode/Prov/AutoSelect"[, <provAutoSelect>]

Response(s)

^SCFG: "MEopMode/Prov/AutoSelect", <provAutoSelect>
OK
ERROR
+CME ERROR: <err>

Write Command

Provider profile configuration.

AT^SCFG="MEopMode/Prov/Cfg"[, <provCfg>]

Response(s)

^SCFG: "MEopMode/Prov/Cfg", <provCfg>
OK
ERROR
+CME ERROR: <err>

Write Command

Extended power saving control.

AT^SCFG="MEopMode/PwrSave"[, <PwrSaveMode>][, <PwrSavePeriod>][, <PwrSaveWakeup>]

Response(s)

^SCFG: "MEopMode/PwrSave", <PwrSaveMode>, <PwrSavePeriod>, <PwrSaveWakeup>
OK
ERROR
+CME ERROR: <err>

Write Command

Subcommand controls whether ring line signalization is used by the UE in case it can't output data due to a blocked interface.

AT^SCFG="MEopMode/RingOnData"[, <ringlineSig>]

Response(s)

^SCFG: "MEopMode/RingOnData", <ringlineSig>
OK
ERROR
+CME ERROR: <err>

Write Command

Subcommand controls GNSS and LTE Priority

AT^SCFG="MEopMode/RscMgmt/Rrc"[, <order>]

Response(s)

^SCFG: "MEopMode/RscMgmt/Rrc", <order>
OK
ERROR
+CME ERROR: <err>

Write Command

Subcommand controls shutdown on critical operation temperature of EXS82-W (5 seconds after "^SCTM_B"=2 or -2 is sent).

`AT^SCFG="MEopMode/ShutdownOnCritTemp"[, <sdoct>]`

Response(s)

`^SCFG: "MEopMode/ShutdownOnCritTemp", <sdoct>`
`OK`
`ERROR`
`+CME ERROR: <err>`

Write Command

Query / configure undervoltage threshold

`AT^SCFG="MEShutdown/sVsup/threshold"[, <vthresh>][, <PowerSupplyDomain>]`

Response(s)

`^SCFG: "MEShutdown/sVsup/threshold", <vthresh_BB_curr>, <vthresh_BB_request>`
`OK`
`ERROR`
`+CME ERROR: <err>`

Write Command

Enable/disable 2G radio bands.

`AT^SCFG="Radio/Band/2G"[, <rba2g>]`

Response(s)

`^SCFG: "Radio/Band/2G", <rba2g>`
`OK`
`ERROR`
`+CME ERROR: <err>`

Write Command

Enable/disable Cat.M radio bands.

`AT^SCFG="Radio/Band/CatM"[, <rbacatm-1>][, <rbacatm-2>]`

Response(s)

`^SCFG: "Radio/Band/CatM", <rbacatm-1>[, <rbacatm-2>]`
`OK`
`ERROR`
`+CME ERROR: <err>`

Write Command

Enable/disable Cat.NB radio bands.

`AT^SCFG="Radio/Band/CatNB"[, <rbacatnb-1>][, <rbacatnb-2>]`

Response(s)

`^SCFG: "Radio/Band/CatNB", <rbacatnb-1>[, <rbacatnb-2>]`
`OK`
`ERROR`
`+CME ERROR: <err>`

Write Command

To control (deactivate / activate) output power limitation for SAR (Specific Absorption Rate)
<PL_mode> 2 and 3 (query / configure) are applicable only with:
"Radio/Mtpl/2G"
"Radio/Mtpl/4G"

AT^SCFG="Radio/Mtpl"[, <PL_mode>[, <PL_profile>]]

Response(s)

^SCFG: "Radio/Mtpl", <PL_mode>[, <PL_profile>]
OK
ERROR
+CME ERROR: <err>

Write Command

To control (query / configure) output power limitation for SAR (Specific Absorption Rate).
<PL_mode> 0 and 1 (deactivate / activate) are applicable only with "Radio/Mtpl".

AT^SCFG="Radio/Mtpl/2G"[, <PL_mode>[, <PL_profile>, <PL_band2g>, , <PL_limit2g>, <PL_limit_psk>]]

Response(s)

^SCFG: "Radio/Mtpl/2G", <PL_mode>[, <PL_profile>, <PL_band2g>, , <PL_limit2g>, <PL_limit_psk>]

In case of <PL_mode>=2 and <PL_profile> one profile configuration is printed out
^SCFG: "Radio/Mtpl/2G", <PL_mode>, <PL_profile>, <PL_band2g>, , <PL_limit2g>, <PL_limit_psk>
^SCFG: ["Radio/Mtpl/2G", <PL_mode>, <PL_profile>, <PL_band2g>, , <PL_limit2g>, <PL_limit_psk>]
^SCFG: ["Radio/Mtpl/2G", ...]

In case of <PL_mode>=2 full profile configuration (1-8) is printed out
^SCFG: "Radio/Mtpl/2G", <PL_mode>, <PL_profile>, <PL_band2g>, , <PL_limit2g>, <PL_limit_psk>
^SCFG: ["Radio/Mtpl/2G", <PL_mode>, <PL_profile>, <PL_band2g>, , <PL_limit2g>, <PL_limit_psk>]
^SCFG: ["Radio/Mtpl/2G", <PL_mode>, <PL_profile>, <PL_band2g>, , <PL_limit2g>, <PL_limit_psk>]
^SCFG: ["Radio/Mtpl/2G", ...]

In case of <PL_mode>=3 and <PL_profile>, <PL_band2g>,,<PL_limit2g>,<PL_limit_psk>
^SCFG: "Radio/Mtpl/2G", <PL_mode>[, <PL_profile>]
OK
ERROR
+CME ERROR: <err>

Write Command

To control (query / configure) output power limitation for SAR (Specific Absorption Rate).
<PL_mode> 0 and 1 (deactivate / activate) are applicable only with "Radio/Mtpl".

AT^SCFG="Radio/Mtpl/4G"[, <PL_mode>[, <PL_profile>, <PL_band4g-1>, <PL_band4g-2>, <PL_limit4g>]]

Response(s)

^SCFG: "Radio/Mtpl/4G", <PL_mode>[, <PL_profile>, <PL_band4g-1>, <PL_band4g-2>, <PL_limit4g>]

In case of <PL_mode>=2 and <PL_profile> one profile configuration is printed out
^SCFG: "Radio/Mtpl/4G", <PL_mode>, <PL_profile>, <PL_band4g-1>, <PL_band4g-2>, <PL_limit4g>
^SCFG: ["Radio/Mtpl/4G", <PL_mode>, <PL_profile>, <PL_band4g-1>, <PL_band4g-2>, <PL_limit4g>]

Write Command   (Continued)

To control (query / configure) output power limitation for SAR (Specific Absorption Rate).
<PL_mode> 0 and 1 (deactivate / activate) are applicable only with "Radio/Mtpl".

AT^SCFG="Radio/Mtpl/4G"[, <PL_mode>[, <PL_profile>, <PL_band4g-1>, <PL_band4g-2>, <PL_limit4g>]]

Response(s)

^SCFG: ["Radio/Mtpl/4G", ...]

In case of <PL_mode>=2 full profile configuration (1-8) is printed out
^SCFG: "Radio/Mtpl/4G", <PL_mode>, <PL_profile>, <PL_band4g-1>, <PL_band4g-2>, <PL_limit4g>
^SCFG: ["Radio/Mtpl/4G", <PL_mode>, <PL_profile>, <PL_band4g-1>, <PL_band4g-2>, <PL_limit4g>]
^SCFG: ["Radio/Mtpl/4G", <PL_mode>, <PL_profile>, <PL_band4g-1>, <PL_band4g-2>, <PL_limit4g>]
^SCFG: ["Radio/Mtpl/4G", ...]

In case of <PL_mode>=3 and <PL_profile>, <PL_band4g-1>,<PL_band4g-2>,<PL_limit4g>
^SCFG: "Radio/Mtpl/4G", <PL_mode>[, <PL_profile>]
OK
ERROR
+CME ERROR: <err>

Write Command

Radio output power reduction.

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

Response(s)

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

Write Command

Configure Suspend Mode.

AT^SCFG="Radio/Suspend"[, <SuspendMode>]

Response(s)

^SCFG: "Radio/suspend", <SuspendMode>
OK
ERROR
+CME ERROR: <err>

Write Command

Select ports for waking up the TE

AT^SCFG="RemoteWakeUp/Ports"[, <RemWakePortSet>[, <RemWakePort>₁[, <RemWakePort>₂[, ...]]]]

Response(s)

^SCFG: "RemoteWakeUp/Ports", "current"[, <RemWakePort>₁[, <RemWakePort>₂[, ...]]]
^SCFG: "RemoteWakeUp/Ports", "powerup"[, <RemWakePort>₁[, <RemWakePort>₂[, ...]]]
OK
ERROR
+CME ERROR: <err>

Write Command

Select the USIM to be used.

`AT^SCFG="SIM/CS"[, <CS>]`

Response(s)

`^SCFG: "SIM/CS", <CS>`
`OK`
`ERROR`
`+CME ERROR: <err>`

Write Command

Configure USIM Dual Mode.

`AT^SCFG="SIM/DualMode"[, <sdm>]`

Response(s)

`^SCFG: "SIM/DualMode", <sdm>`
`OK`
`ERROR`
`+CME ERROR: <err>`

Write Command

Enable / disable automatic acknowledgement of a directly routed incoming SMS without entering `AT+CNMA`.

`AT^SCFG="SMS/AutoAck"[, <SmsAcknl>]`

Response(s)

`^SCFG: "SMS/AutoAck", <SmsAcknl>`
`OK`
`ERROR`
`+CME ERROR: <err>`

Write Command

Configuration of TCP parameter 'MaxRetransmissions'.

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

Response(s)

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

Write Command

Configuration of TCP parameter 'OverallTimeout'.

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

Response(s)

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

Write Command

Configuration of TCP parameter 'Initial Retransmission Timeout'.

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

Response(s)

`^SCFG: "Tcp/IRT", <tcpirt>`
`OK`
`ERROR`
`+CME ERROR: <err>`

Write Command

Configuration of Internet Service URCs:

AT^SCFG="Tcp/WithURCs"[, <tcpWithUrc>]

Response(s)

^SCFG: "Tcp/WithURCs", <tcpWithUrc>
OK
ERROR
+CME ERROR: <err>

Write Command

Set a range of accepted TLS versions for the IPoverAT services.

AT^SCFG="Tcp/TLS/Version", <TLS_min_version>, <TLS_max_version>

Response(s)

^SCFG: "Tcp/TLS/Version", <TLS_min_version>, <TLS_max_version>
OK
ERROR
+CME ERROR: <err>

Write Command

Subcommand controls the behavior of the RING line if it is selected for URC signalization.

AT^SCFG="URC/Ringline"[, <urcRinglineCfg>]

Response(s)

^SCFG: "URC/Ringline", <urcRinglineCfg>
OK
ERROR
+CME ERROR: <err>

Write Command

Subcommand controls duration of active RING line if it is selected for URC signalization.

AT^SCFG="URC/Ringline/ActiveTime"[, <urcRinglineDuration>]

Response(s)

^SCFG: "URC/Ringline/ActiveTime", <urcRinglineDuration>
OK
ERROR
+CME ERROR: <err>

PIN ✈ Last

| - | + | - |

Unsolicited Result Code

^SYSRESUME

If SUSPEND mode is enabled with AT^SCFG "MEopMode/PowerMgmt/Suspend" parameter <Suspend> the "^SYSRESUME" URC indicates that the UE wakes up from SUSPEND mode in following cases:
- The host wakes up the UE using the ON pin.
- The UE temporarily wakes up, triggered by the RING line, when receiving data from the network.
In a resume boot sequence, the "^SYSRESUME" URC replaces the "^SYSSTART" URC.

Parameter Description

`<suspend>`(str)(NV)

Control of Suspend Mode Monitor

The module supports a Suspend Mode Monitor signal (SUSPEND_MON) to indicate the Suspend Mode of the module.
Setting takes effect immediately.

"std"	SUSPEND_MON will indicate Suspend Mode (Low: entered in Suspend Mode, High: leaved Suspend Mode)
"off"(D)	SUSPEND_MON doesn't indicate Suspend Mode

`<gaa>`(str)(NV)

PS Domain auto attach

Setting can be used to control whether or not the UE will perform a PS Domain attach immediately after power-up during registration to the network or right after registering to the network, depending on network configuration. If the setting is changed to "enabled" and the UE is not attached yet, it will not initiate an attach immediately but after the next restart and registration to the network. For LTE please see more information in Section 12.2.1, Attaching to LTE Networks.

"disabled"	PS Domain auto attach is disabled
"enabled"(D)	PS Domain auto attach is enabled

`<nwmode>`(num)(NV)

The setting will take effective after restart.

0	Ask network for MTU size
1	Don't ask network for MTU size and use default value

Note: The default value for AT&T will be "1" and the default value for other MNOs will be "0".

`<mtusize>`(num)(NV)

MTU size in bytes.

1280...1430(D)...1500

Notes:

- When UE stays in NB-IoT network, the default value will automatically change to 1358 bytes and the command AT^SCFG="GPRS/MTU/Size" will be not applicable.
- The default value of `<mtusize>` for AT&T is 1430 bytes and the default value of `<mtusize>` for other MNOs is 1428 bytes.

`<manufacturer>`(str)(NV)

Manufacturer name

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

"Cinterion"(D)

`<product>`(str)(NV)

Product name

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

"EXS82-W"(D)

<mrs>^{(str)(NV)}

Modified Roaming Status

This parameter enables or disables the modified roaming status displayed by AT+CREG. If it is enabled, the registration status is "registered to home network" instead of "registered, roaming", when the registered PLMN and the Home PLMN from USIM Elementary File EF_{IMSI} are mapped to the same network name in the EXS82-W internal operator list.
Please consider this configuration has no influence to the commands AT^SIND="roam" and AT+CGREG!

"0"^(D)	Disable the Modified Roaming Status Display.
"1"	Enable the Modified Roaming Status Display.

<Suspend>^(str)

SUSPEND mode

The AT^SCFG "MEopMode/PowerMgmt/Suspend" parameter <Suspend> enables or disables the SUSPEND mode. Settings take effect immediately.
For more details refer to "EXS82-W Hardware Interface Description, Version 01.100". See also AT^SIND indicators "^SuspendAvailable", "^SuspendReady".
Wakeup from SUSPEND mode is indicated by the "^SYSRESUME" URC.

"0"^(D)	Disable SUSPEND mode.
"1"	Enable SUSPEND mode.

If any of the following services is active, the module will not enter SUSPEND mode:

- TCP based service (e.g. HTTP, FTP, MQTT etc.)
- Transparent mode socket services
- Dial-Up Network (DUN)/Point-to-Point Protocol (PPP) connection
- LwM2M services (ongoing register/update, read/write/execute/discover/observation and FOTA download). Note: "ongoing" means the network connection is not released.
- GNSS service

All volatile parameters of AT commands, which are supported by AT&W and ATZ, will will be saved to non-volatile memory before entering SUSPEND mode and restored upon resume from SUSPEND. A list of parameters stored to the user profile can be found at Section 18.3, AT Command Settings storable with AT&W.

<SuspendModeVolatility>^(str)

Suspend Mode Volatility

The AT^SCFG "MEopMode/PowerMgmt/Suspend" parameter <SuspendModeVolatility> controls the volatility of the SUSPEND mode settings. Settings take effect immediately.

"0 (or empty)"	Configuration is volatile and parameter <Suspend> is reset to 0 (SUSPEND disabled) after the next resume from SUSPEND mode.
"1"	Configuration of <Suspend> parameter is stored in non-volatile memory and restored after power-up or resume from SUSPEND mode.

<provAutoSelect>^{(str)(NV)}

Autoselect provider profile

The AT^SCFG "MEopMode/Prov/AutoSelect" parameter <provAutoSelect> enables / disables the autoselection of provider profiles. Setting takes effect after next restart.

The UE comes with two types of preconfigured provider profiles:

- *Dedicated provider profiles distinguished by the IIN field (Issuer Identification Number) of the ICCIDs in the SIM:*
  Each provider profile loads a set of non-volatile provider specific settings, such as PDP contexts defined with AT+CGDCONT, as well as IMS settings if applicable for the specific provider.

- *One Fallback profile intended for all other providers:*
  The fallback profile comes with default PDP contexts. It depends on the provider whether default PDP contexts will do. If not, the TE will be required to define provider specific PDP contexts.

All preconfigured provider profiles are listed by the AT^SCFG=? test command The currently selected provider profile is indicated by the <provCfg> parameter of the AT^SCFG "MEopMode/Prov/Cfg" read command response and by the <provCur> parameter of the AT^SIND "prov" indicator. For profile settings refer to: AT+CGDCONT.
It is the responsibility of the Customer Application manufacturer to use a desired profile.

"on"(D)	Autoselection is on.
	The provider profile changes automatically when the inserted SIM card matches one of the provider profiles preconfigured in the UE.
"off"	Autoselection is off.
	The provider profile can be set manually using the AT^SCFG "MEopMode/Prov/Cfg" write command.

If autoselection is "on", provider profile settings are non-volatile as long as the same SIM or a SIM of the same provider is inserted. Otherwise, if a different provider configuration is selected, or a SIM of a different provider is inserted the existing profile will be cleared before the new profile can be loaded. This applies, in particular, to all PDP contexts defined by AT+CGDCONT, no matter whether loaded as part of a preconfigured provider profile, or set by the TE.
If the fallback profile is enabled, provider profile settings are non-volatile only as long as exactly the same SIM is inserted. Changing the SIM, even though a SIM of the same issuer, always clears all profile settings.

The provider profile status is reported by the URC +CIEV: prov,<provMm>,<provCur> (see AT^SIND "prov"). The URC is enabled by powerup default. The URC reports the current provider profile status after UE restart and any change of the provider profile configuration when autoselection is "on".
If the ICCID IIN of the inserted SIM matches one of the dedicated preconfigured provider profiles <provMm> equals 0.
If the ICCID IIN of the inserted SIM does not match any dedicated preconfigured provider profile <provMm> equals 1. For the fallback provider profile <provMm> is always 1.

The auto selection procedure includes two steps: first step is to check current image is matching to inserted SIM or not and second step is to check current MBN is matching to inserted SIM or not. If current image does not match, it will start image switch procedure. After reboot the corresponding MBM will be loaded and the module will reboot again.
Note: The whole process of automatic selection might take up to several minutes, and module might reboot twice. Therefore the URC "^SYSSTART" will pop up to two times.

<provCfg>(str)(NV)

Provider configuration

The AT^SCFG "MEopMode/Prov/Cfg" parameter <provCfg> controls the provider profiles.
It is not allowed to manually change the provider profile when <provAutoSelect> value is "on". Any attempt to do so will be denied with result code "+CME ERROR: operation temporary not allowed".

"fallb3gpp"	This value represents the fallback provider profile.
	Can be used if the inserted SIM card does not match the provider profiles preconfigured in the UE.
"attus"	Provider AT&T
"verizonus"	Provider Verizon Wireless

The manual selection procedure include two steps, one step is to switch image, another one step is to switch MBN file.
Note: The whole process of manual selection might take up to several minutes, and module might reboot twice. Therefore the URC "^SYSSTART" will pop up to two times.

<PwrSaveMode>^{(str)(NV)}

Power Save Mode

AT^SCFG "MeOpMode/PwrSave" settings allow to control the EXS82-W's power saving behavior.
See also "EXS82-W Hardware Interface Description, Version 01.100" for additional advice on power saving requirements for USB.
The first parameter <PwrSaveMode> enables or disables power save mode.

"disabled"^(D)	Power save mode is disabled. Under no circumstances the UE will enter its power save (SLEEP) state. <PwrSavePeriod> value is reset to zero.
"enabled"	Power save mode is enabled. This mode enables the UE to enter power save (SLEEP) state when no activity occurs on any port. For ASC0 and ASC1, also set the parameters <PwrSave-Period> and <PwrSaveWakeup>. Power saving will take effect only if there is no data pending on any port. The options you can have to prevent that data remains pending: • On each port, the connected TE must retrieve all data sent from the UE to the TE. <PwrSavePeriod> and <PwrSaveWakeup> settings are non-volatile. However, each time when <PwrSaveMode> is enabled without giving <PwrSave-Period> and <PwrSaveWakeup> the last values set are used. (Delivery default is <PwrSavePeriod>="52" and <PwrSaveWakeup>="50").

<PwrSavePeriod>^{(str)(NV)}

Maximum Power Save Period

This parameter is only effective for the UART, i.e. for the serial interface ASC0 and ASC1.
If <PwrSaveMode> is "enabled" the <PwrSavePeriod> value specifies the maximum duration the UE is allowed to stay in power save (SLEEP) state.

"0"..."52"^(D)..."600"	Maximum power save period in 1/10 seconds. In SLEEP state, the CTS line stays inactive, i.e. the AT commmand interface is not accessible. The UART wakes up from SLEEP state after one of the following events: - cyclically after expiry of the specified <PwrSavePeriod>, - sending a URC (incl. for incoming calls), - RX line wakeup(must ensure module is set to none flow control mode.e.g. send "aat",first input will be considered as rx wakeup signal), - toggling the RTS line (falling edge only) After a wakeup event, the UART stays awake (CTS line becomes active), at least for the time defined by the parameter <PwrSaveWakeup> (5.2 seconds by default). <PwrSavePeriod> value "0" means that the UE is allowed to stay in power save (SLEEP) state for an unlimited duration, without cyclic wakeup if once fallen asleep. In this case, the UE wakes up only by sending a URC, or toggling RTS. Especially for large <PwrSavePeriod> values, toggling RTS is an option to wake up the UE any time before the <PwrSavePeriod> expires. Values between 21 and 600 are recommended when the TE is not designed to toggle RTS. A recommended value is retaining the delivery default 52, i.e. 5.2 seconds. However, depending on the requirements of the Customer Application other values may be more suitable.

<PwrSaveWakeup>(str)(NV)

Minimum awake time

This parameter is only effective for the UART, i.e. for the serial interface ASC0 and ASC1.
The <PwrSaveWakeup> value determines the minimum period the UART remains awake after the last activity occurred on the UART (e.g. the first character sent or received caused UART wakeup), or wakeup by RTS toggling.

"1"..."50"(D)..."36000"	Minimum delay in 1/10 seconds before the UE enters power save mode (SLEEP) again after a wakeup event on the UART .

<ringlineSig>(str)

Parameter determines whether ring line signalization is used by the UE in case it can't output data due to a blocked interface. Interface blocking may be caused by an unplugged USB cable or by an inactive RTS line on ASC0, e.g. if the TE is in power save mode.
For details about URC presentation and related hardware signalization refer to Section 1.8, Unsolicited Result Code Presentation. See also parameters <urcRinglineCfg> and <urcRinglineDuration>.

"on"	Ring line signalization is enabled if data can't be sent by the UE due to a blocked interface.
"off"(P)	No Ring line signalization if interface is blocked.

<order>(num)(NV)

GNSS and LTE Priority

Concurrent LTE and GNSS operations are not supported on EXS82-W. When GNSS is higher priority, RRC connection will be locally suspended until completion of the GNSS positioning and paging may be missed during GNSS positioning. When LTE is higher priority, GNSS positioning will be deferred to when the UE goes to idle DRX State. The setting takes effect immediately.

1(D)	GNSS preferred
2	WWAN (LTE/GPRS) preferred

Notes:

- Low possibility that dynamic switch LTE/GNSS priority during LTE/GNSS on-going activities will cause unexpected result like network detach.
- When configured GNSS preferred, GNSS running engine might still be interrupted or delayed by critical network activities/signaling handling.
- When configured WWAN preferred, before starting GNSS engine, the following conditions are required to ensure GNSS has enough time for location:
  1) RRC connection is released;
  2) The time duration from starting GNSS engine to the beginning of next eDRX cycle is longer than around 100s (For hot/warm/cold start, the required value is slightly different).

<sdoct>(str)

Shutdown at critical temperature:

Setting specifies two different function modes of the shutdown at critical temperature limits. This command can be used up to 5 seconds every time after "^SCTM_B"=2 or "^SCTM_B"= -2 is sent from EXS82-W to prevent the shutdown. Each time the EXS82-W leaves and enters the critical operation temperature again, the command has to be sent again to prevent a shutdown. It is strongly recommended that great care be taken when setting the mode to <sdoct>="off".
Please read carefully the notes of AT^SCTM.

"on"(P)	The EXS82-W will shut down.
"off"	The EXS82-W will NOT shut down in case of "^SCTM_B"=2 or "^SCTM_B"= -2.

<vthresh>(str)(NV)

Undervoltage threshold value

The undervoltage thresholds defined for BB domain are calculated for max. 400 mV voltage drops during transmit burst. Power supply sources for EXS82-W applications shall be designed to tolerate 400 mV voltage drops without crossing the lower limits of 2.8 V (BB domain with power split disabled) / 2.6V (BB domain with power split enabled). For EXS82-W applications operating at the limit of the allowed tolerance the default undervoltage threshold may be adapted by selecting a <vthresh> value.
New settings take effect after restart.

If power split is enabled:

"-4"	2.40 V
"-3"	2.45 V
"-2"	2.50 V
"-1"	2.55 V
"0"(D)	2.60 V
"1"	2.65 V
"2"	2.70 V
"3"	2.75 V
"4"	2.80 V

If power split is disabled:

"-4"	2.60 V
"-3"	2.65 V
"-2"	2.70 V
"-1"	2.75 V
"0"(D)	2.80 V
"1"	2.85 V
"2"	2.90 V
"3"	2.95 V
"4"	3.00 V

<PowerSupplyDomain>(str)

Power Supply Domain

"0"	<vthresh> value applies to BB domain (BATT+$_{BB}$ line).

<vthresh_BB_curr>(str)

Current BB undervoltage threshold

"-4"	2.60 V (power split disabled) 2.40 V (power split enabled)
"-3"	2.65 V (power split disabled) 2.45 V (power split enabled)
"-2"	2.70 V (power split disabled) 2.50 V (power split enabled)
"-1"	2.75 V (power split disabled) 2.55 V (power split enabled)
"0"(D)	2.80 V (power split disabled) 2.60 V (power split enabled)
"1"	2.85 V (power split disabled) 2.65 V (power split enabled)
"2"	2.90 V (power split disabled) 2.70 V (power split enabled)
"3"	2.95 V (power split disabled) 2.75 V (power split enabled)
"4"	3.00 V (power split disabled) 2.80 V (power split enabled)

<vthresh_BB_request>(str)

BB undervoltage threshold after next restart

For values see <vthresh_BB_curr>.

<rba2g>(str)(NV)

<rba2g> determines the 2G frequency bands the UE is allowed to use. Values are given in *hexadecimal 32-bit-value order.* Every bit corresponds to a dedicated band number.

"1"	GSM 900
"2"	GSM 1800
"4"	GSM 850
"8"	GSM 1900

Factory default of <rba2g> is the combination of all available bands meaning that all supported bands are allowed. If AT+COPS equals "0" (automatic mode) this solution allows the subscriber to take advantage of a full-featured automatic network selection when trying to register.

Therefore, changes to the band configuration are recommended only if the subscriber wishes to restrict the allowed bands to a specific band or band combination, in particular to speed up the network search, and thus, to reduce the power consumption. In such case, <rba2g> may be one of the supported single values listed below.

Any change of <rba2g> will take effect immediately and will also be effective after next UE restart. So, <rba2g> is a parameter that may be used to read out the current band combination any time.

Note: The AT^SCFG=? test command shows the minimum and maximum band values.
Switching off all 2G bands using AT^SCFG="Radio/Band/2G","0" is possible.
Switching off all bands returns an error. At least one remaining band must be activated.

<rbacatm-1>(str)(NV)

<rbacatm-1> determines Cat.M frequency bands the UE is allowed to use. Values are given in *hexadecimal 32-bit-value order.* Every bit corresponds to a dedicated band number. The number range of <rbacatm-1> covers band 1 to band 32.

"1"	LTE 2100 (B1)
"2"	LTE 1900 (B2)
"4"	LTE 1800 (B3)
"8"	LTE 1700 (B4)
"10"	LTE 850 (B5)
"80"	LTE 900 (B8)
"800"	LTE 700 (B12)
"1000"	LTE 700 (B13)
"20000"	LTE 850 (B18)
"40000"	LTE 800 (B19)
"80000"	LTE 800 (B20)
"1000000"	LTE 1900 (B25)
"2000000"	LTE 850 (B26)
"4000000"	LTE 800 (B27)
"8000000"	LTE 700 (B28)

Factory default of <rbacatm-1> is the combination of all available bands meaning that all supported bands are allowed. If AT+COPS equals "0" (automatic mode) this solution allows the subscriber to take advantage of a full-featured automatic network selection when trying to register.

Therefore, changes to the band configuration are recommended only if the subscriber wishes to restrict the allowed bands to a specific band or band combination, in particular to speed up the network search, and thus,

to reduce the power consumption. In such case, <rbacatm-1> may be one of the supported single values listed below.

Any change to this parameter will take effect immediately. So, <rbacatm-1> is a parameter that may be used to read out the current band combination any time, but the read value is used for reinitializing the UE after next restart.

Note: The AT^SCFG=? test command shows the minimum and maximum band values. Switching off all bands using AT^SCFG="Radio/Band/CatM","0","0" is possible.

<rbacatm-2> (str)(NV)

<rbacatm-2> determines Cat.M frequency bands the UE is allowed to use. Values are given in *hexadecimal bit-value order.* Every bit corresponds to a dedicated band number. The number range of <rbacatm-2> covers band 33 to max possible band. If the UE does not support bands higher than 32 the AT^SCFG test command returns the value range 0 - 0, and the AT^SCFG read command response does not display <rbacatm-2>.

"200000000"	LTE 1745 (B66)
"10000000000000"	LTE 700 (B85)

Factory default of <rbacatm-2> is the combination of all available bands meaning that all supported bands are allowed. If AT+COPS equals "0" (automatic mode) this solution allows the subscriber to take advantage of a full-featured automatic network selection when trying to register.

Therefore, changes to the band configuration are recommended only if the subscriber wishes to restrict the allowed bands to a specific band or band combination, in particular to speed up the network search, and thus, to reduce the power consumption. In such case, <rbacatm-2> may be one of the supported single values listed below.

Any change to this parameter will take effect immediately. So, <rbacatm-2> is a parameter that may be used to read out the current band combination any time, but the read value is used for reinitializing the UE after next restart.

Note: The AT^SCFG=? test command shows the minimum and maximum band values. Switching off all bands using AT^SCFG="Radio/Band/CatM","0","0" is possible.

<rbacatnb-1> (str)(NV)

<rbacatnb-1> determines Cat.NB frequency bands the UE is allowed to use. Values are given in *hexadecimal 32-bit-value order.* Every bit corresponds to a dedicated band number. The number range of <rbacatnb-1> covers band 1 to band 32.

"1"	LTE 2100 (B1)
"2"	LTE 1900 (B2)
"4"	LTE 1800 (B3)
"8"	LTE 1700 (B4)
"10"	LTE 850 (B5)
"80"	LTE 900 (B8)
"800"	LTE 700 (B12)
"1000"	LTE 700 (B13)
"20000"	LTE 850 (B18)
"40000"	LTE 800 (B19)
"80000"	LTE 800 (B20)
"1000000"	LTE 1900 (B25)
"2000000"	LTE 850 (B26)
"8000000"	LTE 700 (B28)

Factory default of <rbacatnb-1> is the combination of all available bands meaning that all supported bands are allowed. If AT+COPS equals "0" (automatic mode) this solution allows the subscriber to take advantage of a full-featured automatic network selection when trying to register.

Therefore, changes to the band configuration are recommended only if the subscriber wishes to restrict the allowed bands to a specific band or band combination, in particular to speed up the network search, and thus,

to reduce the power consumption. In such case, <rbacatnb-1> may be one of the supported single values listed below.

Any change to this parameter will take effect immediately. So, <rbacatnb-1> is a parameter that may be used to read out the current band combination any time, but the read value is used for reinitializing the UE after next restart.

Note: The AT^SCFG=? test command shows the minimum and maximum band values. Switching off all bands using AT^SCFG="Radio/Band/CatNB","0","0" is possible.

<rbacatnb-2>(str)(NV)

<rbacatnb-2> determines Cat.NB frequency bands the UE is allowed to use. Values are given in *hexadecimal bit-value order.* Every bit corresponds to a dedicated band number. The number range of <rbacatnb-2> covers band 33 to max possible band. If the UE does not support bands higher than 32 the AT^SCFG test command returns the value range 0 - 0, and the AT^SCFG read command response does not display <rbacatnb-2>.

"200000000"	LTE 1745 (B66)
"4000000000"	LTE 600 (B71)
"10000000000000"	LTE 700 (B85)

Factory default of <rbacatnb-2> is the combination of all available bands meaning that all supported bands are allowed. If AT+COPS equals "0" (automatic mode) this solution allows the subscriber to take advantage of a full-featured automatic network selection when trying to register.

Therefore, changes to the band configuration are recommended only if the subscriber wishes to restrict the allowed bands to a specific band or band combination, in particular to speed up the network search, and thus, to reduce the power consumption. In such case, <rbacatnb-2> may be one of the supported single values listed below.

Any change to this parameter will take effect immediately. So, <rbacatnb-2> is a parameter that may be used to read out the current band combination any time, but the read value is used for reinitializing the UE after next restart.

Note: The AT^SCFG=? test command shows the minimum and maximum band values. Switching off all bands using AT^SCFG="Radio/Band/CatNB","0","0" is possible.

<PL_mode>(str)

Power Limitation Mode

AT^SCFG subcommand "Radio/Mtpl/..." can be used to instantly adapt the module's Specific Absorption Rate (SAR) by reducing its output power for specific or all bands in any operating mode. 8 profiles for instant RF output power limitation can be defined and stored to the NV memory.
<PL_mode> 0 and 1 (deactivate / activate) are applicable only with "Radio/Mtpl".
Modes 2 and 3 (query / configure) are applicable only with specific subcommands.
- for GSM use "Radio/Mtpl/2G".
- for LTE/Cat.M/Cat.NB use "Radio/Mtpl/4G".
A profile contains all supported bands
- for GSM see <PL_band2g>,
- for LTE/Cat.M/Cat.NB see <PL_band4g-1> and <PL_band4g-2>
and, for each single band, a parameter limiting the maximum RF output power
- for GSM see <PL_limit2g>,
- for LTE/Cat.M/Cat.NB see <PL_limit4g>.
For GSM, a second parameter, <PL_limit_psk>, is required to set the RF output power limit for GSM 8 PSK. The RF output power limit for a GSM band is related to one transmit timeslot. If two/three/four timeslots are used for transmission the specified power limit is reduced by another 3 / 4.8 / 6 dB.
Changing limit values of a profile with <PL_mode> 3 takes effect after UE restart only. Activating and deactivating power limitation with <PL_mode> 1 or 0, takes effect instantly. The <PL_mode> is volatile, therefore output power limitaton is deactivated after UE restart.
For an example on how to configure and trigger instant power limitation see below *Example* section.

"0"(P)	Power limitation deactivated (no further parameters are possible).
"1"	Power limitation activated. <PL_profile> parameter is mandatory for activation.

"2"	Query profile settings.
	The response shows the currently used limit values if instant power limitation is active, i.e. if `<PL_mode>`= 1. Therefore, bear in mind that modified profile values will be visible only if you restart the UE and run a query before activating instant power limitation.
	You can read either all profiles, or a specific profile by adding a `<PL_profile>` number.
"3"	Configure profile. All parameters are mandatory. Remember to restart the UE after changing the output power limits of a profile.

`<PL_profile>`(str)

Power Limitation Profile

This parameter identifies a profile.
When no profile is activated `<PL_mode>` "0" is returned and if any profile is activated `<PL_mode>` "1" and `<PL_profile>` "1" ... "8" is returned in read command.

| "1"..."8" | Number of profile. |

`<PL_band2g>`(str)

Radio Band 2G

Parameter specifies the 2G frequency bands of the UE in *hexadecimal 32-bit-value order.* Every bit corresponds to a dedicated band number.

"1"	GSM 900
"2"	GSM 1800
"4"	GSM 850
"8"	GSM 1900

`<PL_band4g-1>`(str)

Radio Band 4G First Part

Parameter specifies the 4G frequency bands of the UE in *hexadecimal 32-bit-value order.* Every bit corresponds to a dedicated band number. Value `<PL_band4g-1>` supports band 1 to band 32.

"0"	Must be used when setting any value for `<PL_band4g-2>` (parameter is mandatory).
"1"	LTE 2100 (B1)
"2"	LTE 1900 (B2)
"4"	LTE 1800 (B3)
"8"	LTE 1700 (B4)
"10"	LTE 850 (B5). (B6) is a true sub-band of (B5) with same uarfcn. (B5) and (B6) always switched simultaneous.
"80"	LTE 900 (B8)
"800"	LTE 700 (B12)
"1000"	LTE 700 (B13)
"20000"	LTE 850 (B18)
"40000"	LTE 800 (B19)
"80000"	LTE 800 (B20)
"1000000"	LTE 1900 (B25)
"2000000"	LTE 850 (B26)
"4000000"	LTE 800 (B27)
"8000000"	LTE 700 (B28)

`<PL_band4g-2>`(str)

Radio Band 4G Second Part

Parameter specifies the 4G frequency bands of the UE in *hexadecimal bit-value order.* Every bit corresponds to a dedicated band number. `<PL_band4g-2>` specifies band 33 to band 85 (if supported by UE).

"0"	Must be used when setting any value for `<PL_band4g-1>` (parameter is mandatory).
"200000000"	LTE 1745 (B66)
"4000000000"	LTE 600 (B71)
"10000000000000"	LTE 700 (B85)

`<PL_limit2g>`(str)(NV)

Power Limitation 2G

This parameter is used to set the power limit.
Setting takes effect after next restart.

"18"..."33"	Power limit value in dBm for GSM low bands.
"18"..."30"	Power limit value in dBm for GSM high bands.

`<PL_limit4g>`(str)(NV)

Power Limitation 4G

This parameter is used to set the power limit.
Setting takes effect after next restart.

"18"..."20"	Power limit value in dBm for LTE bands.

`<PL_limit_psk>`(str)(NV)

Power Limitation 8 PSK (only for GSM)

This parameter is used to set the power limit 8 PSK.
Setting takes effect after next restart.

"18"..."27"	Power limit value in dBm only for GSM 8 PSK low bands.
"18"..."26"	Power limit value in dBm only for GSM 8 PSK high bands.

`<ropr>`(str)(NV)

Radio Output Power Reduction

According to 3GPP TS 45.005, it is permissible to reduce the the maximum (E)GPRS output power. The amount of the maximum (E)GPRS power reduction is configurable for the case of 2TX.
Setting takes effect after next restart.

"4"(D)	No power reduction with GMSK and 8PSK.
"5"	0 dB power reduction with GMSK (with 2 Tx), no power reduction for 8PSK.
"6"	2 dB power reduction with GMSK (with 2 Tx), no power reduction for 8PSK.
"7"	3 dB power reduction with GMSK (with 2 Tx), no power reduction for 8PSK.
"8"	Max. power reduction for GMSK and 8PSK (3dB for 2 Tx).

<SuspendMode>^{(str)(NV)}

Configure SUSPEND mode between PSM and eDRX inactive period

Setting can configure the SUSPEND mode between PSM and eDRX inactive period. The AT^SCFG "MEop-Mode/PowerMgmt/Suspend" parameter <Suspend> controls to enable/disable SUSPEND mode. The setting takes effect after the next power-cycle.

"1"^(D)   Suspend is enabled in PSM.

"2"   Suspend is enabled in eDRX inactive period. With this option, 3gpp PSM will be disabled.

<RemWakePortSet>^{(str)(NV)}

Set of ports signaling Remote Wakeup Events

The <RemWakePortSet> parameter specifies whether the "RemoteWakeUp/Ports" configuration set with <RemWakePort> is volatile or non-volatile.

"current"   The currently used configuration (volatile).

"powerup"   The configuration used after powerup or restart (non-volatile).

<RemWakePort>^(str)

Port

Only ports listed with <RemWakePort> try to wake up the TE.

"acm0"^(D)   Refers to USB0

"acm1"^(D)   Refers to USB1

"ecm"^(D)   Refers to ECM

<CS>^{(str)(+CSCS)(NV)}

Card slot / USIM

The AT^SCFG subcommand "SIM/CS" specifies the (U)SIM interface currently used. Usage of this command depends on whether the host application is designed to include an additional second (U)SIM interface. Only one of the supported (U)SIM interfaces can be used at a time. For details on how to connect the first and the second (U)SIM interface please refer to "EXS82-W Hardware Interface Description, Version 01.100".

"0"^(D)   First (U)SIM slot is enabled regardless of whether a (U)SIM card is inserted. Access to another (U)SIM inserted in slot 2 is deactivated.

"3"   Second (U)SIM slot is enabled regardless of whether a (U)SIM card is inserted. Access to another (U)SIM inserted in slot 1 is deactivated.

To check the status of the (U)SIM and the (U)SIM interface you can take advantage of several URCs, such as AT^SIND "simstatus", AT^SCKS, AT^SSET.
When the configuration changes the UE tries to start the selected (U)SIM interface no matter whether a CCIN line is populated.

<sdm>^{(str)(+CSCS)(NV)}

USIM Dual Mode

This parameter enables / disables USIM Dual Mode.
If USIM Dual Mode is enabled the UE is capable of quickly switching between two networks/subscriptions using the subcommand AT^SCFG="SIM/CS",<CS>.
Two USIMs can be connected to the UE via multiplexer driven by GPIO8. GPIO8 is dedicated for this purpose and can never be used as general purpose IO line.
Each subscription has its own USIM card. It is possible to connect USIM cards with different voltage classes and

different connection speeds.
At any given moment only one of the subscriptions is active, i.e. any MO request to the network is done in the account assigned to the currently active USIM card.
For detailed information please refer to AN87 "Smart Network Switching" .

"0"(D)	USIM Dual Mode disabled.
"1"	USIM Dual Mode enabled.

\<SmsAcknl\>(str)

SMS auto acknowledge

Parameter activates or deactivates the ability to automatically acknowledge an incoming short message directly routed to the TE.

"0"(P)	No automatic acknowledgement.
"1"	UE will automatically acknowledge an incoming short message directly routed to the TE / immediately displayed. This eliminates the need for the user to manually acknowledge such messages with AT+CNMA. Please keep in mind that you may lose an incoming short message if the interface is blocked.

\<tcpMr\>(str)(NV)

Maximum Number of Retransmissions (MR)

"1"..."10"(D)..."30"	The AT^SCFG "Tcp/MR" subcommand determines the maximum number of times to retransmit TCP packets. The value set with \<tcpMr\> will be assumed as default for the \<srvParm-Tag\> "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. Use of default value is recommended.

\<tcpOt\>(str)(NV)

Overall TCP Timer for outstanding connections (tcpOT)

"1"..."6000"(D)	The AT^SCFG "Tcp/OT" subcommand 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 two AT^SCFG subcommands "Tcp/OT" and "Tcp/MR" are related to each other. When a packet has to be retransmitted, the TCP/IP stack starts an internal TCP timer to wait for an ACK. Each retransmission attempt for a packet is triggered at a time stamp incrementing from 0,1,3,6,12,24 to 48s where 48s is the maximum. As a result, the entire timeout would equal (\<tcpOt\> value) + (48s or less). For this reason the "SIS: connection timed out" URC may be reported later than set with \<tcpOt\>, in the worst case 48s later. The value set with \<tcpOt\> will be assumed as default for the \<srvParm-Tag\> "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. Use of default value is recommended.

\<tcpirt\>(str)(NV)

Initial Retransmission Timeout

"0"..."60"	Parameter controls the initial retransmission timeout used by TCP on each new connection. Special care must be taken when selecting the value because setting large value will dramatically increase the amount of time that it takes for a TCP connection attempt to fail, if target IP address does not exist. Default value is set to 3 seconds.

`<tcpWithUrc>`(str)(NV)

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.

The setting takes effect on the interface, where this command is executed.

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

`<TLS_min_version>`(str)(NV)

Minimum TLS Version allowed

This parameter sets the accepted minimum TLS version for IPoverAT services.

"MIN"	Automatic minimum
"1.1"	TLSv1.1 (DTLSv1.0)
"1.2"(D)	TLSv1.2
"1.3"	TLSv1.3 (DTLSv1.2)
"MAX"	Automatic maximum

`<TLS_max_version>`(str)(NV)

Maximum TLS version allowed

This parameter sets the accepted maximum TLS version for IPoverAT services. Must be equal or greater than `<TLS_min_version>`.

"1.2"	TLSv1.2
"1.3"	TLSv1.3 (DTLSv1.2)
"MAX"(D)	Automatic maximum

`<urcRinglineCfg>`(str)(NV)

Parameter specifies the ring line to be used for signaling URCs both for idle interface and while interface is reserved, i.e. while busy on AT command execution or data transmission. See also parameter `<ringlineSig>`.
For details about URC presentation and related hardware signalization refer to Section 1.8, `Unsolicited Result Code Presentation`. For details on using the RING0 line line to wake up the TE refer to "EXS82-W Hardware Interface Description, Version 01.100".

"off"	URCs do not activate a ring line.

"local"(D)	Ring line will be activated on the same device where the URC appears: This is the RING0 line (active low) if the URC appears on ASC0 device and a virtual ring line if the URC appears on a USB related device.
"asc0"	RING0 line will be activated (low active) when an URC is sent on the current AT command port.

`<urcRinglineDuration>`(str)(NV)

Parameter determines how long the ring line shall be activated for URC signalization. The type of ring line depends on parameter `<urcRinglineCfg>`.

For details about URC presentation and related hardware signalization refer to Section 1.8, Unsolicited Result Code Presentation.

"0"	Ring line will be activated for 7ms
"1"	Ring line will be activated for about 100ms.
"2"(D)	Ring line will be activated for about 1s.

Examples

EXAMPLE 1

The example shows how to activate or deactivate output power limitation using the AT^SCFG "Radio/Mtpl" command.
See parameters `<PL_mode>` and `<PL_profile>`.

```
^SYSSTART
AT^SCFG="Radio/Mtpl"             Read "Radio/Mtpl" mode.
^SCFG: "Radio/Mtpl","0"          Instant power limitation is still disabled.
OK
AT^SCFG="Radio/Mtpl",1,1         Activate Profile 1.
^SCFG: "Radio/Mtpl","1","1"      Instant power limitation is now enabled with profile 1.
OK
AT^SCFG="Radio/Mtpl",1,2         Switch profiles, and activate profile 2.
^SCFG: "Radio/Mtpl","1","2"      Instant power limitation is now enabled with profile 2,
                                 still using delivery default values.

OK
AT^SCFG="Radio/Mtpl",0           Deactivate instant power limitation.
^SCFG: "Radio/Mtpl","0"          Instant power limitation is now disabled.
OK
```

EXAMPLE 2

The example shows how to query or configure output power limitation using the AT^SCFG "Radio/Mtpl/2G" subcommand.
See parameters `<PL_mode>`, `<PL_profile>`, `<PL_band2g>`, `<PL_limit2g>`, `<PL_limit_psk>`.

```
^SYSSTART
AT^SCFG="Radio/Mtpl/2G"          Read "Radio/Mtpl/2G" mode.
^SCFG: "Radio/Mtpl/2G","0"       Instant power limitation is still disabled.
OK
AT^SCFG="Radio/Mtpl/2G",2,1      Query profile 1 settings. Delivery default settings are
                                 shown:
^SCFG: "Radio/Mtpl/2G","2","1","00000001",,"33","27"
^SCFG: "Radio/Mtpl/2G","2","1","00000002",,"30","26"
^SCFG: "Radio/Mtpl/2G","2","1","00000004",,"33","27"
^SCFG: "Radio/Mtpl/2G","2","1","00000008",,"30","26"
OK
AT^SCFG="Radio/Mtpl/2G",3,1,1,,25,20   Profile 1: Configure max. RF output power limit of
                                       GSM 900 band to 25dBm and 8PSK to 20dBm.
^SCFG: "Radio/Mtpl/2G","0"       Instant power limitation is still disabled.
OK
```

```
AT^SCFG="Radio/Mtpl/2G",3,1,2,,25,20          Profile 1: Configure max. RF output power limit of
                                              GSM 1800 band to 25dBm and 8PSK to 20dBm.
^SCFG: "Radio/Mtpl/2G","0"                    Instant power limitation is still disabled.
OK
AT^SCFG="Radio/Mtpl/2G",3,1,4,,25,20          Profile 1: Configure max. RF output power limit of
                                              GSM 850 band to 25dBm and 8PSK to 20dBm.
^SCFG: "Radio/Mtpl/2G","0"                    Instant power limitation is still disabled.
OK
AT^SCFG="Radio/Mtpl/2G",3,1,8,,25,20          Profile 1: Configure max. RF output power limit of
                                              GSM 1900 band to 25dBm and 8PSK to 20dBm.
^SCFG: "Radio/Mtpl/2G","0"                    Instant power limitation is still disabled.
OK
AT^SCFG="Radio/Mtpl/2G",2,1                   Query profile 1 settings.
......                                        The response returns the old values as above (there-
                                              fore omitted in this example).

AT+CFUN=1,1                                   Restart UE to enable the profile 1 settings configured
                                              above.
OK
^SYSSTART
AT^SCFG="Radio/Mtpl"                          Read "Radio/Mtpl" mode.
^SCFG: "Radio/Mtpl","0"                       Instant power limitation is still disabled.
OK
AT^SCFG="Radio/Mtpl/2G",2,1                   Query profile 1 settings. Changed values are shown
                                              now.
^SCFG: "Radio/Mtpl/2G","2","1","00000001",,"25","20"
^SCFG: "Radio/Mtpl/2G","2","1","00000002",,"25","20"
^SCFG: "Radio/Mtpl/2G","2","1","00000004",,"25","20"
^SCFG: "Radio/Mtpl/2G","2","1","00000008",,"25","20"
OK
AT^SCFG="Radio/Mtpl",1,1                      Activate Profile 1.
^SCFG: "Radio/Mtpl","1","1"                   Instant power limitation is now enabled with profile 1
                                              and new limits as changed above.
OK
AT^SCFG="Radio/Mtpl",1,2                      Switch profiles, and activate profile 2.
^SCFG: "Radio/Mtpl","1","2"                   Instant power limitation is now enabled with profile 2,
                                              still using delivery default values.
OK
AT^SCFG="Radio/Mtpl",0                        Deactivate instant power limitation.
^SCFG: "Radio/Mtpl","0"                       Instant power limitation is now disabled.
OK
```

EXAMPLE 3

The example shows how to query or configure output power limitation using the AT^SCFG "Radio/Mtpl/4G" subcommand.
See parameters <PL_mode>, <PL_profile>, <PL_band4g-1>, <PL_band4g-2>, <PL_limit4g>.

```
^SYSSTART
AT^SCFG="Radio/Mtpl/4G"                       Read "Radio/Mtpl/4G" mode.
^SCFG: "Radio/Mtpl/4G","0"                    Instant power limitation is still disabled.
OK
AT^SCFG="Radio/Mtpl/4G",2,1                   Query profile 1 settings. Delivery default settings are
                                              shown:
^SCFG: "Radio/Mtpl/4G","2","1","00000001","00000000","20"
^SCFG: "Radio/Mtpl/4G","2","1","00000002","00000000","20"
^SCFG: "Radio/Mtpl/4G","2","1","00000004","00000000","20"
^SCFG: "Radio/Mtpl/4G","2","1","00000008","00000000","20"
^SCFG: "Radio/Mtpl/4G","2","1","00000010","00000000","20"
^SCFG: "Radio/Mtpl/4G","2","1","00000080","00000000","20"
^SCFG: "Radio/Mtpl/4G","2","1","00000800","00000000","20"
```

```
^SCFG: "Radio/Mtpl/4G","2","1","00001000","00000000","20"
^SCFG: "Radio/Mtpl/4G","2","1","00020000","00000000","20"
^SCFG: "Radio/Mtpl/4G","2","1","00040000","00000000","20"
^SCFG: "Radio/Mtpl/4G","2","1","00080000","00000000","20"
^SCFG: "Radio/Mtpl/4G","2","1","01000000","00000000","20"
^SCFG: "Radio/Mtpl/4G","2","1","02000000","00000000","20"
^SCFG: "Radio/Mtpl/4G","2","1","04000000","00000000","20"
^SCFG: "Radio/Mtpl/4G","2","1","08000000","00000000","20"
^SCFG: "Radio/Mtpl/4G","2","1","00000000","200000000","20"
^SCFG: "Radio/Mtpl/4G","2","1","00000000","10000000000000","20"
OK
```

`AT^SCFG="Radio/Mtpl/4G",3,1,1,0,18`	Profile 1: Configure max. RF output power limit of LTE B1 band to 18dBm.
`^SCFG: "Radio/Mtpl/4G","0"` `OK`	Instant power limitation is still disabled.
`AT^SCFG="Radio/Mtpl/4G",3,1,2,0,18`	Profile 1: Configure max. RF output power limit of LTE B2 band to 18dBm.
`^SCFG: "Radio/Mtpl/4G","0"` `OK`	Instant power limitation is still disabled.
`AT^SCFG="Radio/Mtpl/4G",3,1,4,0,18`	Profile 1: Configure max. RF output power limit of LTE B3 band to 18dBm.
`^SCFG: "Radio/Mtpl/4G","0"` `OK`	Instant power limitation is still disabled.
`AT^SCFG="Radio/Mtpl/4G",3,1,8,0,18`	Profile 1: Configure max. RF output power limit of LTE B4 band to 18dBm.
`^SCFG: "Radio/Mtpl/4G","0"` `OK`	Instant power limitation is still disabled.
`AT^SCFG="Radio/Mtpl/4G",3,1,10,0,18`	Profile 1: Configure max. RF output power limit of LTE B5 band to 18dBm.
`^SCFG: "Radio/Mtpl/4G","0"` `OK`	Instant power limitation is still disabled.
`AT^SCFG="Radio/Mtpl/4G",3,1,80,0,18`	Profile 1: Configure max. RF output power limit of LTE B8 band to 18dBm.
`^SCFG: "Radio/Mtpl/4G","0"` `OK`	Instant power limitation is still disabled.
`AT^SCFG="Radio/Mtpl/4G",3,1,800,0,18`	Profile 1: Configure max. RF output power limit of LTE B12 band to 18dBm.
`^SCFG: "Radio/Mtpl/4G","0"` `OK`	Instant power limitation is still disabled.
`AT^SCFG="Radio/Mtpl/4G",3,1,1000,0,18`	Profile 1: Configure max. RF output power limit of LTE B13 band to 18dBm.
`^SCFG: "Radio/Mtpl/4G","0"` `OK`	Instant power limitation is still disabled.
`AT^SCFG="Radio/Mtpl/4G",3,1,20000,0,18`	Profile 1: Configure max. RF output power limit of LTE B18 band to 18dBm.
`^SCFG: "Radio/Mtpl/4G","0"` `OK`	Instant power limitation is still disabled.
`AT^SCFG="Radio/Mtpl/4G",3,1,40000,0,18`	Profile 1: Configure max. RF output power limit of LTE B19 band to 18dBm.
`^SCFG: "Radio/Mtpl/4G","0"` `OK`	Instant power limitation is still disabled.
`AT^SCFG="Radio/Mtpl/4G",3,1,80000,0,18`	Profile 1: Configure max. RF output power limit of LTE B20 band to 18dBm.
`^SCFG: "Radio/Mtpl/4G","0"` `OK`	Instant power limitation is still disabled.
`AT^SCFG="Radio/Mtpl/4G",3,1,1000000,0,18`	Profile 1: Configure max. RF output power limit of LTE B25 band to 18dBm.
`^SCFG: "Radio/Mtpl/4G","0"`	Instant power limitation is still disabled.

```
OK
AT^SCFG="Radio/Mtpl/4G",3,1,2000000,0,18      Profile 1: Configure max. RF output power limit of
                                              LTE B26 band to 18dBm.
^SCFG: "Radio/Mtpl/4G","0"                    Instant power limitation is still disabled.
OK
AT^SCFG="Radio/Mtpl/4G",3,1,4000000,0,18      Profile 1: Configure max. RF output power limit of
                                              LTE B27 band to 18dBm.
^SCFG: "Radio/Mtpl/4G","0"                    Instant power limitation is still disabled.
OK
AT^SCFG="Radio/Mtpl/4G",3,1,8000000,0,18      Profile 1: Configure max. RF output power limit of
                                              LTE B28 band to 18dBm.
^SCFG: "Radio/Mtpl/4G","0"                    Instant power limitation is still disabled.
OK
AT^SCFG="Radio/Mtpl/                          Profile 1: Configure max. RF output power limit of
4G",3,1,0,200000000,18                        LTE B66 band to 18dBm.
^SCFG: "Radio/Mtpl/4G","0"                    Instant power limitation is still disabled.
OK
AT^SCFG="Radio/Mtpl/                          Profile 1: Configure max. RF output power limit of
4G",3,1,0,10000000000000,18                   LTE B85 band to 18dBm.
^SCFG: "Radio/Mtpl/4G","0"                    Instant power limitation is still disabled.
OK
AT^SCFG="Radio/Mtpl/4G",2,1                   Read profile 1 settings.
......                                        The response returns the old values as above (there-
                                              fore omitted in this example).

AT+CFUN=1,1                                   Restart UE to enable the profile 1 settings configured
                                              above.

OK
^SYSSTART
AT^SCFG="Radio/Mtpl/4G"                       Read "Radio/Mtpl/4G" mode.
^SCFG: "Radio/Mtpl/4G","0"                    Instant power limitation is still disabled.
OK
AT^SCFG="Radio/Mtpl/4G",2,1                   Read profile 1 settings. Changed values are shown
                                              now.
^SCFG: "Radio/Mtpl/4G","2","1","00000001","00000000","18"
^SCFG: "Radio/Mtpl/4G","2","1","00000002","00000000","18"
^SCFG: "Radio/Mtpl/4G","2","1","00000004","00000000","18"
^SCFG: "Radio/Mtpl/4G","2","1","00000008","00000000","18"
^SCFG: "Radio/Mtpl/4G","2","1","00000010","00000000","18"
^SCFG: "Radio/Mtpl/4G","2","1","00000080","00000000","18"
^SCFG: "Radio/Mtpl/4G","2","1","00000800","00000000","18"
^SCFG: "Radio/Mtpl/4G","2","1","00001000","00000000","18"
^SCFG: "Radio/Mtpl/4G","2","1","00020000","00000000","18"
^SCFG: "Radio/Mtpl/4G","2","1","00040000","00000000","18"
^SCFG: "Radio/Mtpl/4G","2","1","00080000","00000000","18"
^SCFG: "Radio/Mtpl/4G","2","1","01000000","00000000","18"
^SCFG: "Radio/Mtpl/4G","2","1","02000000","00000000","18"
^SCFG: "Radio/Mtpl/4G","2","1","04000000","00000000","18"
^SCFG: "Radio/Mtpl/4G","2","1","08000000","00000000","18"
^SCFG: "Radio/Mtpl/4G","2","1","00000000","200000000","18"
^SCFG: "Radio/Mtpl/4G","2","1","00000000","10000000000000","18"
OK
AT^SCFG="Radio/Mtpl",1,1                      Activate Profile 1.
^SCFG: "Radio/Mtpl","1","1"                   Instant power limitation is now enabled with profile 1
                                              and new limits as changed above.

OK
AT^SCFG="Radio/Mtpl",1,2                      Switch profiles, and activate profile 2.
^SCFG: "Radio/Mtpl","1","2"                   Instant power limitation is now enabled with profile 2,
                                              still using delivery default values.
```

```
OK
AT^SCFG="Radio/Mtpl",0          Deactivate instant power limitation.
^SCFG: "Radio/Mtpl","0"         Instant power limitation is now disabled.
OK
```

2.12 AT^SMSO Switch Off EXS82-W

AT^SMSO initiates EXS82-W's power-off procedure.

The AT^SMSO exec command always performs the "normal" shutdown procedure indicated by response "OK" and "^SHUTDOWN" URC.

An alternative to the "normal" shutdown procedure is Fast-Shutdown. The Fast-Shutdown procedure will be performed if <fso>="fast" in the AT^SMSO write command, there are no responses such as OK, ERROR or "^SHUTDOWN" URC. Flash access cycles (writing/deleting) will be finalized, but there will no network deregistration, current settings will not be saved and there will be no further output on the interfaces. All other jobs will be deleted and logical data consistence cannot be guaranteed.

Do not send any other AT command after this.
For further detail please refer to [2].

Syntax

Test Command

AT^SMSO=?

Response(s)

^SMSO: (list of supported<fso>s)
OK

Exec Command

Normal Shutdown

AT^SMSO

Response(s)

OK
ERROR
+CME ERROR: <err>

Write Command

Fast Shutdown

AT^SMSO=<fso>

Response(s)

PIN	✈	Last
-	+	+

Parameter Description

<fso>(str)

Fast Shutdown

"fast"   perform Fast-Shutdown procedure

3.   Status Control Commands

The AT Commands described in this chapter allow the external application to obtain various status information from the EXS82-W.

3.1   AT+CEER   Extended Error Report

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 PS attach or unsuccessful PDP context activation
- PS detach or PDP context deactivation

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

Syntax

Test Command

AT+CEER=?

Response(s)

OK
ERROR
+CME ERROR: <err>

Exec Command

AT+CEER

Response(s)

+CEER: <report>
OK
ERROR
+CME ERROR: <err>

Write Command

AT+CEER=<reset>

Response(s)

OK
ERROR
+CME ERROR

PIN	✈	Last		Reference(s)
+	+	-		3GPP TS 27.007 [49] 3GPP TS 24.008 [43]

Parameter Description

`<report>`(str)

release cause report

Reason for the last call release or call failure. See Section 3.1.1, List of status codes for extended error report. Both CS and PS domain call types are reported. Cause data is captured from Call Manager events and cached locally to later use by this command.

`<reset>`(num)

0	Reset the extended error report to initial value.

3.1.1 List of status codes for extended error report

CS internal cause
No cause information available (default)
Phone is offline
No service available
Network release, no reason given
Received incoming call
Client ended call
UIM not present
Access attempt already in progress
Access failure, unknown source
Concur service not supported by network
No response received from network
GPS call ended for user call
SMS call ended for user call
Data call ended for emergency call
Rejected during redirect or handoff
Lower-layer ended call
Call origination request failed
Client rejected incoming call
Client rejected setup indication
Network ended call
No funds available
No service available
Full service not available
Maximum packet calls exceeded
Video connection lost
Video protocol closed after setup
Video protocol setup failure
Internal error

CS network cause
Unassigned/unallocated number
No route to destination
Channel unacceptable
Operator determined barring
Normal call clearing
User busy
No user responding
User alerting, no answer
Call rejected
Number changed
Non selected user clearing
Destination out of order
Invalid/incomplete number
Facility rejected
Response to status enquiry
Normal, unspecified
No circuit/channel available
Network out of order
Temporary failure
Switching equipment congestion
Access information discarded
Requested circuit/channel not available
Resources unavailable, unspecified
Quality of service unavailable
Requested facility not subscribed
Incoming calls barred within the CUG
Bearer capability not authorized
Bearer capability not available
Service/option not available
Bearer service not implemented
ACM >= ACM max
Requested facility not implemented
Only RDI bearer is available
Service/option not implemented
Invalid transaction identifier value
User not member of CUG
Incompatible destination
Invalid transit network selection
Semantically incorrect message
Invalid mandatory information
Message non-existent/not implemented

CS network cause
Message type not compatible with state
IE non-existent/not implemented
Conditional IE error
Message not compatible with state
Recovery on timer expiry
Protocol error, unspecified
Interworking, unspecified

CS network reject
IMSI unknown in HLR
Illegal MS
IMSI unknown in VLR
IMEI not accepted
Illegal ME
GPRS services not allowed
GPRS and non GPRS services not allowed
MS identity cannot be derived
Implicitly detached
PLMN not allowed
Location area not allowed
Roaming not allowed
GPRS services not allowed in PLMN
No suitable cells in location area
MSC temporary not reachable
Network failure
MAC failure
Synch failure
Congestion
GSM authentication unacceptable
Service option not supported
Requested service option not subscribed
Service option temporary out of order
Call cannot be identified
No PDP context activated
Semantically incorrect message
Invalid mandatory information
Message type non-existent
Message type not compatible with state
Information element non-existent
Message not compatible with state
RR release indication
RR random access failure

CS network reject		
RRC release indication		
RRC close session indication		
RRC open session failure		
Low level failure		
Low level failure no redial allowed		
Invalid SIM		
No service		
Timer T3230 expired		
No cell available		
Wrong state		
Access class blocked		
Abort message received		
Other cause		
Timer T303 expired		
No resources		
Release pending		
Invalid user data		

PS internal cause
Invalid connection identifier
Invalid NSAPI
Invalid primary NSAPI
PDP establish timeout
Invalid field
SNDCP failure
RAB setup failure
No GPRS context
PDP activate timeout
PDP modify timeout
PDP inactive max timeout
PDP lowerlayer error
PDP duplicate
Access technology change
PDP unknown reason

PS network cause
LLC or SNDCP failure
Insufficient resources
Missing or unknown APN
Unknown PDP address or PDP type
User authentication failed
Activation rejected by GGSN

PS network cause
Activation rejected, unspecified
Service option not supported
Requested service option not subscribed
Service option temporary out of order
NSAPI already used (not sent)
Regular deactivation
QoS not accepted
Network failure
Reactivation required
Feature not supported
Semantic error in the TFT operation
Syntactical error in the TFT operation
Unknown PDP context
PDP context without TFT already activated
Semantic errors in packet filter
Syntactical errors in packet filter
Invalid transaction identifier
Semantically incorrect message
Invalid mandatory information
Message non-existent/not implemented
Message type not compatible with state
IE non-existent/not implemented
Conditional IE error
Message not compatible with state
Protocol error, unspecified

Other release cause
Call barred

PS LTE cause
Operator Determined Barring
Insufficient resources
Unknown or missing APN
Unknown PDN type
User authentication failed
Request rejected by Serving GW or PDN GW
Request rejected, unspecified
Service option not supported
Requested service option not subscribed
Service option temporarily out of order
PTI already in use
Regular deactivation

PS LTE cause
EPS QoS not accepted
Network failure
Reactivation required
Feature not supported
Semantic error in the TFT operation
Syntactical error in the TFT operation
Invalid EPS bearer identity
Semantic errors in packet filter(s)
Syntactical errors in packet filter(s)
EPS bearer context without TFT already activated
PTI mismatch
Last PDN disconnection not allowed
PDN type IPV4 only allowed
PDN type IPV6 only allowed
Single address bearers only allowed
ESM information not received
PDN connection does not exist
Multiple PDN connection for given APN not allowed
Collision with network initiated request
Unsupported QCI value
Invalid PTI value
Symantically invalid message
Invalid mandatory information
Message type non-existent or not implemented
Message type not compatible with the protocol state
Information element non-existent or not implemented
Conditional IE error
Message not compatible with the protocol state
Protocol error, unspecified
APN restriction value incompatible with active EPS bearer context
No Failure

PS LTE local cause
IMSI unknown in HSS
Illegal UE
IMEI not accepted
Illegal ME
EPS services not allowed
EPS services and non-EPS services not allowed
UE identity cannot be derived by the network
Implicitly Detached
PLMN not allowed

PS LTE local cause
Tracking area not allowed
Roaming not allowed in this tracking area
EPS services not allowed in this PLMN
No Suitable cells in tracking area
MSC temporarily not reachable
Network failure
CS Domain Not available
ESM failure
MAC failure
Synch failure
Congestion
UE security capabilities mismatch
Security mode rejected, unspecified
Not Authorized for this CSG
Non-EPS authentication unacceptable
CS fallback call EST not allowed
CS domain temporarily not allowed
No EPS bearer context activated
Unknown EPS bearer context
Semantically incorrect message
Invalid mandatory information
Message type non-existent or not implemented
Message type not compatible with the protocol state
Information element non-existent or not implemented
Conditional IE error
Message not compatible with the protocol state
Protocol error, unspecified
Released AT RRC
Signal Connection Released
EMM detached
EMM attach failed
EMM attach started
NAS service request failed
ESM activate dedicated bearer reactivater by network
Lower layer failure
ESM sync up with network
Network activater dedicated bearer with ID of deffered bearer
BAD OTA message
DS rejected the call
Context transferred due to IRAT
DS explicit deactivation
ESM MSGR failure

PS LTE local cause	
Local Cause not Available	20/09/16
Rejected due to connected state	
Nas Service request failed, no throttle	
EMM T3417 expired	
EMM T3417 ext expired	
Nas LRRC UL data CNF failure TXN	
Nas LRRC UL data CNF failure HO	
Nas LRRC UL data CNF failure CONN release	
Nas LRRC UL data CNF failure RLF	
Nas LRRC UL data CNF failure control Not CONN	
NAS LRRC connection EST success	
NAS LRRC connection EST failure	
NAS LRRC connection EST failure, aborted	
NAS LRRC connection EST failure, access barrer	
NAS LRRC connection EST failure, CELL resel	
NAS LRRC connection EST failure, config failure	
NAS LRRC connection EST failure, timer expired	
NAS LRRC connection EST failure, link failure	
NAS LRRC connection EST failure, not camped	
NAS LRRC connection EST failure, SI failure	
NAS LRRC connection EST failure, CONN reject	
NAS LRRC connection release normal	
NAS LRRC connection release RLF	
NAS LRRC connection release CRE failure	
NAS LRRC connection release QOS during CRE	
NAS LRRC connection release aborted	
NAS LRRC connection release SIB read error	
NAS LRRC connection release aborted IRAT Success	
Nas Reject LRRC radio link failure	
Nas service request failure, LTE network reject	
Nas detach with reattach, LTE network detach	
NAS detach without reattach, LTE network detach	

3.2 AT^SIND Extended Indicator Control

AT^SIND controls the presentation of indicator event URCs. You can enable or disable URCs to be issued by the EXS82-W each time the value of the related indicator changes, you can request the current status of all indicators, and you can also query the status of a single indicator.

Syntax

Test Command

AT^SIND=?

Response(s)

^SIND: (<indDescr>, (list of supported <indValue>s))[, (<indDescr>, (list of supported <indValue>s))[, ...]], (list of supported <mode>s)
OK

Read Command

AT^SIND?

Response(s)

^SIND: <indDescr>, <mode>[, <indValue>]
[^SIND: <indDescr>, <mode>[, <indValue>]]
...

In case of <indDescr>="eons"
^SIND: eons, <mode>, <indValue>, <eonsOperator>, <servProvider>, <servProviderType>

In case of <indDescr>="nitz"
^SIND: nitz, <mode>, <nitzUT>, <nitzTZ>[, <nitzDST>]

In case of <indDescr>="lsta"
^SIND: lsta, <mode>, <lstaLevel>

In case of <indDescr>="ceer"
^SIND: ceer, <mode>, <ceerRelCauseGroup>$_1$[, <ceerRelCauseGroup>$_2$[, ...]]

In case of <indDescr>="is_cert"
^SIND: is_cert, <mode>[, <srvProfileId>, <issuer>, <serialNumber>, <subject>, <signatureAlgorithm>, <thumbprintAlgorithm>, <thumbprint>]

In case of <indDescr>="prov"
^SIND: prov, <mode>, <provMm>, <provCur>[, <provNext>]

OK
ERROR
+CME ERROR: <err>

Write Command

AT^SIND=<indDescr>, <mode>

Response(s)

^SIND: <indDescr>, <mode>[, <indValue>]

In case of: <indDescr>="eons" and <mode>=2
^SIND: eons, <mode>, <indValue>, <eonsOperator>, <servProvider>, <servProviderType>

In case of: <indDescr>="nitz" and <mode>=2
^SIND: nitz , <mode>, <nitzUT>, <nitzTZ>[, <nitzDST>]

Write Command (Continued)

AT^SIND=<indDescr>, <mode>

Response(s)

In case of: <indDescr>="is_cert" and <mode>=1 or 2:
^SIND: is_cert, <mode>[, <srvProfileId>, <issuer>, <serialNumber>, <subject>, <signatureAlgorithm>, <thumbprintAlgorithm>, <thumbprint>]
OK
ERROR
+CME ERROR: <err>

Write Command

AT^SIND="lsta", <mode>[, <lstaLevel>]

Response(s)

^SIND: lsta, <mode>[, <lstaLevel>]
OK
ERROR
+CME ERROR: <err>

Write Command

AT^SIND="ceer", <mode>[, <ceerRelCauseGroup>]

Response(s)

^SIND: ceer, <mode>, <ceerRelCauseGroup>₁[, <ceerRelCauseGroup>₂[, ...]]
OK
ERROR
+CME ERROR: <err>

Write Command

AT^SIND="prov", <mode>

Response(s)

^SIND: prov, <mode>, <provMm>, <provCur>[, <provNext>]
OK
ERROR
+CME ERROR: <err>

PIN ✈ Last

| - | + | - |

Unsolicited Result Codes

URC 1

Format of the standard indicator:

+CIEV: <indDescr>, <indValue>

Value of an indicator has changed.

URC 2

Formats of the "simdata" indicators:
For every USAT Proactive Command (PAC) tracked by AT^SIND="simdata" two different types of URCs are issued.

The first "+CIEV: "simdata"" URC is generated when a PAC is received from the (U)SIM Application. Its format follows the AT^SSTGI response, therefore showing different parameters for the PAC REFRESH and for the PACs OPEN_CHANNEL and CLOSE_CHANNEL.

+CIEV: <indDescr>, <cmdType>, <commandDetails>[, <pathLen>, <fileNum>, <fileList>, <aidList>]

• PAC REFRESH

"+CIEV: "simdata"" URC is issued, e.g. indicating that the content of one or more Elementary Files has been changed or the USIM performs a warm start (REFRESH type RESET).

URC 3

+CIEV: <indDescr>, <cmdType>, <commandDetails>, <text>, <iconQualifier>, <iconId>

- PACs OPEN_CHANNEL and CLOSE_CHANNEL
  "+CIEV: "simdata"" URC is issued to indicate ongoing BIP activity.

URC 4

The second "+CIEV: "simdata"" URC is generated when PAC processing is completed by the UE and the Terminal Response is sent to the (U)SIM Application. Parameters <status> and <statAddInfo> reflect the content of the Terminal Response, similar to the AT^SSTR response. This allows the Customer Application to track problems with these PACs.

+CIEV: <indDescr>, <cmdType>, <commandDetails>, , , , , <status>, <statAddInfo>

- PACs REFRESH, OPEN_CHANNEL and CLOSE_CHANNEL "+CIEV: "simdata"" URC is indicated by <cmdType>=1 + terminate offset, which is equal to 100, similar to "^SSTN".

URC 5

Format of the "eons" indicator:

+CIEV: <indDescr>, <indValue>, <eonsOperator>, <servProvider>, <servProviderType>

One URC is issued for each new LAI (Location Area Information) broadcast by the network.

URC 6

Format of the "nitz" indicator:

+CIEV: <indDescr>, <nitzUT>, <nitzTZ>[, <nitzDST>]

URC 7

Format of the "lsta" indicator:
In case <indValue> equals "0" or <indValue> equals "2".

+CIEV: <indDescr>, <indValue>, <lstaEdvs>, <lstaRssi>

The URC is issued for every radio link error. It provides the error downcounter value corresponding to number of consecutive errors on downlink and the RSSI of the serving cell.
Error downcounter value of 11 corresponds to first error occurred on downlink, 0 corresponds to last before cell loss.

URC 8

In case <indValue> equals "1".

+CIEV: <indDescr>, <indValue>, <lstaNo>, <lstaMin>, <lstaMax>, <lstaMean>, <lstaVar>

After the error downcounter reaches the value 0 the URC provides some statistic parameters of signal strength distribution across the band.

URC 9

In case <indValue> equals "11" or "21".

+CIEV: <indDescr>, <indValue>, <lstaFrRep>, <lstaBandScnd>, <lstaFrMin>, <lstaFrMax>, <lstaMin>, <lstaMax>, <lstaMean>, <lstaGrade>

After radio link loss the URC provides some statistic parameters of signal strength distribution across the band.

URC 10

Format of the "ceer" indicator:

+CIEV: <indDescr>, <ceerRelCauseGroup>, <ceerReport>

Format of the "is_cert" indicator:

+CIEV: <indDescr>, <srvProfileId>, <issuer>, <serialNumber>, <subject>, <signatureAlgorithm>, <thumbprintAlgorithm>, <thumbprint>

The URC is issued after opening a secure Internet connection with AT^SISO.

Format of the "prov" indicator:

+CIEV: <indDescr>, <provMm>, <provCur>[, <provNext>]

Parameter Description

<indDescr>(str)

This section describes <indDescr> values and their associated <indValue> ranges.
For command input on the AT^SIND write command line <indDescr> values are handled as string type. In responses and URCs <indDescr> values are output without quotation marks.

"service"	Service availability: 0 Not registered to any network. 1 Registered to home network or, if "roam"=1 then registered to another network.
"roam"	Roaming indicator: 0 Registered to home network or not registered. 1 Registered to other network.
"rssi"	Received signal (field) strength: 0 Signal strength ≤ -112 dBm 1 - 4 Signal strength in 15 dB steps 5 Signal strength ≥ -51 dBm 99 Signal strength not known or not detectable Received signal (field) strength can also be obtained with AT+CSQ. However, the signal strength is scaled to value range 0..31 by this command.
"simdata"	If the UE has Remote-USAT set to Automatic Response mode the (U)SIM Application activity is handled internally; for details refer to AT^SSTA, parameter <mode>. However, it is necessary for the Customer Application (TE) to be informed about some types of ongoing Proactive Commands (PAC) with their content and status. Therefore, AT^SIND="simdata" provides URC notification for PAC types REFRESH, OPEN_CHANNEL and CLOSE_CHANNEL: • PAC REFRESH is sent by the (U)SIM Application to notify the UE of changes to Elementary File(s) data on the (U)SIM. All data provided by the USIM is stored in one of many of its so-called Elementary Files. This data can be queried by the TE directly via AT+CRSM or implicitly via many AT commands presented by this document. For instance the (U)SIM's International Mobile Subscriber Identity (IMSI) can be queried via AT+CIMI, but actually is stored in EF_{IMSI}, as defined in 3GPP TS 11.11 [19], 3GPP TS 31.101 [20], 3GPP TS 31.102 [21]. However, be aware that the content of any Elementary File can be changed at any time by the network provider or the (U)SIM Application. For details refer to USAT feature "Data Download to USIM" in 3GPP TS 11.14 [23], 3GPP TS 31.111 [24], ETSI TS 102 223 [25]. If this happens the TE urgently needs to refresh its own copy of the changed data to ensure its safe and consistent use! Therefore, "+CIEV: "simdata"" URCs can be enabled in both Remote-USAT modes (Autoresponse mode and Explicit Response mode) indicating that the content of one or more Elementary Files has been changed. • "+CIEV: "simdata"" URCs are also generated if PAC types OPEN_CHANNEL or CLOSE_CHANNEL are issued by the (U)SIM Appli-

cation as part of its Bearer Independent Protocol (BIP) to access the Internet. This allows the Customer Application to track the BIP status and to indicate problems with these PACs to the TE.

For every PAC tracked by `AT^SIND`="simdata" two different types of URCs are issued:
First "`+CIEV`: "simdata"" URC is generated for the PAC received from the (U)SIM and second "`+CIEV`: "simdata"" URC containing the processing result of the Terminal Response sent to it.
The UE provides a limited storage to keep numerous "simdata" events received while `AT^SIND` setting was not enabled or UE-TE link was reserved, e.g. in online data mode. In case of storage overflow a special URC "+CIEV: "simdata",1,254" will be issued.

"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 EXS82-W 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}) on the USIM, as defined in 3GPP TS 11.11 [19], 3GPP TS 31.101 [20], 3GPP TS 31.102 [21].
If this feature is not disabled by the USIM, then whenever a connection is in place, which is, or becomes unenciphered, an indication shall be given to the user. This enables the user's decision how to proceed.
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 presentaion 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 signalling 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. Because the SMS is already sent at this time, two URCs will be issued on this channel, but both are indicating that ciphering is enabled.

- 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.

"eons"	Enhanced Operator Name String (EONS):

The Enhanced Operator Name String indicator feature allows the EXS82-W to output various operator names for different PLMN identities. 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. See also 3GPP TS 22.101 [51].
The EONS tables are stored in the USIM and will be read after SIM PIN authentication.
Following USIM Elementary Files are affected by the EONS feature:
EF_{SST} (USIM 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

The name displayed by the `<eonsOperator>` parameter depends on various sources of information prioritized in the list below. The highest priority has option 1. If an option is not available the next lower option from the list deter-

mines the displayed name. The priority is indicated by the `<indValue>` parameter.

Prioritized sources determining the name displayed by `<eonsOperator>`:

`<indValue>` 0	Not registered.	
`<indValue>` 1	Operator name from EF$_{OPL}$ and EF$_{PNN}$ in alphanumeric format.	
`<indValue>` 2	Operator name in long or short format according to Common PCN Handset Specification (CPHS) [52] depending on availability and content of EF$_{ONString}$ (Operator Name String) and EF$_{OPShort}$ (Operator Name Short form).	
`<indValue>` 3	Operator name received over the network via NITZ service in long and short alphanumeric format.	
`<indValue>` 4	Operator name found in the UE's `AT+COPN` list, given in alphanumeric format.	
`<indValue>` 5	Broadcast MCC-MNC (numeric format which consists of a 3-digit country code plus a 2- or 3-digit network code).	
`<indValue>` 6	CSG (Closed Subscriber Group) Lookup.	

"nitz"

Network Identity and Time Zone:

This indicator shows the time relevant information elements of an MM Information (MMI) or GMM Information (GMMI) message received from the network (see 3GPP TS 24.008 [43], ch. 9.2.15a and 9.4.19).

The `AT^SIND` test command indicates the maximum length of the "nitz" `<indValue>`. 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 although 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 UE detaches from network. Also when a manual network selection fails and the UE 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"	USIM status:
	0 USIM removed.
	Note: Another way to verify the USIM connection is the "^SCKS" URC enabled with AT^SCKS.
	1 USIM inserted.
	3 USIM PIN required - USIM locked. USIM PIN must be entered to enable EXS82-W to register to the network.
	4 Personalization info ready - CHV (Card Holder Verification) data have been verified (if required).
	5 USIM initialization completed - UE has finished reading USIM data.
"simtray"	Indication of USIM tray status as indicated by CCIN line. Result does not depend on whether the tray holds a USIM or not.
	Generating a URC on status change is not supported.
	0 USIM tray empty.
	1 USIM tray plugged in.
"psinfo"	Packet Switched status:
	"psinfo" indicates the status of the UE related to packet switched data calls.
	0 GPRS/EGPRS not available in currently used cell
	1 GPRS available in currently used cell
	2 GPRS attached
	3 EGPRS available in currently used cell
	4 EGPRS attached
	16 Camped on E-UTRAN capable cell
	17 Attached in E-UTRAN capable cell
	18 Camped on E-UTRAN Cat.NB capable cell
	19 Attached in E-UTRAN Cat.NB capable cell
"lsta"	Link Stability indication (for GSM):
	The Link Stability indicator feature allows the EXS82-W to output radio link errors and statistic parameters of signal strength distribution across the band via URC.
	0 Radio link error.
	1 Radio link signal strength distribution.
	The presentation of the "lsta" indicator is determined by the radio link spectrum shape. For example, each time a radio link error appears the URC indicates an Error Downcounter value and the RSSI of the serving cell to provide some kind of warning. Every consecutive error decrements the Error Downcounter value and successful downlink signal reception resets it to start value of 11. The Error Downcounter value is only available in IDLE mode. It will not be presented during PS connections.
	The factor on which Error Downcounter is decremented depends on network settings.
	Error Downcounter value 0 means that the UE has lost the cell and will start the cell reselection process. In this case the URC is enhanced and includes the following statistic parameters of signal strength distribution across the band. These are:
	- Number of reported channels,
	- Maximal signal strength value,
	- Minimal signal strength value,
	- Mean value of signal strength across frequency band and
	- Variance of signal strength across frequency band.
	To avoid that radio link error URCs are output too often, when radio conditions are bad, you can select a lower warning level with <lstaLevel>.
	Link Stability indication (for LTE):
	URC is issued for statistic parameters of signal strength distribution across the band.
	21 Radio link signal strength distribution.
	If UE is out of service the URC with <indValue> equals "21" will be output for each scan.

	It includes statistic parameters of signal strength distribution across the band.
"pacsp"	PLMN mode bit status: : "pacsp" indicates the parsed PLMN mode bit value of the USIM Elementary File EF_{CSP} (Customer Service Profile) according to Common PCN Handset Specification (CPHS) [52].

"pacsp" — PLMN mode bit status:
:
"pacsp" indicates the parsed PLMN mode bit value of the USIM Elementary File EF_{CSP} (Customer Service Profile) according to Common PCN Handset Specification (CPHS) [52].

0   CSP PLMN mode bit off
1   CSP PLMN mode bit on
99   CSP PLMN mode bit not defined or USIM Elementary File EF_{CSP} not accessible

The contents of the USIM Elementary File EF_{CSP} may be changed by the network in the background at any time via USIM Application Toolkit (USAT) procedure "Data download to USIM". For a detailed description please refer to 3GPP TS 11.14 [23], 3GPP TS 31.111 [24], ETSI TS 102 223 [25].
Please note that URC presentation <mode> for this indicator is stored to non-volatile memory with AT&W, restored with ATZ and reset to '0' (disabled) by AT&F.

"iccid" — USIM identification number:
"iccid" indicator shows the USIM identification number stored in the USIM Elementary File EF_{ICCID}.
The AT^SIND test command indicates the maximum length of the "iccid" <indValue>.
Please note that URC presentation <mode> for this indicator is stored to non-volatile memory with AT&W, restored with ATZ and reset to '0' (disabled) by AT&F.

"euiccid" — USIM embedded identification number:
"euiccid" indicator shows the USIM embedded identification number stored in the USIM Elementary File $EF_{EUICCID}$.
The AT^SIND test command indicates the maximum length of the "euiccid" <indValue>.
Please note that URC presentation <mode> for this indicator is stored to non-volatile memory with AT&W, restored with ATZ and reset to '0' (disabled) by AT&F.

"imsi" — International Mobile Subscriber Identity:
The "imsi" indicator shows the IMSI stored in the USIM Elementary File EF_{IMSI}.
The AT^SIND test command indicates the maximum length of the "imsi" <indValue>.

"ceer" — Extended Error Report:
"ceer" delivers an extended error / release cause report as a single line containing the cause information given by the network in textual format.
The URC "CIEV: ceer,<ceerRelCauseGroup>,<ceerReport>" shows the same information as the standard command AT+CEER. If enabled the indicator will show up each time when a release cause is detected, whereas AT+CEER only polls the release cause of the latest event. The major benefit is that "ceer" URCs can be used for better analysis and tracing.

"is_cert" — Report details of the server certificate used for a secure Internet connection opened with AT^SISO.
The following certificate details are listed: <srvProfileId>, <issuer>, <serialNumber>, <subject>, <signatureAlgorithm>, <thumbprintAlgorithm>, <thumbprint>
Detailed guidelines for managing the required certificates can be found in [7].
See also AT commands AT^SISS, AT^SBNR and AT^SBNW.

"prov" — Provider configuration mismatch:
The "prov" indicator delivers the provider configuration mismatch status via URC.
+CIEV: prov,<provMm>,<provCur>,<provNext>

The AT^SIND test command indicates the maximum length of the "prov" <indValue>.

Changing the provider configuration is done by AT^SCFG parameter "MEop-Mode/Prov/Cfg" (see <provCfg>).

Please note that URC presentation <mode>=1 for this indicator is enabled by powerup default.

"suspendAvailable"   Indication SUSPEND mode availability:
For more details refer to AT^SCFG "MEopMode/PowerMgmt/Suspend" parameter <Suspend> and to "EXS82-W Hardware Interface Description, Version 01.100".
0   SUSPEND mode not available.
1   SUSPEND mode available.

"suspendReady"   Indication of module readiness to enter SUSPEND mode:
0   The module is NOT ready to enter SUSPEND mode.
1   The module is ready to enter SUSPEND mode.

<indValue>(num)

Integer type value as specified above for the corresponding <indDescr>.

<mode>(num)

Set or query URC presentation mode of a specific indicator <indDescr>.

Please note, that some indicator types allow the <mode> to be stored to non-volatile memory with AT&W, restored with ATZ and reset to '0' (disabled) by AT&F. See indicator descriptions whether or not AT&W, AT&F and ATZ are effective.

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

<aidList>(str)

String containing a list of USIM Application Ids on which the ongoing PAC Refresh will be performed. If the list is empty PAC Refresh will be performed on the current USIM Application.

<eonsOperator>(str)(+CSCS)

Operator name determined by the source of information. The source is indicated as <indValue>. All possible sources (<indValue>) are listed in the description of the "eons" indicator.

<servProvider>(str)(+CSCS)

Service Provider Name according to the status settings (USIM Service No. 17) in the USIM Service Table (SST) of the USIM.

Service Provider Name (SPN) will be read from EF_{SPN}. Service Provider Display Information (SPDI) will be read from EF_{SPDI} list.

<servProviderType>(num)

Service Provider Type according to Registered Public Land Mobile Network (RPLMN) and Home Public Land Mobile Network (HPLMN).

0   Service Provider Name will not be displayed (EF_{SPN} is empty or not available).

1	Service Provider Name will be displayed. RPLMN is the HPLMN.
2	Service Provider Name will be displayed. One entry of SPDI list is equal to the RPLMN.

`<nitzUT>`(str)(+CSCS)

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

`<nitzTZ>`(num)

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

`<nitzDST>`(num)

Adjustment for Daylight Saving Time as part of the "nitz" Indicator. Displayed only when received from network. Refer to `<indDescr>`.

`<lstaLevel>`(num)

Warning Level

0-11	User value to limit the indication of radio link errors.

Refer to `<indDescr>`.

`<lstaEdvs>`(num)

EDVS (0-11)
Error Downcounter value scaled. Refer to `<indDescr>`.

`<lstaRssi>`(num)

Value in dBm
Received signal strength indication value. Refer to `<indDescr>`.

`<lstaNo>`(num)

Number of reported channels. Refer to `<indDescr>`.

`<lstaMin>`(num)

Value in dBm
Minimal received signal strength value. Refer to `<indDescr>`.

`<lstaMax>`(num)

Value in dBm
Maximal received signal strength value. Refer to `<indDescr>`.

`<lstaMean>`(num)

Value in dBm
Mean value of received signal strength across frequency. Refer to `<indDescr>`.

`<lstaVar>`(num)

Variance of signal strength across frequency. Refer to `<indDescr>`.

`<lstaFrRep>`(num)

Number of reported frequencies. Refer to `<indDescr>`.

<lstaBandScnd>(num)

Scanned band. Refer to <indDescr>.

<lstaFrMin>(num)

Refer to <indDescr>.
4G:
Lowest DL EARFCN reported in the scan. Please see 3GPP TS 36.101 [54] chapter 5.4.4.

<lstaFrMax>(num)

Refer to <indDescr>.
4G:
Highest DL EARFCN reported in the scan. Please see 3GPP TS 36.101 [54] chapter 5.4.4.

<lstaGrade>(num)

Value in dBm.
Grade derived from the <lstaMean> value of the power scan results. Provides values of received signal strength.
Use the following formula in order to calculate <lstaGrade>: (<lstaMean> + 108 + 6) / 6.
Refer to <indDescr> and to the mapping table below:

RSSI measurement	Grade
RSSI <-108 dBm	grade=0
-108 dBm <RSSI <-102 dBm	grade=1
-102 dBm <RSSI <-96 dBm	grade=2
-96 dBm <RSSI <-90 dBm	grade=3
-90 dBm <RSSI <-84 dBm	grade=4
-84 dBm <RSSI <-78 dBm	grade=5
-78 dBm <RSSI <-72 dBm	grade=6
-72 dBm <RSSI <-66 dBm	grade=7
-66 dBm <RSSI <-60 dBm	grade=8
-60 dBm <RSSI <-54 dBm	grade=9
-54 dBm <RSSI <-48 dBm	grade=10

<ceerRelCauseGroup>(num)

Release Cause Group.
To enable the URC "CIEV: ceer,<ceerRelCauseGroup>,<ceerReport>" activate <mode> "1", and either select single <ceerRelCauseGroup> values, or choose value "99" for all release causes.
For each single <ceerRelCauseGroup> value the AT^SIND write command needs to be executed. The responses of the AT^SIND write or read command, however, then will list all activated single values. If only one <ceerRelCauseGroup> or value 99 was activated, the AT^SIND write and read command responses contain just this one value. <ceerRelCauseGroup> value "0" can be used to clear all activated values.

0(P)	Clear activated <ceerRelCauseGroup> values.
1	CS Internal Cause.
2	CS Network Cause.
3	CS Network Reject.
4	PS Internal Cause.
5	PS Network Cause.
6	Other Release Cause.
7	PS LTE Cause.

8	PS LTE Local Cause.
99	All Release Causes. Note that if value "99" is set selecting a single release cause will have no effect. Before activating single release cause values first set `<ceerRelCauseG-roup>` "0".

Example: Activating `<ceerRelCauseGroup>`s 4, 5 and 6:
```
AT^SIND=ceer,1,4
^SIND: ceer,1,4        # Response shows selected <ceerRelCauseGroup> value.
OK
AT^SIND=ceer,1,5
^SIND: ceer,1,4,5      # Response shows all <ceerRelCauseGroup> values currently selected.
OK
AT^SIND=ceer,1,6
^SIND: ceer,1,4,5,6     # Response shows all <ceerRelCauseGroup> values currently selected.
OK
```

`<ceerReport>`(str)

Release cause information given by the network in textual format.

`<srvProfileId>`(num)

Internet service profile identifier. Refer to AT^SISS, `<srvProfileId>`.

`<issuer>`(str)

Certificate's issuer. Refer to `<indDescr>`.

`<serialNumber>`(str)

Certificate's serial number. Refer to `<indDescr>`.

`<subject>`(str)

Certificate's subject. Refer to `<indDescr>`.

`<signatureAlgorithm>`(str)

Certificate's signature algorithm. Refer to `<indDescr>`.

`<thumbprintAlgorithm>`(str)

Certificate's thumbprint algorithm. Refer to `<indDescr>`.

`<thumbprint>`(str)

Certificate's thumbprint. Refer to `<indDescr>`.

`<provMm>`(num)

Provider configuration mismatch.

0	No provider mismatch.
1	Provider mismatch.

`<provCur>`(str)

Current provider.

"fallb3gpp"	Fallback provider profile

"attus"   Provider AT&T

"verizonus"   Provider Verizon Wireless

`<provNext>`(str)

UE will be changed to Provider configuration shown in `<provNext>`.

"fallb3gpp"   Fallback provider profile

"attus"   Provider AT&T

"verizonus"   Provider Verizon Wireless

Notes

- If the AT^SIND indicator "lsta" URC's `<indValue>` equals "1" and `<lstaNo>` is low, the following assumptions are possible:
  - Low `<lstaMean>` indicates out of coverage
  - High `<lstaVar>` indicates industrial interference
  - High (or middle depending on distance from jammer) `<lstaMean>` and low `<lstaVar>` indicates jamming.
- If the AT^SIND indicator "lsta" URC's `<indValue>` equals "1" and `<lstaNo>` is high, the following assumption is possible:
  - High `<lstaMean>` and low `<lstaVar>` indicates jamming.
- If the AT^SIND indicator "lsta" URC's `<indValue>` equals "11" or "21" and `<lstaNo>` is low, the following assumption is possible:
  - Low `<lstaMean>` and low `<lstaGrade>` indicates out of coverage.
- If the AT^SIND indicator "lsta" URC's `<indValue>` equals "11" or "21" and `<lstaNo>` is high, the following assumption is possible:
  - High `<lstaMean>` and high `<lstaGrade>` indicates jamming.

3.3 AT+CPAS Activity Status

AT+CPAS execute command queries EXS82-W's activity status.

Syntax

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

Exec Command
AT+CPAS
Response(s)
+CPAS: <pas>
OK

PIN ✈ Last	Reference(s)
- **+** **-**	3GPP TS 27.007 [49]

Parameter Description

<pas>(num)

0   Ready

4.   Serial Interface Control Commands

The AT Commands described in this chapter allow the external application to determine various settings related to the EXS82-W's serial interface.

4.1   AT&C   Set Data Carrier Detect (DCD) line mode

AT&C controls the behavior of the UE's DCD line.

Syntax

Exec Command
AT&C[<value>]
Response(s)
OK

PIN	→	Last
-	+	-

Parameter Description

<value>(num)(&V)(&W)

[0]	DCD line shall always be on.
1(&F)(D)	DCD line shall be on only when data carrier signal is present.
2	DCD line shall be on when Internet service profiles are in an active state as described below. For details on the various service states refer to AT^SISI, parameter <srvState> or AT^SISO, parameter <srvState>.

  • Transparent TCP or Transparent UDP client, SOCKET, HTTP,: DCD shall be on when <srvState>="Connnecting" or "Up".
  • Transparent TCP Listener: DCD shall be on when <srvState>="Up", "Alerting", "Connected" and "Released".
  • FTP: DCD shall be on when data channel is connected, i.e. <srvState>="Up".

4.2 AT&D Set Data Terminal Ready (DTR) line mode

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

Syntax

Exec Command
AT&D[<value>]
Response(s)
OK

PIN	→	Last
-	+	-

Parameter Description

<value>(num)(&V)(&W)

[0]	ME ignores status of DTR line.
1	ON->OFF on DTR: Change to command mode while retaining the connected call.
2(&F)(D)	ON->OFF on DTR: Disconnect data call or PPP and change to command mode. In Transparent Access Mode set up with AT^SIST DTR ON-OFF transition changes to command mode. For more details see AT^SISS and AT^SIST.

4.3 AT&S Set Data Set Ready (DSR) line mode

AT&S determines how the UE sets the DSR line depending on its communication state.

Syntax

Exec Command
AT&S[<value>]
Response(s)
OK

PIN	✈	Last		Reference(s)
-	+	-		V.250

Parameter Description

<value>(num)(&V)(&W)

[0](&F)(D)	DSR line is always ON
1	ME in command mode: DSR is OFF. ME in data mode: DSR is ON.

4.4 AT\Q Flow Control

AT\Q allows to configure flow control on the EXS82-W's asynchronous serial interface ASC0 and ASC1 (UART). It is strongly recommended to always use RTS/CTS hardware flow control.

The AT\Q setting is always common for all interfaces and can be changed, for compatibility reasons, on each interface, but is only applicable to the ASC0 interface. AT\Q settings have no effect on the USB ports because the USB protocol integrates a flow control mechanism of its own.

Syntax

Exec Command
AT\Q[<n>]
Response(s)
OK

PIN	✈	Last
-	+	-

Parameter Description

<n>(num)(&V)(&W)	
0	Disable flow control
1	XON/XOFF software flow control
2	This value is not supported and will be mapped to RTS/CTS hardware flow control
[3](&F)(D)	RTS/CTS hardware flow control

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.

- For compatibility reasons, AT\Q can be used in Multiplex mode (AT+CMUX), though the settings will not take effect. However, be aware that whenever you use the AT\Q write command in Multiplex mode and then save the current configuration to the user profile with AT&W, the changed AT\Q setting will become active after restart.

4.5 ATE AT Command Echo

ATE controls if the EXS82-W echoes characters received from TE during AT command state.

Syntax

Exec Command
ATE[<value>]
Response(s)
OK
ERROR

PIN	✈	Last		Reference(s)
-	+	-		V.250

Parameter Description

<value>(num)(&V)(&W)

0	Echo mode off
[1](&F)(D)	Echo mode on

4.6 AT+IPR Bit Rate

AT+IPR allows to query and set the bit rate of the EXS82-W's asynchronous serial interface (UART).
The test command returns the values of supported fixed bit rates.
The read command returns the currently set <rate> value.
The write command determines the bit rate to be used for the interface.

A selected fixed bit rate takes effect after the write command returns "OK" and is stored in the non-volatile memory. It is not recommended to set bit rates lower than 9600 bps in order to avoid timing problems (see Section 1.6, Communication between Customer Application and EXS82-W for details about timing).
When using AT+IPR on a USB channel or on a Multiplex mode related channel(AT+CMUX) the AT+IPR write command responds with "OK", but will not have any effect. However, the AT+IPR read command always returns the current setting dedicated to the UART channel.
It is highly recommended to use AT+IPR as a standalone AT command, i.e. better do not combine with other commands on the same AT command line.
The current setting of AT+IPR will be preserved after firmware download (i.e. a firmware update does not restore the factory setting) or in the event of power failure.

Syntax

Test Command

AT+IPR=?

Response(s)

+IPR: () , (list of supported selectable <rate>s)
OK

Read Command

AT+IPR?

Response(s)

+IPR: <rate>
OK

Write Command

AT+IPR=<rate>

Response(s)

OK
ERROR
+CME ERROR: <err>

PIN	✈	Last		Reference(s)
-	+	-		V.250

Parameter Description

<rate>(num)(&V)(NV)

Bit rate per second (bps)

300

1200

2400

4800

9600

19200

38400

57600

115200$^{(D)}$

230400

460800

921600

4.7 AT+ICF Serial Interface Character Framing

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)

The selected setting is stored in the user defined profile with next AT&W. It will only be used on next start of the EXS82-W. AT+ICF read command will always show the setting stored in the user defined profile, not the current setting of the character framing.

For compatibility reason AT+ICF can be used in Multiplex mode (refer AT+CMUX), though setting will not take effect. However, settings made on multiplex channel shall be stored in the user defined profile with next AT&W, but will not change the setting of the physical serial interface(s).

If AT+ICF modes 7E1 or 7O1 are set, the parity bit will not be transmitted over the air!

Syntax

Test Command

AT+ICF=?

Response(s)

+ICF: (list of supported <format>s), (list of supported <parity>s)
OK

Read Command

AT+ICF?

Response(s)

+ICF: <format>[, <parity>]
OK

Write Command

AT+ICF=[<format>[, <parity>]]

Response(s)

OK
ERROR
+CME ERROR: <err>

PIN	✈	Last
-	+	+

Reference(s)

ITU-T V.250 [18]

Parameter Description

<format>(num)(&V)(&W)

Character 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]^{(&F)(D)}	8 data 1 stop
5	7 data 1 parity 1 stop

<code><parity></code>(num)(&V)(&W)

Parity bit

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

4.8 AT+CMUX Multiplex mode

Multiplex mode according to 3GPP TS 27.010 [13] enables a serial interface to be multiplexed into virtual channels. It can be used on any available AT command port on:

- a USB interface;
- the serial interface ASC0;

In either case the current AT command port will be mapped to the first multiplex channel. New AT command ports will be opened in addition and mapped to the multiplex channels beginning with channel 2. The AT^SQPORT command can be used to print the AT command port ID of the currently used instance. The third multiplex channel is dedicated to GPS and will be used if NMEA output is switched on with AT^SGPSC while Multiplex mode is active.

For the host hardware, customers have to create their own multiplex programs conforming to the multiplexer protocol. To help system integrators save the time and expense of designing multiplexer applications, THALES DIS AIS Deutschland GmbH offers WinMux, a ready-to-use multiplex driver for Windows. Another approach is to develop customized solutions based on the sources of the WinMux driver.

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

AT+CMUX write command is used to enter Multiplex mode. Setup of the logical channels is initiated by the TE, i.e. the TE acts as initiator. This means that the TE shall ensure that logical channels are established before any further actions on the channels can be started. There is a timeout of five seconds, if the multiplexer protocol is enabled but no multiplexer control channel is established. Afterwards EXS82-W returns to AT command mode. The parameter maximum frame size (N1) according to 3GPP TS 27.010 [13] is implemented as 98 bytes by default. All other parameters are not available. Refer to "Multiplexer User's Guide" for further details regarding frame size.

Syntax

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

Read Command
AT+CMUX?
Response(s)
+CMUX: <mode>
OK
ERROR
+CME ERROR: <err>

Write Command
AT+CMUX=<mode>
Response(s)
OK
ERROR
+CME ERROR: <err>

PIN	✈	Last		Reference(s)
-	+	+		3GPP TS 27.007 [49]
				3GPP TS 27.010 [13]

Parameter Description

`<mode>`(num)	

Enable Multiplex mode.

0   Basic option

4.8.1   Restrictions while using Multiplex mode

If Multiplex mode is used on ASC0 interface:

1. Before starting Multiplex mode, ensure that the bit rate set with AT+IPR is not lower than 57600 bps. For using data services in Multiplex mode it is recommended to set at least 115200 bps.
2. Using AT+IPR write command on a Multiplex mode related channel command has no effect although "OK" result code will be returned.
3. It is recommended to set hardware flow control (AT\Q3) before starting Multiplex mode. XON/XOFF flow control (AT\Q1) is not supported in Multiplex mode.

4.9 AT^SQPORT Query Port Id

AT^SQPORT enables the Customer Application to query the IDs of the AT command ports.
The AT^SQPORT test command shows the IDs of the supported AT command ports. The number varies depending on whether Multiplex mode is started.
The AT^SQPORT read command shows the ID of the AT command port the Customer Application it is connected to.

Syntax

Test Command
AT^SQPORT=?
Response(s)
(range of available <id>s)   OK

Read Command
AT^SQPORT?
Response(s)
^SQPORT: <id>   OK

Exec Command
AT^SQPORT
Response(s)
^SQPORT: <id>   OK

PIN	✈	Last
-	+	-

Parameter Description

<id>^(num)	
1	ID of AT command port 1 mapped to serial interface ASC0.
2	ID of AT command port 2 mapped to serial interface ASC1.
3	ID of AT command port 3 mapped to USB port 0.
4	ID of AT command port 4 mapped to USB port 1.
5	ID of AT command port 5 mapped to first multiplex channel.
6	ID of AT command port 6 mapped to second multiplex channel.

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

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

The write AT+CPIN command allows the EXS82-W to store the entered password. This may be for example the SIM PIN1 to register to a GSM/UMTS/LTE 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 SIM PIN1 authentication was successful and no SIM PIN1 request is pending the AT+CPIN? read command returns "READY", but the next AT+CPIN=<pin> write command request refers to SIM PIN2. As a result, whilst SIM PIN2 has not been given, each attempt to enter SIM PIN1 again leads to "+CME ERROR: incorrect password", thus decreasing the SIM PIN2 counter. Therefore, you are advised to check which password is requested by using the read command AT^SPIC? and the execute command AT^SPIC.

Syntax

Test Command
AT+CPIN=?
Response(s)
OK

Read Command
AT+CPIN?
Response(s)
+CPIN: <code>   OK   ERROR   +CME ERROR: <err>

Write Command
AT+CPIN=<pin>[, <new pin>]
Response(s)
OK   ERROR   +CME ERROR: <err>

PIN ⇥ Last		Reference(s)
- **+** **-**		3GPP TS 27.007 [49]

Parameter Description

<pin>(str)

Password (string type).
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>.

<code>`<new pin>`</code>^(str)

If the requested code was a PUK: specify a new password or restore the former disabled password.

<code>`<code>`</code>^(text)

SIM PIN authentication

READY	PIN has already been entered. No further entry needed.
SIM PIN	UE is waiting for SIM PIN1.
SIM PUK	UE is waiting for SIM PUK1 if PIN1 was disabled after three failed attempts to enter PIN1.
SIM PIN2	UE is waiting for PIN2.
SIM PUK2	UE is waiting for PUK2 to unblock a disabled PIN2.

Phone security locks set by client or factory

PH-SIM PIN	UE is waiting for phone-to-SIM card password if "PS" lock is active and the client inserts other USIM, card than the one used for the lock. ("PS" lock is also referred to as phone or antitheft lock).
PH-FSIM PIN	UE is waiting for phone-to-very-first-SIM card password. Necessary when "PF" lock was set. When powered up the first time, UE locks itself to the first USIM card put into the card holder. As a result, operation of the mobile is restricted to this one USIM card (unless the PH-FSIM PUK is used as described below).
PH-FSIM PUK	UE is waiting for phone-to-very-first-USIM card unblocking password to be given. Necessary when "PF" lock is active and other than first USIM card is inserted.
PH-NET PIN	UE is waiting for network personalisation password
PH-NET PUK	UE is waiting for network personalisation unblocking password
PH-NETSUB PIN	UE is waiting for network subset personalisation password
PH-NETSUB PUK	UE is waiting for network subset unblocking password
PH-SP PIN	UE is waiting for service provider personalisation password
PH-SP PUK	UE is waiting for service provider personalisation unblocking password
PH-CORP PIN	UE is waiting for corporate personalisation password
PH-CORP PUK	UE is waiting for corprorate personalisation 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 UE fails to register to the network. This may be due to missing network coverage, denied network access with currently used USIM card, no valid roaming agreement between home network and currently available operators etc.
  EXS82-W 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 UE is powered up, or when the network cell changes).
- `<pin>` and `<new pin>` can also be entered in quotation marks (e.g. "1234").
- See AT+CPWD for information on passwords.
- See AT+CLCK for information on lock types.

5.2 AT+CLCK Facility Lock

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

Syntax

Test Command

AT+CLCK=?

Response(s)

+CLCK: list of supported <facility>s
OK

Write Command

AT+CLCK=<facility>, <mode>[, <password>]

Response(s)

If <mode> is 0 or 1 and command successful:
OK
If <mode>= 2 and command successful:
+CLCK: <status>
OK
ERROR
+CME ERROR: <err>

PIN	✈	Last		Reference(s)
+	**±**	**-**		3GPP TS 27.007 [49], 3GPP TS 22.004 [28], 3GPP TS 22.088 [36], 3GPP TS 23.088, 3GPP TS 24.088

Parameter Description

<facility>(str)

Phone security locks set by client or factory:

Primarily intended for the client to take safety precautions, "SC" can be configured individually.

See examples below for further details.

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

<mode>(num)

0	Unlock (parameter <password> is mandatory).
1	Lock (parameter <password> is mandatory).
2	Query status.

<status>(num)

0	Lock is inactive
1	Lock is active

`<password>`(str)

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 which can be modified see `AT+CPWD`.

Example

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

`AT+CLCK="SC",1,"9999"`	The "SC" parameter enables or disables the SIM PIN authentication (PIN1) when you power up the UE.
`OK`	SIM card locked. As a result, SIM PIN1 must be entered to enable UE to register to the network.

`AT+CLCK="SC",0,"9999"`	Unlocks SIM card.
`OK`	When powered up, UE registers to the 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 UE to register to the network.
`OK`	

5.3   AT+CPWD   Change Password

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 command AT+CLCK for more information on the various lock features.

Syntax

Test Command

AT+CPWD=?

Response(s)

+CPWD: list of supported (<facility>, <password length>)
OK

Write Command

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 the network provider or network operator doesn't supply the Network Password:
+CME ERROR: 258 (+CME ERROR: retry operation)
If error is related to ME functionality:
+CME ERROR: <err>

PIN	✈	Last		Reference(s)
+	**±**	**-**		3GPP TS 27.007 [49]

Parameter Description

<facility>(str)

Phone security locks set by client or factory:

Primarily intended for the client to take safety precautions, password "SC" (SIM PIN) is usually predefined, but can be configured individually.

"SC"   SIM PIN. SIM requests password upon ME power-up and when this lock command is issued.
                              If incorrectly entered three times, the SIM PUK is required to perform authentication. Input of the SIM PUK password is possible only with AT command AT+CPIN.
                              <password length>: 4 to 8 digits.

<password length>(num)

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 parameter <facility>. If the entered password is longer then the maximum password length it will be stripped to the maximum length and the remaining digits will be ignored.

`<old password>`(str)

Password specified for 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>`(str)

New password, which will be set if correct old password is provided.

Example

To change PIN1

`AT+CPWD="SC","1111","2222"`	(where "1111" = old PIN1 and "2222" = new PIN1)
`OK`	PIN1 password has been changed to "2222"

5.4 AT^SPIC Display PIN Counter

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

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

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 SIM PIN, SIM PUK.

To check whether or not you need to enter a password use the read commands AT+CPIN? or AT^SPIC?
If no USIM card is inserted the AT^SPIC read, execute and write commands return "+CME ERROR: SIM not inserted".

Syntax

Test Command
AT^SPIC=?
Response(s)
OK

Read Command
AT^SPIC?
Response(s)
^SPIC: <code>
OK

Exec Command
AT^SPIC
Response(s)
[^SPIC: <counter>]
OK

Write Command
AT^SPIC=<facility>[, <pin_puk>]
Response(s)
^SPIC: <counter>
OK
ERROR
+CME ERROR: <err>

PIN	✈	Last
-	+	-

Parameter Description

<counter>^(num)

<counter>(num)

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

`<facility>` (str)

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

"SC"	SIM PIN if parameter `<pin_puk>` is omitted or set to 0. SIM PUK if parameter `<pin_puk>` is set to 1.

`<pin_puk>` (num)

[0]	Show PIN counter for given `<facility>`.
1	Show PUK counter for given `<facility>`="SC".

`<code>` (text)

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.

Notes

- Whenever the required password changes, `<counter>` changes to reflect that change. Please refer to the examples below.
- See also chapters `AT+CLCK`, `AT+CPIN` and `AT+CPWD` for further information on locks and passwords.

Example

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: 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 PUK1.
at^spic
^SPIC: 10
OK                                    10 attempts left for PUK1.
```

```
at+cpin="01234567","1234"
+CME ERROR: incorrect password
at^spic
^SPIC: 9
OK                                          9 attempts left for PUK1.
```

5.5 AT^SSECUA Internet Service Certificate Store Actions

AT^SSECUA can be used to initialize and update the Internet Services Certificate Store of the EXS82-W by pre-configured certificates. Also certificates of the pre-configured and Internet Service certification store can be deleted.

The initialization is possible only in case the Internet Service certificate store is empty, otherwise ERROR is returned. In case the client certificate with key was not pre-configured at the factory, the command returns ERROR and no certificate is copied.

It is possible to update only the server certificates in the Internet Service certificate store. Additionally after firmware update procedure it is possible to update the list of server certificates in the Internet Service certificate store in case it has changed with the latest firmware update procedure. The server certificates that are not currently configured in the active Internet Service certificate store but are in the pre-configured list are added. Firmware update procedure can also introduce list of certificates to be revoked. Those server certificates for which thumbprint is included in the revocation list are removed from the Internet Service certificate store.

Syntax

Test Command
AT^SSECUA=?
Response(s)
+SSECUA:"CertStore/TLS/PreconfigureCerts"
+SSECUA:"CertStore/TLS/PreconfigureCert"
+SSECUA:"CertStore/TLS/UpdateServerCerts"
OK

Write Command
Initialize Internet Service Certificate Store with preconfigured server certificates and a pair of private certificate and key.
AT^SSECUA="CertStore/TLS/PreconfigureCerts"[, <signature>]
Response(s)
^SSECUA: "CertStore/TLS/PreconfigureCerts", <index>
[...]
OK
If error is related to ME functionality:
ERROR
+CME ERROR: <err>

Write Command
Initialize Internet Service Certificate Store with only selected certificate.
AT^SSECUA="CertStore/TLS/PreconfigureCert"[, <signature>], <preloaded-index>
Response(s)
^SSECUA: "CertStore/TLS/PreconfigureCerts", <index>
OK
If error is related to ME functionality:
ERROR
+CME ERROR: <err>

Write Command
Internet Service Certificate Store Update for server certificates.
AT^SSECUA="CertStore/TLS/UpdateServerCerts"[, <signature>]
Response(s)
^SSECUA: "CertStore/TLS/UpdateServerCerts", <index>, <action>
[...]
OK

Write Command   (Continued)

Internet Service Certificate Store Update for server certificates.

AT^SSECUA="CertStore/TLS/UpdateServerCerts"[, <signature>]

Response(s)

If error is related to ME functionality:

ERROR

+CME ERROR: <err>

PIN ✈ Last

| - | + | - |

Unsolicited Result Code

Format of the certification update indicator:

^SSECUA: "CertStore/TLS/UpdateServerCerts", <index>, <action>
[...]

When <certUpdateMode>" is set to automatic mode, the module will generate URCs messages during boot after changing firmware and successful certificates update. The URCs messages are sent for each certificate, which is changed.

Parameter Description

(str)

Signature used to authenticate the command if the asset is configured to be protected in secure mode, otherwise the value is "don't care".

<index>(num)

1...20   index of Internet Service certification store, where the server certificate is added or removed.

<preloaded-index>(num)

1...20   index of Internet Service certification store, where the certificate is added .

<action>(num)

0   for removed certificate

1   for added certificate

Notes

- In case there is not enough space currently to store all added certificates then only part of the certificates are added and ERROR returned.
- The client certificate at index 0 of Internet Service certificate store cannot be updated. The command returns ERROR in case the certificate at index 0 is empty in Internet Service certificate store.
- After successful manual/automatic Internet Service store update the preconfigured certificates set is not removed.

5.6 AT^SSECUC Internet Service Certificate Store Update Configuration

AT^SSECUC="CertStore/TLS/UpdateServerCerts/Mode" can be used to configure and query the update mode for the Internet Services Certificate Store of the EXS82-W.

AT^SSECUC="SEC/MODE" can be used to configure and query the Secure Mode of the EXS82-W.

Syntax

Test Command
AT^SSECUC=?
Response(s)
^SSECUC:"CertStore/TLS/UpdateServerCerts/Mode", maximum length of (<signature>), list of supported (<certUpdateMode>)s ^SSECUC:"SEC/MODE", maximum length of (<signature>), list of supported (<secmode>)s OK

Write Command
Internet Service Certification Store update configuration and query update mode
AT^SSECUC="CertStore/TLS/UpdateServerCerts/Mode"[, <signature>, <certUpdateMode>]
Response(s)
^SSECUC: "CertStore/TLS/UpdateServerCerts/Mode", <certUpdateMode> OK If error is related to ME functionality: ERROR +CME ERROR: <err>

Write Command
Secure Mode Control - Protect Asset Modification on Module
AT^SSECUC="SEC/MODE"[, <signature>, <secmode>]
Response(s)
^SSECUC: "SEC/MODE", <secmode> OK If error is related to ME functionality: ERROR +CME ERROR: <err>

PIN ✈ Last

-	+	-

Parameter Description

<signature>(str)

Signature used to authenticate the command if the asset is configured to be protected in secure mode, otherwise the value "don't care" has to be used.

<certUpdateMode>(str)(NV)

"0"	Disable manual/automatic Internet Service certificate store update with pre configured set.
"1"(D)	Allow manual Internet Service certificate store update.
"2"	Perform automatic Internet Service certificate store update after each firmware update.

<secmode>(str)

Secure Mode.

"0"(D)	Unsecured mode
"1"	Secure mode with certificate only (set and query) where AT commands and other means to access or modify security-relevant configuration data, credentials and code are protected by a cryptographic signature based on the secure-mode certificate loaded onto the module.
"2"	Secure mode with certificate + IMEI (set and query) where AT commands and other means to access or modify security-relevant configuration data, credentials and code are protected by a cryptographic signature based on the secure-mode certificate loaded onto the module and on the IMEI of the module (for customer IMEI modules the module serial no. is used instead).

Note

• AT^SSECUC="CertStore/TLS/UpdateServerCerts/Mode" without any parameters queries current <certUp-dateMode> value.

AT^SSECUC="SEC/MODE" without any parameters queries current <secmode> value.

6. Identification Commands

The AT Commands described in this chapter allow the external application to obtain various identification information related to the EXS82-W and linked entities.

6.1 ATI Display product identification information

The ATI execute command delivers a product information text.

Syntax

Exec Command
ATI
Response(s)
Cinterion
EXS82-W
REVISION xx.yyy
OK

Exec Command
ATI1
Response(s)
Cinterion
EXS82-W
REVISION xx.yyy
A-REVISION xx.zzz.cc
OK

Exec Command
ATI8
Response(s)
C-REVISION ccccc.vv
OK

Exec Command
ATI176
Response(s)
<imeisv_number>
OK

PIN	✈	Last		Reference(s)
-	+	-		ITU-T V.250 [18]

Parameter Description

<imeisv_number>(num)

IMEISV (International Mobile station Equipment Identity and Software Version number) conforming to the format: <IMEI>.<SVN>. For information on IMEISV refer to 3GPP TS 23.003 and 3GPP TS 27.007 [49].

Notes

- The "Revision" information consists of the following parts: Version xx and variant yyy of software release.
- "A-REVISION xx.zzz.cc" information consists of the following parts:
  Application Revision Number 'xx' as an assignment to customer application. '01' indicates no customer application.
  Application Revision Version 'zzz' as an assignment to changes in customer application.
  'cc' as an additional number, e.g. defined by customer.
- If the user changed the setting of the AT^SCFG parameter "Ident/Manufacturer", then instead of "Cinterion" the changed value will be returned (for details please refer to description of parameter <manufacturer>).
- If the user changed the setting of the AT^SCFG parameter "Ident/Product", then instead of "EXS82-W" the changed value will be returned (for details please refer to description of parameter <product>).

6.2 AT+CGMI Request manufacturer identification

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

Syntax

Test Command
AT+CGMI=?
Response(s)
OK
Exec Command
AT+CGMI
Response(s)
Cinterion
OK

PIN	✈	Last		Reference(s)
-	+	-		3GPP TS 27.007 [49]

Note

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

6.3 AT+GMI Request manufacturer identification

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

Syntax

Test Command
AT+GMI=?
Response(s)
OK
Exec Command
AT+GMI
Response(s)
Cinterion
OK

PIN	✈	Last		Reference(s)
-	+	-		ITU-T V.250 [18]

Note

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

6.4 AT+CGMM Request model identification

AT+CGMM returns a product model identification text. Command is identical with AT+GMM.

Syntax

Test Command
AT+CGMM=?
Response(s)
OK

Exec Command
AT+CGMM
Response(s)
EXS82-W
OK

PIN	✈	Last		Reference(s)
-	**+**	**-**		3GPP TS 27.007 [49]

Note

- If the user changed the setting of the AT^SCFG parameter "Ident/Product", then instead of "EXS82-W" the changed value will be returned (for details please refer to description of parameter <product>).

6.5 AT+GMM Request model identification

AT+GMM returns a product model identification text. Command is identical with AT+CGMM.

Syntax

Test Command
AT+GMM=?
Response(s)
OK

Exec Command
AT+GMM
Response(s)
EXS82-W
OK

PIN	✈	Last		Reference(s)
-	**+**	**-**		ITU-T V.250 [18]

Note

- If the user changed the setting of the AT^SCFG parameter "Ident/Product", then instead of "EXS82-W" the changed value will be returned (for details please refer to description of parameter <product>).

6.6 AT+CGMR Request revision identification of software status

AT+CGMR delivers a product firmware version identification.

Syntax

Test Command
AT+CGMR=?
Response(s)
OK

Exec Command
AT+CGMR
Response(s)
REVISION <xx.yyy>
OK

PIN	✈	Last		Reference(s)
-	+	-		3GPP TS 27.007 [49]

Parameter Description

<xx.yyy>(text)

Version xx and variant yyy of software release.

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

AT+CGSN returns the International Mobile Equipment Identity (IMEI).

Syntax

Test Command
AT+CGSN=?
Response(s)
OK

Exec Command
AT+CGSN
Response(s)
<sn>
OK

PIN	✈	Last		Reference(s)
-	+	-		3GPP TS 27.007 [49]

Parameter Description

<sn>(text)

IMEI used to identify mobile equipment when used on a mobile network.

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

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

Syntax

Test Command
AT+CIMI=?
Response(s)
OK

Exec Command
AT+CIMI
Response(s)
<imsi>
OK
ERROR
+CME ERROR: <err>

PIN	✈	Last		Reference(s)
+	+	-		3GPP TS 27.007 [49]

Parameter Description

<imsi>(text)

International Mobile Subscriber Identity

6.9 AT^SINFO Information Output

The AT^SINFO command delivers general product information text.

Syntax

Test Command
AT^SINFO=?
Response(s)
OK

Read Command
AT^SINFO?
Response(s)
^SINFO: "OSS"
OK
ERROR
+CME ERROR: <err>

Write Command
Open Source Software
AT^SINFO="OSS"
Response(s)
^SINFO: "OSS", <OpenSourceSoftware>
OK
ERROR
+CME ERROR: <err>

PIN	✈	Last
-	+	-

Parameter Description

<OpenSourceSoftware>(str)

Open Source Software (OSS).
AT read command prints out in plain text all information about free and open source software used in module firmware. The text being printed out includes following information:
- List of product variants the information printed out applies to.
- For each addressed software package the package name, copyright information, used licenses and text of associated licenses.
- Other instructions and information resulting from licensing of used free or open source software packages.
The text being printed out might be huge in number of lines of text. It is on UE to be able to deal with text output of this dimension.

7. Call related Commands

The AT Commands described in this chapter are related to data connections.

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

ATO is the corresponding command to the +++ escape sequence: If the UE is in command mode during a data connection ATO causes the UE to return to data mode.

Syntax

Exec Command
ATO[<n>]
Response(s)
If connection is not successfully resumed:
NO CARRIER
or
UE returns to data mode from command mode
CONNECT

PIN	✈	Last		Reference(s)
-	-	-		ITU-T V.250 [18]

Parameter Description

<n>(num)

[0]   Switch from command mode to data mode

7.2 +++ Escape from Data Mode to AT Command Mode

+++ escape sequence is only available in a data connection. The +++ character sequence causes the EXS82-W to pause data mode and return to AT command mode. This allows to enter AT commands while maintaining the data connection to the remote device. By the way the same task can be performed by toggling the DTR line if AT&D is set to 1. ATO is used to resume data or PPP online mode.

To prevent the +++ character sequence from being misinterpreted as data, it must be preceded and followed by a pause of 1000 ms. The +++ characters must be entered in quick succession, all within 1000 ms.

Syntax

Exec Command
+++
Response(s)
OK

PIN	✈	Last		Reference(s)
-	-	-		ITU-T V.250 [18]

Note

- 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.

8.   Network Service Commands

The AT Commands described in this chapter are related to various network services.

8.1   AT+CEDRXS   eDRX Setting

The AT+CEDRXS command controls the settings of eDRX parameters of the UE. The command controls whether the UE wants to apply eDRX or not, as well as the requested eDRX value for each specified type of access technology.

The AT+CEDRXS test command displays the supported <mode>s and the value ranges for the access technology and the requested eDRX value as compound values.

The AT+CEDRXS read command displays current settings for each defined value of <AcT-type>.

The AT+CEDRXS and AT^SEDRXS commands share the same configuration store, including the URC settings, and the same "+CEDRXP" URC.

Syntax

Test Command

AT+CEDRXS=?

Response(s)

+CEDRXS:(list of supported <mode>s), (list of supported <AcT-type>s), (list of supported <Requested_eDRX_value>s)
OK

Read Command

AT+CEDRXS?

Response(s)

[+CEDRXS:<AcT-type>, <Requested_eDRX_value>]
[+CEDRXS:<AcT-type>, <Requested_eDRX_value>]
[+CEDRXS:...]
OK
ERROR
+CME ERROR: <err>

Write Command

AT+CEDRXS=[<mode>[, <AcT-type>[, <Requested_eDRX_value>]]]

Response(s)

OK
ERROR
+CME ERROR: <err>

PIN	✈	Last		Reference(s)
+	**+**	**-**		3GPP TS 27.007 [49]

Unsolicited Result Code

When <mode>=2:

+CEDRXP:<AcT-type>[, <Requested_eDRX_value>[, <NW_provided_eDRX_value>[, <Paging_time_window>]]]

eDRX and URC are enabled when the eDRX values provided by network has changed.

Parameter Description

<mode>(num)(NV)

Enable or disable use of eDRX in the UE. This parameter is applicable to all specified types of access technology, i.e. the most recent setting of <mode> will take effect for all specified values of <AcT-type>.

0	Disable the use of eDRX.
1	Enable the use of eDRX.
2	Enable the use of eDRX and enable the "+CEDRXP" unsolicited result code.
3	Disable the use of eDRX and reset the <Requested_eDRX_value> to default.

<AcT-type>(num)

Type of access technology. This parameter is used to specify the relationship between the type of the access technology and requested eDRX value.

0	Access technology is not using eDRX. This parameter value is only used in the unsolicited result code or in AT+CEDRXRDP exec command.
2	GSM (A/Gb mode)
4	E-UTRAN Cat.M1
5	E-UTRAN Cat.NB

<Requested_eDRX_value>(str)(NV)

Half a byte in a 4 bit format. The values are coded as follows:

Values for GSM (A/Gb mode):

"0000"	~1.88 seconds
"0001"	~3.76 seconds
"0010"	~7.53 seconds
"0011"	12.24 seconds
"0100"	24.48 seconds
"0101"	48.96 seconds
"0110"	97.92 seconds
"0111"	195.84 seconds
"1000"	391.68 seconds
"1001"	783.36 seconds
"1010"	1566.72 seconds
"1011"	3133.44 seconds

Values for LTE Cat.M1 and Cat.NB:

"0000"	5.12 seconds
"0001"	10.24 seconds

"0010"	20.48 seconds
"0011"	40.96 seconds
"0100"	61.44 seconds
"0101"	81.92 seconds
"0110"	102.4 seconds
"0111"	122.88 seconds
"1000"	143.36 seconds
"1001"	163.84 seconds
"1010"	327.68 seconds
"1011"	655.36 seconds
"1100"	1310.72 seconds
"1101"	2621.44 seconds

Values for LTE Cat.NB:

"1110"	5242.88 seconds
"1111"	10485.76 seconds

<NW_provided_eDRX_value>(str)

Half a byte in a 4 bit format. The values are coded in the same way as for <Requested_eDRX_value>

<Paging_time_window>(str)

Half a byte in a 4 bit format. The requested values are applied immediately and are stored non-volatile. In case the module is attached to the network the change of the values will trigger tracking area update. The stored configuration is used during the network attach after restart in case the auto-attach is enabled.
Parameter is not applied in GSM.

The values are coded as follows:

Values for LTE Cat.M1:

"0000"	1.28 seconds
"0001"	2.56 seconds
"0010"	3.84 seconds
"0011"	5.12 seconds
"0100"	6.40 seconds
"0101"	7.68 seconds
"0110"	8.96 seconds
"0111"	10.24 seconds
"1000"	11.52 seconds
"1001"	12.80 seconds
"1010"	14.08 seconds
"1011"	15.36 seconds
"1100"	16.64 seconds
"1101"	17.92 seconds
"1110"	19.20 seconds
"1111"	20.48 seconds

Values for LTE Cat.NB:

"0000"	2.56 seconds
"0001"	5.12 seconds
"0010"	7.68 seconds
"0011"	10.24 seconds
"0100"	12.8 seconds
"0101"	15.36 seconds
"0110"	17.92 seconds
"0111"	20.48 seconds
"1000"	23.04 seconds
"1001"	25.6 seconds
"1010"	28.16 seconds
"1011"	30.72 seconds
"1100"	33.28 seconds
"1101"	35.84 seconds
"1110"	38.4 seconds
"1111"	40.96 seconds

Note

- Default setting: use of eDRX for LTE Cat.NB enabled, `<Requested_eDRX_value>` is "1101" (2621.44 seconds) and `<Paging_time_window>` is "0100" (12.8 seconds), while use of eDRX for LTE Cat.M1 and GSM is disabled.

8.2   AT^SEDRXS   eDRX Setting

The AT^SEDRXS command controls the settings of eDRX parameters of the UE. The command controls whether the UE wants to apply eDRX or not, as well as the requested eDRX value for each specified type of access technology. The AT^SEDRXS command allows compared to AT+CEDRXS the control of the Paging Time Window.

The AT^SEDRXS test command displays the supported <mode>s and the value ranges for the access technology, the requested eDRX value and the requested paging time window as compound values.

The AT^SEDRXS read command displays current settings for each defined value of <AcT-type>.

The AT^SEDRXS and AT+CEDRXS commands share the same configuration store, including the URC settings, and the same "+CEDRXP" URC.

Syntax

Test Command
AT^SEDRXS=?
Response(s)
^SEDRXS:(list of supported <mode>s), (list of supported <AcT-type>s), (list of supported <Requested_eDRX_value>s), (list of supported <Requested_Paging_time_window>s) OK

Read Command
AT^SEDRXS?
Response(s)
[^SEDRXS:<AcT-type>, <Requested_eDRX_value>, <Requested_Paging_time_window>] [^SEDRXS:<AcT-type>, <Requested_eDRX_value>, <Requested_Paging_time_window>] [^SEDRXS:...] OK ERROR +CME ERROR: <err>

Write Command
AT^SEDRXS=[<mode>[, <AcT-type>[, <Requested_eDRX_value>][, <Requested_Paging_time_window>]]]
Response(s)
OK ERROR +CME ERROR: <err>

PIN	✈	Last		Reference(s)
+	+	-		3GPP TS 27.007 [49]

Unsolicited Result Code

When <mode>=2:

+CEDRXP:<AcT-type>[, <Requested_eDRX_value>[, <NW_provided_eDRX_value>[, <NW_provided_Paging_time_window>]]]

eDRX and URC are enabled when the eDRX values provided by network has changed.

Parameter Description

`<mode>`(num)(NV)

Enable or disable use of eDRX in the UE. This parameter is applicable to all specified types of access technology, i.e. the most recent setting of `<mode>` will take effect for all specified values of `<AcT-type>`.

0	Disable the use of eDRX.
1	Enable the use of eDRX.
2	Enable the use of eDRX and enable the "+CEDRXP" unsolicited result code.
3	Disable the use of eDRX and reset the `<Requested_eDRX_value>` and `<Requested_Paging_time_window>` to default.

`<AcT-type>`(num)

Type of access technology. This parameter is used to specify the relationship between the type of the access technology and requested eDRX value.

0	Access technology is not using eDRX. This parameter value is only used in the unsolicited result code
2	GSM (A/Gb mode)
4	E-UTRAN Cat.M1
5	E-UTRAN Cat.NB

`<Requested_eDRX_value>`(str)(NV)

Half a byte in a 4 bit format. The values are coded as follows:

Values for GSM (A/Gb mode):

"0000"	~1.88 seconds
"0001"	~3.76 seconds
"0010"	~7.53 seconds
"0011"	12.24 seconds
"0100"	24.48 seconds
"0101"	48.96 seconds
"0110"	97.92 seconds
"0111"	195.84 seconds
"1000"	391.68 seconds
"1001"	783.36 seconds
"1010"	1566.72 seconds
"1011"	3133.44 seconds

Values for LTE Cat.M1 and Cat.NB:

"0000"	5.12 seconds
"0001"	10.24 seconds
"0010"	20.48 seconds
"0011"	40.96 seconds
"0100"	61.44 seconds
"0101"	81.92 seconds
"0110"	102.4 seconds
"0111"	122.88 seconds

"1000"	143.36 seconds
"1001"	163.84 seconds
"1010"	327.68 seconds
"1011"	655.36 seconds
"1100"	1310.72 seconds
"1101"	2621.44 seconds

Values for LTE Cat.NB:

"1110"	5242.88 seconds
"1111"	10485.76 seconds

`<NW_provided_eDRX_value>`(str)

Half a byte in a 4 bit format. The values are coded in the same way as for `<Requested_eDRX_value>`

`<Requested_Paging_time_window>`(str)(NV)

Half a byte in a 4 bit format. The requested values are applied immediately and are stored non-volatile. In case the module is attached to the network the change of the values will trigger tracking area update. The stored configuration is used during the network attach after restart in case the auto-attach is enabled.
Parameter is not applied in GSM.

The values are coded as follows:

Values for LTE Cat.M1:

"0000"	1.28 seconds
"0001"	2.56 seconds
"0010"	3.84 seconds
"0011"	5.12 seconds
"0100"	6.40 seconds
"0101"	7.68 seconds
"0110"	8.96 seconds
"0111"	10.24 seconds
"1000"	11.52 seconds
"1001"	12.80 seconds
"1010"	14.08 seconds
"1011"	15.36 seconds
"1100"	16.64 seconds
"1101"	17.92 seconds
"1110"	19.20 seconds
"1111"	20.48 seconds

Values for LTE Cat.NB:

"0000"	2.56 seconds
"0001"	5.12 seconds
"0010"	7.68 seconds
"0011"	10.24 seconds
"0100"	12.8 seconds

"0101"	15.36 seconds
"0110"	17.92 seconds
"0111"	20.48 seconds
"1000"	23.04 seconds
"1001"	25.6 seconds
"1010"	28.16 seconds
"1011"	30.72 seconds
"1100"	33.28 seconds
"1101"	35.84 seconds
"1110"	38.4 seconds
"1111"	40.96 seconds

<NW_provided_Paging_time_window>(str)

Half a byte in a 4 bit format. The values are coded in the same way as for <Requested_Paging_time_window>

Note

- Default setting: use of eDRX for LTE Cat.NB enabled, <Requested_eDRX_value> is "1101" (2621.44 seconds) and <Requested_Paging_time_window> is "0100" (12.8 seconds), while use of eDRX for LTE Cat.M1 and GSM is disabled.

8.3 AT+CEDRXRDP Read dynamic eDRX parameters

The AT+CEDRXRDP command reads the current dynamic eDRX parameters applied in the cell. The command returns <AcT-type> and <Requested_eDRX_value>, <NW_provided_eDRX_value> and <Paging_time_window> if eDRX is used for the cell that the MS is currently registered to. If the cell that the MS is currently registered to is not using eDRX, the <AcT-type>=0 is returned.

Syntax

Test Command
AT+CEDRXRDP=?
Response(s)
OK

Exec Command
AT+CEDRXRDP
Response(s)
+CEDRXRDP:<AcT-type>[, <Requested_eDRX_value>[, <NW_provided_eDRX_value>[, <Paging_time_window>]]]   OK   ERROR   +CME ERROR: <err>

PIN ✈ Last	Reference(s)
- + -	3GPP TS 27.007 [49]

8.4   AT+COPN   Read operator names

The AT+COPN command returns the list of operator names from the UE. Each operator code <numericn> that has an alphanumeric equivalent <alphan> in the UE memory is returned.

Syntax

Test Command
AT+COPN=?
Response(s)
OK
ERROR
+CME ERROR: <err>

Exec Command
AT+COPN
Response(s)
+COPN: <numericn>, <alphan>
[+COPN: ...]
OK
ERROR
+CME ERROR: <err>

PIN	✈	Last		Reference(s)
+	**+**	**-**		3GPP TS 27.007 [49]

Parameter Description

<numericn>(str)

Operator in numeric format

<alphan>(str)(+CSCS)

Operator in long alphanumeric format

8.5 AT+COPS Operator Selection

AT+COPS queries the present status of the EXS82-W's network registration and allows to determine whether automatic or manual network selection shall be used.

Three operator selection modes are available with AT+COPS:

- Automatic
  EXS82-W searches for the home operator automatically. If successful the EXS82-W registers to the home network. If the home network is not found, EXS82-W goes on searching. If a permitted operator is found, EXS82-W registers to this operator.
  If no operator is found the EXS82-W remains unregistered.

- Manual
  Desired operator can be determined using the AT+COPS write command. If the operator is found, EXS82-W registers to it immediately. If the selected operator is forbidden, the EXS82-W remains unregistered.

- Manual/automatic
  The UE first tries to find the operator determined via AT+COPS write command. If the UE fails to register to this operator, then it starts to select another (permitted) operator automatically.

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

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

Any of the parameters may be unavailable and will then be an empty field (,,). The list of operators comes in the following order: Home network, networks referenced in SIM and other networks.
The operator list is followed by a list of the supported <mode>s and <format>s. These lists are delimited from the operator list by two commas.
The response to the AT+COPS test command is independent of the settings made with <mode>. and <rat>. The AT+COPS test command will return a list of operators with the supported <rat>s.
Under certain conditions the UE has not enough resources to perform a network scan in the background. In such case, the AT+COPS test command is denied with error, for example during location update, data traffic in PS connections etc.

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

The AT+COPS write command forces an attempt to select and register to a network operator. 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.

Syntax

Test Command

```
AT+COPS=?
```

Response(s)

```
+COPS: [list of supported (<opStatus>, long alphanumeric <opName>, short alphanumeric <opName>,
numeric <opName>, <rat>)s], , (list of supported <mode>s), (list of supported <format>s)
OK
ERROR
+CME ERROR:<err>
```

Read Command

AT+COPS?

Response(s)

+COPS:<mode>[, <format>[, <opName>][, <rat>]]
OK
ERROR
+CME ERROR:<err>

Write Command

AT+COPS=<mode>[, <format>[, <opName>[, <rat>]]]

Response(s)

OK
ERROR
+CME ERROR:<err>

Write Command

When <mode>=0:

AT+COPS=[<mode>[, <format>[, <opName>[, <rat>]]]]

Response(s)

OK
ERROR
+CME ERROR:<err>

Write Command

When <mode>=1 or 4:

AT+COPS=<mode>, <format>, <opName>[, <rat>]

Response(s)

OK
ERROR
+CME ERROR:<err>

Write Command

When <mode>=2 (deregistering from network):

AT+COPS=<mode>

Response(s)

OK
ERROR
+CME ERROR:<err>

Write Command

When <mode>=3 (changing only <format>):

AT+COPS=[<mode>], <format>[, <opName>][, <rat>]

Response(s)

OK
ERROR
+CME ERROR:<err>

PIN	✈	Last		Reference(s)
+	-	-		3GPP TS 27.007 [49]

Parameter Description

`<opStatus>`(num)

Operator Status

0	Unknown
1	Operator available
2	Current operator
3	Operator forbidden

`<opName>`(str)(+CSCS)(&V)

Operator Name

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

`<mode>`(num)(&V)(NV)

Only Parameter values 0 and 1 are stored in the non-volatile memory of the EXS82-W.

0(D)	Automatic mode; `<opName>` field is ignored.
1	Manual operator selection The AT+COPS write command requires `<opName>` in numeric format, i.e. `<format>` shall be 2. When using this mode keep in mind that only the `<mode>` parameter is non-volatile, but not the selected `<opName>`. After restarting the UE the network will be selected according to the priority order specified in 3GPP TS 23.122: "Last Registered PLMN", "Home PLMN", "Preferred PLMN" (related USIM elementary files are EF_LOCI, EF_IMSI, EF_PLMNwAcT). The same priority order applies when swapping the USIM during operation.
2	Manually deregister from network and remain unregistered until `<mode>`=0 or 1 or 4 is selected. After setting command AT+COPS=2 wait for `<regStatus>` 0, e.g. indicated by the "+CREG: 0" URC before executing any further network service related AT commands.
3	Set only `<format>` (for AT+COPS read command).
4	Manual / automatic selection (`<opName>` field shall be present); if manual selection fails, automatic mode (`<mode>`=0) is entered. This mode cannot be selected in restricted mode (see note below).

`<rat>`(num)(&V)(NV)

Radio Access Technology (RAT)

By delivery default, the `<rat>` parameter is set to an automatic selection mode which enables the UE to select GSM or E-UTRAN or E-UTRAN Cat.NB1, depending on the network coverage. This automatic mode for selecting `<rat>` remains enabled until you explicitly set either 0 for GSM or 7 for E-UTRAN or 9 for E-UTRAN Cat.NB1 This means, setting the `<rat>` parameter is a restriction, i.e. it forces the UE to select GSM only or E-UTRAN only or E-UTRAN Cat.NB1 only. The selected `<rat>` value will be stored in the non-volatile memory. If the selected `<rat>` is not available, the UE cannot register to a network.
The automatic `<rat>` selection mode can be restored any time by executing the AT+COPS write command without choosing a specific `<rat>`, i.e. simply by omitting the `<rat>` value. When you do so, it does not matter, which value(s) you select for other AT+COPS parameters. For example, an easy way is setting AT+COPS=0, which means both PLMN and RAT are automatically selected. Another way is giving the AT+COPS write command with any `<mode>`, `<format>`, or `<opName>`, but `<rat>` omitted.
Please consider that the AT+COPS? read command does not reflect whether `<rat>` was omitted or explicitly set. This is because the response to the AT+COPS? read command will always indicate the currently used `<rat>`.

0	GSM

3	GSM w/EGPRS Only in read command response, not intended for the AT+COPS write command.
7	E-UTRAN Cat.M1
9	E-UTRAN Cat.NB1

<format>^{(num)(&V)(&W)}	
0^{(&F)(D)}	Long alphanumeric format of <opName>.
1	Short alphanumeric format of <opName>.
2	Numeric format of <opName>. This is the Location Area Identification (LAI) number, which consists of the 3-digit Mobile Country Code (MCC) plus the 2- or 3-digit Mobile Network Code (MNC).

Note

- AT+COPS=? shows PLMNs as available (<opStatus>=1) as long as a location update was not rejected and the PLMNs are not written to the forbidden PLMN list (SIM EF-FPLMN).

8.6 AT+CPLS Select Preferred Operator List

AT+CPLS is used to select a preferred PLMN list defined in Elementary Files of the SIM card or active application of the USIM. The setting takes effect for the AT+CPOL command.

Syntax

Test Command
AT+CPLS=?
Response(s)
+CPLS: (list of USIM supported <plmn-selector>s)   OK

Read Command
AT+CPLS?
Response(s)
+CPLS: <plmn-selector>   OK   ERROR   +CME ERROR: <err>

Write Command
AT+CPLS=<plmn-selector>
Response(s)
OK   ERROR   +CME ERROR: <err>

PIN	→	Last		Reference(s)
+	**-**	**-**		3GPP TS 27.007 [49]

Parameter Description

<plmn-selector>(num)
0(P)   User controlled PLMN with $EF_{PLMNwAcT}$/$EF_{PLMNsel}$
1   Operator controlled PLMN selector with $EF_{OPLMNwAcT}$
2   HPLMN selector with $EF_{HPLMNwAcT}$

8.7 AT+CPOL Preferred Operator List

AT+CPOL read command queries the list of the preferred operators.
AT+CPOL write command allows to edit the list of the preferred operators.
The response of AT+CPOL read command also depends on the setting of AT+CPLS.
If <index> is given but <operator> is left out, the entry is deleted.

Syntax

Test Command
AT+CPOL=?

Response(s)
+CPOL:(list of supported <index>s), (list of supported <format>s)
OK
ERROR
+CME ERROR: <err>

Read Command
AT+CPOL?

Response(s)
+CPOL: <index>, <format>, <operator>[, <gsm>, <gsm_compact>, <utran>, <e-utran>]
+CPOL: ...
OK
ERROR
+CME ERROR: <err>

Write Command
AT+CPOL=[<index>][, <format>[[, <operator>][, <gsm>, <gsm_compact>, <utran>, <e-utran>]]]

Response(s)
OK
ERROR
+CME ERROR: <err>

PIN	✈	Last		Reference(s)
+	**+**	**-**		3GPP TS 27.007 [49]

Parameter Description

<index>(num)

The order number of the operator in the SIM preferred operator list.

<format>(num)

0	Long alphanumeric format <operator>
1	Short alphanumeric format <operator>
2	Numeric format <operator>

<operator>(str)

The operator in the format specified in <format>.

`<gsm>`(num)	
0	AcT GSM disabled
1	AcT GSM enabled

`<gsm_compact>`(num)	
0	AcT GSM Compact disabled

`<utran>`(num)	
0	AcT UTRAN disabled
1	AcT UTRAN enabled

`<e-utran>`(num)	
0	AcT E-UTRAN disabled
1	AcT E-UTRAN enabled

Note

- The Access Technology selection parameters `<gsm>`, `<gsm_compact>`, `<utran>`, `<e-utran>` are required for SIM cards or UICCs containing PLMN selector with Access Technology.

8.8 AT+CPSMS Enable or Disable Power Saving Mode

AT+CPSMS controls settings of the UE's power saving mode (PSM) parameters. It controls whether the UE wants to apply PSM or not, as well as the requested extended periodic RAU value and the requested GPRS READY timer value in GERAN, the requested extended periodic TAU value in E-UTRAN and the requested Active Time value.

If no parameters are specified, the command has the same effect as when set to <mode>=2.

Syntax

Test Command

AT+CPSMS=?

Response(s)

+CPSMS: (list of supported <mode>s), (list of supported <RequestedPeriodicRAU>s), (list of supported <RequestedGprsReadyTime>s), (list of supported <RequestedPeriodicTAU>s), (list of supported <RequestedActiveTime>s)
OK
ERROR
+CME ERROR:<err>

Read Command

AT+CPSMS?

Response(s)

+CPSMS:<mode>[, <RequestedPeriodicRAU>][, <RequestedGprsReadyTime>][, <RequestedPeriodicTAU>][, <RequestedActiveTime>]
OK
ERROR
+CME ERROR:<err>

Write Command

AT+CPSMS=[<mode>[, <RequestedPeriodicRAU>[, <RequestedGprsReadyTime>[, <RequestedPeriodicTAU>[, <RequestedActiveTime>]]]]]

Response(s)

OK
ERROR
+CME ERROR:<err>

PIN	✈	Last		Reference(s)
-	-	-		3GPP TS 27.007 [49]
				3GPP TS 24.008 [43]

Parameter Description

<mode>(num)(NV)

Enable/disable the use of power saving mode (PSM) in the UE.

0(D)	Disable the use of PSM
1	Enable the use of PSM
2	Disable the use of PSM, discard all parameters for PSM and restore default values.

<RequestedPeriodicRAU>(str)(NV)

One byte in an 8 bit format.
Requested extended periodic RAU value (T3312) to be allocated to the UE in GSM. The requested extended periodic RAU value is coded as one byte (octet 3) of the GPRS Timer 3 information element coded as bit format (e.g. "01000111" equals 70 hours). For more information on coding and value range, see 3GPP TS 24.008 [43], table 10.5.163a).
Bits 5 to 1 represent the binary coded timer value. Bits 6 to 8 define the timer value unit as follows:

"000"	Value is incremented in multiples of 10 minutes
"001"	Value is incremented in multiples of 1 hour
"010"	Value is incremented in multiples of 10 hours
"011"	Value is incremented in multiples of 2 seconds
"100"	Value is incremented in multiples of 30 seconds
"101"	Value is incremented in multiples of 1 minute
"110"	Value is incremented in multiples of 320 hours

<RequestedGprsReadyTime>(str)(NV)

One byte in an 8 bit format.
Requested GPRS READY timer value (T3314) to be allocated to the UE in GSM. The requested GPRS READY timer value is coded as one byte (octet 2) of the GPRS Timer information element coded as bit format (e.g. "01000011" equals 3 decihours or 18 minutes). For more information on coding and value range, see 3GPP TS 24.008 [43], table 10.5.172).
Bits 5 to 1 represent the binary coded timer value. Bits 6 to 8 define the timer value unit as follows:

"000"	Value is incremented in multiples of 2 seconds
"001"	Value is incremented in multiples of 1 minute
"010"	Value is incremented in multiples of decihours

<RequestedPeriodicTAU>(str)(NV)

One byte in an 8 bit format.
Requested extended periodic TAU value to be allocated to the UE in E-UTRAN. The requested extended periodic TAU value is coded as one byte (octet 3) of the GPRS Timer 3 information element coded as bit format (e.g. "01000111" equals 70 hours). For more information on coding and value range, see 3GPP TS 24.008 [43], table 10.5.163a).
Bits 5 to 1 represent the binary coded timer value. Bits 6 to 8 define the timer value unit as follows:

"000"	Value is incremented in multiples of 10 minutes
"001"	Value is incremented in multiples of 1 hour
"010"	Value is incremented in multiples of 10 hours
"011"(D)	Value is incremented in multiples of 2 seconds
"100"	Value is incremented in multiples of 30 seconds
"101"	Value is incremented in multiples of 1 minute

<RequestedActiveTime>(str)(NV)

One byte in an 8 bit format.
Requested Active time value to be allocated to the UE. The requested Active Time value is coded as one byte (octet 3) of the GPRS Timer 2 information element coded as bit format (e.g. "00100100" equals 4 minutes). For more information on coding and value range, see 3GPP TS 24.008 [43], table 10.5.163).
Bits 5 to 1 represent the binary coded timer value. Bits 6 to 8 define the timer value unit as follows:

"000"	Value is incremented in multiples of 2 seconds
"001"(D)	Value is incremented in multiples of 1 minute
"010"	Value is incremented in multiples of decihours

8.9 AT+CREG Network Registration Status

AT+CREG serves to monitor the EXS82-W's circuit mode network registration status. Information can be reported by the AT+CREG? read command and by +CREG: URCs.

For packet switched service the AT+CGREG command and response apply to the registration (<stat>) and location information (<lac> and <ci>) for packet switched service.

For EPS service the AT+CEREG command and response apply to the registration (<stat>) and location information (<tac> and <ci>) for EPS service.

Syntax

Test Command

AT+CREG=?

Response(s)

+CREG: (list of supported<urcMode>s)
OK

Read Command

AT+CREG?

Response(s)

+CREG: <urcMode>, <regStatus>[, <netLac>, <netCellId>[, <AcT>]]
OK
ERROR
+CME ERROR: <err>

Write Command

AT+CREG=<urcMode>

Response(s)

OK
ERROR
+CME ERROR: <err>

PIN	✈	Last		Reference(s)
-	+	-		3GPP TS 27.007 [49]

Unsolicited Result Codes

URC 1

If <urcMode>=1 and there is a change in the UE's network registration status:

+CREG: <regStatus>

URC 2

If <urcMode>=2 and there is a change of the UE's network registration status or at least one of the additional network information elements:

+CREG: <regStatus>[, <netLac>, <netCellId>[, <AcT>]]

Parameter Description

<urcMode>(num)(&V)(&W)

[0](&F)	Disable +CREG URC.
1	Enable URC +CREG:<regStatus> to report status of network registration.
2	Enable URC +CREG:<regStatus>[,<netLac>,<netCellId> [, <AcT>]] to report status of network registration including location information. Parameters <netLac>, <netCellId> <AcT> will only be displayed if available.

<regStatus>(num)(&V)	
0	Not registered, UE is currently not searching for new operator. There is a technical problem. User intervention is required. Yet, emergency calls can be made if any network is available. Probable causes:
	• no SIM card available
	• no PIN entered
	• no valid Home PLMN entry found on the SIM
1	Registered to home network.
2	Not registered, but UE is currently searching for a new operator. UE searches for an available network. Failure to log in until after more than a minute may be due to one of the following reasons:
	• No network available or insufficient Rx level.
	• UE has no access rights to the networks available.
	• Networks from the SIM list of allowed networks are around, but login fails due to one of the following reasons:
	- #11 ... PLMN not allowed
	- #12 ... Location area not allowed
	- #13 ... Roaming not allowed in this location area
	After this, the search will be resumed (if automatic network search is enabled).
	• The Home PLMN or an allowed PLMN is available, but login is rejected by the cell (reasons: Access Class or LAC).
	If at least one network is available, emergency calls can be made.
3	Registration denied
	• If automatic network search is enabled: Authentication or registration fails after Location Update Reject due to one of the following reasons:
	- #2 ... IMSI unknown at HLR
	- #3 ... Illegal MS
	- #6 ... Illegal UE
	Either the SIM or the UE are unable to log into any network. User intervention is required. Emergency calls can be made, if any network is available.
	• Only if manual network search is enabled: Manual registration fails after Location Update Reject due to the following reasons:
	- #2 ... IMSI unknown at HLR
	- #3 ... Illegal MS
	- #6 ... Illegal UE
	- #11 ... PLMN not allowed
	- #12 ... Location area not allowed
	- #13 ... Roaming not allowed in this location area
	No further attempt is made to search or log into a network. Emergency calls can be made if any network is available.
4	Unknown, e.g. out of GSM/UMTS/LTE coverage.
5	Registered, roaming. UE is registered at a foreign network (national or international network)

<netLac>(str)

Two byte location area code in hexadecimal format (e.g. "00C1" equals 193 in decimal).

<netCellId>(str)

Cell ID in hexadecimal format:
- 16 bit for 2G
- 28 bit for 4G

<AcT>(num)

Radio access technology

0	GSM
3	GSM w/EGPRS
7	E-UTRAN CAT.M1
9	E-UTRAN CAT.NB1

Example

AT+CREG=1	Activate URC mode.
OK	
AT+COPS=0	Force UE to automatically search a network operator.
OK	
+CREG: 2	URC reports that UE is currently searching.
+CREG: 1	URC reports that operator has been found.

8.10 AT+CSQ Signal Quality

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

Syntax

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

Exec Command
AT+CSQ
Response(s)
+CSQ: `<rssi>`,`<ber>` OK

PIN	✈	Last		Reference(s)
+	**-**	**-**		3GPP TS 27.007 [49]

Parameter Description

`<rssi>`(num)	
0	-113 dBm or less
1	-111 dBm
2..30	-109... -53 dBm
31	-51 dBm or greater
99	not known or not detectable

According to 3GPP TS 27.007 [49], the `<rssi>` value is not applicable to 4G networks. Please use AT+CESQ instead, or AT^SMONI.

`<ber>`(num)	
0..7	as RXQUAL values in the table in 3GPP TS 45.008 [53], section 8.2.4 (for GSM network only).
99	not known or not detectable.

8.11 AT+CESQ Extended Signal Quality

The AT+CESQ command returns received signal quality parameters. If the current serving cell is not a GERAN cell, <rxlev> and <ber> are set to value 99. If the current serving cell is not a UTRA FDD or UTRA TDD cell, <rscp> is set to 255. If the current serving cell is not a UTRA FDD cell, <ecno> is set to 255. If the current serving cell is not an E-UTRA cell, <rsrq> and <rsrp> are set to 255.

Syntax

Test Command
AT+CESQ=?

Response(s)
+CESQ: (list of supported <rxlev>s), (list of supported<ber>s), (list of supported<rscp>s), (list of supported<ecno>s), (list of supported<rsrq>s), (list of supported<rsrp>s) OK

Exec Command
AT+CESQ

Response(s)
+CESQ: <rxlev>, <ber>, <rscp>, <ecno>, <rsrq>, <rsrp> OK ERROR

PIN	✈	Last		Reference(s)
+	**-**	**-**		3GPP TS 27.007 [49]

Parameter Description

<rxlev>(num)

Received signal strength level (see 3GPP TS 45.008 [53] subclause 8.1.4). For 2G networks only

0	rssi < -110 dBm
1	-110 dBm ≤ rssi < -109 dBm
2	-109 dBm ≤ rssi < -108 dBm
...	
61	-50 dBm ≤ rssi < -49 dBm
62	-49 dBm ≤ rssi < -48 dBm
63	-48 dBm ≤ rssi
99	not known or not detectable

<ber>(num)

Channel bit error rate (in percent). For 2G networks only

0..7	as RXQUAL values in the table in 3GPP TS 45.008 [53] subclause 8.2.4
99	not known or not detectable

<rscp>(num)

Received signal code power (see 3GPP TS 25.133 [46] subclauses 9.1.1.3 and 9.1.1.1.3) For 3G networks only

255	not known or not detectable

<ecno>(num)

Ratio of the received energy per PN chip to the total received power spectral density (see 3GPP TS 25.133 [46] subclause 9.1.2.3) For 3G networks only

255	not known or not detectable

<rsrq>(num)

Reference signal received quality (see 3GPP TS 36.133 [55] subclause 9.1.7). For 4G networks only

0	rsrq < -19.5 dB
1	-19.5 dB ≤ rsrq < -19 dB
2	-19 dB ≤ rsrq < -18.5 dB
...	
32	-4 dB ≤ rsrq < -3.5 dB
33	-3.5 dB ≤ rsrq < -3 dB
34	-3 dB ≤ rsrq
255	not known or not detectable

<rsrp>(num)

Reference signal received power (see 3GPP TS 36.133 [55] subclause 9.1.4). For 4G networks only

0	rsrp < -140 dBm
1	-140 dBm ≤ rsrp < -139 dBm
2	-139 dBm ≤ rsrp < -138 dBm
...	
95	-46 dBm ≤ rsrp < -45 dBm
96	-45 dBm ≤ rsrp < -44 dBm
97	-44 dBm ≤ rsrp
255	not known or not detectable

8.12   AT+CTZU   Automatic Time Zone Update

The AT+CTZU command enables and disables automatic time zone update via NITZ (if supported by the network).

When AT+CTZU is set to 1, the Real Time Clock (RTC) on the UE is updated with the network time every time when the UE receives a NITZ message. Any changes to the RTC using the command AT+CCLK will be wiped out by the network time.

When AT+CTZU is set to 0, AT+CCLK can be used to set the RTC. The newly set time will not be overwritten by the network time.

The AT^SIND command can also be used to get NITZ information, for details see "nitz" indicator. Unlike AT+CTZU, AT^SIND settings have no effect for the RTC. See AT+CCLK for examples.

Syntax

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

Read Command
AT+CTZU?
Response(s)
+CTZU: <n>   OK   ERROR   +CME ERROR: <err>

Write Command
AT+CTZU=<n>
Response(s)
OK   ERROR   +CME ERROR: <err>

PIN	✈	Last		Reference(s)
-	**+**	**-**		3GPP TS 27.007 [49]

Unsolicited Result Code

Format of the unsolicited result code:

+CTZU:<nitzUT>, <nitzTZ>[, <nitzDST>]

The URC indicates the RTC update from network time, and contains the time relevant information elements of the NITZ message.

Parameter Description

<n>(num)(NV)	
0(&F)(D)	Disable automatic time zone update via NITZ. Suppress unsolicited result codes.
1	Enable automatic time zone update via NITZ. Output unsolicited result codes.

<nitzUT>(str)

Universal Time delivered as part of the NITZ message.

<nitzTZ>(num)

Time Zone delivered as part of the NITZ message.
Positive (east) or negative (west) offset from the UTC in units of 15 minutes.

<nitzDST>(num)

Adjustment for Daylight Saving Time as part of the NITZ message. Displayed only when received from network. Indicates whether <nitzTZ> includes daylight savings adjustment.

0	No daylight savings adjustment included.
1	+1 hour (equals 4 quarters in <nitzTZ>) adjustment for daylight saving time included.
2	+2 hours (equals 8 quarters in <nitzTZ>) adjustment for daylight saving time included.

8.13   AT^SMONI   Monitoring Serving Cell

The AT^SMONI command supplies information of the serving cell.

Syntax

Test Command
AT^SMONI=?
Response(s)
OK

Exec Command
AT^SMONI
Response(s)
See: Section 8.13.1, AT^SMONI Responses
OK

PIN	✈	Last
-	-	-

8.13.1   AT^SMONI Responses

UE is not connected:

- UE is camping on a GSM (2G) cell and registered to the network:

```
Syntax:
^SMONI:
ACT,ARFCN,BCCH,MCC,MNC,LAC,cell,C1,C2,NCC,BCC,GPRS,PWR,RXLev,ARFCN,TS,timAdv,dBm,Q,ChM
od
Example:
^SMONI: 2G,990,-75,262,03,0139,02C9,28,28,3,0,G,0,-104,NOCONN
```

- UE is camping on a LTE Cat.M1 cell and registered to the network:

```
Syntax:
^SMONI: ACT,EARFCN,Band,CE level,Mode,MCC,MNC,TAC,Global Cell ID,Physical Cell ID,Srx-
lev,RSRP,RSRQ,Conn_state,RS-SINR
Example:
^SMONI: Cat.M1,6300,20,0,FDD,262,02,BF75,0345103,350,33,-94,-7,NOCONN,25
```

- UE is camping on a LTE Cat.NB cell and registered to the network:

```
Syntax:
^SMONI: ACT,EARFCN,Band,CE level,Mode,MCC,MNC,TAC,Global Cell ID,Physical Cell ID,Srx-
lev,RSRP,RSRQ,Conn_state,NRS-SINR
Example:
^SMONI: Cat.NB,6300,20,0,FDD,262,02,BF75,0345103,350,33,-94,-7,NOCONN,21
```

- UE is searching and could not (yet) find a suitable GSM (2G) cell:

```
Syntax:
^SMONI: ACT,ARFCN,BCCH,MCC,MNC,LAC,cell,C1,C2,NCC,BCC,GPRS,ARFCN,TS,timAdv,dBm,Q,ChMod
Example:
^SMONI: 2G,SEARCH,SEARCH
```

- UE is searching and could not (yet) find a suitable LTE Cat.M1 cell:

```
Syntax:
^SMONI: ACT,EARFCN,Band,CE level,Mode,MCC,MNC,TAC,Global Cell ID,Physical Cell ID,Srx-
lev,RSRP,RSRQ,Conn_state,RS-SINR
Example:
^SMONI: Cat.M1,SEARCH
```

- UE is searching and could not (yet) find a suitable LTE Cat.NB cell:

```
Syntax:
^SMONI: ACT,EARFCN,Band,CE level,Mode,MCC,MNC,TAC,Global Cell ID,Physical Cell ID,Srx-
lev,RSRP,RSRQ,Conn_state,NRS-SINR
Example:
^SMONI: Cat.NB,SEARCH
```

- UE is searching and could not (yet) find a suitable cell:

```
Example:
^SMONI: Searching
```

- UE is camping on a GSM cell but not registered to the network:

```
Syntax:
^SMONI:
ACT,ARFCN,BCCH,MCC,MNC,LAC,cell,C1,C2,NCC,BCC,GPRS,PWR,RXLev,ARFCN,TS,timAdv,dBm,Q,ChM
od
Example:
^SMONI: 2G,673,-89,262,07,4EED,A500,16,16,7,4,G,5,-107,LIMSRV
```

- UE is camping on a LTE Cat.M1 cell but not registered to the network:

```
Syntax:
^SMONI: ACT,EARFCN,Band,CE level,Mode,MCC,MNC,TAC,Global Cell ID,Physical Cell ID,Srx-
lev,RSRP,RSRQ,Conn_state,RS-SINR
Example:
^SMONI: Cat.M1,6300,20,0,FDD,262,02,BF75,0345103,350,33,-94,-7,LIMSRV,25
```

- UE is camping on a LTE Cat.NB cell but not registered to the network:

```
Syntax:
^SMONI: ACT,EARFCN,Band,CE level,Mode,MCC,MNC,TAC,Global Cell ID,Physical Cell ID,Srx-
lev,RSRP,RSRQ,Conn_state,NRS-SINR
Example:
^SMONI: Cat.NB,6300,20,0,FDD,262,02,BF75,0345103,350,33,-94,-7,LIMSRV,21
```

UE has a dedicated channel (for example call in progress):

- GSM (2G) cell:

```
Syntax:
^SMONI:
ACT,ARFCN,BCCH,MCC,MNC,LAC,cell,C1,C2,NCC,BCC,GPRS,PWR,RXLev,ARFCN,TS,timAdv,dBm,Q,ChM
od
Example:
^SMONI: 2G,852,-80,262,03,4E2D,6C2D,28,32,3,5,E,0,-104,816,1,3,-71,0,A_FR
```

- LTE Cat.M1 cell:

```
Syntax:
^SMONI: ACT,EARFCN,Band,CE level,Mode,MCC,MNC,TAC,Global Cell ID,Physical Cell
ID,TX_power,RSRP,RSRQ,Conn_state,RS-SINR
Example:
^SMONI: Cat.M1,6300,20,0,FDD,262,02,BF75,0345103,350,33,-94,-7,NOCONN,25
```

- LTE Cat.NB cell:

```
Syntax:
^SMONI: ACT,EARFCN,Band,CE level,Mode,MCC,MNC,TAC,Global Cell ID,Physical Cell
ID,TX_power,RSRP,RSRQ,Conn_state,NRS-SINR
Example:
^SMONI: Cat.NB,6300,20,0,FDD,262,02,BF75,0345103,350,33,-94,-7,NOCONN,21
```

Columns for GSM (2G) Serving Cell parameters:

Column	Description
ACT	Access Technology
ARFCN	ARFCN (Absolute Radio Frequency Channel Number) of the BCCH carrier
BCCH	Receiving level of the BCCH carrier in dBm (level is limited from -110dBm to -47dBm)
MCC	Mobile Country Code (first part of the PLMN code)
MNC	Mobile Network Code (second part of the PLMN code)
LAC	Location Area Code
cell	Cell ID
C1	Coefficient for base station selection
C2	Coefficient for base station selection
NCC	PLMN colour code
BCC	Base station colour code
GPRS	GPRS state
PWR	Maximal power level used on RACH channel in dBm
RxLev	Minimal receiving level (in dBm) to allow registration

Columns for GSM (2G) Dedicated Channel parameters:

Column	Description
ARFCN	ARFCN (Absolute Radio Frequency Channel Number) of the BCCH carrier
TS	Timeslot number
timAdv	Timing advance in bits
dBm	Receiving level of the traffic channel carrier in dBm
Q	Receiving quality (0-7)
ChMod	Channel mode (--: Signalling, S_HR: Half rate, S_FR: Full rate, S_EFR: Enhanced Full Rate, A_HR: AMR Half rate, A_FR: AMR Full rate)

Columns for LTE Cat.M1 Serving Channel parameters:

Column	Description
ACT	Access Technology
EARFCN	E-UTRA Absolute Radio Frequency Channel Number
Band	E-UTRA frequency band (see 3GPP 36.101)
CE level	UE selected coverage enhancement level
Mode	FDD or TDD

Column	Description
MCC	Mobile Country Code (first part of the PLMN code)
MNC	Mobile Network Code (second part of the PLMN code)
TAC	Tracking Area Code (see 3GPP 23.003 Section 19.4.2.3)
Global Cell ID	Global Cell ID
Physical Cell ID	Physical Cell ID
Srxlev	RX level value for base station selection in dB (see 3GPP 25.304)
RSRP	Reference Signal Received Power (see 3GPP 36.214 Section 5.1.1.)
RSRQ	Reference Signal Received Quality (see 3GPP 36.214 Section 5.1.2.)
TX power	Used Uplink Power in 1/10 dBm
Conn_state	Connection state. Can be one of following: CONN, LIMSRV, NOCONN or SEARCH
RS-SINR	Signal to Noise Ratio

Columns for LTE Cat.NB Serving Channel parameters:

Column	Description
ACT	Access Technology
EARFCN	E-UTRA Absolute Radio Frequency Channel Number
Band	E-UTRA frequency band (see 3GPP 36.101)
CE level	UE selected coverage enhancement level
Mode	FDD or TDD
MCC	Mobile Country Code (first part of the PLMN code)
MNC	Mobile Network Code (second part of the PLMN code)
TAC	Tracking Area Code (see 3GPP 23.003 Section 19.4.2.3)
Global Cell ID	Global Cell ID
Physical Cell ID	Physical Cell ID
Srxlev	RX level value for base station selection in dB (see 3GPP 25.304)
RSRP	Reference Signal Received Power (see 3GPP 36.214 Section 5.1.1.)
RSRQ	Reference Signal Received Quality (see 3GPP 36.214 Section 5.1.2.)
TX power	Used Uplink Power in 1/10 dBm
Conn_state	Connection state. Can be one of following: CONN, LIMSRV, NOCONN or SEARCH
NRS-SINR	Signal to Noise Ratio

8.13.2   Service states

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

- "SEARCH" (Searching) - The MS is searching, but could not (yet) find a suitable cell. This output appears after restart of the MS or after loss of coverage.
- "NOCONN" (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.
- "LIMSRV" (Limited Service) - The MS is camping on a cell but not registered to the network. 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.

8.14 AT^SMONP   Monitoring Neighbour Cells

The AT^SMONP supplies information of active cells and all neighbour cells. The active cell information will be delivered additively because an UE can be situated in Soft Handover or Softer Handover.

Syntax

Test Command
AT^SMONP=?
Response(s)
OK

Exec Command
AT^SMONP
Response(s)
See: Section 8.14.1, AT^SMONP Responses
OK

PIN	✈	Last
-	-	-

Notes

- Due to the fact that not all necessary information of the neighbour cells can be decoded during a connection, there are several constraints to be considered:
  - Only neighbour cells that have already been visible in IDLE mode will be further updated, as long as they are still included in the list.
  - Though new neighbour cells can be added to the list (e.g. due to handover), their C1 and C2 parameters cannot be displayed until the connection is released. In this case "-" is presented for C1 and C2.
- The neighbour cells have the same PLMN as the serving cell. In case of searching for a network the serving cell can change and the UE shows different sets of neighbour cells depending on the PLMN of the serving cell.
- Parameters for which no values are available are shown as "-".

8.14.1   AT^SMONP Responses

- *In case of a GSM (2G) serving cell:*

```
Syntax:
2G:
ARFCN_1,rs_1,dBm_1,MCC_1,MNC_1,NCC_1,BCC_1,C1_1,C2_1,LAC_1,cell_1,C31_1,C32_1
ARFCN_2,rs_2,dBm_2,MCC_2,MNC_2,NCC_2,BCC_2,C1_2,C2_2,LAC_2,cell_2,C31_2,C32_2
...
ARFCN_n,rs_n,dBm_n,MCC_n,MNC_n,NCC_n,BCC_n,C1_n,C2_n,LAC_n,cell_n,C31_n,C32_n
4G:
EARFCN_1,RSRQ_1,RSRP_1,PCI_1
EARFCN_2,RSRQ_2,RSRP_2,PCI_2
...
EARFCN_n,RSRQ_n,RSRP_n,PCI_n


Example:
2G:
658,51,-60,262,07,7,4,46,46,4EED,08B8,0,0
666,47,-64,262,07,7,1,42,42,4EED,A500,0,0
```

```
1006,37,-74,262,07,7,4,32,32,4EED,----,0,0
1021,36,-75,262,07,7,1,31,21,4EED,08B2,0,0
702,33,-78,262,07,7,3,28,28,4EED,A4F0,0,0
654,32,-79,262,07,7,5,27,27,4EED,1C3A,0,0
4G:
-----,-----,----,---
OK
```

- *In case of a 4G Cat.M1 serving cell:*

```
Syntax:
Cat.M1:
```
$EARFCN_1,RSRQ_1,RSRP_1,Srxlev_1,PCI_1,RSSI_1,Cell\ ID_1,MCC_1,MNC_1,TAC_1$
$EARFCN_2,RSRQ_2,RSRP_2,Srxlev_2,PCI_2,RSSI_2,Cell\ ID_2,MCC_2,MNC_2,TAC_2$
```
...
```
$EARFCN_n,RSRQ_n,RSRP_n,Srxlev_n,PCI_n,RSSI_n,Cell\ ID_n,MCC_n,MNC_n,TAC_n$

```
Example 1:
Cat.M1:
1830,-12.6,-91,38,368,-60,368,262,03,C463
1830,-11.7,-93,36,262,-72,368,262,03,C463
1830,-10.9,-93,36,329,-73,368,262,03,C463
1830,-15.1,-96,33,261,-72,368,262,03,C463
2527,-9.5,-83,--,1,-57,----,---,---,----
OK
```

```
Example 2:
Cat.M1:
1830,-12.6,-91,38,368,-60,368,262,03,C463
1830,-11.7,-93,36,262,-72,368,262,03,C463
1830,-10.9,-93,36,329,-73,368,262,03,C463
1830,-15.1,-96,33,261,-72,368,262,03,C463
2527,-9.5,-83,--,1,-57,----,---,---,----
OK
```

- *In case of a 4G Cat.NB serving cell:*

```
Syntax:
Cat.NB:
```
$EARFCN_1,NRSRQ_1,NRSRP_1,Srxlev_1,PCI_1,NRSSI_1,Cell\ ID_1,MCC_1,MNC_1,TAC_1$
$EARFCN_2,NRSRQ_2,NRSRP_2,Srxlev_2,PCI_2,NRSSI_2,Cell\ ID_2,MCC_2,MNC_2,TAC_2$
```
...
```
$EARFCN_n,NRSRQ_n,NRSRP_n,Srxlev_n,PCI_n,NRSSI_n,Cell\ ID_n,MCC_n,MNC_n,TAC_n$

```
Example 1:
Cat.NB:
1830,-12.6,-91,38,368,-60,368,262,03,C463
1830,-11.7,-93,36,262,-72,368,262,03,C463
1830,-10.9,-93,36,329,-73,368,262,03,C463
1830,-15.1,-96,33,261,-72,368,262,03,C463
2527,-9.5,-83,--,1,-57,----,---,---,----
OK
```

```
Example 2:
Cat.NB:
1830,-12.6,-91,38,368,-60,368,262,03,C463
1830,-11.7,-93,36,262,-72,368,262,03,C463
1830,-10.9,-93,36,329,-73,368,262,03,C463
1830,-15.1,-96,33,261,-72,368,262,03,C463
```

```
2527,-9.5,-83,--,1,-57,----,---,---,----
OK
```

Columns for GSM (2G) parameters:

Column	Description
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)
NCC	Network colour Code
BCC	Base Station colour code
C1	cell selection criterion
C2	cell reselection criterion
LAC	Location area code
cell	Cell identifier
C31	cell reselection criterion
C32	cell reselection criterion
SRxLev	RX level value for base station selection in dB (see 3GPP 25.304)
rank	Rank of this cell as neighbor for inter-RAT cell reselection

Columns for LTE Cat.M1 parameters:

Column	Description
EARFCN	E-UTRA Absolute Radio Frequency Channel Number
RSRQ	Reference Signal Received Quality as measured by L1 in dB (see ETSI TS 136 214 version 10.1.0 Section 5.1.3.)
RSRP	Reference Signal Received Power as measured by L1 in dBm (see ETSI TS 136 214 version 10.1.0 Section 5.1.1.)
Srxlev	RX level value for base station selection in dB (see 3GPP 25.304)
PCI	Physical Cell ID
RSSI	Received Signal Strength Indication as measured by L1 in dBm
Cell ID	LTE Serving cell ID
MCC	Mobile Country Code
MNC	Mobile Network Code
TAC	Tracking Area Code (see 3GPP 23.003 Section 19.4.2.3)

Columns for LTE Cat.NB parameters:

Column	Description
EARFCN	E-UTRA Absolute Radio Frequency Channel Number
NRSRQ	Narrowband Reference Signal Received Quality as measured by L1 in dB (see ETSI TS 136 214 version 10.1.0 Section 5.1.3.)

Column	Description
NRSRP	Narrowband Reference Signal Received Power as measured by L1 in dBm (see ETSI TS 136 214 version 10.1.0 Section 5.1.1.)
Srxlev	RX level value for base station selection in dB (see 3GPP 25.304)
PCI	Physical Cell ID
NRSSI	Narrowband Received Signal Strength Indication as measured by L1 in dBm
Cell ID	LTE Serving cell ID
MCC	Mobile Country Code
MNC	Mobile Network Code
TAC	Tracking Area Code (see 3GPP 23.003 Section 19.4.2.3)

8.15 AT^SNMON Network Monitoring

The AT^SNMON command can be used to monitor various network information.

Syntax

Test Command

AT^SNMON=?

Response(s)

^SNMON: "INS2G", (list of supported <action>s), (list of supported <rba2g>s)
^SNMON: "INSCatM", (list of supported <action>s), (list of supported <rba4g-1>s), (list of supported <rba4g-2>s)
^SNMON: "INSCatNB", (list of supported <action>s), (list of supported <rbacatnb-1>s), (list of supported <rbacatnb-2>s)
OK
ERROR
+CME ERROR: <err>

Write Command

Start informal network scan for 2G bands. Parameter <action> shall be 2.

AT^SNMON="INS2G", <action>[, <rba2g>]

Response(s)

^SNMON: "INS2G", <reserved>, <rba2g>, <cell_ID>, <lac>, <plmn>, <arfcn>, <rssi>, <dbm>

In case of no cell found for specific band then all values will be omitted.

OK
ERROR
+CME ERROR: <err>

Write Command

Start informal network scan for LTE Cat.M bands. Parameter <action> shall be 2.

AT^SNMON="INSCatM", <action>[, [<rba4g-1>][, <rba4g-2>]]

Response(s)

^SNMON: "INSCatM", <reserved>, <rba4g-1>, <rba4g-2>, <cell_ID>, <tac>, <plmn>, <earfcn>, <pcid>, <bwdl>, <bwup>, <rsrp>, <rsrq>, <cellbarred>

In case of no cell found for specific band then all values will be omitted.

OK
ERROR
+CME ERROR: <err>

Write Command

Start informal network scan for LTE Cat.NB bands. Parameter <action> shall be 2.

AT^SNMON="INSCatNB", <action>[, [<rbacatnb-1>][, <rbacatnb-2>]]

Response(s)

^SNMON: "INSCatNB", <reserved>, <rbacatnb-1>, <rbacatnb-2>, <cell_ID>, <tac>, <plmn>, <earfcn>, <pcid>, <bwdl>, <bwup>, <nrsrp>, <nrsrq>, <cellbarred>

In case of no cell found for specific band then all values will be omitted.

OK
ERROR
+CME ERROR: <err>

PIN	✈	Last		Reference(s)
-	-	-		3GPP TS 45.008 [53]

Parameter Description

<action>(num)

This parameter determines the action to be taken for the monitoring command.

2	Query values

<reserved>(num)

2	Value returned in scan output responses. Currently filled with the <action> parameter of the command that triggered this response.

<rba2g>(str)(NV)

<rba2g> determines the 2G frequency bands the UE is allowed to use. Values are given in *hexadecimal 32-bit-value order.* Every bit corresponds to a dedicated band number. Leading zeros are not necessary.

"1"	GSM 900
"2"	GSM 1800
"4"	GSM 850
"8"	GSM 1900

<rba4g-1>(str)(NV)

<rba4g-1> determines 4G frequency bands the UE is allowed to use. Values are given in *hexadecimal 32-bit-value order.* Every bit corresponds to a dedicated band number. Leading zeros are not necessary. The number range of <rba4g-1> covers band 1 to band 32.

"1"	LTE 2100 (B1)
"2"	LTE 1900 (B2)
"4"	LTE 1800 (B3)
"8"	LTE 1700 (B4)
"10"	LTE 850 (B5)
"80"	LTE 900 (B8)
"800"	LTE 700 (B12)
"1000"	LTE 700 (B13)
"20000"	LTE 850 (B18)
"40000"	LTE 800 (B19)
"80000"	LTE 800 (B20)
"1000000"	LTE 1900 (B25)
"2000000"	LTE 850 (B26)
"4000000"	LTE 800 (B27)
"8000000"	LTE 700 (B28)

`<rba4g-2>`(str)(NV)

`<rba4g-2>` determines 4G frequency bands the UE is allowed to use. Values are given in *hexadecimal 32-bit-value order.* Every bit corresponds to a dedicated band number. The number range of `<rba4g-2>` covers band 33 to max possible band. If the UE does not support bands higher than 32 the `AT^SNMON` test command returns the value range 0 - 0.

"200000000"	LTE 1745 (B66)
"10000000000000"	LTE 700 (B85)

`<rbacatnb-1>`(str)(NV)

`<rbacatnb-1>` determines Cat.NB frequency bands the UE is allowed to use. Values are given in *hexadecimal 32-bit-value order.* Every bit corresponds to a dedicated band number. The number range of `<rbacatnb-1>` covers band 1 to band 32.

"1"	LTE 2100 (B1)
"2"	LTE 1900 (B2)
"4"	LTE 1800 (B3)
"8"	LTE 1700 (B4)
"10"	LTE 850 (B5)
"80"	LTE 900 (B8)
"800"	LTE 700 (B12)
"1000"	LTE 700 (B13)
"20000"	LTE 850 (B18)
"40000"	LTE 800 (B19)
"80000"	LTE 800 (B20)
"1000000"	LTE 1900 (B25)
"2000000"	LTE 850 (B26)
"8000000"	LTE 700 (B28)

`<rbacatnb-2>`(str)(NV)

`<rbacatnb-2>` determines Cat.NB frequency bands the UE is allowed to use. Values are given in *hexadecimal bit-value order.* Every bit corresponds to a dedicated band number. The number range of `<rbacatnb-2>` covers band 33 to max possible band. If the UE does not support Cat.NB bands higher than 32 the `AT^SNMON` test command returns the value range 0 - 0

"200000000"	LTE 1745 (B66)
"4000000000"	LTE 600 (B71)
"10000000000000"	LTE 700 (B85)

`<cell_ID>`(str)

Cell ID

16 bit length for GSM
28 bit length for LTE

`<lac>`(str)

Location Area Code

Two byte location area code in hexadecimal format (e.g. "00C1" equals 193 in decimal) of the cell that was scanned.

<tac> (num)

Tracking Area Code (see 3GPP 23.003 Section 19.4.2.3)

<plmn> (str)

PLMN code

Public Land Mobile Network Code

<arfcn> (num)

Absolute Radio Frequency Channel Number of the BCCH carrier.

<earfcn> (num)

E-UTRA Absolute Radio Frequency Channel Number

<rssi> (num)

Received signal level of the BCCH carrier. 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 45.008 [53]

<dbm> (str)

Signal Strength

signal strength in dBm

<pcid> (num)

Physical Cell ID

<bwdl> (num)

bandwidth in download direction, "-" is shown for Cat.NB.

<bwup> (num)

bandwidth in upload direction, "-" is shown for Cat.NB.

<rsrp> (num)

Reference Signal Received Power as measured by L1 in dBm (see ETSI TS 136 214 version 10.1.0 Section 5.1.1.)

<rsrq> (num)

Reference Signal Received Quality as measured by L1 in dB (see ETSI TS 136 214 version 10.1.0 Section 5.1.3.)

<nrsrp> (num)

Narrowband Reference Signal Received Power as measured by L1 in dBm (see ETSI TS 136 214 version 13.5.0 Section 5.1.26.)

<nrsrq> (num)

Narrowband Reference Signal Received Quality as measured by L1 in dB (see ETSI TS 136 214 version 13.5.0 Section 5.1.27.)

<cellbarred>(str)

Indicates if the cell is barred, as defined in ETSI TS 36 304 version 15.2.0 Section 5.3.1.

"0"	Cell is not barred
"1"	Cell is barred

<tac>(num)

Tracking Area Code (see 3GPP 23.003 Section 19.4.2.3)

Notes

- Informal Network Scan can be used even if no SIM is present or no SIM-PIN was entered.
- Informal Network Scan can not be aborted by AT command.
- Informal Network Scan does not influence the actual network registration status of the UE.
- The Informal Network Scan will work without network registration or with network registration but in idle mode (no ongoing call, no PDP context activated).
- The Informal Network Scan may be aborted internally by any other network related activity that interferes with the network scan (e.g. incoming call, GPRS Attach, data transfer, outgoing call).
  In this case the write command responds with "+CME ERROR: operation temporary not allowed".
- If band(s) used for Informal Network Scan is not supported by the device or the band(s) has been disabled by AT^SCFG="Radio/Band/xyz" command, "+CME ERROR: operation not allowed" will return.

8.16 AT^SXRAT Selection of Radio Access Technology

The AT^SXRAT command specifies the Radio Access Technologies (RAT) to be used for network selection and registration. See also AT+COPS.

The AT^SXRAT write command allows to set the RAT and preferred RATs:

- When the UE is registered, setting only <AcT>=0, 7 or 8 can be used to change the RAT instantly.
- When the UE is not registered and the SIM card is locked, <AcT>=0, 7 or 8 can be set prior to entering SIM PIN1 in order to determine the RAT before registering.
- When <AcT>=9, 10 or 11 is set and the <AcT_pref1> setting is changed then the newly selected preferred RAT will be used first for the next registration attempt.
  In Dual Mode the parameter <AcT_pref2> can be set too, but has no influence to the RAT selection. However, depending on network capability, it is possible that the UE changes to the non-preferred RAT if this more suitable.
- When <AcT>=12 is set, both <AcT_pref1> and <AcT_pref2> can be set.
  <AcT_pref2> can only be set when <AcT>=12 and <AcT_pref1> is explicitly set. But <AcT_pref2> cannot be set same as <AcT_pref1>.
- When <AcT> is changed by AT+COPS in latter step, the value of <AcT> will be set accordingly. For example, if <AcT> is set by AT^SXRAT=0, the radio access technology will change to GSM, then if AT+COPS=0 is set in following step, the automatic <AcT> selection mode will be restored.
- If <AcT_pref1> or <AcT_pref2> is vacant, <AcT_pref1> or <AcT_pref2> will be auto selected by UE, the rule is as below: LTE Cat.M1 > LTE Cat.NB1 > GSM.

In Airplane mode (AT+CFUN=4) the AT^SXRAT read and test command can be used, but not the write command.

Syntax

Test Command
AT^SXRAT=?
Response(s)
^SXRAT:[list of present operator(<AcT>, list of present operator(<AcT_pref1>, list of present operator(<AcT_pref2>] OK ERROR +CME ERROR: <err>

Read Command
AT^SXRAT?
Response(s)
^SXRAT:<AcT>, <AcT_pref1>[, <AcT_pref2>] OK ERROR +CME ERROR:<err>

Write Command
AT^SXRAT=<AcT>[, <AcT_pref1>[, <AcT_pref2>]]
Response(s)
OK ERROR +CME ERROR:<err>

PIN	✈	Last
-	±	-

Parameter Description

<AcT>(num)(NV)	
Radio access technology (RAT)	
0	GSM
7	LTE CAT.M1
8	LTE CAT.NB1
9	LTE CAT.M1 / GSM dual mode If this mode is selected additionally a preferred RAT can be configured, which is stored in NVRAM. In dual mode there are no InterRat measurements and handovers provided.
10	LTE CAT.M1 / LTE CAT.NB1 dual mode If this mode is selected additionally a preferred RAT can be configured, which is stored in NVRAM. In dual mode there are no InterRat measurements and handovers provided.
11	LTE CAT.NB1 / GSM dual mode If this mode is selected additionally a preferred RAT can be configured, which is stored in NVRAM. In dual mode there are no InterRat measurements and handovers provided.
12(D)	LTE CAT.M1 / LTE CAT.NB1 / GSM triple mode If this mode is selected additionally two preferred RATs can be configured, which is stored in NVRAM.. In triple mode LTE CAT.M1 / LTE CAT.NB1 / GSM there are no InterRat measurements and handovers provided.

<AcT_pref1>(num)(NV)	
Access technology 1st preferred	
0	RAT GSM
7(D)	RAT LTE CAT.M1
8	RAT LTE CAT.NB1

<AcT_pref2>(num)(NV)	
Access technology 2nd preferred	
0	RAT GSM
7	RAT LTE CAT.M1
8(D)	RAT LTE CAT.NB1

Examples

EXAMPLE 1

If AT+COPS=0 is excuted, even though network mode is changed to single mode or dual mode by AT^SXRAT, it will change to triple mode. But the priority setting will keep the same with AT^SXRAT.

```
AT^SXRAT=8                              Set up LTE CAT.NB1 single mode.
OK
AT+COPS=0                               Force UE to do automatically network search.
OK
AT^SXRAT?
^SXRAT: 12, 8, 7                        Change to trible mode and 1st preferred Access
                                        technology is LTE CAT.NB1.
OK
```

`AT^SXRAT=9,0`	Change to dual mode and 1st preferred Access technology is GSM.
`OK`	
`AT+COPS=0`	Force UE to do automatically network search.
`OK`	
`AT^SXRAT?`	
`^SXRAT: 12, 0, 7`	Change to trible mode and 1st preferred Access technology is GSM.
	2nd preferred Access technology is CAT.M1.
`OK`	

EXAMPLE 2

If AT+COPS=1 is excuted and RAT is specified, even though network mode is changed to dual or triple mode by AT^SXRAT, it will change to single mode.

`AT^SXRAT=10,8`	Change to dual mode and 1st preferred Access technology is CAT.NB1.
`OK`	
`AT+COPS=1, 2, "00101", 7`	Force UE to do manually network search.
`OK`	
`AT^SXRAT?`	
`^SXRAT: 7, 7`	LTE CAT.M1 single mode.
`OK`	
`AT^SXRAT=12, 8, 0`	Change to trible mode and 1st preferred Access technology is CAT.NB1.
`OK`	
`AT+COPS=1, 2, "00101", 7`	Force UE to do manually network search.
`OK`	
`AT^SXRAT?`	
`^SXRAT: 7, 7`	LTE CAT.M1 single mode.
`OK`	

8.17 AT^SNLWM2M   LwM2M Client Configuration / Controlling

AT^SNLWM2M is used to configure and control LWM2M Client.

Syntax

Test Command

AT^SNLWM2M=?

Response(s)

^SNLWM2M: "act", <stack_id_str>, (list of supported <action>s)
^SNLWM2M: "cfg", <stack_id_str>, <mgmt_rsc>[<rsc_value>]
^SNLWM2M: "cfg/ext", <stack_id_str>, <mgmt_rsc>, <ext_param>, <ext_value>
^SNLWM2M: "cfg/object", <stack_id_str>, <mgmt_rsc>, (list of supported <rsc_operation>s)
^SNLWM2M: "cfg/rsc", <stack_id_str>, <mgmt_rsc>, <value>
^SNLWM2M: "cfg/stack", <stack_id_str>, autostart , (list of supported <autostart>s)
^SNLWM2M: "del/ext", <stack_id_str>, <mgmt_rsc>, <ext_param>
^SNLWM2M: "status/srv", <stack_id_str>, <srvID>
^SNLWM2M: "status/stack", <stack_id_str>
OK

Read Command

AT^SNLWM2M?

Response(s)

^SNLWM2M: "act"
^SNLWM2M: "cfg"
^SNLWM2M: "cfg/ext"
^SNLWM2M: "cfg/object"
^SNLWM2M: "cfg/rsc"
^SNLWM2M: "cfg/stack" , <stack_id_str>, "autostart", "on"
^SNLWM2M: "status/srv"
^SNLWM2M: "status/stack"
OK

Write Command

The following command shall be used to control LwM2M Client:

AT^SNLWM2M="act" , <stack_id_str>, <action>

Response(s)

^SNLWM2M: "act" , <action>, <action_status>
OK
ERROR
+CME ERROR: <err>

Write Command

The following command shall be used to configure LwM2M Client bootstrap:

AT^SNLWM2M="cfg" , <stack_id_str>[, <mgmt_rsc>[, <rsc_value>]]

Response(s)

^SNLWM2M: "cfg" , <stack_id_str>, <mgmt_rsc>,[<rsc_value>]
OK
ERROR
+CME ERROR: <err>

Write Command

The following command shall be used to configure extension configuration:

AT^SNLWM2M="cfg/ext" , <stack_id_str>[, <mgmt_rsc>[, <ext_param>[, <ext_value>]]]

Response(s)

^SNLWM2M: "cfg/ext" , <stack_id_str>, <mgmt_rsc>, <ext_param>, <ext_value>
OK
ERROR
+CME ERROR: <err>

Write Command

The following command shall be used to create or remove an Object Instance:

AT^SNLWM2M="cfg/object" , <stack_id_str>, <mgmt_rsc>, <rsc_operation>

Response(s)

OK
ERROR
+CME ERROR: <err>

Write Command

The following command shall be used for Object Resource Instance Setting:

AT^SNLWM2M="cfg/rsc" , <stack_id_str>, <mgmt_rsc>, <value>

Response(s)

OK
ERROR
+CME ERROR: <err>

Write Command

The following command shall be used to control LwM2M Client autostart:

AT^SNLWM2M="cfg/stack" , <stack_id_str>, autostart , <autostart>

Response(s)

^SNLWM2M: "cfg/stack" , <stack_id_str>, autostart, <autostart>
OK
ERROR
+CME ERROR: <err>

Write Command

The following command shall be used to delete extension configuration:

AT^SNLWM2M="del/ext" , <stack_id_str>, <mgmt_rsc>, <ext_param>

Response(s)

OK
ERROR
+CME ERROR: <err>

Write Command

The following command shall be used to get the current status of the LwM2M Client:

AT^SNLWM2M="status/stack" , <stack_id_str>

Response(s)

^SNLWM2M: "status/stack" , <stack_id_str>, <stack_status>[, <status_parameter>]
OK
ERROR
+CME ERROR: <err>

Write Command

The following command shall be used to get the current status of the LwM2M Server:

AT^SNLWM2M="status/srv" , <stack_id_str>[, <srvID>]

Response(s)

^SNLWM2M: "status/srv" , <stack_id_str>, <srvID>, <server_status>[,
<server_status_parameter>]
OK
ERROR
+CME ERROR: <err>

PIN ✈ Last
- **+** **-**

Unsolicited Result Code

^SNLWM2M, "procedure", <stack_id_str>, [<srvID>], <procedure>,
<procedure_status>[, <procedure_status_parameter>]

URCs indicate execution status of LwM2M action procedure.

Parameter Description

<stack_id_str>(text)

This parameter is used for identification of the client

MODS	Identification of the client Module Service.
attus	Identification of the client AT&T LwM2M service.
vzwus	Identification of the client Verizon Wireless LwM2M service.

Example: To start the AT&T LwM2M service execute following command: AT^SNLWM2M="act", "attus", "start".

<mgmt_rsc>(str)

This parameter is used for identification of the management object in the format of /object/object instance or for identification of resource in the format of /object/object instance/resource[/resource instance].

"/"	to configure default value.

<rsc_value>(str)

This parameter represent the value of resource and is omitted when the management object has the status uninitialized, not printable or Secure Read.

<rsc_operation>(str)

This parameter determines if a management object will be created or deleted.

"new"	creation of object instance
"del"	deletion of object instance

<value>(str)

This parameter is used to set the object resource instance.

<ext_param>(str)

This parameter is used for identification of the management object parameter.

"conID"	for context ID

<ext_value>(str)

This parameter is used for identification of the management object value, eg. parameter <cid> of AT+CGDCONT.

<action>(str)

This parameter determines if a management object will be created or deleted.

"start"	start LwM2M Client
"stop"	stop LwM2M Client

<action_status>(str)

This parameter determines if a management object will be created or deleted.

"0"	success for start/stop of LwM2M Client
"1"	error for start/stop of LwM2M Client

<autostart>(str)

the parameter controls the autostart of the LwM2M Client.

"on"	autostart switched on
"off"	autostart switched off

<stack_status>(str)

the parameter shows the status of the LwM2M Client.

"init"	LwM2M client is in factory bootstrap mode, i.e. resources and objects can be configured via AT interface. All connections to servers are disabled
"active"	LwM2M client is in normal LwM2M operation mode, i.e. it registers to configured LwM2M servers. Resource values can be configured via AT interface
"server-bootstrap"	LwM2M client is in remote bootstrap mode, i.e. it connects to the bootstrap server to get initial configuration. Objects or resources cannot be configured or modified via the AT interface. AT^SNLWM2M="status/srv" will return status only of the bootstrap server connection.

<status_parameter>(str)

the parameter shows additional status information of the LwM2M Client.

<srvID>(str)

LwM2M Server Identification is integer value of short server id or empty for bootstrap server

<server_status>(str)

The parameter shows the status of the LwM2M Server.

"deregistered"	No registration to the server and client is currently not attempting registration.
"connecting"	Transport connection is being setup - e.g. DNS query or (D)TLS handshake.
"registering"	Registration on CoAP layer started.
"registered"	Registered to the server.
"sleep"	Queue mode activated - registered, but server is buffering data.
"error"	There was an error in the last registration attempt, client is not registered
"bootstrapping"	The client is connected to the bootstrap server and bootstrap procedure is ongoing.

<server_status_parameter>(str)

The parameter shows additional status information of the LwM2M Server. In case of "error" state it shall contain error code and description of the error.

<procedure>(str)

The parameter shows the procedure in progress

"start"	to indicate the LwM2M client is performing the start action procedure
"stop"	to indicate the LwM2M client is performing the stop action procedure
"fwdownload"	to indicate the LwM2M client is performing the firmware download procedure
"fwupdate"	to indicate the LwM2M client is performing the firmware update procedure

<procedure_status>(str)

The parameter shows the status of procedure in progress

"start failed"	to indicate the failure occurs during LwM2M client start action
"stop failed"	to indicate the failure occurs during LwM2M client stop action
"init"	to indicate the action which firmware download is starting with URL information provided in <procedure_status_parameter>
"ready"	to indicate action is ready to be initiated
"progress"	to indicate download progress percentage, with downloading percentage information provided in <procedure_status_parameter>, the URC will be printed in every 5 percent increased
"status"	to indicate final action status

<procedure_status_parameter>(str)

The parameter shows additional status information of the procedure in progress.

8.18 AT+CCIOTOPT CIoT Optimization Configuration

The AT+CCIOTOPT write command controls which CIoT EPS optimizations the UE indicates as supported and preferred in the ATTACH REQUEST and TRACKING AREA UPDATE REQUEST messages.
The AT+CCIOTOPT write command is also used to control the URC "+CCIOTOPTI". The URC "+CCIOTOPTI" is used to indicate the supported CIoT EPS optimizations by the network.
The read command returns the current settings for supported and preferred CIoT EPS optimizations and the current status of the URC "+CCIOTOPTI".
The current supported network status of the URC "+CCIOTOPTI" is indicated after registration.

Syntax

Test Command

`AT+CCIOTOPT=?`

Response(s)

`+CCIOTOPT:` (list of supported `<n>`s), (list of supported `<supported_UE_opt>`s), (list of supported `<preferred_UE_opt>`s)
`OK`
`ERROR`
`+CME ERROR:<err>`

Read Command

`AT+CCIOTOPT?`

Response(s)

`+CCIOTOPT:<n>, <supported_UE_opt>, <preferred_UE_opt>`
`OK`
`ERROR`
`+CME ERROR:<err>`

Write Command

`AT+CCIOTOPT=[<n>[, <supported_UE_opt>[, <preferred_UE_opt>]]]`

Response(s)

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

PIN	⟶	Last		Reference(s)
-	-	-		3GPP TS 27.007 [49]

Unsolicited Result Code

`+CCIOTOPTI: <supported_Network_opt>`

Indicate the supported CIoT EPS optimizations by the network

Parameter Description

`<n>`(num)

Enable/disable reporting of unsolicited code +CCIOTOPTI.

0(D)	Disable reporting
1	Enable reporting
3	Disable reporting and reset the parameters for CIoT EPS optimization to the default values

`<supported_UE_opt>`(num)(NV)

Indicate the UE's support for CIoT EPS optimizations.

1(D)   Support for control plane CIoT EPS optimization

3   Support for both control plane CIoT EPS optimization and user plane CIoT EPS optimization

`<preferred_UE_opt>`(num)(NV)

Indicate the UE's preference for CIoT EPS optimizations.

1(D)   Preference for control plane CIoT EPS optimization

2   Preference for user plane CIoT EPS optimization. This can be set only when `<supported_UE_opt>`=3.

`<supported_Network_opt>`(num)

Indicate the Network support for CIoT EPS optimizations.

0   No support

1   Support for control plane CIoT EPS optimization

2   Support for user plane CIoT EPS optimization

3   Support for both control plane CIoT EPS optimization and user plane CIoT EPS optimization

Note

- AT command AT+CCIOTOPT is only valid for Cat.NB.

9.   USIM Application Toolkit (USAT) Commands

This chapter describes AT commands and responses related to the EXS82-W's USIM Application Toolkit (USAT) implementation.

USAT is a technology that allows an application running on the USIM to control the GSM/LTE Cat. M1/Cat. NB1 Engine (UE); it is specified in 3GPP TS 11.14 [23], 3GPP TS 31.111 [24], ETSI TS 102 223 [25]. Remote USIM Application Toolkit, or short Remote-USAT, provides a link between an application running on the USIM and the Customer Application (TE). The purpose of Remote-USAT is to allow the TE to send AT commands to the USAT interface and to display dedicated USAT activity on the user interface of the TE. The overall scenario is illustrated in the context diagram below.

Following types of data are exchanged between the EXS82-W and the application running on the USIM:

- Proactive commands (PACs) are sent from the USIM application to the UE. Some PAC types are executed by the UE itself, comparable with AT commands. Other PAC types are immediately forwarded to the TE, e.g. "DISPLAY TEXT".
- Terminal Response is the UE's answer to the last PAC, sometimes to be provided by the TE.
- Envelope commands are sent from the UE or TE to the USIM Application, such as "MENU SELECTION".
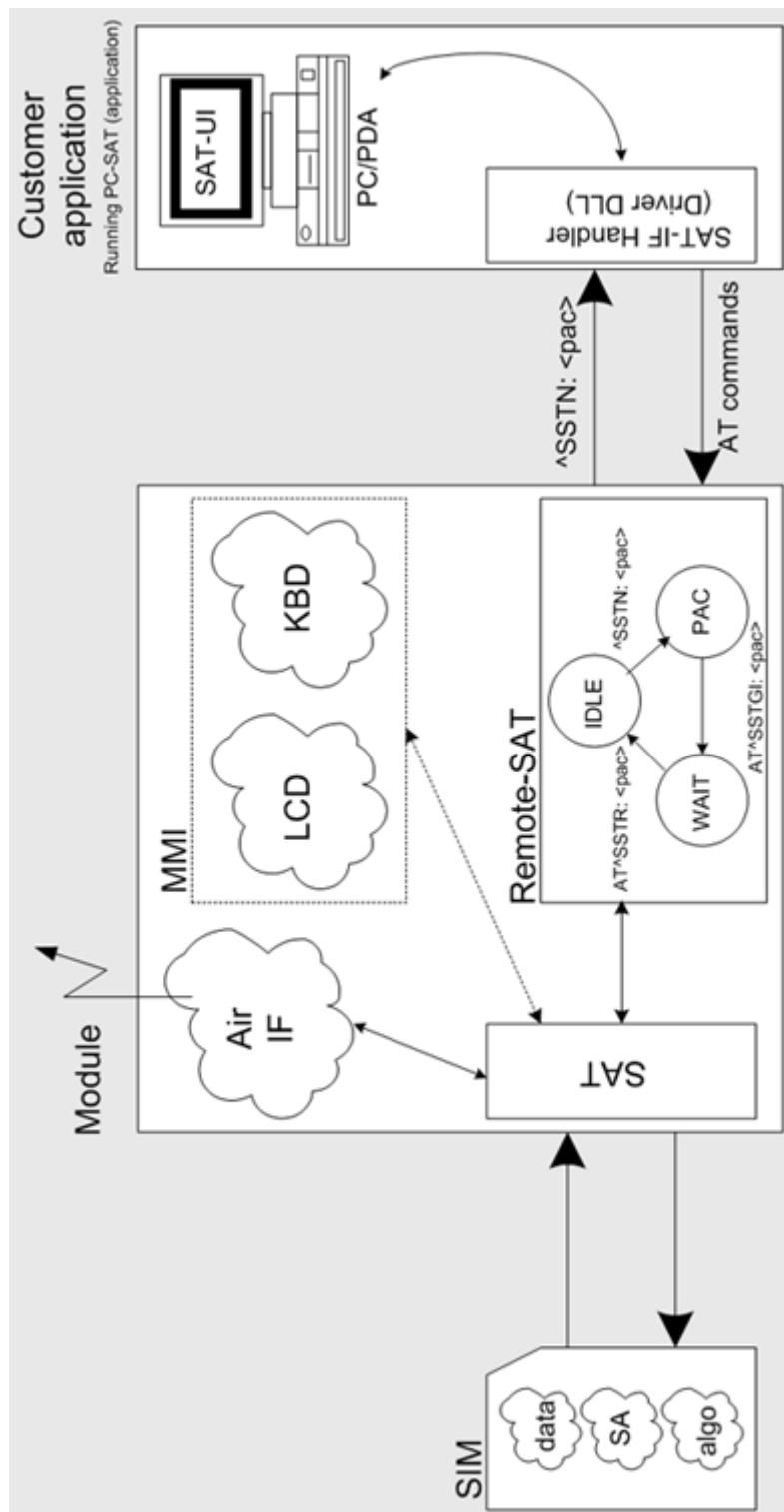
Figure 9.1: Remote-USAT Context Diagram

9.1 Usage of Remote-SAT

If USAT functionality is delivered by the USIM provider, the related USAT commands have to be handled. Otherwise other USIM functionality may not working correctly (e.g. SMS-PP downloads).
Therefore two possible modes are available.

9.1.1 Automatic Response Mode (AR Mode)

If the UE operates in this (default) mode, usage of any Remote-USAT AT commands is not necessary. In this case, all commands and responses are exchanged automatically between the UE and the USIM application. The type of Terminal Response (TR) to a USAT Proactive Command issued by the USIM application used in AR mode is listed at Table 9.6, Command Type Table, column "Auto Terminal Response". However, even while using AR Mode it is crucial to react on USAT REFRESH Proactive Commands, indicating that data read from the USIM has been changed!

Additionally a "+CIEV: "simdata"" URC is issued if a Refresh is rejected (<status> and <statAddInfo> are visible).
This URC is independent from Remote-USAT modes (Autoresponse mode and Explicit Response mode). This can happen if it is not possible to refresh an EF (e.g. EF_IMSI during a call). In this case the customer have to cancel all Calls as soon as possible and wait for the next Refresh command from the SIM card.
If the Refresh will not occour again, please restart the module to complete the Refresh request.
Therefore, enable handling of AT^SIND, using parameter <indDescr>="simdata" to get informed about USAT REFRESH events.
Furthermore it is recommended to activate the AT^SCKS URC, because for USAT REFRESH Type SIM RESET the same internally functionality as for physical remove and insertion of the USIM is done.

To take full advantage of Remote-USAT the ER mode has to be enabled using AT^SSTA=1. This setting is stored in the non-volatile memory and takes effect after next switch-on of the UE.

9.1.2 Explicit Response Mode (ER Mode)

As a Wireless Modem does not have an MMI, Remote-USAT differs from a phone implementation of USAT. It uses a special set of AT commands to pass data, e.g. a list of menu items, to the TE and to receive responses, e.g. a selected menu item.
The TE is required to monitor the status of an ongoing USAT Proactive Command (PAC) and, if required, sends appropriate AT commands, depending upon users input.
The "+CIEV: "simdata"" URC is issued if a Refresh is rejected (<status> and <statAddInfo> are visible).
This can happen if it is not possible to refresh an EF (e.g. EF_IMSI during a call). In this case the customer have to cancel all Calls as soon as possible and wait for the next Refresh command from the SIM card.
If the Refresh will not occour again, please restart the module to complete the Refresh request.

9.1.3 Character Sets

Strings are passed as UCS2 characters, but using the GSM alphabet is also possible. Use of GSM alphabet is not recommended since a USIM can contain text which might be not displayable, e.g. Greek characters. Use the AT^SSTA command to select the type of alphabet both for input and output. UCS is specified in ISO/IEC 10646. There are 2 and 4 octet versions available, of which only the 2-octet variant is used, known as UCS2. The 65536 positions in the 2-octet form of UCS are divided into 256 rows, each with 256 cells. The first octet of a character representation gives the row number, the second the cell number. The first row, row 0, contains exactly the same characters as ISO/IEC 8859-1. The first 128 characters are thus the ASCII characters. The octet representing an ISO/IEC 8859-1 character is easily transformed to the representation in UCS by putting a 0 octet in front of it. UCS includes the same control characters as ISO/IEC 8859 which are located in row 0.

9.1.4   USIM Update Initiated by the Network

If a Customer Application (TE) uses data of the USIM card please consider that the contents of all elementary files are subject to change at any time. This happens because the network can change the USIM data in the background via the USIM Application Toolkit (USAT) procedure "Data download to USIM". For a detailed description refer to 3GPP TS 11.14 [23], 3GPP TS 31.111 [24], ETSI TS 102 223 [25]. In order to receive the information that an elementary file has been changed the TE has to activate Remote-USAT and needs to look for the USAT Proactive Command "REFRESH", Section 9.7, AT^SSTGI.

9.1.5   Icon Handling

Several USAT Proactive commands may provide an icon identifier. Icons are intended to enhance the MMI by providing graphical information to the user. The display of icons is optional for the UE.
The USIM indicates to the UE whether the icon replaces an alpha identifier or text string, or whether it accompanies it (icon qualifier).

If both an alpha identifier or text string, and an icon are provided with a proactive command, and both are requested to be displayed, but the UE is not able to display both together on the screen, then the alpha identifier or text string takes precedence over the icon.

If the USIM provides an icon identifier with a proactive command, then the UE shall inform the USIM if the icon could not be displayed by sending the response "Command performed successfully, but requested icon could not be displayed" (via AT^SSTR).

Icon data can be fetched directly from the USIM using the AT+CRSM command, for details please refer to 3GPP TS 11.11 [19], 3GPP TS 31.101 [20], 3GPP TS 31.102 [21]. Icon data can be read from the USIM on system start then cached.

9.1.6   Using SMS Related AT Commands

UE activities triggered by USAT often end in sending or receiving short messages. Usually, a short message containing a service request is sent to the network, for example a request to send the latest news. Subsequently, the network returns a short message containing the requested information. This short message needs to be read by the Customer Application.

Set SMS text mode
AT+CMGF=1

Activate the display of a URC on every received SMS
AT+CNMI=1,1

If needed activate extended SMS text mode parameter output
AT+CSDH=1
This is useful in order to obtain more detailed header information along with the incoming SMS (e.g. SMS class). Please refer to 3GPP TS 23.038 [38] for details.

As a result, a URC will be output each time a short message is received
"+CMTI": "MT", 1 where
• the first parameter "MT" specifies the storage type of the SMS
• the second parameter contains a unique location number.
In the given example, the short message was stored to the memory type "MT" at location number 1.
The short message storage "MT" is a logical storage. For more detailed information please refer to AT+CPMS.

To read the SMS data use
AT+CMGR=<location>
where <location> is the location number of the received SMS, e.g. 1 in the example above.

To list all stored short messages use
AT+CMGL="ALL"

To delete a certain SMS after reading use
AT+CMGD=<location>

9.2   Remote-SAT States

In order to communicate with the SIM Application Toolkit it is necessary to use AT commands which are explained in detail in the following chapters. In general, the type of AT command which should be issued depends on the current state of the Remote-SAT interface.
The current state of Remote-SAT is determined by

1. the Remote-SAT operating mode (AR or ER mode),
2. the application running on the SIM,
3. the Customer Application (in case of ER mode only), and
4. internal actions of the UE (especially SAT and Call Control).

9.2.1 Remote-SAT State Transition Diagram
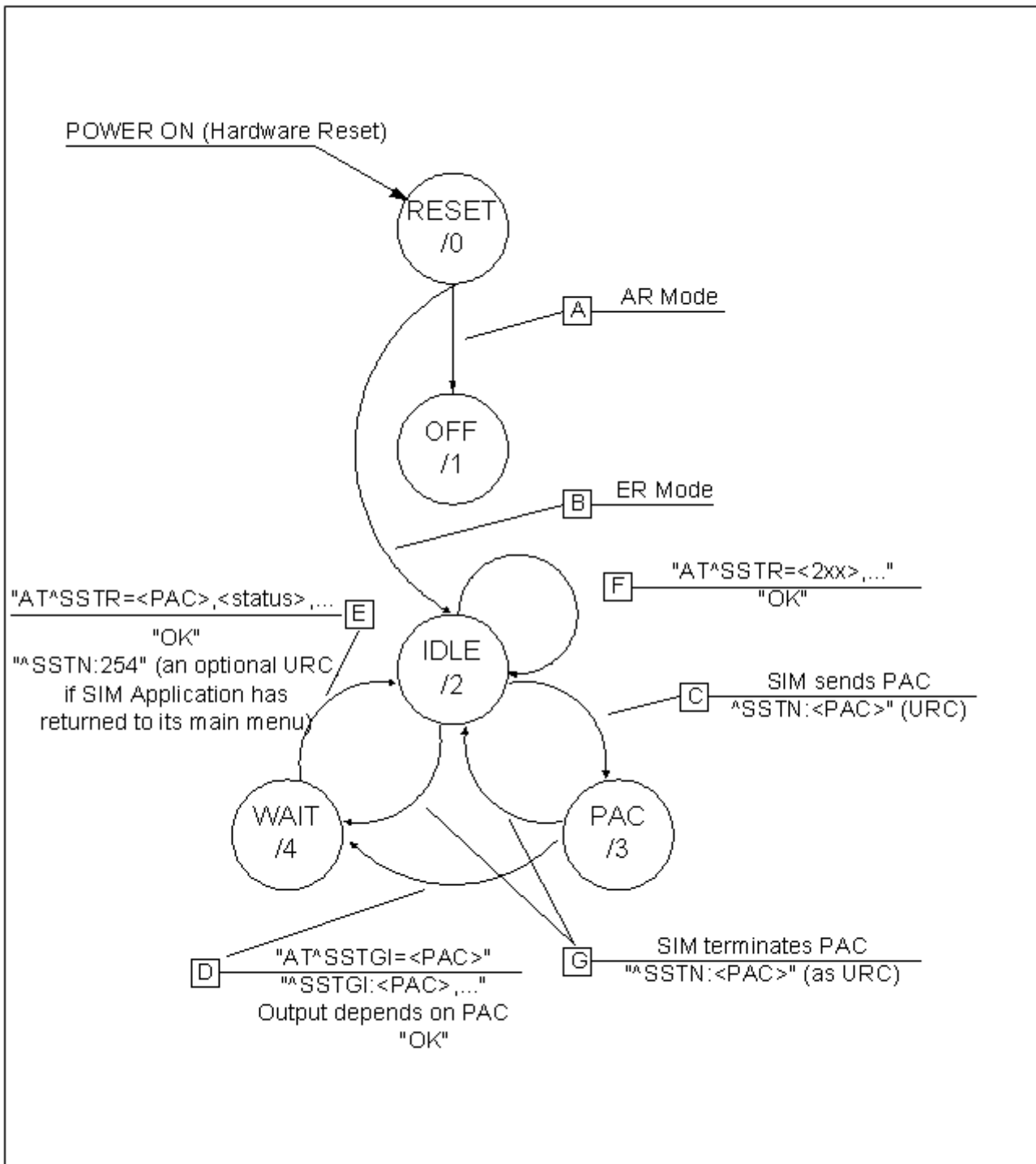
Figure 9.2: Remote-SAT State Transition Diagram

9.2.2 Remote-SAT State Transition Table

The following table outlines which AT commands can be issued during certain states. However, the test and read AT commands are available at any time. This way it is possible to determine the current state of the interface via AT^SSTA?.

Meaning of options usable in column "M/O/X" of the following tables:
M: The TE has to issue the AT command to get Remote-SAT service (mandatory).
O: Usage of AT command is optional.
X: Usage of AT command is not allowed or not useful at this time and may cause an error message.

Table 9.1: State: RESET description

RESET: State after power on the UE.		
AT command	M/O/X	Description
^SSTA=0,n	O	Enable AR Mode (with alphabet type <n>)
^SSTA=1,n	O	Enable ER Mode (with alphabet type <n>)
^SSTGI=<pac>	X	
^SSTR=<pac>	X	
^SSTR=<event>	X	

Table 9.2: State: OFF description

OFF: UE is in Auto Response Mode.		
AT command	M/O/X	Description
^SSTA=0,n	O	Enable AR Mode (with alphabet type <n>)
^SSTA=1,n	O	Enable ER Mode (with alphabet type <n>)
^SSTGI=<pac>	X	
^SSTR=<pac>	X	
^SSTR=<event>	X	

Table 9.3: State: IDLE description

IDLE: UE is in Explicit Response Mode.		
AT command	M/O/X	Description
^SSTA=0,n	O	Enable AR Mode (with alphabet type <n>)
^SSTA=1,n	O	Enable ER Mode (with alphabet type <n>)
^SSTGI=<pac>	O	Show PAC information
^SSTR=<pac>	X	
^SSTR=<event>	O	

Table 9.4:   State: PAC description

PAC[1]: SIM application has issued a proactive command. This event is signalled to the TE via ^SSTN: <cmdType>.		20/09/16
AT command	M/O/X	Description
^SSTA=0,n	O	Enable AR Mode (with alphabet type <n>)
^SSTA=1,n	O	Enable ER Mode (with alphabet type <n>)
^SSTGI=<pac>	M	Show PAC information
^SSTR=<pac>	X	
^SSTR=<event>	X	

Table 9.5:   State: WAIT description

WAIT[1]: SIM application is waiting for the response to the ongoing proactive command.		
AT command	M/O/X	Description
^SSTA=0,n	O	Enable AR Mode (with alphabet type <n>)
^SSTA=1,n	O	Enable ER Mode (with alphabet type <n>)
^SSTGI=<pac>	O	Show PAC information
^SSTR=<pac>	M	
^SSTR=<event>	X	

1) To limit the time Remote-SAT is kept in states PAC or WAIT, any ongoing (but unanswered) PAC will be aborted after 5 minutes automatically. For details refer to AT^SSTA, parameter <userTOut>.

9.3 Remote-SAT Command Types

The Command Type value (cmdType) identifies the type of command or associated response passed between the TE and the UE.

cmdType is the parameter that comes first in AT commands, in responses to AT^SSTGI and AT^SSTR commands, and in the "^SSTN" URC. Also, the cmdType values may be used as Next Action Indicator for the SETUP MENU and for SELECT ITEM.

USAT implementation supports SAT class 3 (as specified by 3GPP TS 11.14 [23], 3GPP TS 31.111 [24], ETSI TS 102 223 [25] Release 99, letter class "c").

Table 9.6: Command Type Table

Proactive Toolkit commands vs. Terminal Responses			
Proactive Toolkit command (AT^SSTR=<cmd-Type>)	Terminal Response in Automatic Response Mode (see AT^SSTA=0)	Terminal Response user choices in Explicit Response Mode (see AT^SSTR=<cmd-Type>,<status>)	Terminal Response after user timeout in Explicit Response Mode (see URC ^SSTN: <cmdTerminateValue>)
REFRESH (1)	0,4	0	0
SET UP EVENT LIST (5)	0	0, 32, 48, 132	132
SEND SHORT MESSAGE (19)	0,4	0, 4, 32, 48, 132	132
DISPLAY TEXT (33)	0,4	0, 4, 16, 17, 18, 32, 48, 132	132
GET INKEY (34)	48	0, 4, 16, 17, 18, 19, 32, 48, 132	18
GET INPUT (35)	48	0, 4, 16, 17, 18, 19, 32, 48, 132	18
SELECT ITEM (36)	48	0, 4, 16, 17, 18, 19, 32, 48, 132	18
SET UP MENU (37)	0,4	0, 4, 32, 48, 132	132
SET UP IDLE MODE TEXT (40)	0,4	0, 4, 32, 48, 132	132
LANGUAGE NOTIFICATION (53)	0	0	0
OPEN CHANNEL (64)	0,4	0, 4, 16, 32, 48, 132	132
CLOSE CHANNEL (65)	0,4	0, 4, 16, 32, 48, 132	132
RECEIVE DATA (66)	0,4	0, 4, 16, 32, 48, 132	132
SEND DATA (67)	0,4	0, 4, 16, 32, 48, 132	132

9.4 AT^SSTA Remote-SAT Interface Activation

AT^SSTA write command can be used to determine the Remote-SAT activation mode <mode> and, if Explicit Response mode is enabled, to activate the Remote-SAT interface. Removing and inserting the SIM does not affect the activation status.

SAT commands which are not using the AT interface (non-MMI related SAT commands, e.g. PROVIDE LOCAL INFORMATION) are executed without activating Remote-SAT.

The read command can be used to request the current operating status and the used alphabet of the Remote-SAT interface.

Syntax

Test Command

AT^SSTA=?

Response(s)

^SSTA: (list of supported <state>s), (list of supported <Alphabet>s)
OK

Read Command

AT^SSTA?

Response(s)

^SSTA: <state>, <Alphabet>, <allowedInstance>, <SatProfile>, <userTOut>, <AppType>
OK

Write Command

AT^SSTA=<mode>[, <Alphabet>]

Response(s)

OK

PIN ✈ Last
 -   +   -

Parameter Description

<state>(num)

UE Remote-SAT interface states

0	RESET
1	OFF
2	IDLE
3	PAC
4	WAIT

<Alphabet>(num)(NV)

Setting becomes effective after restarting the UE.

0(D)   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>(num)

Remote-SAT handling (i.e. "^SSTN" URC, AT^SSTGI and AT^SSTR sequence) is only usable via the serial channel on which the Explicit Response (ER) mode was activated.
To change the serial channel execute AT^SSTA=1 on the desired channel and perform a restart.

0	Not applicable
1	SAT may be started on this instance via the write version of this command.

<SatProfile>(str)

SAT or USAT Terminal Profile according to 3GPP TS 11.14 [23], 3GPP TS 31.111 [24], ETSI TS 102 223 [25].
UE supports different profiles for 2G SIM and 3G USIM applications. The type of profile issued by AT^SSTA read command depends on the inserted SIM or USIM.
In case of no SIM is inserted the SAT Terminal Profile will be issued.
The profile tells the SIM Application which features (e.g. Proactive Commands) are supported by the SIM Application Toolkit implementation of the UE.

<userTOut>(num)

PAC user timeout in seconds.
To limit the time Remote-SAT is kept in states PAC or WAIT, any ongoing (but unanswered) proactive command will be aborted automatically after 5 minutes. In this case, the terminal response is either "ME currently unable to process command", or if applicable, "No response from user". In addition a URC "Terminate Proactive Command" will be sent to the external application.

<AppType>(num)

SIM Application type.
This parameter shows the type of SIM application currently running.

0	(U)SIM not inserted
1	2G Application (SAT)
2	3G Application (USAT)

<mode>(num)(NV)

Select Remote-SAT activation mode.
Setting becomes effective after restarting the UE. Removing and inserting the SIM does not affect the activation status.

0(D)	Automatic Response (AR) mode. All commands and responses are exchanged automatically between the UE and the SIM application. This eliminates the need to enter any Remote-SAT commands including the AT^SSTA command. If AR mode is enabled the UE enters the OFF state (<state>=1) after restart.
1	Explicit Response (ER) mode. This mode is intended for use with an MMI. If ER mode is enabled the MMI is required to handle, via UE's Remote-SAT interface, all commands and responses transmitted to or from the SIM or USIM. If ER mode is enabled the UE enters the IDLE state (<state>=2) after reboot.

9.5 ^SSTN SAT Notification

Unsolicited Result Codes

URC 1

Proactive command notification

^SSTN: <cmdType>

Every time the SIM Application issues an MMI relevant proactive command, via the UE, the TE will receive a notification. This indicates the type of proactive command issued.
AT^SSTGI must then be used by the TE to request the parameters of the proactive command from the UE. Upon receiving the ^SSTGI response from the UE, the TE 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 UE, 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 TE should avoid sending any further commands related to the terminated proactive command, e.g. AT^SSTGI or AT^SSTR.

URC 3

Notification to the TE when the SIM Application has finished a command cycle and does not issue a subsequent proactive command.

^SSTN: 254

The TE does not need to respond directly, i.e. AT^SSTR is not required. The next action is left as an implementation decision to the manufacturer of the Customer Application (TE). Examples:

- If a Toolkit menu "^SSTN: 37" (SET UP MENU) proactive command was received at startup, the customer application can return to this Toolkit menu again after receiving the "^SSTN: 254" URC.
- In a Windows Mobile environment, the ToolkitUI application can be closed after receiving this URC.

Important notes:

- The Idle Mode text transferred with the SET UP IDLE MODE TEXT proactive command should not be removed as a result of this URC.
- If the text transferred with the DISPLAY TEXT proactive command is coded with an immediate response object set to "1" (see parameter <immediateResponse> of the AT^SSTGI=33 command), the text should not be removed as a result of this URC.

URC 4

SIM reset notification

^SSTN: 255

Notification to the TE indicating that the SIM is lost, e.g. if a proactive command "REFRESH - SIM Reset" has been issued by the SIM Application, please refer to AT^SSTGI=1.
This URC should be used to set the Customer Application to its initial state since the SIM Application will start from the beginning, too.
The TE does not need to respond directly, i.e. related AT^SSTGI and AT^SSTR are neither required nor allowed.
After reset SIM PIN authentication is required.

Parameter Description

<cmdType>(num)

Proactive Command number

`<cmdTerminateValue>`(num)

Defined as `<cmdType>` + terminate offset. The terminate offset equals 100.

9.6 AT^SSTGI SAT Get Information

This command shall be used upon receipt of a URC "^SSTN" to request the parameters of the Proactive Command.
Then the TE 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 some user information, e.g. a selected menu item.
The Proactive Command type value specifies to which "^SSTN" the command is related.

Syntax

Test Command

AT^SSTGI=?

Response(s)

^SSTGI:(list of supported <state>s), (list of supported <cmdType>s)
OK

Read Command

AT^SSTGI?

Response(s)

^SSTGI: <state>,<cmdType>
OK

Write Command

AT^SSTGI=<cmdType>

Response(s)

OK
ERROR
+CME ERROR: <err>

PIN	✈	Last
-	+	-

Parameter Description

<state>(num)

EXS82-W Remote-SAT interface states

0	RESET
1	OFF
2	IDLE
3	PAC
4	WAIT

<cmdType>(num)

Related Proactive Command

9.7 AT^SSTGI SAT Get Information - Refresh (1)

The AT^SSTGI=1 command shall be used after receiving the URC "^SSTN: 1". This URC notifies the TE that one or more Elementary Files on the USIM have been changed as a result of a USIM application activity, usually caused by the network provider. The response to the AT^SSTGI=1 command indicates what type of USIM refresh has occurred. The change requires that the Elementary Files of the USIM be synchronized with the equivalent information (if any) stored inside the TE. Depending on the type of USIM refresh the TE may need to use the AT+CRSM command to read out the Elementary Files and store the refreshed information.

The response parameters <pathLen>, <fileNum> and <fileList> are mandatory if <commandDetails> equals 1 or 2. In all other cases they are optional and can be ignored.

Syntax

Write Command
AT^SSTGI=1
Response(s)
^SSTGI: <cmdType>, <commandDetails>[, <pathLen>, <fileNum>, <fileList>]
OK
ERROR
+CME ERROR: <err>

PIN	✈	Last
-	+	-

Parameter Description

<cmdType>(num)

1	Proactive command ID, see Section 9.3, Remote-SAT Command Types and Table 9.6.

<commandDetails>(num)

For every return value of <commandDetails> other than 4 (USIM Reset) the TE shall complete the proactive command cycle using AT^SSTR=1,0.

0	USIM Initialization and Full File Change Notification
1	File Change Notification
2	USIM Initialization and File Change Notification
3	USIM Initialization
4	Value "4" means USIM Reset, but the value itself never appears. This is because value "4" is mapped to the URC "^SSTN: 255" which will be sent when a USIM reset occurs. In this case, the TE does not need to respond, i.e. the USIM Refresh commands AT^SSTGI and AT^SSTR are neither required nor allowed. Instead, as the USIM application restarts, the Toolkit application inside the TE should also return to initial state after receiving the URC "^SSTN: 255". For more information on USIM reset and the URC "^SSTN: 255" refer to Section 9.5, ^SSTN SAT Notification.
5...255	Reserved values

<pathLen>(num)

Number of bytes coded in <fileList>

<fileNum>(num)

Number of updated Elementary Files (EF) with path given in <fileList>

<fileList>(str)

String containing Elementary File paths. Each path contains at least two file entries; each file entry (MF, EF or DF) consists of two bytes, e.g. '3F002FE2' or '3F007F206FAD'. Every path in the file description begins with the Master File (MF). There can be any number of Dedicated File (DF) entries between Master File and Elementary File.

9.8 AT^SSTGI SAT Get Information - Set Up Event List (5)

This command shall be used after receiving the URC ^SSTN: 5.
However, please refer to the note below.
The response informs the TE of the events that it must monitor within itself. If any of these events occur the TE must report them to the UE.

Syntax

Write Command

AT^SSTGI=5

Response(s)

^SSTGI: <cmdType>,<commandDetails>,<eventList>
OK
ERROR
+CME ERROR: <err>

PIN → Last

| - | + | - |
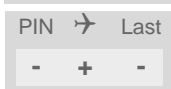
Parameter Description

<cmdType>(num)

5   Proactive command ID, see Table 9.6, Command Type Table.

<commandDetails>(num)

This byte is RFU.

<eventList>(num)

The event list tells the TE which events have to be reported to the UE via the related commands AT^SSTR=(232, 233, 235, 236)

0...65535	Used as bit field
bit 1-4	RFU
bit 5	0: User Activity not in Event List
	1: Any user activity (keyboard press) has to be signaled to the UE
bit 6	0: Idle Screen Available not in Event List
	1: Any idle screen available event has to be signaled to the UE.
bit 7	RFU
bit 8	0: Language Selection not in Event List
	1: Language Selection events have to be signaled to the UE.
bit 9	0: Browser Termination not in Event List
	1: Browser Termination events have to be signaled to the UE
bit 10-16	RFU

Note

- It is possible to issue AT^SSTGI during states IDLE, PAC and WAIT for this proactive command without previously receiving a URC ^SSTN:<cmdType>, see AT^SSTGI.

9.9 AT^SSTGI SAT Get Information - Send Short Message (19)

This command shall be used after receiving the URC ^SSTN: 19
The SIM Application is sending a Short Message and the TE is informed of this. The user can be passed a string containing information to display.

Syntax

Write Command

AT^SSTGI=19

Response(s)

^SSTGI: <cmdType>, <commandDetails>, <textInfo>, <iconQualifier>, <iconId>
OK
ERROR
+CME ERROR: <err>

PIN → Last

| - | + | - |

Parameter Description

<cmdType>(num)

19	Proactive command ID, see Table 9.6, Command Type Table.

<commandDetails>(num)

This byte is RFU.

<textInfo>(str)

String to provide the user with information.
If the string is provided by the SIM, the TE shall use it to inform the user. This is also an indication that the TE should not give any other information to the user on the fact that the UE is sending a short message.
If the alpha identifier is not provided by the SIM, the UE may give information to the user concerning what is happening.

<iconQualifier>(num)

0...255	Used as bit field
bit 1	0: Icon is self explanatory and replaces text
	1: Icon is not self-explanatory and shall be displayed with the text Determined value only if associated icon ID is not 0 (an icon exists).
bit 2-8	RFU

<iconId>(num)

0...255	
0	No Icon
1	An icon is provided by the SIM, the icon indicated in the command may be used by the UE to inform the user, in addition to, or instead of the alpha identifier, as indicated with the icon qualifier.

9.10 AT^SSTGI SAT Get Information - Display Text (33)

This command shall be used after receiving the URC ^SSTN: 33. The TE gets a message to be displayed to the user. The message can have different display characteristics.

Syntax

Write Command

AT^SSTGI=33

Response(s)

^SSTGI: <cmdType>, <commandDetails>, <text>, <immediateResponse>, <iconQualifier>, <iconId>
OK
ERROR
+CME ERROR: <err>

PIN ✈ Last
| - | + | - |

Parameter Description

<cmdType>(num)

| 33 | Proactive command ID, see Section 9.3, Remote-SAT Command Types and Table 9.6. |

<commandDetails>(num)

0...255	Used as bit field
bit 1	0: Normal priority (see note).
	1: High priority (see note).
bit 2-7	RFU
bit 8	0: Clear message after a delay.
	1: Wait for user to clear message.

<text>(str)

String to be displayed

<immediateResponse>(num)

This parameter indicates whether the UE should sustain the display beyond sending the TERMINAL RESPONSE.

| 0 | Send TERMINAL RESPONSE when text is cleared from screen. |
| 1 | Send TERMINAL RESPONSE immediately and continue to display the text until one of the following events occurs: |

- A subsequent proactive command is received, containing display data.
- A short delay notified with <commandDetails> has expired.
- User intervention.

- A higher priority event occurs, e.g. a mobile terminated call.

No further TERMINAL RESPONSE shall be sent when the UE removes the text from the display, regardless of the cause.
If the `<immediateResponse>` parameter equals "1" the subsequent "`^SSTN`: 254" URC should not be used to clear the text from the screen - in this case the text should remain on the screen until one of the above events occurs.

`<iconQualifier>`(num)	
0...255	Used as bit field
bit 1	0: Icon is self explanatory and replaces text.
	1: Icon is not self-explanatory and shall be displayed with the text Determined value only if associated icon ID is not 0 (an icon exists).
bit 2-8	RFU

`<iconId>`(num)	
0...255	
0	No Icon

Notes

- The MMI shall reject normal priority text commands if the screen is currently used for more than its normal standby display, e.g. if the MMI is in sub-menu. If the command is rejected, the MMI sends the TERMINAL RESPONSE message to the SIM (UE currently unable to process command - screen busy).
- High priority text shall be displayed on the screen immediately, except if a priority conflict of the alerting events occurs, e.g. incoming call or a URC if the battery needs to be charged, see 3GPP TS 11.14 [23], 3GPP TS 31.111 [24], ETSI TS 102 223 [25].

9.11 AT^SSTGI SAT Get Information - Get Inkey (34)

This command shall be used after receiving the URC ^SSTN: 34.
The TE is asked to prompt the user for an input, which is a single character. Help can be requested by the user, if available.

Syntax

Write Command
AT^SSTGI=34
Response(s)
^SSTGI: <cmdType>, <commandDetails>, <text>, <iconQualifier>, <iconId>
OK
ERROR
+CME ERROR: <err>

PIN	→	Last
-	+	-

Parameter Description

<cmdType>(num)	
34	Proactive command ID, see Remote-SAT Command Types

<commandDetails>(num)	
0...255	Used as bit field
bit 1	0: Digits only (0 9, *, # and +)
	1: Alphabet set
bit 2	0: SMS default alphabet (GSM character set)
	1: UCS2 alphabet
bit 3	0: Character sets defined by bit 1 and bit 2 are enabled
	1: Character sets defined by bit 1 and bit 2 are disabled and the "Yes/No" response is requested
bit 4-7	RFU
bit 8	0: No help information available
	1: Help information available

<text>(str)	

String as prompt for text.

<iconQualifier>(num)	
0...255	Used as bit field
bit 1	0: Icon is self explanatory and replaces text
	1: Icon is not self-explanatory and shall be displayed with the text Determined value only if associated icon ID is not 0 (an icon exists).
bit 2-8	RFU

<iconId>(num)	
0...255	
0	No Icon

9.12 AT^SSTGI SAT Get Information - Get Input (35)

This command shall be used after receiving the URC ^SSTN: 35.
The TE is asked to prompt the user for an input, of a specified length and type, e.g. digits only. Help can be requested by the user, if available.

Syntax

Write Command

AT^SSTGI=35

Response(s)

^SSTGI: <cmdType>, <commandDetails>, <text>, <responseMin>, <responseMax>[, <defaultText>], <iconQualifier>, <iconId>
OK
ERROR
+CME ERROR: <err>

PIN	✈	Last
-	+	-

Parameter Description

<cmdType>(num)

35	Proactive command ID, see Remote-SAT Command Types

<commandDetails>(num)

0...255	Used as bit field
bit 1	0: Digits only (0 9, *, # and +)
	1: Alphabet set
bit 2	0: SMS default alphabet (GSM character set)
	1: UCS2 alphabet
bit 3	0: UE may echo user input on the display
	1: User input shall not be revealed in any way (see note)
bit 4	0: User input to be in unpacked format
	1: User input to be in SMS packed format
bit 5-7	RFU
bit 8	0: No help information available
	1: Help information available

<text>(str)

String as prompt for text

<responseMin>(num)

0...255	Minimum length of user input.

<responseMax>(num)

0...255	Maximum length of user input.

<defaultText>(str)	

String supplied as default response text

<iconQualifier>(num)	
0...255	Used as bit field
bit 1	0: Icon is self explanatory and replaces text
	1: Icon is not self-explanatory and shall be displayed with the text Determined value only if associated icon ID is not 0 (an icon exists).
bit 2-8	RFU

<iconId>(num)	
0...255	
0	No Icon

Note

- Hidden entry mode (see 3GPP TS 11.14 [23], 3GPP TS 31.111 [24], ETSI TS 102 223 [25]) is only available when using digit input. In hidden entry mode only characters ('0', '9', '*' and '#') are allowed.
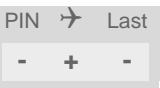
9.13 AT^SSTGI SAT Get Information - Select Item (36)

This command shall be used after receiving the URC ^SSTN: 36.
The TE is supplied with a list of items allowing the user to select one. Help can be requested by the user, if available and the presentation style is specified. In addition to text strings and icon identifiers, a next action indicator informs the user of the likely result of selecting a chosen item.

Syntax

Write Command

AT^SSTGI=36

Response(s)

The first line of output from the ME is:
^SSTGI: <cmdType>, <commandDetails>, <numOfItems>, <titleText>, <defaultItemId>,
<itemIconsPresent>, <itemIconsQualifier>, <titleIconQualifier>, <titleIconId>
One line follows for every item, repeated for <numOfItems>:
^SSTGI: <cmdType>, <itemId>, <itemText>, <nextActionId>, <iconId>
OK
ERROR
+CME ERROR: <err>

PIN → Last

| - | + | - |

Parameter Description

<cmdType>^(num)

| 36 | Proactive command ID, see Remote-SAT Command Types |

<commandDetails>^(num)

0...255	Used as bit field
bit 1	0: Presentation type is not specified
	1: Presentation type is specified in bit 2
bit 2	0: Presentation as a choice of data values, if bit 1 = '1'
	1: Presentation as a choice of navigation options if bit 1 is '1'
bit 3	0: No selection preference
	1: Selection using soft key preferred
bit 4-7	RFU
bit 8	0: No help information available
	1: Help information available

<numOfItems>^(num)

Number of items in the list

<titleText>^(str)

String giving menu title

<defaultItemId>(num)

ID of default item
The SIM may supply with the list an indication of the default item, e.g. the previously selected item

0	No default item issued by the SIM application
1...255	Id of the default Item

<itemIconsPresent>(num)

0	No icons
1	Icons present

<itemIconsQualifier>(num)

0...255	Used as bit field
bit 1	0: Icon is self explanatory and replaces text
	1: Icon is not self-explanatory and shall be displayed with the text Determined value only if associated icon ID is not 0 (an icon exists).
bit 2-8	RFU

<titleIconQualifier>(num)

0...255	Used as bit field
bit 1	0: Icon is self explanatory and replaces text
	1: Icon is not self-explanatory and shall be displayed with the text Determined value only if associated icon ID is not 0 (an icon exists).
bit 2-8	RFU

<titleIconId>(num)

0...255	
0	No Icon

<itemId>(num)

Item identifier (1 - <numOfItems>)

<itemText>(str)

String giving menu title

<nextActionId>(num)

The next proactive command type to be issued upon execution of the menu item. See Remote-SAT Command Types

0	Next Action information available

<iconId>(num)

0...255	
0	No Icon

9.14   AT^SSTGI   SAT Get Information - Set up Menu (37)

This command shall be used after receiving the URC ^SSTN: 37. The response provides the main menu of the SIM Application to the TE. It needs to be stored by the TE so that it can be displayed without invoking a proactive session.

As with every proactive command the TE is expected to acknowledge the ^SSTGI response with AT^SSTR to confirm that the proactive command has been executed.
Terminal Response via AT^SSTR will not provide any user information in case of this proactive command. Refer to AT^SSTR.

AT^SSTGI can be issued during states IDLE, PAC and WAIT for this proactive command without previously receiving a URC ^SSTN:<cmdType>, see AT^SSTGI.

Syntax

Write Command

AT^SSTGI=37

Response(s)

The first line of output from the ME is:
^SSTGI: <cmdType>, <commandDetails>, <numOfItems>, <titleText>,
<menuItemIconsPresent>, <menuItemIconsQualifier>, <titleIconQualifier>,
<titleIconId>
One line follows for every item, repeated for <numOfItems>:
^SSTGI: <cmdType>, <itemId>, <itemText>, <nextActionId>, <iconId>
OK
ERROR
+CME ERROR: <err>

PIN   ✈   Last

| - | + | - |

Parameter Description

<cmdType>(num)

| 37 | Proactive command ID, see Remote-SAT Command Types |

<commandDetails>(num)

0...255	Used as bit field
bit 1	0: No selection preference
	1: Selection using soft key preferred
bit 2-7	RFU
bit 8	0: No help information available
	1: Help information available

<numOfItems>(num)

Number of menu items in the list

<titleText>(str)

String displaying menu title

<menuItemIconsPresent>(num)

0	No icons
1	Icons present

<menuItemIconsQualifier>(num)

0...255	Used as bit field
bit 1	0: Icon is self explanatory and replaces text
	1: Icon is not self-explanatory and shall be displayed with the text Determined value only if associated icon ID is not 0 (an icon exists).
bit 2-8	RFU

<titleIconQualifier>(num)

0...255	Used as bit field
bit 1	0: Icon is self explanatory and replaces text
	1: Icon is not self-explanatory and shall be displayed with the text Determined value only if associated icon ID is not 0 (an icon exists).
bit 2-8	RFU

<titleIconId>(num)

0...255	
0	No Icon

<itemId>(num)

Menu item identifier (1 - <numOfItems>)

<itemText>(str)

Title of menu item

<nextActionId>(num)

The next proactive command type to be issued upon execution of the menu item. See Remote-SAT Command Types

0	No next Action information available

<iconId>(num)

0...255	
0	No Icon

9.15 AT^SSTGI SAT Get Information - Set up Idle Mode Text (40)

This command shall be used after receiving the URC ^SSTN: 40.
It provides text and optionally an icon to be displayed by the TE when the display is Idle.

Syntax

Write Command

AT^SSTGI=40

Response(s)

^SSTGI: <cmdType>, <commandDetails>, <text>, <iconQualifier>, <iconId>
OK
ERROR
+CME ERROR: <err>

PIN	→	Last
-	+	-

Parameter Description

<cmdType>(num)

40   Proactive command ID, see Remote-SAT Command Types

<commandDetails>(num)

This byte is RFU.

<text>(str)

Text to be displayed when TE in IDLE mode

<iconQualifier>(num)

0...255	Used as bit field
bit 1	0: Icon is self explanatory and replaces text
	1: Icon is not self-explanatory and shall be displayed with the text Determined value only if associated icon ID is not 0 (an icon exists).
bit 2-8	RFU

<iconId>(num)

0...255	
0	No Icon

Note

- AT^SSTGI can be issued during states IDLE, PAC and WAIT for this proactive command without previously receiving a URC ^SSTN:<cmdType>, see AT^SSTGI.

9.16 AT^SSTGI SAT Get Information - Language Notification (53)

This command shall be used after receiving the URC ^SSTN: 53.

It provides text to inform the TE about the language currently used for any text string within proactive commands or envelope command responses.

The notified language remains valid until the end of the card session or upon executing another LANGUAGE NOTIFICATION command.

If the Toolkit application is not aware of the currently selected language, no specific language or several languages will be used. The SIM may notify non-specific language. All LANGUAGE NOTIFICATION previously made will be cancelled.

Two types of language notification are defined:

• specific, where a two-character language notification is issued in <langText>,

• non-specific, where no language notification is issued, i.e. <langText> is an empty string.

The TE may use the language included in LANGUAGE NOTIFICATION as appropriate. For instance, this could be done to avoid a mix of languages in screen displays combining UE MMI and SIM Toolkit originating text strings.

Syntax

Write Command
AT^SSTGI=53
Response(s)
^SSTGI: <cmdType>, <commandDetails>, <langText>   OK   ERROR   +CME ERROR: <err>

PIN	✈	Last
-	+	-

Parameter Description

<cmdType>(num)

53	Proactive command ID, see Remote-SAT Command Types

<commandDetails>(num)

0...255	Used as bit field
bit 1	0: non-specific language notification
	1: specific language notification
bit 2-8	RFU

<langText>(str)

Language code string provided as a pair of alpha-numeric characters, defined in ISO 639. Each alphanumeric character is coded on one byte using the SMS default 7-bit coded alphabet as defined in 3GPP TS 23.038[38].

Note

• AT^SSTGI can be issued during states IDLE, PAC and WAIT for this proactive command without previously receiving a URC ^SSTN:<cmdType>, see AT^SSTGI.

9.17 AT^SSTGI SAT Get Information - Open Channel (64)

The SIM Application is opening a data session for the Bearer Independent Protocol, and can provide the TE with some information about this.
Text and an icon identifier can be passed to the TE for display to the user.

Syntax

Write Command

AT^SSTGI=64

Response(s)

^SSTGI: <cmdType>, <commandDetails>, <text>, <iconQualifier>, <iconId>
OK
ERROR
+CME ERROR: <err>

PIN → Last

| - | + | - |

Parameter Description

<cmdType>(num)

| 64 | Proactive command ID, see Table 9.6, Command Type Table. |

<commandDetails>(num)

This byte is RFU.

<text>(str)

String to provide the user with information.
If the string is provided by the SIM, the TE shall use it to inform the user. This is also an indication that the TE should not give any other information to the user on the fact that the UE is performing an Open Channel command.
If the alpha identifier is not provided by the SIM, the UE may give information to the user concerning what is happening.

<iconQualifier>(num)

0...255	Used as bit field
bit 1	0: Icon is self explanatory and replaces text
	1: Icon is not self-explanatory and shall be displayed with the text Determined value only if associated icon ID is not 0 (an icon exists).
bit 2-8	RFU

<iconId>(num)

| 0...255 | |
| 0 | No Icon |

9.18 AT^SSTGI SAT Get Information - Close Channel (65)

The SIM Application is closing a data session for the Bearer Independent Protocol, and can provide the TE with some information about this.
Text and an icon identifier can be passed to the TE for display to the user.

Syntax

Write Command

AT^SSTGI=65

Response(s)

^SSTGI: <cmdType>, <commandDetails>, <text>, <iconQualifier>, <iconId>
OK
ERROR
+CME ERROR: <err>

PIN → Last

| - | + | - |

Parameter Description

<cmdType>(num)

| 65 | Proactive command ID, see Table 9.6, Command Type Table. |

<commandDetails>(num)

This byte is RFU.

<text>(str)

String to provide the user with information.
If the string is provided by the SIM, the TE shall use it to inform the user. This is also an indication that the TE should not give any other information to the user on the fact that the UE is performing a Close Channel command.
If the alpha identifier is not provided by the SIM, the UE may give information to the user concerning what is happening.

<iconQualifier>(num)

0...255	Used as bit field
bit 1	0: Icon is self explanatory and replaces text
	1: Icon is not self-explanatory and shall be displayed with the text Determined value only if associated icon ID is not 0 (an icon exists).
bit 2-8	RFU

<iconId>(num)

| 0...255 | |
| 0 | No Icon |

9.19 AT^SSTGI SAT Get Information - Receive Data (66)

The SIM Application receives data in an open session for the Bearer Independent Protocol, and can provide the TE with some information about this.
Text and an icon identifier can be passed to the TE for display to the user.

Syntax

Write Command

AT^SSTGI=66

Response(s)

^SSTGI: <cmdType>, <commandDetails>, <text>, <iconQualifier>, <iconId>
OK
ERROR
+CME ERROR: <err>

PIN ✈ Last

| - | + | - |

Parameter Description

<cmdType>(num)

66   Proactive command ID, see Table 9.6, Command Type Table.

<commandDetails>(num)

This byte is RFU.

<text>(str)

String to provide the user with information.
If the string is provided by the SIM, the TE shall use it to inform the user. This is also an indication that the TE should not give any other information to the user on the fact that the UE is performing an Open Channel command.
If the alpha identifier is not provided by the SIM, the UE may give information to the user concerning what is happening.

<iconQualifier>(num)

0...255	Used as bit field
bit 1	0: Icon is self explanatory and replaces text
	1: Icon is not self-explanatory and shall be displayed with the text Determined value only if associated icon ID is not 0 (an icon exists).
bit 2-8	RFU

<iconId>(num)

0...255	
0	No Icon

9.20 AT^SSTGI SAT Get Information - Send Data (67)

The SIM Application sends data in an open session for the Bearer Independent Protocol, and can provide the TE with some information about this.
Text and an icon identifier can be passed to the TE for display to the user.

Syntax

Write Command

AT^SSTGI=67

Response(s)

^SSTGI: <cmdType>, <commandDetails>, <text>, <iconQualifier>, <iconId>
OK
ERROR
+CME ERROR: <err>

PIN → Last

| - | + | - |

Parameter Description

<cmdType>(num)

67 Proactive command ID, see Table 9.6, Command Type Table.

<commandDetails>(num)

This byte is RFU.

<text>(str)

String to provide the user with information.
If the string is provided by the SIM, the TE shall use it to inform the user. This is also an indication that the TE should not give any other information to the user on the fact that the UE is performing an Open Channel command.
If the alpha identifier is not provided by the SIM, the UE may give information to the user concerning what is happening.

<iconQualifier>(num)

0...255	Used as bit field
bit 1	0: Icon is self explanatory and replaces text
	1: Icon is not self-explanatory and shall be displayed with the text Determined value only if associated icon ID is not 0 (an icon exists).
bit 2-8	RFU

<iconId>(num)

0...255	
0	No Icon

9.21 AT^SSTR   SAT Response

The TE is expected to acknowledge the AT^SSTGI response with AT^SSTR to confirm that the Proactive Command has been executed. AT^SSTR will also provide any user information, e.g. a selected menu item.

Syntax

Test Command

AT^SSTR=?

Response(s)

^SSTR:(list of supported <state>s), (list of supported <cmdType>s)
OK

Read Command

AT^SSTR?

Response(s)

^SSTR: <state>, <cmdType>
OK

Write Command

AT^SSTR=<cmdType>, <status>[, <inputNumber>][, <inputString>][, <statAddInfo>]

Response(s)

^SSTR: <cmdType>[, <TerminationQualifier>, <TerminationCauseText>]
OK

PIN ✈ Last

| - | + | - |

Parameter Description

<state>(num)

EXS82-W Remote-SAT interface states

0	RESET
1	OFF
2	IDLE
3	PAC
4	WAIT

<cmdType>(num)

Number related to Proactive Command or event type according to 3GPP TS 11.14 [23], 3GPP TS 31.111 [24], ETSI TS 102 223 [25].

<TerminationQualifier>(num)

0	The proactive command has been successfully finished.
1...255	The proactive command did not perform successfully.

`<TerminationCauseText>`(str)

This text has to be shown to the user for an appropriate time, e.g. 2 seconds. The text contains information regarding the termination cause, e.g. in case of a failed dialing process call barring through Call Control by SIM mechanism may be indicated.

If `<TerminationCauseText>` is an empty string and `<TerminationQualifier>` is not equal to 0, the TE may give an own indication to the user.

`<status>`(num)

Command status return regarding the type of action that has taken place, e.g. action performed by the user. Values are in accordance with 3GPP TS 11.14 [23], 3GPP TS 31.111 [24], ETSI TS 102 223 [25].

`<inputNumber>`(num)

Response number entered by user

`<inputString>`(str)

Response string entered by user

`<statAddInfo>`(num)

Optional additional command status; for possible values refer to 3GPP TS 11.14 [23], 3GPP TS 31.111 [24], ETSI TS 102 223 [25].

9.22 AT^SSTR SAT Response - Refresh (1)

The TE is expected to acknowledge the AT^SSTGI response with AT^SSTR to confirm that the Proactive Command has been executed.

Syntax

Write Command

AT^SSTR=1, <status>, , [, <statAddInfo>]

Response(s)

OK

PIN	✈	Last
-	+	-

Parameter Description

<status>(num)

0...255

0   Command performed successfully

<statAddInfo>(num)

Optional additional command status; for possible values refer to 3GPP TS 11.14 [23], 3GPP TS 31.111 [24], ETSI TS 102 223 [25].

0...255

Note

* The refresh action (SIM data cache update) will be performed in any case, i.e. <status> values other than 0 will be ignored.

9.23 AT^SSTR SAT Response - Set Up Event List (5)

The TE is expected to acknowledge the AT^SSTGI response with AT^SSTR to confirm that the Proactive Command has been executed. The TE acknowledges that the event list has been set up correctly.

Syntax

Write Command
AT^SSTR=5, <status>, , [, <statAddInfo>]
Response(s)
OK

PIN	✈	Last
-	+	-

Parameter Description

<status>(num)

0...255

0	Command performed successfully
32	UE currently unable to process command
48	Command beyond UE's capabilities
132	UE currently unable to process command because screen is busy

<statAddInfo>(num)

Optional additional command status; for possible values refer to 3GPP TS 11.14 [23], 3GPP TS 31.111 [24], ETSI TS 102 223 [25].

0...255

9.24 AT^SSTR SAT Response - Send Short Message (19)

The TE is expected to acknowledge the AT^SSTGI response with AT^SSTR to confirm that the Proactive Command has been executed.

Syntax

Write Command

AT^SSTR=19, <status>

Response(s)

^SSTR: 19, <TerminationQualifier>, <TerminationCauseText>
OK

PIN	✈	Last
-	+	-

Parameter Description

<status>(num)

0...4

0   Command performed successfully. Indicate that the user has accepted the SMS request.

4   Command performed successfully, but requested icon could not be displayed.

9.25 AT^SSTR SAT Response - Display Text (33)

The TE is expected to acknowledge the AT^SSTGI response with AT^SSTR to confirm that the Proactive Command has been executed.

Syntax

Write Command
AT^SSTR=33, <status>, , [, <statAddInfo>]
Response(s)
OK

PIN	✈	Last
-	+	-

Parameter Description

<status>(num)

0...255

0	Command performed successfully. Indicates that the user has accepted the Display Text request.
4	Command performed successfully, but requested icon could not be displayed.
16	Proactive SIM session terminated by user
17	Backward move in the proactive SIM session requested by the user
18	No response from user
32	UE currently unable to process command
48	Command beyond UE's capabilities
132	UE currently unable to process command because screen is busy

<statAddInfo>(num)

Optional additional command status; for possible values refer to 3GPP TS 11.14 [23], 3GPP TS 31.111 [24], ETSI TS 102 223 [25].

0...255

9.26 AT^SSTR SAT Response - Get Inkey (34)

The TE is expected to acknowledge the AT^SSTGI response with AT^SSTR to confirm that the Proactive Command has been executed.

Syntax

Write Command

AT^SSTR=34, <status>, , <inputString>[, <statAddInfo>]

Response(s)

OK

PIN ✈ Last

| - | + | - |

Parameter Description

<status>(num)

0...255

0	Command performed successfully. Indicates that the user has accepted the Get Inkey request.
4	Command performed successfully, but requested icon could not be displayed.
16	Proactive SIM session terminated by user
17	Backward move in the proactive SIM session requested by the user
18	No response from user
19	Help information required by the user
32	UE currently unable to process command
48	Command beyond UE's capabilities
132	UE currently unable to process command because screen is busy

<inputString>(str)

User response entered as a string parameter

<statAddInfo>(num)

Optional additional command status; for possible values refer to 3GPP TS 11.14 [23], 3GPP TS 31.111 [24], ETSI TS 102 223 [25].

0...255

Notes

- Coding of any input character is related to the selected alphabet:
    - Input of a character in case of GSM character set requests one byte, e.g. "Y".
    - Input of any characters in UCS2 alphabet requests a 4 byte set, e.g. "0059" is coding the same character "Y".
    - If, as a user response, a binary choice (Yes/No) is requested by the SIM application using bit 3 of the <commandDetails> parameter the valid content of the <inputString> is:
      a) GSM alphabet: "Y" or "y" (positive answer) and "N" or "n" (negative answer).
      b) UCS2 alphabet "0079" or "0059" (positive answer) and "006E" or "004E" (negative answer). For more detailed information refer to AT^SSTGI.
    - Coding of an empty string is done as a "\1b" string with every alphabet.

- The `<Alphabet>` parameter of `AT^SSTA` determines the alphabet used on the AT command interface, while the value reported by the `<commandDetails>` bit 2 of the `AT^SSTGI`=34 command determines the set of characters allowed. If these alphabet settings are different, the following applies:
  Example: If UCS2 alphabet is selected with `AT^SSTA` and the `<commandDetails>` bit 2 of the `AT^SSTGI`=34 command is reported as "SMS default alphabet (GSM character set)" any input has to be done in UCS2 alphabet. However, take care to enter only UCS2 characters for which equivalent characters are defined in the SMS (GSM) default alphabet. In this case, the ME will correctly translate the given UCS2 data into a TERMINAL RESPONSE coded in SMS (GSM) default alphabet. See also Section 1.7.2, UCS2 and GSM character coding and conversion.

9.27 AT^SSTR   SAT Response - Get Input (35)

The TE is expected to acknowledge the AT^SSTGI response with AT^SSTR to confirm that the Proactive Command has been executed.

Syntax

Write Command
AT^SSTR=35, <status>, , <inputString>[, <statAddInfo>]
Response(s)
OK

PIN   ✈   Last

-   **+**   **-**

Parameter Description

<status>(num)

0...255

0	Command performed successfully. Indicates that the user has accepted the Get Input request.
4	Command performed successfully, but requested icon could not be displayed.
16	Proactive SIM session terminated by user
17	Backward move in the proactive SIM session requested by the user
18	No response from user
19	Help information required by the user
32	UE currently unable to process command
48	Command beyond UE's capabilities
132	UE currently unable to process command because screen is busy

<inputString>(str)

User response entered as a string, length depends on the <responseMin> and <responseMax> values returned by the related AT^SSTGI=35 command.

<statAddInfo>(num)

Optional additional command status; for possible values refer to 3GPP TS 11.14 [23], 3GPP TS 31.111 [24], ETSI TS 102 223 [25].

0...255

Notes

• Coding of any input character is related to the selected alphabet:
  • Input of a character in case of GSM character set requests one byte, e.g. "Y".
  • Input of any characters in UCS2 alphabet requests a 4 byte set, e.g. "0059" is coding the same character "Y".
  • Coding of an empty string is done as a "\1b" string with every alphabet.

- The <Alphabet> parameter of AT^SSTA determines the alphabet used on the AT command interface, while the value reported by the <commandDetails> bit 2 of the AT^SSTGI=35 command determines the set of characters allowed. If these alphabet settings are different, the following applies:
  Example: If UCS2 alphabet is selected with AT^SSTA and the <commandDetails> bit 2 of the AT^SSTGI=35 command is reported as "SMS default alphabet (GSM character set)" any input has to be done in UCS2 alphabet. However, take care to enter only UCS2 characters for which equivalent characters are defined in the SMS (GSM) default alphabet. In this case, the UE will correctly translate the given UCS2 data into a TERMINAL RESPONSE coded in SMS (GSM) default alphabet. See also Section 1.7.2, UCS2 and GSM character coding and conversion.
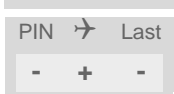
9.28 AT^SSTR SAT Response - Select Item (36)

The TE is expected to acknowledge the AT^SSTGI response with AT^SSTR to confirm that the Proactive Command has been executed. The TE sends a response that can indicate the user's intentions, e.g. when the user is requesting help or selecting a menu item.

For compatibility reasons <itemId> is optional in case of <status>=19 ("Help information required by the user"). In this case <itemId>=0 is sent to the USIM.

Syntax

Write Command

AT^SSTR=36, <status>, <itemId>[, <statAddInfo>]

Response(s)

OK

PIN	✈	Last
-	+	-

Parameter Description

<status>(num)

0...255

0	Command performed successfully. Indicates that the user has accepted the Select Item request.
4	Command performed successfully, but requested icon could not be displayed.
16	Proactive SIM session terminated by user
17	Backward move in the proactive SIM session requested by the user
18	No response from user
19	Help information required by the user
32	UE currently unable to process command
48	Command beyond UE's capabilities
132	UE currently unable to process command because screen is busy

<itemId>(num)

Item IDs are supplied by the SIM Application

1...255	ID of selected item can be issued if a <status> value of 0 is returned
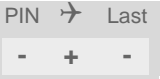
<statAddInfo>(num)

Optional additional command status; for possible values refer to 3GPP TS 11.14 [23], 3GPP TS 31.111 [24], ETSI TS 102 223 [25].

0...255

9.29 AT^SSTR SAT Response - Set Up Menu (37)

The TE is expected to acknowledge the AT^SSTGI response with AT^SSTR to confirm that the Proactive Command has been executed.

Syntax

Write Command
AT^SSTR=37, <status>, , [, <statAddInfo>]
Response(s)
OK

PIN	✈	Last
-	+	-

Parameter Description

<status>(num)

0...255

0	Command performed successfully. Indicates that the user has accepted the Set Up Menu request.
4	Command performed successfully, but requested icon could not be displayed.
32	UE currently unable to process command
48	Command beyond UE's capabilities
132	UE currently unable to process command because screen is busy

<statAddInfo>(num)

Optional additional command status; for possible values refer to 3GPP TS 11.14 [23], 3GPP TS 31.111 [24], ETSI TS 102 223 [25].

0...255

Note

- The response simply conveys, to the SAT, the information that the main menu was received and set up on the user interface. It does not transmit any information about a selected item, like in the case of AT^SSTR.

  Once this command was executed the user can proceed as described in the AT^SSTR SAT Response - Setup Menu (37).

9.30 AT^SSTR SAT Response - Set Up Idle Mode Text (40)

The TE is expected to acknowledge the AT^SSTGI response with AT^SSTR to confirm that the Proactive Command has been executed.

Syntax

Write Command
AT^SSTR=40, <status>, , [, <statAddInfo>]
Response(s)
OK

PIN	✈	Last
-	+	-

Parameter Description

<status>(num)

0...255

0	Command performed successfully. Indicates that the user has accepted the Set Up Idle Mode Text request.
4	Command performed successfully, but requested icon could not be displayed.
32	UE currently unable to process command
48	Command beyond UE's capabilities
132	UE currently unable to process command because screen is busy

<statAddInfo>(num)

Optional additional command status; for possible values refer to 3GPP TS 11.14 [23], 3GPP TS 31.111 [24], ETSI TS 102 223 [25].

0...255

9.31 AT^SSTR SAT Response - Language Notification (53)

The TE is expected to acknowledge the AT^SSTGI response with AT^SSTR to confirm that the Proactive Command has been executed. The TE indicates whether the Language Notification command was correctly executed.

Syntax

Write Command

AT^SSTR=53, <status>, , [, <statAddInfo>]

Response(s)

OK

PIN ✈ Last

| - | + | - |

Parameter Description

<status>(num)

0...255

0   Command performed successfully. Indicates that the user has accepted the Language Notification request.

<statAddInfo>(num)

Optional additional command status; for possible values refer to 3GPP TS 11.14 [23], 3GPP TS 31.111 [24], ETSI TS 102 223 [25].

0...255

9.32 AT^SSTR SAT Response - Open Channel (64)

The TE is expected to acknowledge the AT^SSTGI response with AT^SSTR to confirm that the Proactive Command has been executed.

Syntax

Write Command

AT^SSTR=64, <status>, , [, <statAddInfo>]

Response(s)

OK

PIN → Last

| - | + | - |

Parameter Description

<status>(num)

0...255

0	Command performed successfully. Indicates that the user has accepted the Open Channel request.
4	Command performed successfully, but requested icon could not be displayed.
16	Proactive SIM session terminated by user
32	UE currently unable to process command
48	Command beyond UE's capabilities
132	UE currently unable to process command because screen is busy

<statAddInfo>(num)

Optional additional command status; for possible values refer to 3GPP TS 11.14 [23], 3GPP TS 31.111 [24], ETSI TS 102 223 [25].
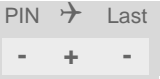
0...255

9.33 AT^SSTR SAT Response - Close Channel (65)

The TE is expected to acknowledge the AT^SSTGI response with AT^SSTR to confirm that the Proactive Command has been executed.

Syntax

Write Command

AT^SSTR=65, <status>, , [, <statAddInfo>]

Response(s)

OK

PIN ✈ Last

- **+** **-**

Parameter Description

<status>(num)

0...255

0	Command performed successfully. Indicates that the user has accepted the Close Channel request.
4	Command performed successfully, but requested icon could not be displayed.
16	Proactive SIM session terminated by user
32	UE currently unable to process command
48	Command beyond UE's capabilities
132	UE currently unable to process command because screen is busy

<statAddInfo>(num)

Optional additional command status; for possible values refer to 3GPP TS 11.14 [23], 3GPP TS 31.111 [24], ETSI TS 102 223 [25].

0...255

9.34   AT^SSTR   SAT Response - Receive Data (66)

The TE is expected to acknowledge the AT^SSTGI response with AT^SSTR to confirm that the Proactive Command has been executed.

Syntax

Write Command

AT^SSTR=66, <status>, , [, <statAddInfo>]

Response(s)

OK

PIN	✈	Last
-	+	-

Parameter Description

<status>(num)

0...255

0	Command performed successfully. Indicates that the user has accepted the Receive Data request.
4	Command performed successfully, but requested icon could not be displayed.
16	Proactive SIM session terminated by user
32	UE currently unable to process command
48	Command beyond UE's capabilities
132	UE currently unable to process command because screen is busy

<statAddInfo>(num)

Optional additional command status; for possible values refer to 3GPP TS 11.14 [23], 3GPP TS 31.111 [24], ETSI TS 102 223 [25].

0...255

9.35 AT^SSTR SAT Response - Send Data (67)

The TE is expected to acknowledge the AT^SSTGI response with AT^SSTR to confirm that the Proactive Command has been executed.

Syntax

Write Command

AT^SSTR=67, <status>, , [, <statAddInfo>]

Response(s)

OK

PIN	✈	Last
-	+	-

Parameter Description

<status>(num)

0...255

0	Command performed successfully. Indicates that the user has accepted the Send Data request.
4	Command performed successfully, but requested icon could not be displayed.
16	Proactive SIM session terminated by user
32	UE currently unable to process command
48	Command beyond UE's capabilities
132	UE currently unable to process command because screen is busy

<statAddInfo>(num)

Optional additional command status; for possible values refer to 3GPP TS 11.14 [23], 3GPP TS 31.111 [24], ETSI TS 102 223 [25].

0...255

9.36 AT^SSTR   SAT Event - Menu Selection (211)

The TE specifies the user's selection of an item from the main menu, which was set up using SETUP MENU command. Alternatively help can be requested.

Syntax

Write Command

AT^SSTR=211, <status>, <itemId>

Response(s)

OK

PIN ✈ Last

| - | + | - |

Parameter Description

<status>(num)

0...255

| 0 | Command performed successfully. |
| 19 | Help information required by the user, no other value can be returned. |

<itemId>(num)

ID of selected item

0...255

9.37 AT^SSTR SAT Event - User Activity (232)

Sent by the customer application to indicate that a key has been pressed.

Syntax

Write Command
AT^SSTR=232
Response(s)
OK

PIN	✈	Last
-	+	-

9.38 AT^SSTR SAT Event - Idle Screen Available (233)

Sent by the customer application to indicate that the screen has become idle.

Syntax

Write Command
AT^SSTR=233
Response(s)
OK

PIN	✈	Last
-	+	-

9.39 AT^SSTR SAT Event - Language Selection (235)

Sent by the customer application to indicate that the customer application has changed the language.
The last value given via this command is also provided to the SIM as response to the proactive command "Provide Local Information (Language Setting)".

Syntax

Write Command

AT^SSTR=235,,,<inputString>

Response(s)

OK

PIN	✈	Last
-	+	-

Parameter Description

<inputString>(str)

Two character language tag, e.g. "en" for English or "de" for German. Default value is "en".

9.40 AT^SSTR SAT Event - Terminate Command (254)

This command allows the TE to finish an ongoing proactive command session. As a result, the UE will attempt to return to IDLE mode. This is done by sending repeatedly a Terminal Response ("ME currently unable to process command") to the SIM (see 3GPP TS 11.14 [23], 3GPP TS 31.111 [24], ETSI TS 102 223 [25]), if issued in states PAC or WAIT. No action is performed if the interface is already in IDLE state, however, the command returns "OK".

The reaction to the Terminal Response depends on the SIM application: The UE may either be kept in IDLE state or requested to perform another action.

Syntax

Write Command
AT^SSTR=254
Response(s)
OK

PIN	✈	Last
-	+	-

9.41   Examples for Using Remote-SAT

To give you an idea of how to start and use Remote-SAT, you may follow the steps described below:

```
// Start after switch on the module
at
OK

// Switch on verbose error messages
at+cmee=2
OK

// Enter the PIN code (if necessary due to SIM configuration)
at+cpin=1234
OK

// Query the Remote-SAT activation status
at^ssta?

OK
// First '1' indicates that the interface is in OFF state, i.e. the Automatic Response (AR) mode is enabled. During
this mode all SAT Proactive Commands are handled internally by the UE.

// Tell the module that the TE is interested in handling SAT, i.e. switch to Explicit Response (ER) mode.
at^ssta=1,0
OK

// This setting takes effect after next start of the UE only, so switch off first
AT^SMSO
OK

// Switch on UE again

// Switch on verbose error messages
at+cmee=2
OK

// Enter the PIN code (if necessary due to SIM configuration)
at+cpin=1234
OK

// Receiving the first proactive command (if the mounted SIM carries a SIM Application)
^SSTN:37

// Requesting parameter details
at^sstgi=37

// These are the details:
^SSTGI: 37,0,3,"SAT Special Menu",0,1,1,0
^SSTGI: 37,1,"News",0,0
^SSTGI: 37,2,"EMail",0,0
^SSTGI: 37,3,"Banking",0,0

OK

// To query the status of the proactive command
at^sstr=37,0

OK
```

// SAT indicates that the proactive session has ended and enters its main menu (which should then be opened

on the screen by an MMI): ^SSTN:254

// Selecting item number 1 of the menu sent before:
at^sstr=211,0,1

OK

// Receiving the next proactive command:
^SSTN:36

// Requesting more information...
at^sstgi=36

// ... and get it:
^SSTGI: 36,0,12,"Rubriken >",0,0,1,1,0
^SSTGI: 36,1,"News >",0,0
^SSTGI: 36,2,"Stock Infos>",0,0
^SSTGI: 36,3,"Aktien D >",0,0
^SSTGI: 36,4,"Aktien INT >",0,0
^SSTGI: 36,5,"Sports >",0,0
^SSTGI: 36,6,"1.BL-Clubs >",0,0
^SSTGI: 36,7,"Unterhaltung>",0,0
^SSTGI: 36,8,"Horoskop >",0,0
^SSTGI: 36,9,"Wetter D >",0,0
^SSTGI: 36,10,"Wetter INT >",0,0
^SSTGI: 36,11,"Wetter spez>",0,0
^SSTGI: 36,63,"Extras >",0,0

OK

// Remember to acknowledge:
at^sstr=36,0,63

OK

// And again: Receiving the next proactive command:
^SSTN:36
// ...

Examples

EXAMPLE 1

    // Switch on verbose error messages
    at+cmee=2
    OK

EXAMPLE 2

    // Enter the PIN code
    at+cpin=1234
    OK

EXAMPLE 3

    // Start Remote-SAT
    at^ssta=1,0
    OK

EXAMPLE 4

    // Proactive command "GET INKEY" is issued by the SIM
    ^SSTN: 34

EXAMPLE 5

    // Get complete data

at^sstgi=34
^SSTGI: 34,0,"<COLOUR-ICON>",1,2
OK

EXAMPLE 6

// Use GET RESPONSE command (192) to analyze SIM file EF-IMG (hex. 4F20)
at+crsm=192,20256,0,0,15
+CRSM: 144,0,000000644F20040014F04401020114
OK

EXAMPLE 7

// Use READ RECORD command (178) to get its content
at+crsm=178,20256,2,4,20
+CRSM: 144,0,010808214F0200000016FFFFFFFFFFFFFFFFFFFF
OK

EXAMPLE 8

// Use READ BINARY command (176) to get content of image instance data file (e.g. hex 4F02)
at+crsm=176,20226,0,0,22
+CRSM: 144,0,080802030016AAAA8002854281428142815
28002AAAA
OK

at+crsm=176,20226,0,22,9
+CRSM: 144,0,FF000000FF000000FF
OK

EXAMPLE 9

// Finalize Proactive Command session
at^sstr=34,0,,"+"
OK

EXAMPLE 10

// Session end indication, i.e. display SAT main menu
^SSTN: 254

10. Short Message Service (SMS) Commands

The AT Commands described in this chapter allow an external application to use the Short Message Service with the EXS82-W.

10.1 SMS parameters

This section provides an overview of parameters included in SMS related AT commands and lists references to 3GPP TS specifications.

Parameter Description

`<ackpdu>`(num)

Format is same for `<pdu>` in case of SMS, but without 3GPP TS 24.011 [42] SC address field and parameter shall be bounded by double quote characters like a normal string type parameter.

`<ct>`(num)

Command Type

3GPP TS 23.040 [39] TP-Command-Type in integer format

[0]...255

`<da>`(str)(+CSCS)

Destination Address

3GPP TS 23.040 [39] TP-Destination-Address Address-Value field in string format; BCD numbers (or GSM default alphabet characters) are converted into characters; type of address given by `<toda>`

`<data>`(num)(+CSCS)

User Data (in text mode)

In case of SMS: 3GPP TS 23.040 [39] TP-User-Data in text mode responses; format:

- If `<dcs>` indicates that 3GPP TS 23.038 [38] default alphabet is used and `<fo>` indicates that 3GPP TS 23.040 [39] TP-User-Data-Header-Indication is not set: UE 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 3GPP TS 23.040 [39] TP-User-Data-Header-Indication is set: UE converts each 8-bit octet into hexadecimal numbers con-taining 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: 3GPP TS 23.041 [40] CBM Content of Message in text mode responses; format:

- If `<dcs>` indicates that 3GPP TS 23.038 [38] default alphabet is used: UE 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: UE converts each 8-bit octet into hexa-decimal numbers containing two IRA characters.

`<dt>`(num)

Discharge Time

Parameter for Status Reports: 3GPP TS 23.040 [39] 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>(num)

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>(num)

Integer type; value in the range of location numbers supported by the associated memory.

<length>(num)

Message Length

For PDU mode (<mode>=0):
Integer type value indicating in PDU mode (AT+CMGF=0), the length of the actual TP data unit in octets (i.e. the RP layer SMSC address octets are not counted in the length).

For Text mode (<mode>=1):
In Text mode the value of the <length> parameter depends on the <dcs> parameter in following way:

- If <dcs> indicates that GSM 7 bit default alphabet is used: every character counts as 1, i.e. for "ABC" <length>= 3.
- If <dcs> indicates that 8-bit data coding scheme is used: every coded character (2 IRA characters) counts as 1, i.e. for "414243" (= "ABC") <length>= 3.
- If <dcs> indicates that UCS2 data coding scheme is used: every coded character (4 IRA characters) counts as 1, i.e. for "004100420043" (= "ABC") <length>= 3.

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 UCS2 data, the maximum length of the short message is: (140 - (6 or 7))/2)= 67 or 66 characters.

<max>(num)

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>(str)(NV)

Memory to be used when listing, reading and deleting messages:

"SM"	SIM message storage
"ME"	UE message storage
"MT"	Same as "ME" storage
"SR"	Status report storage Received status reports are not stored by the module. Therefore, AT+CMGR, AT+CMGL, AT^SMGR, AT^SMGL commands will show only status reports previously stored to the "SR" memory.

<mem2>(str)(NV)

Memory to be used when writing and sending messages:

"SM"	SIM message storage
"ME"	UE message storage

| "MT" | Same as "ME" storage |
| "SR" | Status report storage |

<mem3>^{(str)(NV)}

Received messages will be placed in this memory storage if routing to TE is not set. See command AT+CNMI with parameter <mt>=2.

"SM"	SIM message storage
"ME"	UE message storage
"MT"	Same as "ME" storage
"SR"	Status report storage

<mid>^(num)

Message Identifier

3GPP TS 23.041 [40] CBM Message Identifier in integer format

<mn>^(num)

Message Number

3GPP TS 23.040 [39] TP-Message-Number in integer format

<mr>^(num)

Message Reference

3GPP TS 23.040 [39] TP-Message-Reference in integer format

<oa>^{(str)(+CSCS)}

Originating Address

3GPP TS 23.040 [39] TP-Originating-Address Address-Value field in string format; BCD numbers (or GSM default alphabet characters) are converted into characters; type of address given by <tooa>

<pdu>^(num)

In the case of SMS: 3GPP TS 24.011 [42] SC address followed by 3GPP TS 23.040 [39] TPDU in hexadecimal format: UE 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> 3GPP TS 23.040 [39] 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>^{(str)(+CSCS)}

Recipient Address

3GPP TS 23.040 [39] 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>^(num)

Reference number to identify all segments of the concatenated SMS (i.e. the number needs to be the same for each segment).

| 0...255 | 8 bit reference number <ieia>=8 |
| 0...65535 | 16 bit reference number <ieia>=16 |

<sca>(str)(+CSCS)(NV)

Service Center Address

3GPP TS 24.011 [42] 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>(num)

Service Centre Time Stamp

3GPP TS 23.040 [39] TP-Service-Centre-Time-Stamp in time-string format (refer <dt>)

<seq>(num)

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

<st>(num)

Status

3GPP TS 23.040 [39] TP-Status in integer format for Status Report

0...255

<stat>(str)

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>(num)

Type of Destination Address

3GPP TS 24.011 [42] 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>(num)

Type of Originating Address

3GPP TS 24.011 [42] TP-Originating-Address Type-of-Address octet in integer format (default refer <toda>)

<tora>(num)

Type of Recipient Address

3GPP TS 24.011 [42] TP-Recipient-Address Type-of-Address octet in integer format (default refer <toda>)

<tosca>(num)

Type of Service Center Address

3GPP TS 24.011 [42] RP SC address Type-of-Address octet in integer format (default refer <toda>)

10.2 AT+CMGC Send an SMS command

Syntax

Test Command

AT+CMGC=?

Response(s)

OK

Write Command

If text mode (see AT+CMGF=1)

AT+CMGC=<fo>, <ct>[, <pid>[, <mn>[, <da>[, <toda>]]]]<CR> Text can be entered <CTRL-Z>/<ESC>

Response(s)

+CMGC: <mr>[, <scts>]
If sending fails
ERROR
+CMS ERROR: <err>

Write Command

If PDU mode (see AT+CMGF=0)

AT+CMGC=<length><CR> PDU can be entered <CTRL-Z>/<ESC>

Response(s)

+CMGC: <mr>[, <ackpdu>]
OK
ERROR
+CMS ERROR: <err>

PIN	✈	Last		Reference(s)
+	**-**	**-**		3GPP TS 27.005 [48]

Note

- After invoking the commands AT+CMGW, AT+CMGS or AT+CMGC it is necessary to wait for the prompt ">" before entering text or PDU.

10.3 AT+CMGD Delete short message

The AT+CMGD write command deletes a short message from the preferred message storage <mem1> location
<index>.

Syntax

Test Command
AT+CMGD=?
Response(s)
+CMGD: (list of used <index>s)
OK

Write Command
AT+CMGD=<index>
Response(s)
OK
ERROR
+CMS ERROR: <err>

PIN	✈	Last		Reference(s)
+	+	-		3GPP TS 27.005 [48]

Notes

- To delete multiple SMS please use concatenated AT+CMGD=<index> commands, for example AT+CMGD=1;+CMGD=17;+CMGD=55. Note that a single concatenated command line supports max. 1000 characters.
- If there is no short message stored at the selected index, the response is OK too.
- Users should be aware that error will occur when using this AT command quickly after SIM PIN authentication due to the fact the SIM data may not yet be accessible.

10.4   AT+CMGF   Select SMS message format

The AT+CMGF command specifies the input and output format of the short messages.

Syntax

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

Read Command
AT+CMGF?
Response(s)
+CMGF: \<mode>
OK

Write Command
AT+CMGF=\<mode>
Response(s)
OK

PIN	✈	Last		Reference(s)
+	**+**	**-**		3GPP TS 27.005 [48]

Parameter Description

\<mode>(num)(&V)(&W)	
[0](&F)	PDU mode
1	Text mode

10.5 AT+CMGL List SMS messages from preferred store

The write command returns messages with status value <stat> from message storage <mem1> to the TE. If the status of the message is 'received unread', the status in the storage changes to 'received read'.
The execute command is the same as the write command with the given default for <stat>.

Syntax

Test Command

`AT+CMGL=?`

Response(s)

`+CMGL:` (list of supported <stat>s)
`OK`

Exec Command

`AT+CMGL`

Response(s)

`+CMGL:` (see write command for default of <stat>)
`OK`

Write Command

`AT+CMGL=<stat>`

Response(s)

Output if text mode (AT+CMGF=1) and command successful:
For SMS- SUBMITs and/or SMS-DELIVERs
`+CMGL:` <index>, <stat>, <oa>/<da>, , [<scts>][, <tooa>/<toda>, <length>]
<data>
[...]
`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>, , <length>
<pdu>
[...]
`OK`

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

PIN ✈ Last

+ + -

Reference(s)

3GPP TS 27.005 [48]

Notes

- The selected <mem1> can contain different types of SMs (e.g. SMS-DELIVERs, SMS-SUBMITs 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 error will occur when using this AT command quickly after SIM PIN authentication due to the fact the SIM data may not yet be accessible.

- Status reports are not stored by the module and therefore are not displayed by AT+CMGR and AT+CMGL commands.

10.6   AT+CMGR   Read SMS messages

The write command returns SMS message with location value <index> from message storage <mem1> to the TE. If status of the message is 'received unread', status in the storage changes to 'received read'.

Syntax

Test Command

AT+CMGR=?

Response(s)

OK

Write Command

AT+CMGR=<index>

Response(s)

Output if text mode (AT+CMGF=1) and command successful:
For SMS-DELIVER
+CMGR: <stat>, <oa>, , <scts>[, <tooa>, <fo>, <pid>, <dcs>, <sca>, <tosca>, <length>]
<data>
[...]
OK

For SMS-SUBMIT
+CMGR: <stat>, <da>, [, <toda>, <fo>, <pid>, <dcs>, [<vp>], <sca>, <tosca>, <length>]
<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>, , <length>
<pdu>
[...]
OK
ERROR
+CMS ERROR: <err>

PIN	✈	Last		Reference(s)
+	+	-		3GPP TS 27.005 [48]

Notes

- If AT+CMGR is used to read an empty record the response is: OK.
- If AT+CMGR is used to read a non-existent record index the response is: "+CMS ERROR: 321" (invalid memory index).
- Users should be aware that error will occur when using this AT command quickly after SIM PIN authentication due to the fact the SIM data may not yet be accessible.
- Status reports are not stored by the module and therefore are not displayed by AT+CMGR and AT+CMGL commands.

10.7   AT+CMGS   Send Short Message

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>.
To abort sending use <ESC>. Abortion is acknowledged with "OK", though the message will not be sent.
The message reference <mr> is returned to the TE on successful message delivery. The value can be used to identify the message in a delivery status report provided as an unsolicited result code.

Syntax

Test Command

AT+CMGS=?

Response(s)

OK

Write Command

If text mode (see AT+CMGF=1)

AT+CMGS=<da>[, <toda>]<CR> Text can be entered. <CTRL-Z>/<ESC>

Response(s)

+CMGS: <mr>[, <scts>]
OK
ERROR
+CMS ERROR: <err>

Write Command

If PDU mode (see AT+CMGF=0)

AT+CMGS=<length><CR> PDU can be entered. <CTRL-Z>/<ESC>

Response(s)

+CMGS: <mr>[, <ackpdu>]
OK
ERROR
+CMS ERROR: <err>

PIN	✈	Last		Reference(s)
+	**-**	**-**		3GPP TS 27.005 [48]

Notes

- Note that some providers do not recognize an @ symbol used in a short message. A widely used alternative is typing "*" as defined in 3GPP TS 23.040 [39].

- 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.

10.8 AT+CMGW Write Short Messages to Memory

The execute and write commands transmit a short message (either SMS-DELIVER or SMS-SUBMIT) from TE to memory storage <mem2>. Memory location <index> of the stored message is returned. Message status will be set to 'stored unsent' unless otherwise given in parameter <stat>.
After invoking the execute or write command wait for the prompt ">" and then start to write the message. To save the message simply enter <CTRL-Z>.
To abort writing use <ESC>. Abortion is acknowledged with "OK", though the message will not be saved.

Syntax

Test Command

```
AT+CMGW=?
```

Response(s)

```
OK
```

Exec Command

If text mode (see AT+CMGF=1):

```
AT+CMGW
```

Response(s)

<CR> Text can be entered. <CTRL-Z>/<ESC>

```
+CMGW: <index>
OK
ERROR
+CMS ERROR: <err>
```

Write Command

If text mode (see AT+CMGF=1):

AT+CMGW=<oa>/<da>[, [<tooa>/<toda>][, <stat>]]<CR> Text can be entered. <CTRL-Z>/<ESC>

Response(s)

```
+CMGW: <index>
OK
ERROR
+CMS ERROR: <err>
```

Write Command

If PDU mode (see AT+CMGF=0):

AT+CMGW=<length>[, <stat>]<CR> PDU can be entered. <CTRL-Z>/<ESC>

Response(s)

```
+CMGW: <index>
OK
```
If writing fails see notes below.

PIN	✈	Last		Reference(s)
+	**+**	**-**		3GPP TS 27.005 [48]

Notes

- Note that some providers do not recognize an @ symbol used in a short message. A widely used alternative is typing "*" as defined in 3GPP TS 23.040 [39].
- 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.

- PDU Mode:
    - Writing message without `<stat>` as type SMS-SUBMIT will be saved with `<stat>`=2 ("STO UNSENT") if proper PDU content is given.
    - Writing message without `<stat>` as type SMS-DELIVER will be saved with `<stat>`=0 ("REC UNREAD") if proper PDU content is given.

10.9 AT+CMSS Send short messages from storage

The write command sends message with location value <index> from message storage <mem2> to the network (SMS-SUBMIT or SMS-COMMAND).
If new recipient address <da> is given for SMS-SUBMIT, it shall be used instead of the one stored with the message. Reference value <mr> is returned to the TE on successful message delivery. Value can be used to identify message upon unsolicited delivery status report result code.
If the optional parameter <da> is given, the old status of the short message at <index> remains unchanged (see <stat>).

Syntax

Test Command

AT+CMSS=?

Response(s)

OK

Write Command

If text mode (AT+CMGF=1):

AT+CMSS=<index>[, <da>[, <toda>]]

Response(s)

+CMSS: <mr>[, <scts>]
OK
If sending fails
ERROR
+CMS ERROR: <err>

Write Command

If PDU mode (AT+CMGF=0):

AT+CMSS=<index>[, <da>[, <toda>]]

Response(s)

+CMSS: <mr>[, <ackpdu>]
OK
ERROR
+CMS ERROR: <err>

PIN	✈	Last
+	**-**	**-**

Reference(s)

3GPP TS 27.005 [48]

10.10   AT+CNMA   New Message Acknowledgement to UE/TE

The AT+CNMA write and execute commands confirm successful receipt of a new message (SMS-DELIVER or SMS-STATUS-REPORT) routed directly to the TE. If the EXS82-W does not receive acknowledgement within required time (network timeout), it sends an "RP-ERROR" message to the network. The UE will automatically disable routing to the TE by setting both <mt> and <ds> values of AT+CNMI to zero.

Please see AT^SCFG subcommand "Sms/AutoAck", parameter <SmsAcknl>, for options of automatically acknowledging incoming short messages rather than using AT+CNMA.

Syntax

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

Exec Command
AT+CNMA
Response(s)
OK
ERROR
+CMS ERROR: <err>

Write Command
AT+CNMA=<n>
Response(s)
OK
ERROR
+CMS ERROR: <err>

PIN	✈	Last		Reference(s)
+	**-**	**-**		3GPP TS 27.005 [48]

Parameter Description

<n>(num)

Parameter required only for PDU mode.

0	Command operates similarly as in text mode.
1	Send positive (RP-ACK) acknowledgement to the network. Accepted only in PDU mode.
2	Send negative (RP-ERROR) acknowledgement to the network. Accepted only in PDU mode.

Note

- Execute and write command shall only be used when AT+CSMS parameter <service> equals 1 (= phase 2+) and an appropriate URC has been issued by the module, i.e.:
  "+CMT" for <mt>=2 incoming message classes 0,1,3 and none;
  "+CMT" for <mt>=3 incoming message classes 0 and 3;
  "+CDS" for <ds>=1.

10.11 AT+CNMI SMS Event Reporting Configuration

AT+CNMI controls details of the SMS related URC presentation. It selects the procedure how the receipt of a new SMS from the network is indicated to the TE when TE is active.

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 also only available in phase 2+.

Syntax

Test Command

AT+CNMI=?

Response(s)

+CNMI: (list of supported<mode>s), (list of supported <mt>s), (list of supported <bm>s), (list of supported <ds>s), (list of supported <bfr>s)
OK

Read Command

AT+CNMI?

Response(s)

+CNMI: <mode>, <mt>, <bm>, <ds>, <bfr>
OK

Write Command

AT+CNMI=[[<mode>][[, <mt>][[, <bm>][[, <ds>][[, <bfr>]]]]]]

Response(s)

OK
ERROR
+CMS ERROR: <err>

PIN	✈	Last		Reference(s)
+	**+**	**-**		3GPP TS 27.005 [48]

Unsolicited Result Codes

URC 1

<mt>=1,2 or 3 - indication only (text and PDU mode):

+CMTI: <mem3>, <index>

Indicates that new message has been received

URC 2

<mt>=1,2 or 3 - directly routed message (PDU mode enabled):

+CMT: <length><CR><LF><pdu>

Indicates that new message has been received

URC 3

<mt>=1,2 or 3 - directly routed message (text mode enabled):

+CMT: <oa>, , <scts>[, <tooa>, <fo>, <pid>, <dcs>, <sca>, <tosca>, <length>]<CR><LF><data>

Indicates that new message has been received

URC 4

<ds>=1 (PDU mode enabled):

+CDS: <length><CR><LF><pdu>

Indicates that new SMS status report has been received

URC 5

<ds>=1 (text mode enabled):

+CDS: <fo>, <mr>[, <ra>][, <tora>], <scts>, <dt>, <st>

Indicates that new SMS status report has been received

Parameter Description

<mode>(num)(&V)(&W)	
0(&F)(D)	SMS related URCs are always buffered in the UE. If the buffer is full, the oldest indications are discarded and replaced with newly received indications.
1	SMS related URCs are forwarded directly to the TE. However, if this is not possible because UE-TE link is reserved, e.g. during a data call, these URCs are discarded.
2	SMS related URCs are forwarded directly to the TE. However, if this is not possible because UE-TE link is reserved these URCs are buffered and flushed to the TE afterwards. Additionally, while UE-TE link is reserved, buffered URCs can be signaled to the TE by activating the RING line, according to parameters AT^SCFG "URC/Ringline" <urcRinglineCfg> and AT^SCFG "URC/Ringline/ActiveTime" <urcRinglineDuration>.

<mt>(num)(&V)(&W)	

Rules for storing received short messages depend on the relevant data coding method (refer to 3GPP TS 23.038 [38]), preferred memory storage setting (AT+CPMS) and this value.

0(&F)(D)	No SMS-DELIVER indications are routed to the TE.
1	Class 0 SMS-DELIVERs are routed directly to the TE via URC. For all other messages the following applies: If SMS-DELIVER is stored in UE, indication of the memory location is routed to the TE via URC.
2	SMS-DELIVERs, except class 2 messages and messages in the message waiting indication group (store message) are routed directly to the TE via URC. Class 2 messages and messages in the message waiting indication group (store message) result in indication as defined for <mt>=1
3	Class 0 and 3 SMS-DELIVERs are routed directly to the TE via URCs defined in <mt>=2. Messages of other data coding schemes result in indication as defined in <mt>=1.

<bm>(num)(&V)(&W)	

Cell Broadcast settings. Not supported by EXS82-W.

0(&F)(D)	No CBM indications are routed to the TE.

<ds>(num)(&V)(&W)	
0(&F)(D)	No SMS-STATUS-REPORTs are routed to the TE. Also see notes.
1	SMS-STATUS-REPORTs are routed to the TE via URC.

<bfr>^{(num)(&V)(&W)}	
1^{(&F)(D)}	UE's buffer of SMS related URCs is cleared when <mode> changes from 0 to 1, 2.

<index>^(num)	

Integer type; value in the range of location numbers supported by the associated memory

Notes

- It is not possible to route messages to more than one AT command port (have none zero settings for <mt> and <ds> on more than one AT command port). Any attempt to activate settings that conflict with existing settings on another interface, will result in "+CMS ERROR: operation not allowed".

- With <mt>=2,3 and <ds>=1 messages routed directly to the TE (either short messages or status reports) have to be acknowledged with AT+CNMA. To do this, GSM Phase 2+ has to be enabled (see AT+CSMS).

- If Phase 2+ is enabled and either a short message or a status report is not acknowledged within the required time, then <mt> and <ds> will be set to zero. See AT+CNMA for further detail.

- Received status reports are not stored by the module. Therefore, AT+CMGR, AT+CMGL, AT^SMGR, AT^SMGL commands will show only status reports previously stored to the "SR" memory.

10.12 AT+CPMS Preferred SMS message storage

The AT+CPMS write command selects memory storages <mem1>,<mem2>, <mem3> to be used for reading, writing, etc.
The AT+CPMS test command lists the supported memory storages.
The AT+CPMS read command indicates the currently selected memory storages incl. the numbers of used and total entries.

Syntax

Test Command

```
AT+CPMS=?
```

Response(s)

```
+CPMS:  (list of supported <mem1>s), (list of supported <mem2>s), (list of supported <mem3>s)
OK
```

Read Command

```
AT+CPMS?
```

Response(s)

```
+CPMS: <mem1>, <used1>, <total1>, <mem2>, <used2>, <total2>, <mem3>, <used3>, <total3>
OK
ERROR
+CMS ERROR: <err>
```

Write Command

```
AT+CPMS=<mem1>[, <mem2>[, <mem3>]]
```

Response(s)

```
+CPMS: <used1>, <total1>, <used2>, <total2>, <used3>, <total3>
OK
ERROR
+CMS ERROR: <err>
```

PIN	✈	Last		Reference(s)
+	**+**	**-**		3GPP TS 27.005 [48]

Parameter Description

<used1>^(num)

Number of messages currently in <mem1>

<used2>^(num)

Number of messages currently in <mem2>

<used3>^(num)

Number of messages currently in <mem3>

<total1>^(num)

Number of messages storable in <mem1>

<total2>^(num)

Number of messages storable in <mem2>

<total3>^(num)

Number of messages storable in <mem3>

Notes

- The Mobile Equipment storage "ME" offers space for 255 short messages, see <mem1>.
- Incoming Class 1 short messages (ME specific) will be preferably stored to "ME" and may be transferred to the "SM" storage if "ME" is used up.
  Incoming Class 2 messages (SIM specific) will be stored to the SIM card only, no matter whether or not there is free "ME" space. For more information regarding SIM and ME specific message classes refer to parameter <dcs> and the following specification: 3GPP TS 23.038 [38].
- 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 memory for all parameters.
- Users should be aware that error will occur when using this AT command quickly after SIM PIN authentication due to the fact the SIM data may not yet be accessible.

10.13 AT+CMMS   More Messages to Send

AT+CMMS controls the continuity of the SMS relay protocol link. If the feature is enabled (and supported by the currently used network) multiple messages can be sent faster as the link is kept open.

Syntax

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

Read Command
AT+CMMS?
Response(s)
+CMMS: <mode>
OK

Write Command
AT+CMMS=<mode>
Response(s)
OK
ERROR
+CMS ERROR: <err>

PIN	✈	Last		Reference(s)
+	**+**	**-**		3GPP TS 27.005 [48]

Parameter Description

<mode>(num)

[0]   Feature disabled.

1   Keep link open until the time between the response of the latest message's send command (AT+CMGS, AT+CMSS, etc.) and the next send command exceeds 1-5 seconds. Afterwards UE will close the link and automatically switches <mode> back to 0.

2   Keep link open until the time between the response of the latest message's send command (AT+CMGS, AT+CMSS, etc.) and the next send command exceeds 1-5 seconds. Afterwards UE will close the link, but will not reset <mode> to 0.

Notes

- After read command usage a delay of 5-10 seconds is required before issuing the write command, otherwise the "+CMS ERROR: 500" may appear.
- CMMS mode changes directly from 2 to 1 is not possible. To change it, first disable CMMS mode (0) and then enable (1 or 2).

10.14 AT+CSCA   SMS Service Center Address

Write command updates the SMSC address, through which mobile originated SMs are transmitted. In text mode, setting is used by send and write commands. In PDU mode, setting is used by the same commands, but only when the length of the SMSC address coded into the <pdu> parameter equals zero.

Syntax

Test Command
AT+CSCA=?
Response(s)
OK

Read Command
AT+CSCA?
Response(s)
+CSCA: <sca>, <tosca>
OK

Write Command
AT+CSCA=<sca>[, <tosca>]
Response(s)
OK

PIN	✈	Last		Reference(s)
+	+	-		3GPP TS 27.005 [48]

Notes

- The SMS service center address should be entered as specified by the service provider.
- An empty string ("") for <sca> is not accepted and denied with error.

10.15 AT+CSDH Show SMS text mode parameters

The write command sets whether or not detailed header information is shown in text mode result codes.

Syntax

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

Read Command
AT+CSDH?
Response(s)
+CSDH:<show>
OK

Write Command
AT+CSDH=<show>
Response(s)
OK
ERROR
+CMS ERROR: <err>

PIN	✈	Last		Reference(s)
+	**+**	**-**		3GPP TS 27.005 [48]

Parameter Description

<show>(num)(&V)(&W)

0(&F)(D)	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 "+CMT", 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>
1	Show the values in result codes

10.16   AT+CSMP   Set SMS Text Mode Parameters

AT+CSMP controls additional parameters needed when an SMS is sent to the network or placed in a storage if 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 the range 0... 255) or define an absolute time for validity period termination (<vp> is a string). The format of <vp> is given by <fo>.

Syntax

Test Command
AT+CSMP=?
Response(s)
OK

Read Command
AT+CSMP?
Response(s)
+CSMP:<fo>, <vp>/ <scts>, <pid>, <dcs>   OK

Write Command
AT+CSMP=<fo>[, <vp>/<scts>[, <pid>[, <dcs>]]]
Response(s)
OK   ERROR   +CMS ERROR: <err>

PIN	✈	Last		Reference(s)
+	**+**	**-**		3GPP TS 27.005 [48]

Parameter Description

<fo>(num)

First Octet

Depending on the command or result code: First octet of 3GPP TS 23.040 [39] SMS-DELIVER, SMS-SUBMIT, SMS-STATUS-REPORT, or SMS-COMMAND in integer format.

0...17(&F)(P)...255

<vp>(num)

Validity Period

Depending on SMS-SUBMIT <fo> setting: 3GPP TS 23.040 [39] TP-Validity-Period either in integer format or in time-string format (refer <dt>).

0...167(&F)(P)...255

<pid>(num)(NV)

Protocol Identifier

3GPP TS 23.040 [39] TP-Protocol-Identifier in integer format.

0(&F)...255

<dcs>(num)(NV)

Data Coding Scheme

3GPP TS 23.038 [38] SMS Data Coding Scheme, or Cell Broadcast Data Coding Scheme in integer format.

0(&F)...247   Compressed SMS are network dependent and may not be supported properly.

Note

- 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>.

10.17 AT+CSMS Select Message Service

Syntax

Test Command

`AT+CSMS=?`

Response(s)

`+CSMS:` (list of supported`<service>`s)
`OK`

Read Command

`AT+CSMS?`

Response(s)

`+CSMS:` `<service>, <mt>, <mo>, <bm>`
`OK`

Write Command

`AT+CSMS=<service>`

Response(s)

`+CSMS:` `<mt>, <mo>, <bm>`
`OK`
`ERROR`
`+CMS ERROR:` `<err>`

PIN	✈	Last		Reference(s)
+	**+**	**-**		3GPP TS 27.005 [48]

Parameter Description

`<service>`(num)(&V)(&W)

0(&F)	3GPP TS 23.040 [39] and 3GPP TS 23.041 [40] (the syntax of SMS AT commands is compatible with 3GPP TS 27.005 [48] Phase 2 version 4.7.0; Phase 2+ features which do not require new command syntax may be supported, e.g. correct routing of messages with new Phase 2+ data coding schemes)
1	3GPP TS 23.040 [39] and 3GPP TS 23.041 [40] (the syntax of SMS AT commands is compatible with 3GPP TS 27.005 [48] Phase 2+ version; the requirement of `<service>` setting 1 is mentioned under corresponding command descriptions).

`<mt>`(num)(&V)

Mobile Terminated Messages:

0	Type not supported
1	Type supported

`<mo>`(num)(&V)

Mobile Originated Messages:

0	Type not supported
1	Type supported

$\text{<bm>}^{\text{(num)(\&V)}}$

Broadcast Type Messages:

0	Type not supported

Note

- Phase 2+ (`<service>`=1) must be set before acknowledging incoming short messages with `AT+CNMA` is possible. Acknowledgements are required for directly routed messages delivered using "`+CMT`" and "`+CDS`" URCs. Direct routing is used for certain message classes when `<mt>`=2, `<mt>`=3 or `<ds>`=1.

10.18   AT^SMGL   List Short Messages from preferred store without setting status to REC READ

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 u n c h a n g e d (unread remains unread).
The execute command is the same as the write command, but uses the given default of <stat>.

Syntax

Test Command
AT^SMGL=?
Response(s)
same as AT+CMGL

Exec Command
AT^SMGL
Response(s)
^SMGL: (For default values of <stat>, see "Section 10.1, SMS parameters.)
OK

Write Command
AT^SMGL=<stat>
Response(s)
same as AT+CMGL

PIN	✈	Last
+	+	-

Notes

- The selected <mem1> can contain different types of SMs (e.g. SMS-DELIVERs, SMS-SUBMITs 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 an error or a short delay before the requested AT command response is returned.

10.19 AT^SMGR   Read short message without setting status to REC READ

The AT^SMGR command is a proprietary 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".

Syntax

Test Command
AT^SMGR=?
Response(s)
OK

Write Command
AT^SMGR=<index>
Response(s)
see AT+CMGR

PIN	✈	Last
+	**+**	**-**

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.

10.20 AT^SSDA Set SMS Display Availability

AT^SSDA determines whether to display an incoming Class 0 short message directly to the user or to store it automatically in the SMS memory. This means, for Class 0 short messages, AT^SSDA overrides the AT+CNMI <mt> settings.
For all other short message classes AT^SSDA is not effective, i.e. they will be indicated as specified with AT+CNMI.

In case of Class 0 SMS, the <da> setting modifies the AT+CNMI functionality for <mt> as follows:
- If AT^SSDA=0:
  The UE handles Class 0 short messages as though there was no message class: SMS-DELIVER is stored in the UE and indication of the memory location is routed to the TE via URC. This approach is compliant with 3GPP TS 23.038 [38].
- If AT^SSDA=1:
  Class 0 SMS-DELIVERs are routed directly to the TE via URC.

Syntax

Test Command
AT^SSDA=?
Response(s)
^SSDA:(list of supported <da>s)
OK
Read Command
AT^SSDA?
Response(s)
^SSDA:<da>
OK
Write Command
AT^SSDA=<da>
Response(s)
OK

PIN	✈	Last
-	+	-

Parameter Description

<da>(num)(NV)

Display Availability

0	Application is not able to display incoming short message
1(&F)(D)	Application is able to display incoming short message

Note

- If the ME operates on different instances () 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+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".

11.   Internet Service Commands

EXS82-W 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 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.

The embedded TCP/IP stack provides the following services:

1. Socket Services:
   - TCP Client in Non-Transparent or Transparent Mode
   - UDP Client in Non-Transparent or Transparent Mode
   - Transparent TCP Listener
   - Standard TCP Listener in Non-Transparent or Transparent Mode
   - Non-Transparent UDP Endpoint
2. FTP Client
3. HTTP Client
4. MQTT Client

Step-by-step overview of how to configure and use TCP/IP communications with EXS82-W:

- Use AT+CGDCONT to create an Internet connection profile (= bearer). The PDP context IDs set with <cid> will later be used as "conId" parameter when creating a service profile with AT^SISS. Optionally, you can specify DNS preferences using AT^SICS. To activate or deactivate the bearer use the AT^SICA command.
- Use AT^SISS to create service profile(s), each identified by the <srvProfileId>. The service profile specifies the type of Internet service to use, e.g., Socket, FTP, HTTP.
- Once the bearer has been established with AT^SICA, and the service profile is created with AT^SISS, an Internet session can be opened by entering the AT^SISO write command and the desired <srvProfileId>. A URC indicates how to proceed. The "^SIS" URC with <urcCause> "5" shows that an opened listener or endpoint is ready. The "^SISW" URC means that data can be sent. The "^SISR" URC means that received data are available for reading. Error or event information is reported by the "^SIS" URC with <urcCause> "0".
- The next steps differ depending on the service type and the transfer mode (Non-Transparent or Transparent).
- Once a service is opened, 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 sent and received, 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 close an opened service, enter the AT^SISC write command and the <srvProfileId>. Then you can deactivate the bearer using AT^SICA.
  AT^SISH disconnects a remote client from a Transparent TCP Listener without closing the listener (see also below).

Transparent Mode or Non-Transparent Mode:

- *Transparent Mode* is stream-oriented, i.e. a single data stream can be sent, and another single data stream can be received. Packetizing of data is done automatically by the embedded TCP/IP stack.
  Transparent Mode is activated with AT^SIST and then indicated by the "CONNECT" result code. The mode eliminates the need for AT^SISW and AT^SISR read and write sequences.
  Keep in mind that the used AT command port will be blocked for any other AT commands as long as Transparent Mode is active.
- *Non-Transparent Mode* is packet oriented, i.e. data is transferred in separate packets. Maximum packet size is 1500 bytes for TCP, 1460 bytes for UDP. To read and write data AT^SISW and AT^SISR sequences shall be used. FTP, HTTP employ Non-Transparent Mode, for Socket services it is optional.
  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. The read/write cycles can be controlled by URCs or polling. For details see below, section "URC mode and polling mode".
To end an upload data stream set the <eodFlag> in the last AT^SISW command.

- FTP, HTTP, and UDP Endpoint employ Non-Transparent Mode.
  TCP Client, UDP client and Standard TCP Listener can employ both modes, and may even mix both modes in the same connection.

Listener services:
A listener is waiting for incoming remote client requests. EXS82-W supports two listener types: Transparent TCP Listener and Standard TCP Listener.
After opening a listener with AT^SISO no "^SISW" URC appears. Instead, the "^SIS" URC with <urcCause> "5" shows that the opened listener is ready and starts listening. Additionally, the states can be verified with AT^SISI which shows state "4" (Up - listening).
An incoming remote client request is indicated by the "^SIS" URC. For details please refer to Section 11.16, Internet Service URC, escpecially parameters <urcCause> and <urcInfoId>.

- *Transparent TCP Listener:*
  - The Transparent TCP Listener can accept 1 remote client. The connection to the remote client does not need an additional service profile, as it uses the Transparent TCP Listener instance.
  - To define a listener service profile as Transparent TCP Listener the "etx" parameter is mandatory in the address. See AT^SISS.
  - AT^SISS allows some specific options for the Transparent TCP Listener service, such as "autoconnect", "connecttimeout", "addrfilter";
  - If autoconnect is enabled an incoming remote client is indicated by the "^SIS" URC with <urcCause> "3" (Transparent) and <urcInfoId> "1" (= autoconnect enabled). The request is automatically accepted. The Listener profile instantly changes to Server mode (AT^SISO <socketState> to 4 = SERVER) and opens transparent data mode (indicated by "CONNECT" result code).
  - If autoconnect is disabled, the remote client connection request is indicated by the "^SIS" URC with <urcCause> "3" (Transparent) and <urcInfoId> "0" (= autoconnect disabled). The request can be accepted with AT^SISO or rejected with AT^SISH. In all cases the same <srvProfileId> shall be used. After accepting the client the Listener profile instantly changes to Server mode (AT^SISO <socketState> to 4 = SERVER).
    If a remote client connection request is not accepted within the configured 'connecttimeout', it will be rejected automatically, and the URC "^SIS" is sent with <urcCause> set to '4'.
  - As long as one remote client is connected all other remote client requests are rejected automatically without displaying the "^SIS" URC. The <rejCounter> in the response of the AT^SISO read command indicates such hidden rejects.
  - AT^SISH disconnects a remote client, without closing the service, allowing the Transparent TCP Listener to wait for the next remote client.
    AT^SISC both disconnects the remote client and shuts down the Transparent TCP Listener.
  - An example can be found in Section 11.16, Internet Service URC and Section 11.17.5, Transparent TCP Listener: Accepting / Rejecting Incoming Remote Client
- *Standard TCP Listener:*
  - The Standard Listener can accept several remote clients. Each incoming remote client connection request is dynamically assigned to the next free service profile indicated as <srvProfileId> within the "^SIS" URC. <urcCause> in the "^SIS" URC equals "1" (Non-Transparent). The dynamically assigned profile acts as Server (AT^SISO <socketState> equals 4 = SERVER). Its <srvProfileId> shall be used to accept the remote client with AT^SISO, or to reject it with AT^SISC. The number of acceptable remote clients depends on the number of free service profiles.
  - To transfer data it is possible to proceed with Transparent Mode using AT^SIST, or Non-Transparent Mode using AT^SISR and AT^SISW read / write sequences.
  - An example can be found in Section 11.16, Internet Service URC and Section 11.17.3, Configuring Non-Transparent Listener

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 EXS82-W offers two kinds of Socket service with UDP protocol.

- *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 UDP Client can use Transparent Mode and Non-Transparent Mode.

- *Non-Transparent UDP Endpoint:* 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.
  See example in Section 11.17.9, UDP Scenario.

MQTT client service

The MQTT client provides basic MQTT functionality according to specification OASIS MQTT Version 3.1.1. Supported transport protocols are:

- TCP/IP - defined in URI as "mqtt://"

- TLS - defined in URI as "mqtts://"

The MQTT client support sending MQTT control packets CONNECT, DISCONNECT, PUBLISH, SUBSCRIBE and UNSUBSCRIBE.

The MQTT client handle automatically MQTT control packets CONNACK, PUBACK, PUBREC, PUBCOMP, SUBACK, UNSUBACK, PINGREQ and PINGRESP.

MQTT client Control

Setup: there are 3 types how to setup and handle MQTT connection by AT commands interface from host device:

- Static parameters request - parameters are setup together with connection parameters by command AT^SISS before opening a connection with AT^SISO and <optParam>=0 or omitted. Only one request is possible to be sent during active connection which is triggered by AT^SISO.

- Dynamic parameters - request parameters are setup by AT^SISD only after opening connection by AT^SISO and <optParam>=2. Multiple request are allowed to be send during active connection. Trigger for sending request is done by AT^SISU.

- Dynamic request - request parameters are setup and request itself is triggered by one AT^SISU only after opening connection by AT^SISO and <optParam>=2. Multiple requests are allowed to send during active connection.

Triggers: the host can trigger sending request to server by:

- AT^SISO command - request will be send automatically after successful connection. Request parameters needs to be defined statically by AT^SISS. Payload could be defined by hcContent parameter or by AT^SISW.

- AT^SISU command - request will be send during already active connection. Request parameters need to be defined dynamically by AT^SISD or AT^SISU. Payload could be defined by hcContent parameter or by AT^SISW.

- AT^SISC command - used for sending DISCONNECT control packet for correct end of connection with server.

Return of OK response from module signal accepting data for sending by MQTT client but not acknowledgement from MQTT server.

Getting information about the current status of the MQTT client is possible by URCs OR by polling from the host device.

Secure connection (TLS)

All services except Listener services support server and client authentication for Transport Layer Security (TLS).

- To set TLS add "s" to the address type, such as socktcps, sockudps, ftps, https. For details see AT^SISS <srvParmTag> parameter "address".

- To create, load, delete and read customized TLS certificates use the commands AT^SBNW and AT^SBNR.
- The AT^SISS session profile parameter "secopt" specifies whether or not to check certificates received from the server against the local certificate store (if at least one local certificate is set).
- The AT^SCFG subcommand "Tcp/TLS/Version" specifies the security level.
- The used certificates can be shown in text format (issuer, serial, subject, signatureAlg, thumbprint). For this purpose it is recommended to enable the "+CIEV: "is_cert" URC, see AT^SIND.

URC mode or polling mode (for non-Transparent Mode only)
The EXS82-W offers two modes of controlling a Non-Transparent Mode session opened with AT^SISO. To select the mode use the AT^SCFG command, parameter "Tcp/WithURCs" (refer to <tcpWithUrc>).

- URC mode (delivery default):
  The progress of a Non-Transparent Mode 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 all other <urcCause>s (needed for listener or endpoint and therefore always enabled).

Address notation
Server addresses shall be provided as IPv4 addresses in standard dot format, e.g. "192.168.1.2", or as IPv6 addresses in standard colon format enclosed in square brackets, e.g. "[FE80::2]", or as server address names resolvable by a DNS server.

Timeouts
Timeouts are not part of the Internet AT command functionality implemented in EXS82-W 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, for example by sending a close message or starting a timer.

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 the states "Up" or "Connecting" are indicated, for FTP and transparent TCP only the state "Up", for the Transparent TCP Listener service the states "Up", "Alerting", "Connected" and "Released".

Suspend Mode
If any of the following internet services is active, the module will not enter SUSPEND mode:
- TCP based service (e.g. HTTP, FTP, MQTT etc.)
- Transparent mode socket services

Open UDP IP service will not prevent the module from entering SUSPEND mode. After the module resumes from SUSPEND, it will restore UDP Socket services including both UDP client and UDP endpoint that were active before entering SUSPEND mode.
The UDP services will be restored immediately once LTE or GSM cell is re-acquired.

11.1 AT^SICA Internet Connection Activate or Deactivate

The AT^SICA write command can be used to activate or deactivate an Internet service connection using a PDP context defined with AT+CGDCONT. To track activation errors the AT^SIND indicator "ceer" should be used.

The AT^SICA read command shows whether a connection for Internet services is active and which PDP context is used for it. If no connection is active, then the read command just returns OK.

Syntax

Test Command

AT^SICA=?

Response(s)

^SICA: (list of supported <state>s), (list of supported <cid>s)
OK
ERROR
+CME ERROR: <err>

Read Command

AT^SICA?

Response(s)

[^SICA: <cid>, <state>]
[^SICA: ...]
OK
ERROR
+CME ERROR: <err>

Write Command

AT^SICA=<state>, <cid>

Response(s)

OK
ERROR
+CME ERROR: <err>

PIN	✈	Last
+	-	-

Parameter Description

<state>(num)

0	Deactivate(d)
1	Activate(d)

<cid>(num)

Parameter specifies a particular PDP context definition (see AT+CGDCONT parameter <cid>).

11.2 AT^SICS Internet Connection Settings

AT^SICS serves to specify additional settings for Internet connection specified with the AT+CGDCONT command. Currently only setup and query of DNS server addresses is supported.
Keep in mind changes will be used upon next restart of the module and PDP context activation.

Table 11.1: Applicability of AT^SICS <conParmTag> values

<conParmTag>	Mandatory or optional
"dns1"	optional
"dns2"	optional
"ipv6dns1"	optional
"ipv6dns2"	optional

Syntax

Test Command

AT^SICS=?

Response(s)

OK

Read Command

AT^SICS?

Response(s)

^SICS: <conProfileId>, <conParmTag>, <conParmValue>
[^SICS: ...]
OK

Write Command

AT^SICS=<conProfileId>, <conParmTag>, <conParmValue>

Response(s)

OK
ERROR
+CME ERROR: <err>

PIN ✈ Last

| - | + | - |

Parameter Description

<conProfileId>(num)(NV)

Internet connection profile as specified with AT+CGDCONT parameter <cid>.

<conParmTag>(str)(NV)

Internet connection parameter.

“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 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. See also note below.
"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.
"ipv6dns1"	Primary IPv6 DNS server address (IP address Each group is written as 4 hexadecimal digits and the groups are separated by colons (:). The whole address is encapsulated by square brackets []. 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. "ipv6dns1" = "[]" (default) means that the 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 IPv6 address, while the value "[]" is not indicated at all, no matter whether assumed by default or explicitly specified. See also note below.
"ipv6dns2"	Secondary IPv6 DNS server address (IP address Each group is written as 4 hexadecimal digits and the groups are separated by colons (:). The whole address is encapsulated by square brackets []. "ipv6dns2" = "[]" (default) means that the connection profile uses dynamic DNS assignment. Any other address means that the secondary 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 IPv6 address, while the value "[]" is not indicated at all, no matter whether assumed by default or explicitly specified.

`<conParmValue>`(str)(NV)

Parameter value; type and supported content depend on related `<conParmTag>`.

Note

- If a 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.

11.3 AT^SIPS Internet Profile Storage

AT^SIPS saves and loads the settings of the Internet service profiles in the non-volatile memory. AT^SIPS can also be used to reset the settings to their default values without saving.

Syntax

Test Command
AT^SIPS=?
Response(s)
^SIPS:(list of supported <type>s), (list of supported <action>s), (list of supported <ProfileId>s) OK

Write Command
AT^SIPS=<type>, <action>[, <ProfileId>]
Response(s)
OK ERROR +CME ERROR: <err>

PIN	✈	Last
-	+	-

Parameter Description

<type>(str)

Internet profile storage type parameter.

“service“	Handle AT^SISS parameter set.
“all“	Implemented for compatibility with other products. For EXS82-W, same effect as value "service".

<action>(str)

Internet profile storage action parameter

“reset“	Reset current profile(s) for given <type> to default settings without saving. If <ProfileId> is given only specific profile will be reset. Only the connections which are in "Down" status and the services which are in "Allocated" status could be affected.
“save“	Stores current profile(s) for given <type>. If <ProfileId> is given only specific profile will be stored.
“load“	Loads stored profile(s) for given <type>. If <ProfileId> is given only specific profile will be loaded.

<ProfileId>(num)

Internet service profile storage identifier

0...9	Possible profile identifiers of used <type>

11.4   AT^SISS   Internet Service Setup Profile

AT^SISS specifies the Internet service profiles needed to control data connections by using AT^SICA, AT^SISO, AT^SISC, AT^SISR, AT^SISW, AT^SIST, AT^SISH, AT^SISD, AT^SISU and AT^SISE.

The AT^SISS 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 AT^SISS 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, partially, sets their defaults. Changing the <srvParmTag> "srvType" of an existing service profile will reset all <srvParmTag> values.

To change the settings the write command needs to be executed for each single <srvParmTag>. All profile parameters set with AT^SISS are volatile. mandatory (= m) or optional (= o).

All internet service profiles will be saved to non-volatile memory before entering SUSPEND mode and restored upon resume from SUSPEND.

Table 11.2:   Applicability of AT^SISS <srvParmTag> values

<srvParmTag>	Socket	FTP	HTTP	MQTT
SrvType	m	m	m	m
conId	m	m	m	m
address	m	m	m	m
address2		o	o	
address3		o	o	
address4		o	o	
tcpMR	o	o	o	
tcpOT	o	o	o	
cmd		m	m	m
path		o		
files		o	o	
ftpath		o		
hcContent			o	Publish: o
hcContLen			m	Publish: o
hcUserAgent			o	
hcProp			o	
user (as separate parameter or in address field)		m	o	o
passwd (as separate parameter or in address field		m	o	o
alphabet	o	o	o	
ipVer	o	o	o	
secopt	o	o	o	
secsni	o	o	o	o
sniname	o	o	o	o
clientId				m
keepAlive				o
willFlag				o

<srvParmTag>	Socket	FTP	HTTP	MQTT
lastWillTopic				o
lastWillMessage				o
lastWillQos				o
lastWillRetain				o
cleanSession				o
Topic				Publish: m
Qos				Publish: o
Retain				Publish: o
TopicFilter				Subscribe: m Unsubscribe: m
TopicQos				Subscribe: o

Syntax

Test Command

AT^SISS=?

Response(s)

OK

Read Command

AT^SISS?

Response(s)

^SISS: <srvProfileId>, <srvParmTag>, <srvParmValue>
[^SISS: ...]
OK
ERROR
+CME ERROR: <err>

Write Command

AT^SISS=<srvProfileId>, <srvParmTag>, <srvParmValue>

Response(s)

OK
ERROR
+CME ERROR: <err>

PIN → Last

| - | + | - |

Parameter Description

<srvProfileId>(num)

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, AT^SIST, AT^SISH, AT^SISD, AT^SISU, AT^SISE and AT^SISC the <srvProfileId> is needed to select a specific service profile.

0...9

<srvParmTag>(u)	

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-srvType>.
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 no matter whether the <srvParmTag> value "srvType" has been set. For supported values of <srvParmValue> refer to <srvParmValue-alphabet>.
user	User name string for FTP, HTTP, MQTT authentication. The user name can be set by <srvParmTag> parameter "user" or as part of "address" parameter. For HTTP only simple authentication is supported. Length: 64 octets
passwd	Password string for FTP, HTTP, MQTT authentication. The password can be set by <srvParmTag> parameter "password" or as part of "address" parameter. Length: 64 octets
conId	Internet connection profile as defined with AT+CGDCONT. The value is one of the PDP context IDs set with parameter <cid>. If the UE is configured for Verizon Wireless Network the "conId" value set by default shall be changed to value 3 (= APN 3).

address	String value containing the URL for the specific service:
	
	1. Socket Service URLs:
	
	  - TCP Client URL:
	    "socktcp[s]://<host>:<remotePort>[;etx[=<etxChar>][;timer=<value>][;bufsize=<value>]][;keepidle=<value>][;keepcnt=<value>][;keepintvl=<value>]"
	
	  - UDP Client URL:
	    "sockudp[s]://<host>:<remotePort>[;etx[=<etxChar>][;timer=<value>][;bufsize=<value>]][;port=<localPort>]"
	
	  - UDP Endpoint URL:
	    "sockudp://:<localPort>"
	
	  - Standard TCP Listener URL:
	    "socktcp://listener:<localPort>[;keepidle=<value>][;keepcnt=<value>][;keepintvl=<value>]"
	
	  - Transparent TCP Listener URL:
	    "socktcp://listener:<localPort>;etx[=<etxChar>][;timer=<value>][;bufsize=<value>][;autoconnect='0|1'][;connecttimeout=<value>][;keepidle=<value>][;keepcnt=<value>][;keepintvl=<value>][;addrfilter=<filter>]"
	
	  Socket service URL parameters:
	
	  - <host>: IPv4 address in standard dot format, e.g. "192.168.1.2", or IPv6 address in standard colon format enclosed in square brackets, e.g. "[FE80::2]", or as FQDN.
	
	  - <remotePort>: 1 ... 2^{16}-1 for the remote port number.
	
	  - <localPort>: 1 ... 2^{16}-1 for the local port number.
	
	  - "etx": This parameter allows a socket service to use Transparent Mode. For the Transparent Listener "etx" is mandatory.
	    For the Client services "etx" is optional, but required for using the Trans-

parent Mode parameters "etxChar" and "timer".
Please note that even though "etx" is set in a service profile, data transfer can be performed by a mixing Transparent Mode (AT^SIST) and Non-Transparent Mode (AT^SISW / AT^SISR cycles) in the same connection. This applies both to the Transparent Listener and to Client services.

- "<etxChar>": Specifies the character used to change from Transparent Mode to AT Command Mode.
range: 1...15,17...255 (16 is not allowed because it is used as DLE (0x10))
If parameter is not set no escaping is configured, thus requiring either +++ or DTR ON-OFF transition for changing to AT command mode. If value is set, the transmitted bytes are parsed for the DLE (0x10) character followed by the specified <etxChar> value. If both characters are found the service returns to AT command mode without transmitting these two bytes.
If you wish to send DLE characters as normal text string within your payload data the characters shall be doubled (DLE DLE).

- "bufsize": For Transparent Mode only: Specifies maximum payload size for sending data from the IP service to the underlying IP stack with AT^SIST, i.e. for limiting the length of UDP packets.
range: 1..[1460]

- "timer": The parameter configures the Nagle algorithm, which is used in Transparent Mode.
range: 0, 20...[100]...500 milliseconds in steps of 20
Value 0 disables the Nagle algorithm.

- "keepidle": specifies the TCP parameter TCP_KEEPIDLE (see RFC1122, Section 4.2.3.6; not for Transparent UDP client)
range: 1...65535 seconds; disabled if no value set (default).

- "keepcnt": specifies the TCP parameter TCP_KEEPCNT (see RFC1122, Section 4.2.3.6; not for Transparent UDP client); ignored if option "keepidle" is not set
range: 1...[9]...127

- "keepintvl": specifies the TCP parameter TCP_KEEPINTVL (see RFC1122, Section 4.2.3.6; not for Transparent UDP client); ignored if option "keepidle" is not set
range: 1...[75]...255 seconds

- "autoconnect" (for Transparent TCP Listener service only):
0 ... disabled (default)
1 ... automatically accept incoming client connects

- "connecttimeout": specifies the time after which incoming client connects are rejected automatically (for Transparent TCP Listener service only)
range: 1...[30]...180 seconds

- "addrfilter": This option allows to filter incoming client connects based on the IP address of the client (for Transparent TCP Listener service only). It is possible to specify a maximum of 3 filters separated by commas.
If the IP address of any incoming client connect does not match any of the specified filters, then the connect is rejected automatically. If the option is not specified, then all client connects are allowed.
In IPv4: Each filter is specified as 4 numbers separated by dots ("<n>.<n>.<n>.<n>"). Each number n can be in the range between 0 and 254. It is allowed to use the wildcard "*" instead of n which matches all.
Example: "addrfilter=10.10.0.*,80.190.158.9" - allows connects from 10.10.0.81 and 80.190.158.9 but not from 10.10.17.81 and 80.190.158.10.
In IPv6: Each filter is specified by up to 8 bytes separated by colons ("<x7>:<x6>:...:<x0>"). Each byte can be in the range between 0 and [f,F]. It is allowed to use the wildcard "*" which matches all.

Examples: *:5678:9abc:def0:1234:5678:9ABC:D*F0
1234::
::1**4
1*34:*::3456

2. FTP Client URL
The maximum length of "address" is 511, can be extended to 2044 by using optional parameters "address2", "address3" and "address4".
Writing to "address" will delete the content of "address2", "address3" and "address4".
"ftp[s][es]://[<user>:<passwd>@]<host>[:<port>][/<path>]"
"ftp://": The default TCP port 21 for ftp server is used.
"ftps://": The default SSL port 990 for secure ftp server is used.
"ftpes://": The default SSL port 21 for explicit secure ftp server is used.
<host>: element can be an IPv4 address, or an IPv6 address enclosed in square brackets, or a DNS FQDN string.
<port>: element can be set optionally to replace the default port.
<user>: username for authentication, 64 octets. Can be set as part of "address" or separately by <srvParmTag> parameter "user".
<passwd>: password for authentication, 64 octets. Can be set as part of "address" or separately by <srvParmTag> parameter "passwd".
<path>: path of file or directory. To read a root directory or subdirectory path shall be terminated with slash: <path>/.

3. HTTP Client URL
Length: 6...511, can be extended to 2044 by using optional parameters "address2", "address3" and "address4".
Writing to "address" will delete the content of "address2", "address3" and "address4".
"http[s]://[<user>:<passwd>@]<server>[:<port>/<path>]"
<server>: element can be an FQDN, or an IPv4 address, or an IPv6 address enclosed in square brackets.
<path>: path of file or directory.
<port>: If parameter is omitted the service connects to HTTP default port 80.
<user>: username for authentication, 64 octets.
<passwd>: password for authentication, 64 octets.
"https://": Used for SSL connection.
Refer to "IETF-RFC 2616".

4. MQTT client URL
"mqtt[s]://[<user>:<passwd>@]<host>[:<port>][;connackTime-out=<value>][;retryMsgTime=<value>]"
<host>: element can be an FQDN, or an IPv4 address, or an IPv6 address enclosed in square brackets.
<user>: username for authentication, 12 octets.
<passwd>: password for authentication, 12 octets.
<port>: If parameter is omitted the service connects to default port 1883 and for TLS default port 8883.
<connackTimeout>: Definition of max time in seconds waiting for CON-NACK packet from server.
range: 5...[20]...60 seconds.
<retryMsgTime>: Definition of number of seconds to wait before retrying messages with Qos > 0.
range: 3...[10]...60 seconds.

address2	Second part of address extension, max. length is 511. The parameter "address", "address2", "address3" and "address4" will be concatenated to an address with max. length of 2044 characters. When writing to parameter "address", the content of "address2" will be deleted.
address3	Third part of address extension, max. length is 511. The parameter "address", "address2", "address3" and "address4" will be concatenated to an address with max. length of 2044 characters. When writing to parameter "address", the content of "address3" will be deleted.

address4	Fourth part of address extension, max. length is 511. The parameter <address, "address2", "address3" and "address4" will be concatenated to an address with max. length of 2044 characters. When writing to parameter "address", the content of "address4" will be deleted.

cmd	**1.** HTTP service
	
	  - "0" or "get": Send HTTP GET request to server
	  - "1" or "post": Send HTTP POST request to server
	  - "2" or "head": Send HTTP HEAD request to server
	
	2. FTP service
	
	  - get [<OffsetString>]: get a single file from FTP server.
	  - put [<OffsetString>]: create and write a single file to FTP server using AT^SISW.
	  - dir: List the directory on the FTP server and show file size.
	  - list: List the directory on the FTP server without showing file size.
	  - fget: Get multiple files listed in <srvParmTag> parameter "files".
	  - fput: Send one or multiple files listed in <srvParmTag> parameter "files".
	  - size: Request the size of the file element on the FTP server. The size result is output as "^SIS" URC.
	  - del: Delete a file specified with <srvParmTag> parameter "files" on FTP server.
	  - append: Append data to existing file on FTP server
	  - unique: 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.
	
	  <OffsetString> is an optional parameter for "get" and "put". It allows resuming a broken uplink or downlink transfer to resend data. The <OffsetString> value specifies the offset in number of octets to start the transfer from. Maximum length is 16 digits. For "get" the <OffsetString> value must be calculated from the <urcInfoId> 2100 of the "^SIS" URC requested before by using "size".
	
	3. MQTT Service
	Types of MQTT request:
	
	  - "publish": The MQTT client sends data by PUBLISH control packet request to server
	  - "subscribe": The MQTT client that wants to receive data must subscribe to it by SUBSCRIBE control packet
	  - "unsubscribe": The MQTT client that doesn't want to receive subscribed data anymore must unsubscribe specified topic by sending UNSUBSCRIBE control packet

path	Path on the local FFS. Specifies drive prefix and pathname. Optional for FTP. Default: AT^SISS=<srvProfileId>,"path","file:///a:".
ftpath	Specifies the path of the remote FTP server after login. If no path is set the default path will be used.
files	Specifies single or multiple files: • Name of a single file for upload from the AT command interface to a server, or download from a server to the AT command interface if the "cmd" parameter is given with "get" or "post" in case of HTTP, with "get", "put" or "del" in the case of FTP. • Name(s) of file(s) located on the FFS when "cmd" parameter is given with parameters "fput" or "fget" in case of FTP. Maximum 5 files can be handled,

separated by comma.

hcContent	HTTP "POST": Variable mode. Optional parameter if HTTP "post" is set with `<srvParmTag>` parameter "cmd". Length: 1...255 bytes Can be used to transfer a small amount of data. The content of this string will only be sent if "hcContLen" = 0. 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`. Usage example: AT^SISS=x,cmd,"POST" AT^SISS=x,hcContent,"This text will be sent to the server now .... response OK" OK AT^SISS=x,hcContLen,0 AT^SISO=x OK ^SIS: x,0,2200,"Http connect 10.42.228.61:80" ^SISW: x,2 Please take care not to exceed the maximum "hcContent" length 255 bytes. Otherwise data is truncated. MQTT Client Payload: Definition of payload in case parameter "hcContLen" = 0. Length: 0...128 Can be used to transfer a small amount of data without the need for `AT^SISW`. The content of the "hcContent" string will only be sent if "hcContLen" = 0. To transmit a larger amount of data, the "hcContLen" string shall 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	HTTP "POST": Fixed mode. Mandatory parameter if HTTP "post" is set with `<srvParmTag>` parameter "cmd". 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, the HTTP client will go from service state "Up" to service state "Closing" (see `AT^SISO <srvState>` and `AT^SISI <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`. MQTT Client Payload Length: Definition of payload length. If this parameter is non-zero value the payload is then defined by the `AT^SISW` command. Length: 0...128 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. If this parameter is not set, default hcContLen 0 is used.

hcUserAgent	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
hcProp	Parameter for several HTTP settings. Length: 0...127 The general format is 'key': <space> 'value' Multiple settings can be given separated by "\0d\0a" sequences within the string, do not put them at the end. Possible 'key' values are defined at HTTP/1.1 Standard RFC 2616.
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".

ipVer	Used IP Protocol version:
	This parameter limits the IP Protocol version for the Internet service when the PDP context defined with AT+CGDCONT supports IPv4 and IPv6.
	4 Values 4 (default) or 6 can be used for the following situations only:
	6 An IPv4v6 PDP context is employed, and this context provides both IPv4 and IPv6 interfaces, and
	       - either the service acts as a listener,
	       - or the client address is a hostname, and the DNS server provides both IPV4 and IPV6 addresses.
	       In such case value 4 allows IPv4 addresses only, and value 6 allows IPv6 addresses only.

secopt	Security Option of IP service. Values: 1 (default) Check received certificates from server against local store, if local store has at least one certificate. 0 Do not check received certificates from server against the local store. NOTE: Local store is created with AT^SBNW,is_cert.
secsni	Security Option for Server Name Indication (SNI) extension (defined by RFC6066). • If parameter "secsni" is not provided then default configuration is "1", i.e. SNI extension is enabled by default. • If user does not configure AT^SISS=<srvProfileId>,secsni but enters AT^SISS=<srvProfileId>,sniname,"name": SNI extension will be used with "name". • If user sets AT^SISS=<srvProfileId>,secsni,1 and sets AT^SISS=<srvProfileId>,sniname,"name": SNI extension will be used with with "name". • If neither "secsni" nor "sniname" is configured or if user sets AT^SISS=<srvProfileId>,secsni,1 but does not configure AT^SISS=<srvProfileId>,sniname,"name": SNI extension will be used with hostname extracted from AT^SISS=<srvProfileId>,address. NOTE: Data related to SNI extension are sent in first client message called

	"Client Hello" and processed by server. 1 (default) SNI Extension will be used if TLS connection will be invoked. 0 SNI Extension will not be used.
sniname	AT^SISS=<srvProfileId>,sniname,"name" means that the "name" is used as server name indication during TLS connection setup. If parameter is not provided and SNI extension is enabled then the hostname value from AT^SISS=<srvProfileId>,address is used. Length of "name" must be greater than 0 and less than 256 characters.
clientId	Unique client identification of the connection to the MQTT server. ClientId are between 1 and 23 UTF-8 encoded bytes in length, and that contain only the following characters "0123456789abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLMNOPQRSTUVWXYZ"
keepAlive	Define keep alive time interval defined in seconds. range: [0]...65535 seconds
willFlag	Definition of will flag bit. • 0: If the Will Flag is set to 0 the Will QoS and Will Retain fields in the Connect Flags must be set to zero and the Will Topic and Will Message fields must not be present in the payload. If the Will Flag is set to 0, a Will Message must not be published when this Network Connection ends: • 1: If the Will Flag is set to 1 this indicates that, if the Connect request is accepted, a Will Message must be stored on the Server and associated with the Network Connection. The Will Message must be published when the Network Connection is subsequently closed unless the Will Message has been deleted by the Server on receipt of a DISCONNECT Packet:
lastWillTopic	Definition of last will topic. Length: 0...64 octets
lastWillMessage	Definition of last will message. Length: 0...128 octets
lastWillQos	Definition of Qos level of publishing last will message. • 0: At most once delivery • 1: At least once delivery • 2: Exactly once delivery If this parameter is not set, default Qos 0 is used.
lastWillRetain	Definition if last will message is to be retained by server. • 0: Retained message must not be stored as a retained message on the Server • 1: The Server must store the Application Message If this parameter is not set, default Retain 0 is used.
cleanSession	Definition of session type to be initiated with server. • 0: Server will try to resume current session with client • 1: Server will start new clean session If this parameter is not set, default value 1 is used.
Qos	Definition of Qos level of publishing application message. • 0: At most once delivery • 1: At least once delivery • 2: Exactly once delivery If this parameter is not set, default Qos 0 is used.
Topic	Definition topic of publishing application message. Length: 0...64
Retain	Flag define if application message will be retained on server.

- 0: Retained message MUST NOT be stored as a retained message on the Server
- 1: The Server MUST store the Application Message

If this parameter is not set, default Retain 0 is used.

topicFilter	Definition of topic filter list for subscribing or unsubscribing data. Each topicFilter separated by a semicolon, the max number is 5.
topicQos	Definition of maximum Qos level at which the server can send application messages to the client for each topic filter from topicFilter list. Each topicQos separated by a semicolon, the max number is 5. If all topics should have same Qos then only one needs to be defined.

`<srvParmValue>`(str)(+CSCS)

Parameter value; type and supported content depend on related `<srvParmTag>`.

`<srvParmValue-srvType>`(str)

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^SISI`. Only when `<srvState>`=2 is returned for this specific service profile you can change its service type.

"Socket"	EXS82-W acting as client or server (listener) for TCP or UDP. "etx" subparameter in URL configures Transparent mode for Socket service.
"Ftp"	EXS82-W acting as FTP client.
"Http"	EXS82-W acting as HTTP client.
"Mqtt"	EXS82-W acting as MQTT client. The MQTT client support sending MQTT control packets CONNECT, DISCONNECT, PUBLISH, SUBSCRIBE and UNSUBSCRIBE. The MQTT client handle automatically MQTT control packets CONNACK, PUBACK, PUBREC, PUBCOMP, SUBACK, UNSUBACK, PINGREQ and PINGRESP. The maximum number of configurable MQTT client is 1.
"none"	Reset Internet service profile settings. Operation is not allowed if profile is in use, i.e. it was activated via `AT^SISO`.

`<srvParmValue-alphabet>`(str)

Supported string parameter character set selections in `<srvParmValue>` for `<srvParmTag>` value "alphabet".

["0"]	Applicable character set is determined by current setting of `AT+CSCS`.
"1"	International Reference Alphabet (IRA, seven bit ASCII).

Notes

- String parameters are truncated if greater than the maximum length specified above.
- For correct input of the @ character in address parameters please refer to Section 1.7, `Supported character sets`.

11.5 AT^SISI Internet Service Information

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.

Syntax

Test Command

AT^SISI=?

Response(s)

[^SISI:(list of defined <srvProfileId>s)]
OK

Read Command

AT^SISI?

Response(s)

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

AT^SISI=<srvProfileId>

Response(s)

^SISI: <srvProfileId>, <srvState>, <rxCount>, <txCount>, <ackData>, <unackData>
OK
ERROR
+CME ERROR: <err>

PIN → Last

| - | + | - |

Parameter Description

<srvProfileId>(num)

Internet service profile identifier as defined by AT^SISS (<srvProfileId>).

0...9

<srvState>(num)

Internet service state (for details see AT^SISO parameter <srvState>).

2	Allocated
3	Connecting
4	Up
5	Closing
6	Down
7	Alerting
8	Connected
9	Released

<rxCount>(num)

Number of bytes received via AT^SISR or AT^SIST 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>(num)

Number of bytes sent via AT^SISW or AT^SIST 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>(num)

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, Socket with UDP. For these services the counter is always set to 0.

<unackData>(num)

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, Socket with UDP. For these services the counter is always set to 0.
<unackData> includes the overhead needed for encryption when TLS/SSL is used.

Note

- If a service is in state "Down" or "Released" the responses for <rxCount>, <txCount>, <ackData> and <unackData> are the last known values for the service in the states "Connecting", "Up/Listening", "Connected" and "Closing".

11.6 AT^SISO Internet Service Open

The AT^SISO write command starts an Internet service configured with AT^SISS. Before you can start a service it is necessary to activate the bearer with with AT^SICA.
The command may be aborted by any character sent from the TE to the UE during execution.

Syntax

Test Command

AT^SISO=?

Response(s)

OK

Read Command

AT^SISO?

Response(s)

If response is related to service profile(s) created / opened on this interface:
^SISO: <srvProfileId>, <srvType>, <srvState>, <socketState>, <rxCount>, <txCount>, <locAddr>, <remAddr>[, <rejCounter>]
[^SISO: ...]

If response is related to service profile(s) created / opened on other interface(s):
^SISO: <srvProfileId>, <srvType>
[^SISO: ...]
OK

Write Command

AT^SISO=<srvProfileId>[, <optParam>]

Response(s)

OK
ERROR
+CME ERROR: <err>

PIN ✈ Last

| - | - | - |

Parameter Description

<srvProfileId>(num)

<srvProfileId> 0 ... 9 specified with AT^SISS.

<srvType>(str)

The type of the internet service as specified by the AT^SISS parameter <srvParmValue-srvType>.

<srvState>(num)

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 Standard 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 11.17.5.
4	Up The service performs its purpose. The data transfer process is the major function at this state. FTP: Data channel is up. Transparent TCP Listener service: the service is listening to remote client connection requests. Not applicable to Standard Listener. See examples in Section 11.17.6.
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.
7	Alerting A client tries to connect to the Transparent TCP Listener service. Not applicable to Standard Listener.
8	Connected A client is connected with the Transparent TCP Listener service. Not applicable to Standard Listener.
9	Released The client has disconnected from the Transparent TCP Listener service but there are unread data. To go back into Up/Listening state read the pending data using AT^SIST or discard them by using AT^SISH.

<socketState>(num)

Socket state identifier.

1	Socket not assigned, i.e. no TCP/UDP connection active.
2	Socket assigned as CLIENT.
3	Socket assigned as LISTENER or UDP Endpoint.
4	Socket assigned as SERVER.

<rxCount>(num)

Number of bytes received via AT^SISR or AT^SIST since last successful AT^SISO write command.

<txCount>(num)

Number of bytes sent via AT^SISW or AT^SIST since last successful AT^SISO write command.

<locAddr>(str)

Recently used local IPv4 address in dotted-four-byte format and TCP port separated by colon, e.g. "192.60.10.10:80", or recently used local IPv6 address in colon format enclosed in square brackets, e.g. "[FE80::2]" and TCP port separated by colon, e.g. "[FE80::2]:80".

<remAddr>(str)

Remote IPv4 address in dotted-four-byte format and TCP port, separated by colon, e.g. "192.60.10.10:80", or remote IPv6 address in colon format enclosed in square brackets, e.g. "[FE80::2]" and TCP port separated by colon, e.g. "[FE80::2]:80".
If the Socket service is configured as UDP Endpoint, a remote IP address cannot be assigned, and a default value will be shown instead.

<rejCounter>(num)

Number of automatically rejected client connect attempts to a Transparent TCP Listener service because the service is already connected with a client.

<optParam>(num)

[0]	MQTT service: Connect and use static setup defined by AT^SISS
1	Show only parameters of service profile for given <srvProfileId>.
2	MQTT service: Connect and use dynamic setup defined by AT^SISD

Notes

- If the bearer cannot be established and AT^SISO returns an error there might be a general mobile network 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.

- If an FTP connection is no longer available after network loss or server shutdown a 3-minute closing timeout for each of the two used sockets takes effect, adding up to 6 minutes. The timeout is effective if the AT^SISC is not sent. Please keep in mind that this time may vary depending on the settings of <tcpMr> and <tcpOt>.

- 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, AT^SISW or AT^SIST. 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.

11.7 AT^SISC Internet Service Close

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>, <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.

Syntax

Test Command
AT^SISC=?
Response(s)
OK

Write Command
AT^SISC=<srvProfileId>
Response(s)
OK
ERROR
+CME ERROR: <err>

PIN	✈	Last
±	-	-

Parameter Description

<srvProfileId>(num)

0...9   <srvProfileId> specified with AT^SISS.

11.8 AT^SISR Internet Service Read Data

The AT^SISR write command can be used to read data for the specified service. It may return the following errors: The AT^SISR command either triggers a read operation (download) or queries the number of bytes in the internal buffer.
The "^SISR: x, 1" URC is also used to report status changes of the transparent TCP service while the client is in AT command mode.

The AT^SISR write command may return the following errors:
- "+CME ERROR: operation failed" if there is a problem on application, socket, PPP or network 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.

Syntax

Test Command
AT^SISR=?
Response(s)
OK

Write Command
AT^SISR=<srvProfileId>, <reqReadLength>
Response(s)
^SISR: <srvProfileId>, <cnfReadLength>[, <remainUdpPacketLength>[, <Udp_RemClient>]]
Number of data bytes are sent as specified by <cnfReadLength>. If peek operator was used no data bytes are sent.
OK
ERROR
+CME ERROR: <err>

PIN ✈ Last

| - | - | + |

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 Description

<srvProfileId>(num)

<srvProfileId> 0 ... 9 specified with AT^SISS. Transparent TCP Listener services are not supported.

`<reqReadLength>`(num)	
0	Peek Operator: Query number of received bytes within internal buffers. The behaviour 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 specified in `<srvProfileId>`.

`<cnfReadLength>`(num)	
-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>`(num)	

Indicates whether or not data is available for reading with AT^SISR and AT^SIST.

1	*Meaning of value "1" for all services except Transparent TCP service:* 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. *Meaning of value "1" for Transparent TCP service:* If the Transparent TCP service is in AT command mode the "^SISR: x, 1" URC notifies the client that the server has sent new data. In this case the client shall enter the AT^SIST command to go to transparent access mode and read the data.
2	End of data. Data transfer has completed (all data read). The service can be closed with AT^SISC.

`<remainUdpPacketLength>`(num)	

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 maxmimum 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 `<remainUdpPack-etLength>` 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.
(max. data size)-1...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.

`<Udp_RemClient>`(str)

Service specific parameter of the `AT^SISR` write command response. If the Socket service is configured as UDP endpoint this parameter shows the IP address and the UDP port of the remote host that has sent the current UDP data. See example in Section 11.17.9, UDP Scenario.

11.8.1 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 is 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.

11.9   AT^SISW   Internet Service Write Data

AT^SISW triggers a write operation (upload) and queries the amount of data already sent, but not acknowledged at the TCP layer. The URC "^SISW: <srvProfileId>, <urcCauseId>" will be issued if the EXS82-W is ready to accept user data.

The AT^SISW write command may return the following errors:
- "+CME ERROR: operation failed" if there is a problem on application, socket, PPP or network 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.

Syntax

Test Command
AT^SISW=?
Response(s)
OK

Write Command
AT^SISW=<srvProfileId>, <reqWriteLength>[, <eodFlag>[, <Udp_RemClient>]]
Response(s)
^SISW: <srvProfileId>, <cnfWriteLength>, <unackData> Number of data bytes as specified by <cnfWriteLength>. OK ERROR +CME ERROR: <err>

PIN	✈	Last
±	-	+

Unsolicited Result Code

^SISW: <srvProfileId>, <urcCauseId>

The URC indicates the following status changes:
- After opening a TCP Client or UDP Client with AT^SISO the "^SISW" URC indicates that the service is ready to accept data. After this initial "^SISW" URC, the TCP Client or UDP Client can proceed in Transparent Mode or Non-Transparent Mode.
  The initial "^SISW" URC is not issued after a Transparent Listener or UDP Endpoint was opened, because for listening services the "^SIS" URC will be issued.
- During AT^SISW write cycles the "^SISW" URC indicates that the service is ready to accept new data, or that data transfer has finished successfully.

The URC is disabled in polling mode. See AT^SCFG, parameter "Tcp/WithURCs", <tcpWithUrc>.

Parameter Description

<srvProfileId>(num)

<srvProfileId> 0 ... 9 specified with AT^SISS. Transparent TCP Listener services are not supported.

<reqWriteLength>(num)

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 performed. This allows the application to explictly request, in particular at the end of an upload job, the amount of unacknowledged data at the TCP layer indicated by `<unackData>`.
- 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 1460 bytes. Otherwise, it is possible that the following URC occurs: "`^SIS`: <id>, 0, 9, The supplied buffer was too small / large".

`<eodFlag>`(num)

End of data indication flag. See also Section 11.9.1.

0...7	Used as bit field
bit 1	Represents End of data is signaled to the Internet Service.
	[0]: No end of data. Other data may follow to be transmitted via the Internet service.
	Notes: - UDP Endpoint service: Value 0 must be set before `<Udp_RemClient>` parameter although `<eodFlag>` is not effective for UDP Endpoint. - `<eodFlag>` is not intended and not usable for HTTP.
	1: End of data is signalled 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 `<cnfWriteLength>`, in particular if the `<reqWriteLength>` equals 0. End-of-data flag must be enabled for following actions: - FTP "cmd","put" (sending single file to FTP server)
bit 2	Represents release assistance indication: no further uplink or downlink data transmission is expected.
	0: Further uplink or downlink data transmission is expected
	1: No further uplink or downlink data transmission is expected
bit 3	Represents release assistance indication: only a single downlink data transmission (e.g. acknowledgement or response to uplink data) and no further uplink data transmission subsequent to the uplink data transmission is expected.
	0: Both downlink and further uplink data transmission subsequent is expected
	1: Only a single downlink but no further uplink data transmission subsequent to the uplink data transmission is expected

Notes:
- Bit 2 of `<eodFlag>` is meaningless to all internet service, which are based on TCP.
- Bit 2 and Bit 3 cannot be set at the same time.

`<Udp_RemClient>`(str)

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. See example in Section 11.17.9, UDP Scenario.

<cnfWriteLength>(num)

0...1500	Confirmed number of data bytes which can be transmitted via the Internet service configured in `<srvProfileId>`. 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 `<cnfWriteLength>`. A 0 value means that no data can be written at this time, i.e. it serves as a flow control mechanism.

<unackData>(num)

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.
`<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, Socket with UDP protocol. For these services the counter is always set to 0.
`<unackData>` includes the overhead needed for encryption when TLS/SSL is used.

<urcCauseId>(num)

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.

Note

- Do not send any characters after AT^SISW command line termination (ATS3) until "^SISW" URC 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 1.5, AT Command Syntax.

11.9.1 Usage of parameter <eodFlag>

Service type	
Socket	Parameter is optional for Socket services. Not applicable to Socket with UDP protocol, i.e. value is ignored. 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".
FTP	Parameter is mandatory for FTP "put" (sending single file to FTP server). After accepting 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.
HTTP	Parameter is not indended and not usable for HTTP.

11.10   AT^SIST   Transparent Mode

AT^SIST activates / deactivates Transparent Mode. Keep in mind that the used AT command port will be blocked for any other AT commands as long as Transparent Mode is active.

After entering the AT^SIST command, the CONNECT response notifies that the service has entered Transparent Mode and is ready to transparently send and receive payload data over the AT command interface. In this mode, the signaling of the URCs is done by RING line. This can be configured by AT^SCFG, parameter <urcRinglineCfg>.

There are several ways to quit the Transparent Mode and revert to AT Command Mode:
- +++ escape sequence (also transmitted over the air)
- DTR ON-OFF transitions (see AT&D for configuring DTR line)
- "etxChar" parameter set within the server address (see AT^SISS, <srvParmTag> "address" for Socket service URLs.

Switching back and forth between both modes does not affect the underlying socket and has no influence on the service <srvState>.
If the service is in AT Command Mode the "^SISR: x, 1" URC appears once to indicate that the remote side has sent new data. In this case, the client or listener shall enter AT^SIST to go to Transparent Mode and read out the new data.

If the connection is released by the remote side the following applies:
- If the service is in Transparent Mode (CONNECT mode): UE returns to AT Command Mode, issues a specific "NO CARRIER" result code and goes to <srvState> 6 ("Down") in case of TCP or UDP Client, and to 4 ("Up/Listening") in case of Transparent Listener. The "NO CARRIER" result code starts with 0x10 (DLE) and 0x04 (EOT) and ends with the command line termination character (ATS3), followed by the response formatting character (ATS4).
- If the service is in AT Command Mode the "^SISR: x, 1" URC appears to indicate that the state of the service has changed. In this case, the client or listener shall go to Transparent Mode with AT^SIST in order to read remaining data (if any) and get the "NO CARRIER" result code. After this, the service changes to <srvState> 6 ("Down"). Otherwise, if the client or listener does not go to Transparent Mode after receiving "^SISR: x, 1" URC the service remains in <srvState> 4 ("Up") even though the remote side has shut down. In some cases, depending on the remote side and the network, it is possible that "^SIS" URCs may be reported, for example "^SIS" URCs with <urcInfoId> 15 ("Remote host has reset the connection") and 19 ("Socket has been shut down). See Section 11.16, Internet Service URC for a list of possible URCs.
- In all above scenarios, the Transparent service shall be closed with AT^SISC. Trying to return to Transparent Mode with AT^SIST would only end up with "NO CARRIER" once again and is not recommended.
- Use AT^SISO and AT^SISI to check the <srvState>.

Syntax

Test Command
AT^SIST=?
Response(s)
OK

Write Command
AT^SIST=<srvProfileId>
Response(s)
CONNECT
(indicates that UE has entered Transparent Mode)
OK
ERROR
+CME ERROR: <err>

PIN	✈	Last
-	-	+

Parameter Description

<srvProfileId>^(num)

<srvProfileId> 0 ... 9 specified with AT^SISS.

Note

- If AT^SIST is running for a certain <srvProfileId>, then the commands AT^SISR and AT^SISW are not usable for the same <srvProfileId>.

11.11 AT^SISD Internet Service MQTT Dynamic Setup Profile

AT^SISD serves to set up the necessary parameters in the MQTT service profiles. Service profiles can then be used to control a data link in conjunction with AT^SISU and AT^SISE.

Command could be used only after connection is opened with AT^SISO parameter <optParam>=2. Each request parameter can be changed multiple time during active connection.

The AT^SISD write command specifies the parameters for MQTT service profile identified by <srvProfileId>.
To change the settings the write command needs to be executed for each single <dynParamTag>. All profile parameters set with AT^SISD are volatile.

The list below shows which <dynParamTag> parameters apply to MQTT service and which of them are mandatory (= m) or optional (= o).

Table 11.3: Applicability of AT^SISD <dynParamTag> values

<dynParamTag>	Mandatory or optional
Publish	
"Cmd"	m
"Qos"	o
"Topic"	m
"Retain"	o
"hcContent"	o
"hcContLen"	o
Subscribe	
"Cmd"	m
"topicFilter"	m
"topicQos"	o
Unsubscribe	
"Cmd"	m
"topicFilter"	m

Syntax

Test Command
AT^SISD=?
Response(s)
OK

Write Command
Set parameters defined by <dynParamTag> to value <dynParamValue>
AT^SISD=<srvProfileId>, "setParam", <dynParamTag>, <dynParamValue>
Response(s)
OK
ERROR
+CME ERROR: <err>

Write Command

Get current value of dynamic parameters defined by <dynParamTag>

AT^SISD=<srvProfileId>, "getParam", <dynParamTag>

Response(s)

^SISD: <srvProfileId>, <dynParamTag>, <dynParamValue>
OK
ERROR
+CME ERROR: <err>

Write Command

Set all dynamic parameters for service to default value

AT^SISD=<srvProfileId>, "cleanParam"

Response(s)

OK
ERROR
+CME ERROR: <err>

Write Command

Get all dynamic parameters of service

AT^SISD=<srvProfileId>

Response(s)

^SISD: <srvProfileId>, <dynParamTag>, <dynParamValue>
^SISD: ...
OK
ERROR
+CME ERROR: <err>

PIN   →   Last

| - | - | - |

Parameter Description

<srvProfileId>(num)

Internet service profile identifier as defined by AT^SISS <srvProfileId>.

0...9

<dynOption>(str)

Parameter<dynOption> define action in dynamic setup of request parameters.
Omitting this parameter will show all dynamic parameters of service in the response.

"setParam"	Set parameter defined by <dynParamTag> to value <dynParamValue>.
"getParam"	Get current value of parameter defined by <dynParamTag>.
"cleanParam"	Set all request parameters for service to its default value.

<dynParamTag>(u)

MQTT service profile parameter.

cmd	refer to <srvParmTag>.
Qos	refer to <srvParmTag>.
Topic	refer to <srvParmTag>.
Retain	refer to <srvParmTag>.
hcContent	refer to <srvParmTag>.

hcContLen	refer to `<srvParmTag>`.
topicFilter	refer to `<srvParmTag>`.
topicQos	refer to `<srvParmTag>`.

`<dynParamValue>`(str)(+CSCS)

Parameter value; type and supported content depend on related `<dynParamTag>`.

11.12 AT^SISU MQTT Dynamic Send Request

AT^SISU serves to setup and send MQTT request.

Command could be used only after connection is opened with AT^SISO parameter <optParam>=2. Each request parameter can be changed multiple time during active connection.
The AT^SISU write command with only first parameter <srvProfileId> is used to trigger send of service request that was defined by dynamic parameters with command AT^SISD.
The AT^SISU write command with second parameter is used to define dynamic request.

All profile parameters set with AT^SISU are volatile.

Syntax

Test Command

AT^SISU=?

Response(s)

OK

Write Command

AT^SISU=<srvProfileId>[, <dynReqType>[, <dynReqValue>]]

Response(s)

OK
ERROR
+CME ERROR: <err>

PIN	✈	Last
-	-	-

Parameter Description

<srvProfileId>(num)

Internet service profile identifier as defined by AT^SISS <srvProfileId>.

0...9

<dynReqType>(str)

Parameter <dynReqType> define type of service specific request.

"publish"	The MQTT client sends data by PUBLISH control packet request to server.
"subscribe"	The MQTT client that wants to receive data must subscribe to it by SUBSCRIBE control packet.
"unsubscribe"	The MQTT client that doesn't want to receive subscribed data anymore must unsubscribe specified topic filter by sending UNSUBSCRIBE control packet.

<dynReqValue>(str)(+CSCS)

Parameter <dynReqValue> define all request parameters separated by ":" character.

- PUBLISH: Qos;Topic;Retain;hcContent;hcContLen

- SUBSCRIBE: topicFilter;topicQos
  Multiple topics could be send by one subscribe request in topicFIlter separated by ",". Accordingly for each topic in topicFilter different Qos can be setup in topicQos separated by "," with preserved order. If all topics should have same Qos then only one Qos needs to be defined.

- UNSUBSCRIBE: topicFilter

Parameter value and supported content depend on related <dynParamTag>.

11.13 AT^SISH   Disconnect Remote Client

AT^SISH is intendend only for a Transparent TCP Listener service. It allows to reject an incoming remote client connection request or to disconnect an established client connection from server side.

Syntax

Test Command
AT^SISH=?
Response(s)
OK

Write Command
AT^SISH=<srvProfileId>[, <mode>]
Response(s)
OK
ERROR
+CME ERROR: <err>

PIN	→	Last
-	-	-

Parameter Description

<srvProfileId>(num)

0...9   A Transparent TCP Listener service <srvProfileId> defined with AT^SISS.

<mode>(num)

Specifies disconnect mode.

[0]   Socket is closed with graceful option

1   Socket is closed without graceful option

11.14 AT^SISX   Internet Service Execution

The AT^SISX command can be used to send ICMP (Internet Control Message Protocol) Echo Requests to a target IP address or DNS host name (also referred to as Ping command). This command can also be used to resolve DNS host names to IP addresses (HostByName) or resolve the network time, NTP protocol, in UTC.
The AT^SISX command can be used any time while a connection profile (bearer) is active. If issued although no connection is active, then AT^SISX returns ERROR.
If the AT^SISX write command is executed for Ping, then the command returns one row for every ICMP Echo Request. The last Ping response line is followed by two lines to report a statistic calculated from the Echo Request responses. After starting the Ping command the AT channel is blocked until all ICMP requests are executed. To stop the periodic Ping early, send any character (user break).
It is also possible to cancel the HostByName or NTP service by user break. But this may temporarily block further AT^SISX write commands which is indicated by the error response "+CME ERROR: operation temporary not allowed". As soon as the background activity for the last started HostByName service is finished the AT^SISX write command can be used again.

Syntax

Test Command

AT^SISX=?

Response(s)

^SISX:"Ping", (list of supported <conProfileId>s), , (range of supported <request>s), (range of supported <timelimit>s)
^SISX:"HostByName", (list of supported <conProfileId>s)
^SISX:"Ntp", (list of supported <conProfileId>s)
OK

Write Command

AT^SISX=<service>, <conProfileId>, <address>[, <request>[, <timelimit>]]

Response(s)

In case of <pingInfoType>= 1: ICMP Echo Requests (1 - 30 rows)
^SISX:"Ping", <pingInfoType>, <conProfileId>, <ip-address>, <roundTripTime>
[...]

In case of <pingInfoType>= 2: Packet statistic (1 row)
^SISX:"Ping", <pingInfoType>, <conProfileId>, <sent>, <received>, <lost>, <lostPercent>

In case of <pingInfoType>= 3: Time statistic (1 row)
^SISX:"Ping", <pingInfoType>, <conProfileId>, <minRTT>, <maxRTT>, <meanRTT>

In case of <service>= "HostByName"
^SISX:"HostByName", <ip-address>
[...]

In case of <service>= "Ntp"
^SISX:"Ntp", <ntp>

OK
ERROR
+CME ERROR: <err>

PIN ✈ Last

| + | - | - |

Parameter Description

<service>(str)

"Ping"   Ping host.

"HostByName"   Get first address from a host.

"Ntp"   Network time protocol.

<conProfileId>(num)

Internet connection profile to be used as specified with AT+CGDCONT parameter <cid>.

<address>(str)(+CSCS)

In case of "Ping" or "Ntp" this is the target host as FQDN or IP address (i.e. "192.168.1.3"), in case of "HostBy-Name" this is the FQDN to be resolved into the IP address.

<ip-address>(str)

The IP address of the host (i.e. "192.168.1.3").

<request>(num)

[1]...30   Number of "Ping" ICMP Echo Requests to be sent.
                        Not supported for "HostByName".

4   IPV4 only in case of "HostByName"

6   IPV6 only in case of "HostByName"

<timelimit>(num)

200...[5000]...10000   Amount of time, in milliseconds, to wait for an ICMP Echo Response message
                        related to a previously sent Echo Request message.
                        Parameter is not supported for "HostByName".

<pingInfoType>(num)

Indicate the type and format of the information given in the command responses (see syntax of the AT^SISX write command above).

1   Ping status 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   one row packet statistic calculated from the ping response(s) received for
                        <pingInfoType>=1.

3   one row time statistics calculated from the ping response(s) received for
                        <pingInfoType>=1 (displayed only if at least one Echo response message
                        was received).

<roundTripTime>(num)

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>(num)

Number of sent packets.

<received>(num)

Number of received packets.

`<lost>`(num)

Number of lost packets.

`<lostPercent>`(num)

Lost packets in percent.

`<minRTT>`(num)

Minimum Round Trip Time in milliseconds.

`<maxRTT>`(num)

Maximum Round Trip Time in milliseconds.

`<meanRTT>`(num)

Average Round Trip Time in milliseconds.

`<ntp>`(num)

time in extended format UTC without time zone information ("YYYY-MM-DDThh:mm:ss")

11.15 AT^SISE   Internet Service Error Report

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 or if a service fails the commands AT^SISR, AT^SISW or AT^SIST 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 network problem might be the reason.

Syntax

Test Command

AT^SISE=?

Response(s)

OK

Write Command

AT^SISE=<srvProfileId>[, <infoMode>]

Response(s)

^SISE: <srvProfileId>, <infoID>[, <info>]
OK
ERROR
+CME ERROR: <err>

PIN   ✈   Last

| - | - | - |

Parameter Description

<srvProfileId>(num)

Internet service profile identifier as defined by AT^SISS <srvProfileId>.

0...9

<infoMode>(num)

Information Mode

| 0 | Return current error status in response parameter <infoID> and <info>. |
| 1 | Return oldest unread event in response parameter <infoID> and <info> – used for polling |

<infoID>(num)

Reason for Internet service error. This is a subset of the <urcInfoId>s which can be found in Section 11.16, Internet Service URC.
The value 0 indicates there is no special Internet service error. In this case the application may use AT+CEER to check for general network problems.

<info>(str)

Information text related to <infoID>. This is a subset of the <urcInfoText>s which can be found in Section 11.16, Internet Service URC.

Note

- In particular cases, the AT^SISE command may deliver information and warnings. This applies the following services:
FTP: Information 2100
If an error occurs the information and warning messages are overwritten by error messages.

11.16   Internet Service URC

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 or <urcCause>=5 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, 2, 3 or 4, 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>(num)

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 Standard TCP Listener service (in Non-Transparent Mode) 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.
3	Indicates that an opened Transparent TCP Listener service is receiving a connection request from a remote client. The parameter <urcInfoId> then indicates whether auto answering is active for the service (<urcInfoId>=1) or not. Parameter <urcInfoText> contains the remote IP address and the port of the connecting client. Example: "^SIS: 5,3,0,"192.168.105.17:1712" means that a client from host 192.168.105.17 tries to connect from port 1712 to our listening Transparent TCP Listener with profile 5. Auto answering is disabled.
4	Indicates for a Transparent TCP Listener service, that a remote client which is allowed due to the used address filter (see option "addrfilter" for AT^SISS), was internally rejected, e.g. because the connect timeout has expired (see option "connecttimeout" for AT^SISS). The URC is not generated if the remote

	client is rejected because its IP address is not matching the address filters. If `<urcCause>` equals "4", then `<urcInfoId>` always equals "0". This cause is also used if UE is not in Transparent Mode and a connected client has closed the connection remotely.
5	Only for TCP Listeners, Non-Transparent UDP Endpoint. Indicates that the service is ready.

`<urcInfoId>`(num)

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). Value 1000 notifies that service profile contains invalid parameter(s).
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.
If `<urcCause>` is 3, `<urcInfoId>` is used as auto answer indicator. If the value is 0, auto answering is disabled, if the value is 1, auto answering is enabled.

`<urcInfoText>`(str)

Information text related to `<urcCause>`. See tables below for further detail. The maximum length of an information text is 255 bytes. Any longer messages will be truncated.
If `<urcCause>` is 3, `<urcInfoText>` is used to indicate the IP address and port of the connecting client, e.g. "192.168.105.17:1712".

11.16.1 Information Elements Related to the Service Application

The following table lists the informatiomation 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, Transparent TCP or Transparent UDP, FTP,HTTP).

`<urcInfoId>`	`<urcInfoText>`	Description
Information Elements Returned by the TCP/IP socket		
2	Invalid socket descriptor	Socket error
3	Bad address 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

<urcInfoId>	<urcInfoText>	Description
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 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 <urcInfoText>.
49	Fatal: No memory is available for service action	
50	Fatal: Service has detected an internal error	
51	Application Task ID is not registered	
52	Fatal: Entity not supported	
53	No free Entity available	
54	Index not supported	
55	Service is not writeable	
56	Syntax error in URL	
57	Configuration Error	
58	No more data available	
59	Peek operation rejected	
60	Service don't accept further data	
61	Fatal: Service has no socket connection	
62	Unknown internal TLS error	SSL error
63	Wrong format of certificate data	SSL error
64	Certificate validity period is in future	SSL error
65	Certificate validity period expired	SSL error

<urcInfoId>	<urcInfoText>	Description
66	Peer certificate is not confirmed	SSL error
67	Wrong signature key format	SSL error
68	Unsupported signature key type	SSL error
69	Wrong protocol data format	SSL error
70	Wrong protocol data format	SSL error
71	No memory available for TLS	SSL error
72	Buffer error in TLS	SSL error
73	Wrong input data for RSA operation	SSL error
74	TLS/SSL protocol error	SSL error
75	Internat error in TLS	SSL error
76	Certificate format error	SSL error
77	The certificate does not exist	SSL error
78	Unknown TLS error code!	SSL 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
89	PDP: can not obtain controling task	
90	PDP: internal error 1	
91	PDP: internal error 2	
92	PDP: no authentication req	
93	PDP: internal error 3	
94	PDP: conection failed	
95	PDP: internal error 4	
96	PDP: no IP assigned	
97	PDP: no network	
98	PDP: network is not up	
99	PDP: internal error 5	
119	PDP: no DNS received	
120	DNS: no data	
121	DNS: timeout	
122	DNS: connection refused	
123	DNS: terminated lookup	
124	DNS: domain name is too long	
125	DNS: invalid server	
126	DNS: undefined error	

General Information Elements

`<urcInfoId>`	`<urcInfoText>`	Description
1000	PARA-ERR: <Info>	Notifies that service profile contains a wrong parameter. <Info> text indicates the service profile parameter that contains an error.
6001		General progress information for connection setup.

*) Text varies depending on scenario.

11.16.2 Information Elements Related to FTP Service

`<urcInfoId>`	`<urcInfoText>`	Description
Error URCs		
100	FTP-ERR: <FTP Response Str>	<FTP Response Str> text depends on FTP server implementation
Info URCs		
2100	<info>	<info> text depends on FTP server implementation

11.16.3 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"	

11.16.4 Information Elements Related to MQTT Service

<urcInfoId>	<urcInfoText>	Description
Error URCs		
140	MQTT: publish received cannot be processed	Received publish packet payload over 4k
Info URCs		
500	Connection refused, version rejected	
501	Connection refused, identifier rejected	
502	Connection refused, bad user name or password	
503	Connection refused, not authorized	
504	Connection accepted, MQTT service is unavailable	
505	Connection closed by server	
2500	Connection accepted on clean session	
2501	Connection accepted on retain session	
2505	Disconnected by the client	
2506	Disconnected by the server OR unexpected TCP client disconnection	
2510	Unsubscribed request acknowledged	
2520	Subscribed topic name	Filter topic subscribed with maximum QoS=0
2521	Subscribed topic name	Filter topic subscribed with maximum QoS=1
2522	Subscribed topic name	Filter topic subscribed with maximum QoS=2
3488	Publish received topic name	PUBLISH received with DUP=0 and Retain=0 and Payload
3489	Publish received topic name	PUBLISH received with DUP=0 and Retain=1 and Payload
3490	Publish received topic name	PUBLISH received with DUP=1 and Retain=0 and Payload
3491	Publish received topic name	PUBLISH received with DUP=1 and Retain=1 and Payload
3492	Publish received topic name	PUBLISH received with DUP=0 and Retain=0 and NO payload
3493	Publish received topic name	PUBLISH received with DUP=0 and Retain=1 and NO payload
3494	Publish received topic name	PUBLISH received with DUP=1 and Retain=0 and NO payload
3495	Publish received topic name	PUBLISH received with DUP=1 and Retain=1 and NO payload
3520	Publish topic name	Publish acknowledged
4500	Filter topic subscribe not accepted	

11.17 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.

11.17.1 Selecting URC Mode or Polling Mode

To enable or disable the presentation of URCs for the Internet services use the AT^SCFG command, type "TcpIp/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`	

11.17.2 Configuring an Internet Connection Profile

`AT+COPS?`	Checking network registration.
`+COPS: 0,0,"E-Plus",0`	ME is registered to German provider E-Plus.
`OK`	
`AT+CGATT=1`	Attaching to GPRS network (optional).
`OK`	
`AT+CGDCONT=1,"IP","internet.eplus.de"`	Specifying PDP context 1 with APN for E-Plus.
`OK`	
`AT^SICS=1,"dns1","198.023.097.002"`	Specifiying primary DNS address (optional).
`OK`	
`AT^SICS=1,"dns2","212.023.097.003"`	Specifiying secondary DNS address (optional).
`OK`	
`AT^SICA=1,1`	Activating PDP context 1.
`OK`	
`AT+CGPADDR=1`	Requesting dynamic IP address assigned to local client for context 1.
`+CGPADDR: 1,"10.129.137.217"`	Response returns currently assigned IP address.
`OK`	

11.17.3 Configuring Non-Transparent Listener

Keep in mind that if the host is configured as Non-Transparent Listener another service profile must be left free to be dynamically assigned as Server when the Non-Transparent Listener receives a connection request from a remote client.

Configure the service profile 4 for use as Non-Transparent Listener:

`AT^SISS=4,srvType,"Socket"`	Select service type Socket.
`OK`	
`AT^SISS=4,conId,"1"`	Select connection profile.
`OK`	

`AT^SISS=4,address,"socktcp://lis-`
`tener:65534"`
 	
`OK`
	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.

Open the Listener service and query the IP address dynamically assigned to the Listener:

`AT^SISO=4` `OK`	Open the Listener service.

`AT^SISO?`
`^SISO: 0,""`
`^SISO: 1,""`
	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: 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`	

11.17.4 Configuring TCP Client for Calling a TCP Listener

Configure the client's service profile for calling a TCP Listener on another host:

`AT^SISS=1,srvType,"Socket"` `OK`	Select service type Socket.
`AT^SISS=1,conId,"1"` `OK`	Select connection profile.

`AT^SISS=1,address,"socktcp://`
`10.10.0.187:65534"`
 	
`OK`
	Add the IP address and the TCP port of the remote host (from example in Section 11.17.3, Configuring Non-Transparent Listener.

11.17.5 Transparent TCP Listener: Accepting / Rejecting Incoming Remote Client

Host 1: Configure Transparent TCP Listener with Autoconnect disabled:

`AT^SISS=1,"srvType","Socket"` `OK`	Select service type Socket.
`AT^SISS=1,conId,"1"` `OK`	Select connection profile.

`AT^SISS=1,"address","socktcp://lis-`
`tener:2000;etx=26;autoconnect=0"`
`OK`
`AT^SISS=1,"tcpMR","3"`
`OK`
`AT^SISS=1,"tcpOT","5555"`
`OK`
	"etx" configures Transparent mode. Autoconnect disabled.

Host 1: Open Transparent TCP Listener and query IP address dynamically assigned to Listener:

```
AT^SISO=1
OK
^SIS: 1,5                                         Listener ready, listening (value 5).
AT^SISO=1,1                                       Query status of profile 1.
^SISO:                                            Profile is running in listener mode, where
1,"Socket",4,3,0,0,"10.10.0.187:65534","0.0      <srvState>=4 (listening) and <socketState>=3
.0.0:0"                                           (LISTENER). Dynamic IP address is shown.

OK
```

Host 2: Configure TCP Client:

```
AT^SISS=0,srvType,"Socket"                        Select service type Socket.
OK
AT^SISS=0,conId,"1"                               Select connection profile.
OK
AT^SISS=0,"address","socktcp://                   Set Listener's IP address.
"10.10.0.187:65534"
OK
AT^SISS=0,"tcpMR","3"
OK
AT^SISS=0,"tcpOT","5555"
OK
```

Host 2: Start TCP Client

```
AT^SISO=0
OK
^SISW: 0,1                                         URC indicates that sending data is possible.
```

Host 1: Listener rejects incoming connection request from host 2:

```
^SIS: 1,3,0,"10.66.90.165:46723"                  URC indicates incoming connection request.
AT^SISH=1                                          Listener rejects connection request.
OK
AT^SISO=1,1                                         Query status of profile 1.
1,"Socket",4,3,0,0,"10.10.0.187:65534","0.0       Listener is listening again.
.0.0:0"
OK
```

Host 1: Listener accepts incoming connection request from host 2:

```
^SIS: 1,3,0,"10.66.90.165:46723"                  URC indicates incoming connection request.
AT^SISO=1                                          Listener accepts connection request, profile
                                                   changes to Server mode.
OK
^SISW: 1,1                                          URC indicates that data transmission is possible.
AT^SISO=1,1                                         Query status of profile 1.
1,"Socket",8,4,0,0,"10.10.0.187:65534","10.       Service connected (value 8) and in Server mode /
66.90.165:46723",0                                value 4).
OK
AT^SIST=0                                           Change to transparent access mode.
CONNECT                                            Service enters transparent access mode.
Hello ....                                         For further handling see examples below, e.g. Sec-
                                                   tion 11.17.11, Opening and Closing Transparent
                                                   TCP Service, Section 11.17.12, Transparent TCP
                                                   Client Receives Data While in AT Command Mode
```

11.17.6   Transparent TCP Listener: Autoanswering Incoming Remote Client

Host 1: Configure Transparent TCP Listener with Autoconnect enabled.

`AT^SISS=1,"srvType","Socket"` `OK`	Select service type Socket.
`AT^SISS=1,conId,"1"` `OK`	Select connection profile.

`AT^SISS=1,"address","socktcp://lis-`
`tener:2000;etx=26;autoconnect=1"`
`OK`
`AT^SISS=1,"tcpMR","3"`
`OK`
`AT^SISS=1,"tcpOT","5555"`
`OK`
	"etx" configures Transparent mode. Autoconnect enabled.

Host 1: Open Transparent TCP Listener and query IP address dynamically assigned to Listener:

`AT^SISO=1`
`OK`
`^SIS: 1,5`
	Listener ready, listening (value 5).

`AT^SISO=1,1`	Query status of Listener profile.

`^SISO:`
`1,"Socket",4,3,0,0,"10.10.0.187:2000","0.0.`
`0.0:0"`
`OK`
`^SISW: 1,1`
	Listener ready, listening (value 4). Dynamic IP address is shown.

Host 2: Configure TCP Client.

`AT^SISS=0,srvType,"Socket"` `OK`	Select service type Socket.
`AT^SISS=0,conId,"1"` `OK`	Select connection profile.

`AT^SISS=0,"address","socktcp://`
`10.10.0.187:2000"`
`OK`
`AT^SISS=0,"tcpMR","3"`
`OK`
`AT^SISS=0,"tcpOT","5555"`
`OK`
	Set Listener's IP address.

Host 2: Start TCP Client

`AT^SISO=0`
`OK`
`^SISW: 0,1`	

Host 1: Transparent TCP Listener automatically accepts connection request from host 2:

`^SIS: 1,3,1,"10.66.90.165:46723"`	URC indicates incoming connection request.
`CONNECT`	Service autoconnects to client and enters Transparent Mode.
`Hello ....`	For further handling see examples below, e.g. Section 11.17.11, Opening and Closing Transparent TCP Service, Section 11.17.12, Transparent TCP Client Receives Data While in AT Command Mode Type +++ to return to AT command mode (+++ not visible in example).
`OK`	
`AT^SISO=1,1`	Query status of profile 1.

`^SISO:`
`1,"Socket",8,4,0,0,"10.10.0.187:2000","10.6`
`6.90.165:46723",0`
`OK`
	Transparent TCP Listener connected to client (value 8) and in Server mode (value 4).

11.17.7 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 `<eodFlag>`.
	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 transfered 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.

11.17.8 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 `<eodFlag>` 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`	

11.17.9 UDP Scenario

The following example shows a communication between a UDP endpoint (host 1) and a UDP client (host 2).
Part 1 of the example refers to the UDP endpoint and shows the configuration which allows the UDP endpoint to communicate with any UDP client.
Part 2 shows the settings of a UDP client.
Part 3 and 4 are running in parallel: Part 3 shows the procedures on the UDP endpoint side done when communicating with a UDP client. Part 4 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=1,srvtype,socket`	Select service type Socket.
`OK`	
`AT^SISS=1,conid,1`	Select connection profile 1.
`OK`	
`AT^SISS=1,alphabet,1`	Choose ASCII alphabet.
`OK`	
`AT^SISS=1,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`
`OK`
`^SIS: 0,5`
	Open the service.
	
	URC indicates that host 1 is waiting (on UDP port 6666).

`AT^SISO=0,1`
`^SISO:`
`0,"Socket",4,3,0,0,"10.10.0.219:6666","0.0.`
`0.0:0"`
`OK`
	Request connection status.

`^SISR: 0,1`	URC indicates that host 2 has opened the connection to host 1 and has sent some data.
`AT^SISR=0,100` `OK`	Host 1 requests to read 100 bytes.

`^SISR: 0,22,"10.10.0.222:6561"`
`Hello, I'm the client!`
 	
`OK`
	Host 1 is reading the text string received from host 2 (see part 4 of the example) and gets information about the remote client, i.e. the address of host 2.

`AT^SISW=0,25,0,"10.10.0.222:6561"` `^SISW: 0,25,0`	Host 1 starts sending 25 bytes to host 2. Host 1 is sending the message "Hi, I'm the UDP end-point!" (25 bytes) to host 2. As a result, host 2 is receiving the URC "^SISR: 1,1" shown below in part 4 of the example.

`OK`
`^SISW: 0,1`
`AT^SISC=0`
`OK`
	URC confirms that host 1 can send data again.
	Close the service.

Part 4 - host 2 opens the service and communicates with host 1:

`AT^SISO=1`
`OK`
`^SISW: 1,1`
	Open the service.
	
	URC indicates that host 2 can send data.

`AT^SISO=1,1`
`^SISO:`
`1,"Socket",4,2,0,0,"10.10.0.222:6561","10.1`
`0.0.219:6666"`
`OK`
	Request connection status.

`AT^SISW=1,22` `^SISW: 1,22,0`	Host 2 starts to write 22 bytes. Host 2 is writing the message "Hello, I'm the client!" (22 bytes). As a result, host 1 is receiving the URC "^SISR: 0,1" shown above in part 3 of this example.

`OK`
`^SISW: 1,1`
`^SISR: 1,1`
	URC confirms that host 2 could send data.
	URC indicates that host 2 has received data from host 1.

`AT^SISR=1,100`
`^SISR: 1,25`
`Hi, I'm the UDP endpoint!`
`OK`
	Host 2 requests to read 100 bytes.
	Response indicates that host 2 has received 25 characters from host 1.

`AT^SISC=1` `OK`	Close the service.

11.17.10   Creating Transparent TCP Socket Client

`AT^SISS=1,srvType,"Socket"` `OK`	Select service type "Socket".
`AT^SISS=1,conId,1` `OK`	Select connection profile 1.

`AT^SISS=1,address,"socktcp://`
`10.10.0.110:9996;etx;timer=200"`
`OK`
	Specify server address. Add "etx" parameter to set Transparent mode.

11.17.11   Opening and Closing Transparent TCP Service

`AT^SISO=1` `OK`	Open Transparent TCP service.
`^SISW: 1,1`	URC indicates that Transparent TCP service is ready.
`at^sist=1`	Open transparent access mode.
`CONNECT`	Service is ready to send or receive data.
	Client is sending data, e.g Good Morning (not visible in example).
	Client types +++ to return to AT command mode (+++ not visible in example).
`OK`	
`at^sisi=1`	Check the service state of service profile 1.
`^SISI: 1,4,0,16,16,0`	Service is in state "Up" (4). 0 bytes received, 16 bytes sent and acknowledged.
`OK`	
`AT^SISO?`	Check the service state of service profile 1.
`^SISO: 0,""`	

`^SISO:`
`1,"Socket",4,2,0,16,"10.10.0.200:1024","10.`
`10.0.108:65532"`
	Service is in state "Up" (4). Socket is assigned. 0 bytes received, 16 bytes sent. Local and remote IP address are assigned.

`^SISO: 2,""`	
`^SISO: 3,""`	
`^SISO: 4,""`	
`^SISO: 5,""`	
`^SISO: 6,""`	
`^SISO: 7,""`	
`^SISO: 8,""`	
`^SISO: 9,""`	
`OK`	
`AT^SISC=1` `OK`	Close the service.
`at^sisi=1`	Check the service state of service profile 1.
`^SISI: 1,2,0,0,0,0`	Service profile 1 is in state "Allocated" (2).
`OK`	
`AT^SISO?`	Check the service state of service profile 1.
`^SISO: 0,""`	
`^SISO:` `1,"Socket",2,1,0,0,"0.0.0.0:0","0.0.0.0:0"`	Service is in state "Allocated" (2). Socket not assigned.
`^SISO: 2,""`	
`^SISO: 3,""`	
`^SISO: 4,""`	
`^SISO: 5,""`	
`^SISO: 6,""`	

```
^SISO: 7,""
^SISO: 8,""
^SISO: 9,""
OK
```

11.17.12 Transparent TCP Client Receives Data While in AT Command Mode

`AT^SISO=1`	Open Transparent TCP service.
`OK`	
`^SISW: 1,1`	URC indicates that Transparent TCP service is ready.
`at^sist=1`	Open transparent access mode.
`CONNECT`	Service is ready to send or receive data.
`Hello`	Client is reading received data.
	Client types **+++** to return to AT command mode (+++ not visible in example).
`OK`	
`^SISR: 1,1`	URC indicates that new data is available for the client.
`at^sist=1`	Return to transparent access mode.
`CONNECT`	Service is ready to send or receive data.
`Goodbye`	Client is reading received data.
	Client types **+++** to return to AT command mode (not visible in example).
`OK`	
`at^sisi=1`	Check the service state of service profile 1.
`^SISI: 1,4,12,6,6,0`	Service is in state "Up" (4). 12 bytes received, 6 bytes sent and acknowledged.
`OK`	
`AT^SISO?`	Check the service state of service profile 1.
`^SISO: 0,""`	
`^SISO: 1,"Socket",4,2,12,6,"10.10.0.200:1025","10.10.0.108:65532"`	Service is in state "Up" (4). Socket is assigned. 12 bytes received, 6 bytes sent. Local and remote IP address are assigned.
`^SISO: 2,""`	
`^SISO: 3,""`	
`^SISO: 4,""`	
`^SISO: 5,""`	
`^SISO: 6,""`	
`^SISO: 7,""`	
`^SISO: 8,""`	
`^SISO: 9,""`	
`OK`	
`AT^SISC=1`	Close the service.
`OK`	
`at^sisi=1`	Check the service state of service profile 1.
`^SISI: 1,2,0,0,0,0`	Service profile 1 is in state "Allocated" (2).
`OK`	
`AT^SISO?`	Check the service state of service profile 1.
`^SISO: 0,""`	
`^SISO: 1,"Socket",2,1,0,0,"0.0.0.0:0","0.0.0.0:0"`	Service is in state "Allocated" (2). Socket not assigned.
`^SISO: 2,""`	
`^SISO: 3,""`	

```
^SISO: 4,""
^SISO: 5,""
^SISO: 6,""
^SISO: 7,""
^SISO: 8,""
^SISO: 9,""
OK
```

11.17.13 Remote Server Disconnects While Transparent TCP Service is in Transparent Access Mode

`AT^SISO=1`	Open Transparent TCP service.
`OK`	
`^SISW: 1,1`	URC indicates that Transparent TCP service is ready.
`at^sist=1`	Open transparent access mode.
`CONNECT`	Service is ready to send or receive data.
`Good Morning`	Remote server has sent data and disconnected. Client reads data. Then client gets NO CARRIER in AT command mode.
`NO CARRIER`	
`at^sisi=1`	Check the service state of service profile 1.
`^SISI: 1,6,12,0,0,0`	Service is in state "Down" (6). 12 bytes received.
`OK`	
`AT^SISO?`	Check the service state of service profile 1.
`^SISO: 0,""`	

`^SISO:`
`1,"Socket",6,2,12,0,"10.10.0.200:1026","10.`
`10.0.108:65532"`
	Service is in state "Down" (6). Socket is assigned. 6 bytes received. 12 bytes sent. Local and remote IP address are assigned.

`^SISO: 2,""`	
`^SISO: 3,""`	
`^SISO: 4,""`	
`^SISO: 5,""`	
`^SISO: 6,""`	
`^SISO: 7,""`	
`^SISO: 8,""`	
`^SISO: 9,""`	
`OK`	
`AT^SISC=1`	Close the service.
`OK`	
`at^sisi=1`	Check the service state of service profile 1.
`^SISI: 1,2,0,0,0,0`	Service profile 1 is in state "Allocated" (2).
`OK`	

11.17.14 Server Disconnects While Transparent TCP Service is in AT Command Mode and Data is Pending

`AT^SISO=1`	Open Transparent TCP service.
`OK`	
`^SISW: 1,1`	URC indicates that Transparent TCP service is ready.
`at^sist=1`	Open transparent access mode.
`CONNECT`	Service is ready to send or receive data.
`Good Morning`	Client is reading data.

	Client types +++ to return to AT command mode (not visible in example).
`OK`	
`^SISR: 1,1`	Remote server has sent data and closed the connection (not visualized in this example). URC indicates that remaining data is available for reading.
`at^sisi=1`	Check service state of service profile 1.
`OK`	
`^SISI: 1,4,12,3,3,0`	Service profile 1 is in state "Up" (4). 12 bytes received. 3 bytes sent and acknowledged.
`OK`	
`AT^SISO?`	Check the service state of service profile 1.
`^SISO: 0,""`	

`^SISO:`
`1,"Socket",4,2,12,3,"10.10.0.200:1027","10.`
`10.0.108:65532"`
	Service is in state "Up" (4). Socket is assigned. 12 bytes received. 3 bytes sent. Local and remote IP address are assigned.

`^SISO: 2,""`	
`^SISO: 3,""`	
`^SISO: 4,""`	
`^SISO: 5,""`	
`^SISO: 6,""`	
`^SISO: 7,""`	
`^SISO: 8,""`	
`^SISO: 9,""`	
`OK`	
`at^sist=1`	Return to transparent access mode.
`CONNECT`	Service is ready to send or receive data.
`Good bye`	Client reads remaining data. Then client gets NO CARRIER in AT command mode.
`NO CARRIER`	
`at^sisi?`	Check service state of service profile 1.
`^SISI: 1,6,20,3,3,0`	Service is in service "Down" state (6). 20 bytes received. 3 bytes sent and acknowledged.
`OK`	
`AT^SISO?`	Check the service state of service profile 1.
`^SISO: 0,""`	

`^SISO:`
`1,"Socket,20,3,"10.10.0.200:1027","10.10.0.`
`108:65532"`
	Service is in state "Down" (6). Socket is assigned. 20 bytes received. 3 bytes sent. Local and remote IP address are assigned.

`^SISO: 2,""`	
`^SISO: 3,""`	
`^SISO: 4,""`	
`^SISO: 5,""`	
`^SISO: 6,""`	
`^SISO: 7,""`	
`^SISO: 8,""`	
`^SISO: 9,""`	
`OK`	
`AT^SISC=1`	Close the service.
`OK`	
`at^sisi=1`	Check service state of service profile 1.
`^SISI: 1,2,0,0,0,0`	Service profile 1 is in state "Allocated" (2).
`OK`	
`AT^SISO?`	Check the service state of service profile 1.
`^SISO: 0,""`	
`^SISO:` `1,"Socket",2,1,0,0,"0.0.0.0:0","0.0.0.0:0"`	Service is in state "Allocated" (2). Socket is not assigned. Local and remote IP address not assigned.
`^SISO: 2,""`	

```
^SISO: 3,""
^SISO: 4,""
^SISO: 5,""
^SISO: 6,""
^SISO: 7,""
^SISO: 8,""
^SISO: 9,""
OK
```

11.17.15   FTP Download to FFS (URC Mode)

Configure the service profile 1 for FTP:

`AT^SISS=1,srvType,"Ftp"`	Select service type FTP.
`OK`	
`AT^SISS=1,conId,"1"`	Select connection profile 1.
`OK`	
`AT^SISS=1,address,"ftp://ftp.heise.de/pub"`	Specify FTP address.
`OK`	
`AT^SISS=1,cmd,"fget"`	Select command type download.
`OK`	
`AT^SISS=1,user,"anonymous"`	
`OK`	
`AT^SISS=1,passwd,"tester@google.com"`	
`OK`	
`AT^SISS=1,path,"file:///a:/data/"`	Specify target path on local FFS.
`OK`	
`AT^SISS=1,files,"INDEX"`	Specify file to be downloaded.
`OK`	

Make an FTP connection:

`AT^SISO=1`	Open the service.
`OK`	Bearer is established, service is getting started.
`^SIS: 1,0,2100,"Ftp open(ftp.heise.de:21)"`	"^SIS" URC with <urcInfoId> 2100 (FTP) indicates download status.
`^SIS: 1,0,2100,"220 Hallo auf ftp.heise.de."`	
`^SIS: 1,0,2100,"FTP Login OK"`	
`^SIS: 1,0,2100,"fget INDEX"`	
`^SIS: 1,0,2100,"FGET : INDEX 225 bytes"`	
`^SISR: 1,2`	Download complete.
`AT^SISO?`	Request service state.

`^SISO:`
`1,"Ftp",4,1,225,0,"37.80.21.126:4113","193.`
`99.144.79:21"`	

`AT^SISC=1`	Close the service.
`OK`	
`AT^SISO?`	Request service state.
`^SISO:`	Service is closed and reset.
`1,"Ftp",2,1,0,0,"0.0.0.0:0","0.0.0.0:0"`	

11.17.16   FTP Upload Single File (URC Mode)

Configure the service profile 2 for FTP:

`AT^SISS=2,"srvType","Ftp"` `OK`	Select service type FTP.
`AT^SISS=2,conId,"1"` `OK`	Select connection profile 1.

`AT^SISS=2,"address","ftp://`
`myname:mypasswd@testnetwork/upload"`
`OK`
	Specify FTP address with individual user name and password.

`AT^SISS=2,"cmd","put"` `OK`	Select command type upload for single file.
`AT^SISS=2,"files","newdata.txt"` `OK`	File "newdata.txt" shall be put on FFTP server.

Make an FTP connection:

`AT^SISO=2`
`OK`
`^SIS: 2,0,2100,"Ftp open(testnetwork:21)"`
	Open the service.
	Bearer is established, service is getting started.
	"`^SIS`" URC with `<urcInfoId>` 2100 (FTP) status information from FTP server.

`^SIS: 2,0,2100,"220 FTP server (Version 6.4/OpenBSD/Linux-ftpd-0.17) ready."`	
`^SIS: 2,0,2100,"FTP Login OK"`	
`^SIS: 2,0,2100,"put newdata.txt"`	
`^SISW: 2,1`	URC indicates that FTP service is ready for upload.
`AT^SISW=2,40`	Client requests to send 40 bytes.
`^SISW: 2,40,0`	The write command response confirms that 40 bytes must be transferred now.
`01234567890123456789012345678901234567890` `OK`	User data is transferred.
`^SISW: 2,1`	URC indicates that the FTP service is ready to transfer more data.
`AT^SISW=2,40`	Client requests to send 40 bytes.
`^SISW: 2,40,0`	The write command response confirms that 40 bytes must be transferred now.
`01234567890123456789012345678901234567890` `OK`	User data is transferred.
`^SISW: 2,1`	URC indicates that the FTP service is ready to transfer more data.
`AT^SISW=2,0,1` `^SISW: 2,0,0`	No more data available. `<eodFlag>` set. File "newdata.txt" shall be closed on FTP server.
`OK` `^SIS: 2,0,2100,"226 Transfer complete."`	
`^SISW: 2,2`	URC indicates that data transfer finished successfully. Connection to the FTP server closes.
`AT^SISC=2` `OK`	Close the FTP service.

11.17.17   HTTP Download Using TLS

Configure the service profile 4 for HTTPS:

`AT^SISS=4,srvType,"Http"` `OK`	Select service type HTTP.
`AT^SISS=4,conId,"1"` `OK`	Select connection profile 1.
`AT^SISS=4,address,"https://www.face-` `book.com"`	Specify access to Facebook website (always secured).

```
OK
AT^SISS=4,cmd,"get"                            Select command type download.
OK
```

Opening connection:

```
AT^SISO=4                                      Open the service.
OK
^SISS: 4,0,2200,"Http www.facebook.com:443"

^SISR: 4,1                                     URC indicates that the HTTP service is ready to read
                                               data.
AT^SISR=4,1000                                 Read 1000 bytes.
^SISR: 4,1000
<?xml version="1.0" encoding="utf-8"?> <!DOCTYPE html PUBLIC "-//WAPFORUM//DTD XHTML
Mobile 1.0//EN" "http://www.wapforum.org

OK
AT^SISR=4,1000                                 Repeat reading data n times.
^SISR: 4,1000
....
^SISR: 4,2                                     URC indicates that data transfer finished success-
                                               fully. Connection to the HTTP server closes.
AT^SISC=4                                      Close the HTTP service.
OK
```

11.17.18 HTTP Post

Configure the service profile 6 for HTTP:

```
AT^SISS=6,srvType,"Http"                       Select service type HTTP.
OK
AT^SISS=6,conId,"1"                            Select connection profile 1.
OK
AT^SISS=6,"address","http://testnetwork/       Specify URL.
cgi/first.pl"
OK
AT^SISS=6,"user","myuser"                      Specify user name.
OK
AT^SISS=6,"passwd","mypasswd"                  Specify password.
OK
AT^SISS=6,cmd,"post"                           Select command type download.
OK
AT^SISS=6,"hcContent"," "                      Parameter is ignored.
OK
AT^SISS=6,"hcContLen","60"                     "hcContlen" specifies to send 60 bytes. Data will be
                                               sent from AT command interface.
OK
```

Opening connection:

```
AT^SISO=6                                      Open the service.
OK
^SIS: 6,0,2200,"Http pegasus.testnetz.sw5:80"

^SIS: 6,0,2200,"POST Bytes: 60"
```

```
^SISW: 6,1                              URC indicates that the HTTP service is ready to
                                        send data.
AT^SISW=6,30                            Send 30 bytes.
^SISW: 6,30,0
OK
^SISW: 6,1                              URC indicates that the HTTP service is ready to
                                        send data.
AT^SISW=6,30                            Send 30 bytes.
^SISW: 6,30,0
OK
^SISW: 6,1                              URC indicates that the HTTP service is ready to
                                        send data.
^SISW: 6,2                              URC confirms: all data sent to server.
^SIS: 6,0,2200,"HTTP POST: http://testnetwork/cgi/first.pl"


^SIS: 6,0,2200,"HTTP POST Response: 200"
AT^SISC=6                               Close the HTTP service.
OK
```

11.17.19 Ping

This example shows a Ping output. The example uses the Internet connection profile shown in Section 11.17.2.

```
AT^SISX=Ping,1,"74.125.39.99",5,5000
^SISX: "Ping",1,1,"74.125.39.99",1696
^SISX: "Ping",1,1,"74.125.39.99",175
^SISX: "Ping",1,1,"74.125.39.99",174
^SISX: "Ping",1,1,"74.125.39.99",174
^SISX: "Ping",1,1,"74.125.39.99",2111
^SISX: "Ping",2,1,5,5,0,0
^SISX: "Ping",3,1,174,2111,865
OK
```

11.17.20 Resolving DNS Host Name to IP Address

This example uses the Internet connection profile shown in Section 11.17.2.

```
AT^SISX=HostByName,1,"www.google.de"
^SISX: "HostByName","74.125.39.99"
OK
```

11.17.21 Configuring MQTT Client

This example configures the service profile 1 for use as MQTT client.

```
AT^SICA=0,1                             Activate Context 0
OK
AT^SISS=1,srvType,"Mqtt"               Select Service Type
OK
AT^SISS=1,conId,"1"                    Select connection profile
OK
AT^SISS=1,address,"mqtt://bro-          Add the IP address and Port of the MQTT broker
ker.hivemq.com:1883;connackTimeout=30"
OK
```

`AT^SISS=1,clientId,"004401083574984"`	Set Client ID (e.g. IMEI)
`OK`	
`AT^SISS=1,cleanSession,"1"`	Broker does not any subscription information or undelivered messages for the client
`OK`	
`AT^SISS=1,ipVer,"4"`	Select IP Version
`OK`	
`AT^SISS=1,cmd,"unsubscribe"`	Select MQTT command
`OK`	
`AT^SISS=1,TopicFilter,"MQTTDemoListener"`	Select Topic Filter
`OK`	
`AT^SICA=1,1`	Activate Context 1
`OK`	
`AT^SISO=1,2`	Open Service Profile 1 with use of dynamic setup defined by AT^SISD
`OK`	
`^SIS: 1,0,8800,"Mqtt connect 18.196.16.204:1883"`	Connected to MQTT Broker
`^SIS: 1,0,2500,"Connection accepted on clean session."`	Connection accepted on clean session
`^SIS: 1,0,2510,"MQTTDemoListener"`	Unsubscribed request acknowledged

11.17.22   MQTT Client: Publish and Subscribe

This example uses the Internet connection profile shown in Section 11.17.21.

Subscribe for TopicFilter "MQTTDemoListener":

`AT^SISD=1,"cleanParam"`	Broker does not any subscription information or undelivered messages for the client.
`OK`	
`AT^SISU=1,"subscribe","MQTTDemoListener;2"`	Subscribe for TopicFilter=MQTTDemoListener with QoS=2
`OK`	
`^SIS: 1,0,2522,"MQTTDemoListener"`	Filter topic subscribed with maximum QoS=2
`OK`	

Publish - Send Data for Topic "MQTTDemo":

`AT^SISU=1,"publish","2;MQTTDemo;1;0;14"`	Publish with QoS=2, Topic=MQTTDemo, Retain=1, hcContent=0, hcContLen=14 (Data will be sent by AT^SISW)
`OK`	
`^SISW: 1,1`	Service is ready to accept new user data
`at^sisw=1,14`	Sent 14 Bytes to Broker
`^SISW: 1,14,0`	Ready to write data
`Hello World! 1`	Write data
`OK`	
`^SIS: 1,0,3520,"MQTTDemo"`	Publish acknowledged
`^SISW: 1,2`	Data transfer has been finished successfully
`AT^SISU=1,"publish","2;MQTTDemo;1;0;14"`	Publish with QoS=2, Topic=MQTTDemo, Retain=1, hcContent=0, hcContLen=14 (Data will be sent by AT^SISW)
`OK`	
`^SISW: 1,1`	Service is ready to accept new user data
`AT^SISW=1,14`	Sent 14 Bytes to Broker
`^SISW: 1,14,0`	Ready to write data

`Hello World! 2`	Write data
`OK`	
`^SIS: 1,0,3520,"MQTTDemo"`	Publish acknowledged
`^SISW: 1,2`	Data transfer has been finished successfully

Receive Data for subscribed TopicFilter "MQTTDemoListener":

`^SIS: 1,0,3488,"topic=MQTTDemoListener;` `bytes=17"`	Publish received from Broker
`^SISR: 1,1`	Data available and can be read by AT^SISR
`AT^SISR=1,1500`	Request to read 1500 Bytes
`^SISR: 1,17`	17 Bytes are available
`That's all folks!`	Data received from Broker
`OK`	
`^SISR: 1,2`	All data read

12. Packet Domain Related Commands

The AT commands described in this chapter allow the Customer Application to control packet switched services in GSM/UMTS/LTE networks.

12.1 AT+CEMODE   Modes of Operation for EPS

AT+CEMODE indicates the mode of operation for EPS (Evolved Packet System), see 3GPP TS 24.301 [45].
AT+CEMODE read command returns the mode of operation set by the TE, independent of the current serving cell capability and independent of the current serving cell Access Technology.
AT+CEMODE test command is used for requesting information on the supported mode of operation.
AT+CEMODE write command is used to set the MT to operate according to the specified mode of operation for EPS, see 3GPP TS 24.301 [45]. If the requested mode of operation is not supported, an ERROR or +CME ERROR response is returned.

Syntax

Test Command
AT+CEMODE=?
Response(s)
+CEMODE: (list of supported <mode>s)
OK
ERROR
+CME ERROR: <err>

Read Command
AT+CEMODE?
Response(s)
+CEMODE: <mode>
OK
ERROR
+CME ERROR: <err>

Write Command
AT+CEMODE=<mode>
Response(s)
OK
ERROR
+CME ERROR: <err>

PIN ✈ Last	Reference(s)
+ - -	3GPP TS 27.007 [49]

Parameter Description

<mode>(num)(NV)

Indicates the mode of operation.

0	PS mode 2 of operation
2(D)	CS/PS mode 2 of operation

Note

• The setting in write command will take effect after restarting the MT.

12.2   AT+CGDCONT   Define PDP Context

AT+CGDCONT 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 AT+CGDCONT test command. A special form of the write command (AT+CGDCONT=<cid>) causes the values for context <cid> to become undefined. If context 1 is undefined on startup, it will be recreated automatically with <PDP_type> "IPV4V6" and all other parameters set to their defaults.
It is not allowed to undefine an already activated context.
The AT+CGDCONT read command returns the current settings for each defined PDP context.

The default settings of AT+CGDCONT depend on the loaded network provider profile. For details see AT^SCFG "MEopMode/Prov/Cfg" parameter <provCfg> and AT^SCFG "MEopMode/Prov/AutoSelect" parameter <prov-AutoSelect>.

Syntax

Test Command

AT+CGDCONT=?

Response(s)

+CGDCONT: (range of supported <cid>s), "IP", , , (list of supported <d_comp>s), (list of supported <h_comp>s), (list of supported <IPv4AddrAlloc>s), (list of supported <emergency_indication>s), (list of supported <P-CSCF_discovery>s), (list of supported <IM_CN_Signalling_Flag_Ind>s), (list of supported <NSLPI>s), (list of supported <securePCO>s), (list of supported <IPv4_MTU_discovery>s), (list of supported <Local_Addr_Ind>s)
+CGDCONT: (range of supported <cid>s), "IPV6", , , (list of supported <d_comp>s), (list of supported <h_comp>s), (list of supported <IPv4AddrAlloc>s), (list of supported <emergency_indication>s), (list of supported <P-CSCF_discovery>s), (list of supported <IM_CN_Signalling_Flag_Ind>s), (list of supported <NSLPI>s), (list of supported <securePCO>s), (list of supported <IPv4_MTU_discovery>s), (list of supported <Local_Addr_Ind>s)
+CGDCONT: (range of supported <cid>s), "IPV4V6", , , (list of supported <d_comp>s), (list of supported <h_comp>s), (list of supported <IPv4AddrAlloc>s), (list of supported <emergency_indication>s), (list of supported <P-CSCF_discovery>s), (list of supported <IM_CN_Signalling_Flag_Ind>s), (list of supported <NSLPI>s), (list of supported <securePCO>s), (list of supported <IPv4_MTU_discovery>s), (list of supported <Local_Addr_Ind>s)
+CGDCONT: (range of supported <cid>s), "Non-IP", , , (list of supported <d_comp>s), (list of supported <h_comp>s), (list of supported <IPv4AddrAlloc>s), (list of supported <emergency_indication>s), (list of supported <P-CSCF_discovery>s), (list of supported <IM_CN_Signalling_Flag_Ind>s), (list of supported <NSLPI>s), (list of supported <securePCO>s), (list of supported <IPv4_MTU_discovery>s), (list of supported <Local_Addr_Ind>s)
OK
ERROR
+CME ERROR: <err>

Read Command

AT+CGDCONT?

Response(s)

[+CGDCONT: <cid>, <PDP_type>, <APN>, <PDP_addr>, <d_comp>, <h_comp>[, <IPv4AddrAlloc>[, <emergency_indication>[, <P-CSCF_discovery>[, <IM_CN_Signalling_Flag_Ind>[, <NSLPI>[, <securePCO>[, <IPv4_MTU_discovery>[, <Local_Addr_Ind>]]]]]]]]
[+CGDCONT: <cid>, <PDP_type>, <APN>, <PDP_addr>, <d_comp>, <h_comp>[, <IPv4AddrAlloc>[, <emergency_indication>[, <P-CSCF_discovery>[, <IM_CN_Signalling_Flag_Ind>[, <NSLPI>[, <securePCO>[, <IPv4_MTU_discovery>[, <Local_Addr_Ind>]]]]]]]]
[+CGDCONT: ...]
OK
ERROR
+CME ERROR: <err>

Write Command

AT+CGDCONT=<cid>[, <PDP_type>[, <APN>[, <PDP_addr>[, <d_comp>[, <h_comp>[, <IPv4AddrAlloc>[, <emergency_indication>[, <P-CSCF_discovery>[, <IM_CN_Signalling_Flag_Ind>[, <NSLPI>[, <securePCO>[, <IPv4_MTU_discovery>[, <Local_Addr_Ind>]]]]]]]]]]]]]

Response(s)

OK
ERROR
+CME ERROR: <err>

PIN	✈	Last		Reference(s)
-	+	-		3GPP TS 27.007, 3GPP TS 23.003, 3GPP TS 24.301, 3GPP TS 25.323, 3GPP TS 44.065

Parameter Description

<cid>(num)(NV)

PDP Context Identifier

Parameter specifies a particular PDP context definition. This parameter is used in other PDP context-related commands.

1...16

<PDP_type>(str)(NV)

Packet Data Protocol type

Specifies the type of the packet data protocol.

"IP"	Internet Protocol (IETF STD 5)
"IPV6"	Internet Protocol, version 6 (see RFC 2460)
"IPV4V6"	Virtual <PDP_type> introduced to handle dual IP stack UE capability. (See 3GPP TS 24.301 [45]).
"Non-IP"	Transfer of Non-IP data to external packet data network (See 3GPP TS 24.301 [45]).

<APN>(str)(NV)

Access Point Name

Logical name used to select the GGSN or the external packet data network. Maximum length: 100 characters. An Access Point Name has to follow the syntax rules specified in 3GPP TS 23.003 in section 9.1. If the value is null or omitted, then the subscription value will be requested.

<PDP_addr>(str)(NV)

Packet Data Protocol address

Identifies the MT in the address space applicable to PDP (e.g. IPv4 address for PDP type IP). If the value is null or omitted, then a value may be provided by the TE during the PDP startup procedure or, failing that, a dynamic address will be requested. The read command will continue to return the null string even if an address has been allocated during the PDP startup procedure. A string consisting of the values 0.0.0.0 for IPV4 or 0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0 for IPV6 has the same meaning as a null string. The allocated address may be read using AT+CGPADDR.

<d_comp>(num)(NV)

Data Compression

Controls the PDP data compression (applicable for Subnetwork Dependent Convergence Protocol (SNDCP) only); see 3GPP TS 44.065 and GPP TS 23.003 for details.

[0]	off
1	on
2	V.42bis

<h_comp>(num)(NV)

Header Compression

Controls the PDP header compression; see 3GPP TS 44.065 and 3GPP TS 25.323 for details.

[0]	off
1	on
2	RFC1144
3	RFC2507
4	RFC3095

<IPv4AddrAlloc>(num)(NV)

Numeric parameter that controls how the MT/TA requests to get the IPv4 address information.

[0]	IPv4 Address Allocation through NAS Signalling

<emergency_indication>(num)(NV)

Numeric parameter used to indicate whether the PDP context is for emergency bearer services or not.

[0]	PDP context is not for emergency bearer services
1	PDP context is for emergency bearer services

<P-CSCF_discovery>(num)(NV)

Numeric parameter influences how the MT/TA requests to get the P-CSCF address, see 3GPP TS 24.229 [89] annex B and annex L.

[0]	Preference of P-CSCF address discovery not influenced by +CGDCONT
1	Preference of P-CSCF address discovery through NAS Signalling
2	Preference of P-CSCF address discovery through DHCP

<IM_CN_Signalling_Flag_Ind>(num)(NV)

Numeric parameter used to indicate to the network whether the PDP context is for IM CN subsystem-related signalling only or not.

[0]	UE indicates that the PDP context is not for IM CN subsystem-related signaling only
1	UE indicates that the PDP context is for IM CN subsystem-related signaling only

<NSLPI>(num)

Numeric parameter used to indicate the NAS signalling priority requested for this PDP context.

0	Indicates that this PDP context is to be activated with the value for the low priority indicator configured in the MT.
1	Indicates that this PDP context is is to be activated with the value for the low priority indicator set to "MS is not configured for NAS signalling low priority".

<securePCO>(num)

Specifies if security protected transmission of PCO is requested or not (applicable for EPS only, see 3GPP TS 23.401, subclause 6.5.1.2).

0	Security protected transmission of PCO is not requested.
1	Security protected transmission of PCO is requested.

<IPv4_MTU_discovery>(num)

Influences how the MT/TA requests to get the IPv4 MTU size, see 3GPP TS 24.008 [43] subclause 10.5.6.3.

0	Preference of IPv4 MTU size discovery not influenced by AT+CGDCONT.
1	Preference of IPv4 MTU size discovery through NAS signalling.

<Local_Addr_Ind>(num)

Indicates to the network whether or not the MS supports local IP address in TFTs, see 3GPP TS 24.301 [45] and 3GPP TS 24.008 [43] subclause 10.5.6.3.

0	Indicates that the MS does not support local IP address in TFTs.
1	Indicates that the MS supports local IP address in TFTs.

Notes

- EXS82-W doesn't support to define same APN and same IP type on different PDP context.
- EXS82-W supports Non-IP Data Delivery (NIDD) only for NB-IoT.
- EXS82-W is requesting always "non-IP MTU request".

12.2.1   Attaching to LTE Networks

The following considerations are only valid if the UE is not configured for Verizon Wireless Network (see AT^SCFG subcommand "MEopMode/Prov/Cfg parameter <provCfg>):

To allow access to the PS domain, the UE has to perform the attach and context activation procedure. For context activation, the access point name (APN) specifies the packet data network to which the context will be established.

In contrast to where attach and context activation are performed separately, the LTE attach procedure always includes the automatic activation of one context, either using the default bearer or, usually, the APN specified for <cid> 1. This means, you have two methods to trigger an LTE attach:
- auto attach procedure if AT^SCFG subcommand "GPRS/AutoAttach" is set to "enabled"
- manual attach procedure by using AT+CGATT.
Please consider that one of the two methods shall be employed, otherwise the UE never attaches to LTE. A successful LTE attach is prerequisite for activating a WWAN connection in an LTE network (see with AT^SWWAN command).

As long as the UE is attached and registered to LTE any attempt to deactivate the first PDP context (via AT+CGACT=0,1) will be denied with "+CME ERROR: operation not allowed". The detach command AT+CGATT=0

is accepted but will cause the UE to deregister from LTE.

When PS Domain auto attach is enabled and the UE automatically tries to attach to LTE after the SIM PIN1 is unlocked, the application shall ensure that the correct APN is specified *before* the UE attaches to LTE.

LTE attach with no APN
If no APN is specified for `<cid>` 1 when the UE attaches to LTE, the network will automatically select the so called default APN, specified in the HSS, to establish the initial context (PDN connection/default bearer). Although the LTE attach procedure will be successful in that case, the context for the default APN might be configured with restrictions concerning the transmission of data, depending on the operator settings.

LTE attach with wrong APN
If a wrong APN is configured for `<cid>` 1 during the LTE attach procedure, e.g. if an application allows the user to change SIM cards and the APN was not set correctly after the SIM change, the LTE attach will be rejected by the network. As result, the RAT type LTE will be disabled by the UE for a limited amount of time and the UE will only use for PS access. The duration while RAT type LTE is disabled depends on network configuration (timer T3402, default 12 minutes).

Recommendations for LTE attach
When using LTE auto attach, the application shall ensure that the correct APN is specified for `<cid>` 1 *before* the UE attaches to LTE. To do so, use the command `AT+CGDCONT`=1,`<PDP_type>`,`<APN>`.
If the application cannot ensure that the correct APN is configured for `<cid>` 1 *before* the UE attempts to attach to LTE, the application shall employ one of the following command sequences:

- `AT+COPS`=2 to deregister from the network, `AT+CGDCONT` to set the APN, then `AT+COPS`=0 to force a new network registration, thus enabling a new LTE auto attach attempt. If running, the T3402 timer will be stopped by `AT+COPS`=0.

- `AT+COPS`=2 to deregister from the network, `AT+CGDCONT` to set the APN, then `AT+CFUN`=1,1 to restart the UE (since the `AT+CGDCONT` setting is non-volatile).

12.3 AT+CGATT PS Attach or Detach

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

Syntax

Test Command

AT+CGATT=?

Response(s)

+CGATT: (list of supported <state>s)
OK

Read Command

AT+CGATT?

Response(s)

+CGATT: <state>
OK

Write Command

AT+CGATT=[<state>]

Response(s)

OK
ERROR
+CME ERROR: <err>

PIN	✈	Last		Reference(s)
+	**-**	**-**		3GPP TS 27.007 [49]

Parameter Description

<state>(num)

Indicates the state of PS attachment.

0(P)	Detached
[1]	Attached

12.4 AT+CGACT PDP Context Activate or Deactivate

AT+CGACT write command is used to activate or deactivate the specified PDP context(s). After 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 MT is not PS attached when the activation form of the command is executed, MT firstly performs a PS 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.

AT+CGACT read command returns the current activation states for all defined PDP contexts.

AT+CGACT test command is used for requesting information on supported PDP context activation states.

Syntax

Test Command

AT+CGACT=?

Response(s)

+CGACT: (list of supported <state>s)
OK
ERROR
+CME ERROR: <err>

Read Command

AT+CGACT?

Response(s)

+CGACT: [<cid>, <state>]
[+CGACT: <cid>, <state>]
...
OK
ERROR
+CME ERROR: <err>

Write Command

AT+CGACT=<state>[,<cid>[,<cid>[, ...]]]

Response(s)

OK
ERROR
+CME ERROR: <err>

PIN	✈	Last		Reference(s)
+	-	-		3GPP TS 27.007 [49]

Parameter Description

<state>(num)

Indicates the state of PDP context activation.

0	Deactivated
1	Activated

<cid>(num)

Parameter specifies a particular PDP context definition (see AT+CGDCONT parameter <cid>).

Notes

- More than one PDP context can be active if each PDP context ID has a specific setting, e.g. the APN. Note that, depending on the provider, the number of activated contexts may be further restricted.
  Contexts activated by AT^SWWAN are not indicated by AT+CGACT.
- If activation or deactivation of a context fails, then AT+CEER may provide further informations about the reason.
- Please see AT&D for information on disconnecting data call.

12.5 AT+CGPADDR Show PDP Address

The AT+CGPADDR exec command returns a list of PDP addresses for all defined contexts.

The AT+CGPADDR write command returns a list of PDP addresses for the specified context identifiers. If a context is not defined, then no output line is generated for it. If no <cid> is specified, the addresses for all defined contexts are returned.

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

Syntax

Test Command

AT+CGPADDR=?

Response(s)

[+CGPADDR: (list of defined <cid>s)]
OK

Exec Command

AT+CGPADDR

Response(s)

[+CGPADDR: <cid>[, <PDP_address_1>[, <PDP_address_2>]]]
[+CGPADDR: ...]
OK
ERROR
+CME ERROR: <err>

Write Command

AT+CGPADDR=[<cid>[,<cid>[, ...]]]

Response(s)

[+CGPADDR: <cid>[, <PDP_address_1>[, <PDP_address_2>]]]
[+CGPADDR: ...]
OK
ERROR
+CME ERROR: <err>

PIN	✈	Last		Reference(s)
+	**+**	**-**		3GPP 27.007

Parameter Description

<cid>(num)

Parameter specifies a particular PDP context definition (see AT+CGDCONT parameter <cid>).

<PDP_address_1>(str)

A string that identifies the MT in the address space applicable to the PDP. The address may be static or dynamic. If address is not available parameter is omitted.
Parameter specifies the assigned address as a dot-separated numeric (0-255) parameter of the form "a1.a2.a3.a4" for IPv4 and "a1.a2.a3.a4.a5.a6.a7.a8.a9.a10.a11.a12.a13.a14.a15.a16" for IPv6.
The settings of AT+CGPIAF can influence the format of the IPv6 address.

<PDP_address_2>^(str)

A string that identifies the MT in the address space applicable to the PDP. The address may be static or dynamic.
Parameter is displayed only when both IPv4 and IPv6 addresses are assigned, with <PDP_address_1> containing the IPv4 address and this parameter the IPv6 address.
Parameter specifies the assigned IPv6 address as a dot-separated numeric (0-255) parameter of the form "a1.a2.a3.a4.a5.a6.a7.a8.a9.a10.a11.a12.a13.a14.a15.a16".
The settings of AT+CGPIAF can influence the format of this parameter.

12.6 AT+CGPIAF   Select Printing IP address format

AT+CGPIAF specifies the format to print IPV6 address parameters of other AT commands. See RFC 4291 for details of the IPv6 address format. The +CGPIAF parameters <format>, <subnet>, <lzeros> and <cze-ros> affect the following commands and parameters:

- in AT+CGDCONT, the <PDP_addr>;
- in AT+CGPADDR, the <PDP_address_1> and <PDP_address_2>;
- in AT+CGCONTRDP, the <LocalAddr and SubNetMask>, <GwAddr>, <DNS_prim_addr>, <DNS_sec_addr>, <P_CSCF_prim_addr> and <P_CSCF_sec_addr>.

The read command returns the current command parameter settings.
The test command returns supported parameter values.

Syntax

Test Command

AT+CGPIAF=?

Response(s)

+CGPIAF: (list of supported <format>s), (list of supported <subnet>s), (list of supported <lzeros>s), (list of supported <czeros>s)
OK

Read Command

AT+CGPIAF?

Response(s)

+CGPIAF: <format>, <subnet>, <lzeros>, <czeros>
OK

Write Command

AT+CGPIAF=[<format>[, <subnet>[, <lzeros>[, <czeros>]]]]

Response(s)

OK
ERROR
+CME ERROR: <err>

PIN	⇥	Last		Reference(s)
+	**+**	**-**		3GPP 27.007

Parameter Description

<format>(num)

A numeric parameter which decides the IPv6 address format. Relevant for all AT command parameters that can hold an IPv6 address.

0(&F)(P)   Use IPv4-like dot-notation. IP address, and subnetwork mask if appliccable, are dot-separated, e.g.
"32.1.13.184.0.0.205.48.0.0.0.0.0.0.0.0.255.255.255.255.255.255.255.240.0.0.0.0.0.0.0.0"
for parameters holding address and subnet mask and
"32.1.13.184.0.0.205.48.0.0.0.0.0.0.0.0"
for other IP address parameters.

1	Use IPv6-like colon-notation. IP address, and subnetwork mask if applicable and when given explicitly, are separated by a space, e.g. "2001:0DB8:0000:CD30:0000:0000:0000:0000 FFFF:FFFF:FFFF:FFF0:0000:0000:0000:0000" for parameters holding address and subnet mask and "2001:0DB8:0000:CD30:0000:0000:0000:0000" for other IP address parameters.

<subnet>(num)

A numeric parameter which decides the subnet-notation for parameters that hold remote address and subnet mask Setting does not apply if <format>= 0.

0(&F)(P)	Both IP Address and subnet mask are stated explicitly, separated by a space, e.g. "2001:0DB8:0000:CD30:0000:0000:0000:0000 FFFF:FFFF:FFFF:FFF0:0000:0000:0000:0000".
1	The printout format is applying / (forward slash) subnet-prefix Classless Inter-Domain Routing (CIDR) notation, e.g. ":0DB8:0000:CD30:0000:0000:0000:0000/60"

<lzeros>(num)

A numeric parameter which decides whether leading zeros are omitted or not. Setting does not apply if <format>= 0.

0(&F)(P)	Leading zeros are omitted, e.g. "2001:DB8:0:CD30:0:0:0:0".
1	Leading zeros are included, e.g. "2001:0DB8:0000:CD30:0000:0000:0000:0000".

<czeros>(num)

A numeric parameter which decides whether 1-n instances of 16-bit zero-values are replaced by only '::'. This applies only once. Setting does not apply if <format>= 0.

0(&F)(P)	No zero compression, e.g. "2001:DB8:0:CD30:0:0:0:0".
1	Use zero compression, e.g. "2001:DB8:0:CD30::".

12.7 AT+CGEREP Packet Domain Event Reporting

The AT+CGEREP write command enables or disables sending of unsolicited result codes, +CGEV URCs from MT to TE in the case of certain events occurring in the Packet Domain MT or the network.
Parameter <mode> controls the processing of unsolicited result codes specified within this command. <bfr> controls the effect on buffered codes when <mode> 1 or 2 is entered. If a setting is not supported by the MT, ERROR or +CME ERROR: is returned.

The AT+CGEREP read command returns the current <mode> and buffer settings.

The AT+CGEREP test command returns the modes and buffer settings supported by the MT as compound values.

Syntax

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

Read Command
AT+CGEREP?
Response(s)
+CGEREP: <mode>, <bfr>
OK

Write Command
AT+CGEREP=[<mode>[, <bfr>]]
Response(s)
OK
ERROR
+CME ERROR: <err>

PIN	↗	Last		Reference(s)
+	**+**	**-**		3GPP TS 27.007 [49]

Unsolicited Result Codes

URC 1

+CGEV: NW DETACH

The network has forced a PS detach.

URC 2

+CGEV: ME DETACH

The UE has forced a PS detach.

URC 3

+CGEV: PDN ACT <cid>

A context activation has been forced. The <cid> that was used to activate the context is provided if known to the MT. The context represents a PDN connection in LTE or a Primary PDP context in GSM/UMTS.

URC 4

+CGEV: PDN DEACT <cid>

A context deactivation has been forced. The <cid> that was used to activate the context is provided if known to the MT. The context represents a PDN connection in LTE or a Primary PDP context in GSM/UMTS.

Parameter Description

<mode>(num)	
0(P)	Buffer unsolicited result codes in the MT. Currently 3 +CGEV URCs can be buffered. If MT result code buffer is full, the oldest ones will be discarded. No codes are forwarded to the TE.
1	Discard unsolicited result codes when MT TE link is reserved (e.g. AT command port is in use, e.g. in online mode or in waiting state due to AT command processing); otherwise forward them directly to the TE.
2	Buffer unsolicited result codes in the MT when MT TE link is reserved (AT command port is in use, e.g. in online mode or in waiting state due to AT command processing) and flush them to the TE when MT TE link becomes available; otherwise forward them directly to the TE. Currently 3 +CGEV URCs can be buffered. If MT result code buffer is full, the oldest URCs will be discarded.

<bfr>(num)	
0	MT buffer of unsolicited result codes defined within this command is cleared when <mode> 1 or 2 is entered
1	MT buffer of unsolicited result codes defined within this command is flushed to the TE when <mode> 1 or 2 is entered (OK response will be given before flushing the codes). Buffer is empty afterwards.

12.8   AT+CGREG   Packet Domain Network Registration Status

The AT+CGREG write command enables the presentation of the URC "+CGREG: <stat>" when <n>=1 and ME's Packet Domain network registration status in changes, or URC "+CGREG: <stat>[, <lac>][, <ci>][, <AcT>]" when <n>=2 and the current network cell in changes.

If the UE wants to apply PSM for reducing its power consumption (see AT+CPSMS) the AT+CGREG write command controls the presentation of the URC "+CGREG: <stat>[, [<lac>], [<ci>], [<AcT>][, , , [, [<Active-Time>], [<PeriodicRAU>], [<GPRSREADYTime>]]]]". When <n>=4 the URC will provide the UE with additional information for the Active Time value, the extended periodic RAU value and the GPRS READY timer value if there is a change of the network cell in GSM.

AT+CGREG read command queries the current URC presentation status <n> and an integer <stat> which shows whether the network has currently indicated the registration of the ME.

Location information elements <lac>, <ci> and <AcT> are sent only if available, if <n>=2 and if ME is registered to the network.

Syntax

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

Read Command
AT+CGREG?
Response(s)
+CGREG: <n>, <stat>[, [<lac>], [<ci>], [<AcT>][, , , [, [<ActiveTime>], [<PeriodicRAU>], [<GPRSREADYTime>]]]] OK

Write Command
AT+CGREG=<n>
Response(s)
OK ERROR +CME ERROR: <err>

PIN	✈	Last		Reference(s)
+	**+**	**-**		3GPP 27.007

Unsolicited Result Codes

URC 1

   +CGREG: <stat>

   Indicates a change in the ME's Packet Domain network registration status.

URC 2

   +CGREG: <stat>[, <lac>][, <ci>][, <AcT>]

   Indicates a change in the ME's Packet Domain network registration status or a change of the network cell including location information.

+CGREG: <stat>[, [<lac>], [<ci>], [<AcT>][, , , [, [<ActiveTime>],
[<PeriodicRAU>], [<GPRSREADYTime>]]]]

For the UE that wants to apply PSM, the URC indicates a change in the UE's GERAN network registration status or a change of the network cell including location information, active time, extended periodic RAU or the GPRS READY time.

Parameter Description

<n>(num)	
0(&F)(P)	Disable Packet Domain network registration URC
1	Enable Packet Domain network registration URC "+CGREG: <stat>"
2	Enable Packet Domain network registration URC "+CGREG: <stat>[, <lac>][, <ci>][, <AcT>]"
4	For a UE that wants to apply PSM, enable network registration URC "+CGREG: <stat>[, [<lac>], [<ci>], [<AcT>][, , , [, [<ActiveTime>], [<PeriodicRAU>], [<GPRSREADYTime>]]]]"

<stat>(num)	
0	Not registered, ME is not currently searching an operator to register to.
1	Registered, home network.
2	Not registered, but ME is currently trying to attach or searching an operator to register to.
3	Registration denied.
4	Unknown
5	Registered, roaming.

<lac>(str)
Two byte location area code in hexadecimal format.

<ci>(str)
Cell ID in hexadecimal format: - 16 bit for 2G

<AcT>(num)	
Radio access technology	
0	GSM
3	GSM w/EGPRS
7	E-UTRAN
9	E-UTRAN Cat.NB1

<ActiveTime>(str)
One byte in an 8 bit format. Active time value to be allocated to the UE. The Active Time value is coded as one byte (octet 3) of the GPRS Timer 2 information element coded as bit format (e.g. "00100100" equals 4 minutes). For more information on coding and value range, see 3GPP TS 24.008 [43], table 10.5.163).

<PeriodicRAU>(str)

One byte in an 8 bit format.
Extended periodic RAU value to be allocated to the UE in E-UTRAN. The extended periodic RAU value is coded as one byte (octet 3) of the GPRS Timer 3 information element coded as bit format (e.g. "01000111" equals 70 hours). For more information on coding and value range, see 3GPP TS 24.008 [43], table 10.5.163a).

<GPRSREADYTime>(str)

One byte in an 8 bit format.
GPRS READY timer value allocated to the UE in GERAN. The GPRS READY timer value is coded as one byte (octet 2) of the GPRS Timer information element coded as bit format (e.g. "01000011" equals 3 decihours or 18 minutes). For more information on coding and value range, see 3GPP TS 24.008 [43], table 10.5.172).

12.9 AT+CEREG EPS Network Registration Status

The AT+CEREG write command enables presentation of URC "+CEREG: <stat>" when <n>=1 and UE's EPS network registration status in LTE changes, or URC "+CEREG: <stat>[, [<tac>], [<ci>], [<AcT>]]" when <n>=2 and the current network cell in LTE changes.
If the UE wants to apply PSM for reducing its power consumption (see AT+CPSMS) the AT+CEREG write command controls the presentation of the URC "+CEREG: <stat>[, [<tac>], [<ci>], [<AcT>][, , [, [<ActiveTime>], [<PeriodicTAU>]]]]". When <n>=4 the URC will provide the UE with additional information for the Active Time value and the extended periodic TAU value if there is a change of the network cell in E-UTRAN.
The AT+CEREG execute command restores default value "0" for parameter <n>.
The AT+CEREG 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 <tac> and <ci> are returned only if <n>=2 and ME is registered to the network.

Syntax

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

Read Command
AT+CEREG?
Response(s)
+CEREG: <n>, <stat>[, [<tac>], [<ci>], [<AcT>][, , [, [<ActiveTime>], [<PeriodicTAU>]]]]
OK

Exec Command
AT+CEREG
Response(s)
OK

Write Command
AT+CEREG=<n>
Response(s)
OK
ERROR
+CME ERROR: <err>

PIN	✈	Last		Reference(s)
+	+	-		3GPP TS 27.007 [49]

Unsolicited Result Codes

URC 1

  +CEREG: <stat>

  Indicates a change in the UE's EPS network registration status.

URC 2

  +CEREG: <stat>[, [<tac>], [<ci>], [<AcT>]]

  Indicates a change in the UE's EPS network registration status or a change of the network cell including location information.

URC 3

```
+CEREG: <stat>[, [<tac>], [<ci>], [<AcT>][, , [, [<ActiveTime>],
[<PeriodicTAU>]]]]
```

For the UE that wants to apply PSM, the URC indicates a change in the UE's EPS network registration status or a change of the network cell including location information, active time or requested TAU.

Parameter Description

`<n>`(num)	
0(&F)(P)	Disable network registration unsolicited result code
1	Enable network registration URC "+CEREG: <stat>"
2	Enable network registration URC "+CEREG: <stat>[, [<tac>], [<ci>], [<AcT>]]"
4	For a UE that wants to apply PSM, enable network registration URC "+CEREG: <stat>[, [<tac>], [<ci>], [<AcT>][, , [, [<ActiveTime>], [<Periodic-TAU>]]]]"

`<stat>`(num)	
0	Not registered, ME is not currently searching an operator to register to.
1	Registered, home network.
2	Not registered, but ME is currently trying to attach or searching an operator to register to.
3	Registration denied.
4	Unknown, e.g. out of LTE coverage
5	Registered, roaming.

`<tac>`(str)

Two byte tracking area code in hexadecimal format (e.g. "00C3" equals 195 in decimal)

`<ci>`(str)

Four byte LTE cell ID in hexadecimal format.

`<AcT>`(num)	
Radio access technology	
0	GSM (not applicable)
3	GSM w/EGPRS (not applicable)
7	E-UTRAN
9	E-UTRAN Cat.NB1

`<ActiveTime>`(str)

One byte in an 8 bit format.
Active time value to be allocated to the UE. The Active Time value is coded as one byte (octet 3) of the GPRS Timer 2 information element coded as bit format (e.g. "00100100" equals 4 minutes). For more information on coding and value range, see 3GPP TS 24.008 [43], table 10.5.163).

`<PeriodicTAU>`^(str)

One byte in an 8 bit format.
Extended periodic TAU value to be allocated to the UE in E-UTRAN. The extended periodic TAU value is coded as one byte (octet 3) of the GPRS Timer 3 information element coded as bit format (e.g. "01000111" equals 70 hours). For more information on coding and value range, see 3GPP TS 24.008 [43], table 10.5.163a).

12.10 AT+CGCONTRDP PDP context read dynamic parameters

The AT+CGCONTRDP write command returns dynamic parameters for the active non-secondary PDP context specified with <cid>.
The AT+CGCONTRDP execute command returns dynamic parameters for all active non-secondary PDP contexts.
For contexts of <PDP_type> "IPV4V6" the response of exec and write command will have two lines per <cid>.
First line describes the IPV4 dynamic parameters followed by another line with the IPV6 dynamic parameters.

Syntax

Test Command

AT+CGCONTRDP=?

Response(s)

+CGCONTRDP: (list of supported <cid>s) associated with active contexts
OK

Exec Command

AT+CGCONTRDP

Response(s)

+CGCONTRDP: <cid>, <Bearer_ID>, <APN>[, <LocalAddr and SubNetMask>[, <GwAddr>[, <DNS_prim_addr>[, <DNS_sec_addr>[, <P_CSCF_prim_addr>[, <P_CSCF_sec_addr>[, <IM_CN_Signalling_Flag>[, <LipaIndication>[, <IPv4_MTU>[, <WLAN_Offload>[, <Local_Addr_Ind>[, <Non-IP_MTU>]]]]]]]]]]]
+CGCONTRDP: <cid>, <Bearer_ID>, <APN>[, <LocalAddr and SubNetMask>[, <GwAddr>[, <DNS_prim_addr>[, <DNS_sec_addr>[, <P_CSCF_prim_addr>[, <P_CSCF_sec_addr>[, <IM_CN_Signalling_Flag>[, <LipaIndication>[, <IPv4_MTU>[, <WLAN_Offload>[, <Local_Addr_Ind>[, <Non-IP_MTU>]]]]]]]]]]]
[+CGCONTRDP: ...]
OK
ERROR
+CME ERROR: <err>

Write Command

AT+CGCONTRDP=<cid>

Response(s)

+CGCONTRDP: <cid>, <Bearer_ID>, <APN>[, <LocalAddr and SubNetMask>[, <GwAddr>[, <DNS_prim_addr>[, <DNS_sec_addr>[, <P_CSCF_prim_addr>[, <P_CSCF_sec_addr>[, <IM_CN_Signalling_Flag>[, <LipaIndication>[, <IPv4_MTU>[, <WLAN_Offload>[, <Local_Addr_Ind>[, <Non-IP_MTU>]]]]]]]]]]]
OK
ERROR
+CME ERROR: <err>

PIN	✈	Last		Reference(s)
+	**-**	**-**		3GPP TS 27.007 [49]

Parameter Description

<cid>(num)

Specifies a particular non-secondary PDP context definition. The parameter is local to the TE-MT interface and is used in other PDP context-related commands. See AT+CGDCONT.

<Bearer_ID>(num)

Identifies the bearer, EPS Bearer in EPS and NSAPI.

<APN>(str)

Access Point Name

Logical name used to select the GGSN or the external packet data network.

<LocalAddr and SubNetMask>(str)

Shows the IP address and subnet mask of the UE in the format specified by AT+CGPIAF.

<GwAddr>(str)

Shows the Gateway Address of the UE in the format specified by AT+CGPIAF.

<DNS_prim_addr>(str)

Shows the IP address of the primary DNS server.
The settings of AT+CGPIAF influences the format of this parameter.

<DNS_sec_addr>(str)

Shows the IP address of the secondary DNS server.
The settings of AT+CGPIAF influences the format of this parameter.

<P_CSCF_prim_addr>(str)

Shows the IP address of the primary P-CSCF server.
The settings of AT+CGPIAF influences the format of this parameter.

<P_CSCF_sec_addr>(str)

Shows the IP address of the secondary P-CSCF server.
The settings of AT+CGPIAF influences the format of this parameter.

<IM_CN_Signalling_Flag>(num)

Shows whether the PDP context is for IM CN subsystem-related signalling only or not.

<LipaIndication>(num)

Indicates that the PDP context provides connectivity using a LIPA PDN connection. This parameter cannot be set by the TE.

0	Indication not received that the PDP context provides connectivity using a LIPA PDN connection.
1	Indication received that the PDP context provides connectivity using a LIPA PDN connection.

<IPv4_MTU>(num)

Shows the IPv4 MTU size in octets.

<WLAN_Offload>(num)

indicates whether traffic can be offloaded using the specified PDN connection via a WLAN or not. This parameter cannot be set by the TE.

0	offloading the traffic of the PDN connection via a WLAN when in S1 mode or when in Iu mode is not acceptable.
1	offloading the traffic of the PDN connection via a WLAN when in S1 mode is acceptable, but not acceptable in Iu mode.

2	offloading the traffic of the PDN connection via a WLAN when in Iu mode is acceptable, but not acceptable in S1 mode.
3	offloading the traffic of the PDN connection via a WLAN when in S1 mode or when in Iu mode is acceptable.

<Local_Addr_Ind>(num)

Indicates whether or not the MS and the network support local IP address in TFTs (see 3GPP TS 24.301 [45] and 3GPP TS 24.008 [43] subclause 10.5.6.3). This parameter cannot be set by the TE.

0	indicates that the MS or the network or both do not support local IP address in TFTs.
1	indicates that the MS and the network support local IP address in TFTs.

<Non-IP_MTU>(num)

Shows the Non-IP MTU size in octets. It's only shown for Non-IP PDP context.

12.11 AT+CGSMS Select Service for MO Short Messages

AT+CGSMS specifies the service or service preference that the MT will use to send MO (mobile originated) short messages.

Syntax

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

Read Command
AT+CGSMS?
Response(s)
+CGSMS: <service>
OK

Write Command
AT+CGSMS=<service>
Response(s)
OK
ERROR
+CME ERROR: <err>

PIN	✈	Last		Reference(s)
+	**+**	**-**		3GPP 27.007

Parameter Description

<service>(num)(&V)(NV)

A numeric parameter which indicates the service or service preference to be used.

1(D)	Circuit switched
3	Circuit switched preferred (use Packet Domain if circuit switched is not available)

12.12   ATD*99#   Request Packet Domain service

This command causes the MT to perform whatever actions are necessary to establish a 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. PS attachment and PDP context activation procedures may take place prior to or during the PDP startup if they have not already been performed using the AT+CGATT and AT+CGACT commands.
To confirm acceptance of the command before entering the V.250 online data state command will respond with CONNECT.
The application that initiates the PPP mode must be designed to start all LCP configure requests in accordance with TS 27.060 par 9.1. Otherwise the MT remains, after the CONNECT, infinitely in a waiting state.
When the layer 2 protocol has terminated, either as a result of an orderly shut down of the PDP or an error, the MT enters V.250 command state and returns NO CARRIER.

Syntax

Exec Command
ATD*99[* [<called_address>][* [<L2P>][* [<cid>]]]]#
Response(s)
CONNECT
NO CARRIER
ERROR

PIN	✈	Last		Reference(s)
+	**-**	**+**		3GPP TS 27.007 [49]

Parameter Description

<called_address>(str)

This parameter is not supported by EXS82-W.

<L2P>(str)

Layer 2 protocol to be used between the TE and MT.

[“PPP“]	layer 2 protocol PPP
“1“	layer 2 protocol PPP

<cid>(num)

Parameter specifies a particular PDP context definition (see AT+CGDCONT parameter <cid>).
If parameter is not specified, then the first defined primary context is used.

Notes

- The UE will not enter the SUSPEND mode
    - if PPP session is established on given serial interface.
    - if the PPP session is suspended from the host side using an escape sequence or setting DTR line to logical low (communication interface switches from transparent to command mode).

    After the PPP session is terminated the UE may enter the SUSPEND mode.

- When PPP share same PDP with embedded application, downlink data with a port number in the range of 4000 to 5000 are routed to the embedded application. This port number range can't be used by PPP.

12.13 AT^SGAUTH Set Type of Authentication for PDP-IP Connections

Syntax

Test Command

AT^SGAUTH=?

Response(s)

^SGAUTH:(range of supported<cid>s), (list of supported <auth_type>s), ,
OK
ERROR
+CME ERROR: <err>

Read Command

AT^SGAUTH?

Response(s)

^SGAUTH:<cid>, <auth_type>[, <user>]
^SGAUTH:<cid>, <auth_type>[, <user>]
...
OK
ERROR
+CME ERROR: <err>

Write Command

AT^SGAUTH=<cid>[, <auth_type>[, <passwd>, <user>]]

Response(s)

OK
ERROR
+CME ERROR: <err>

PIN ✈ Last
| - | + | - |

Parameter Description

<cid>(num)(NV)

Parameter specifies a particular PDP context definition (see AT+CGDCONT parameter <cid>).

<auth_type>(num)(NV)

Indicates the types of authentication to be used for the specified context. If CHAP or PAP is selected two additional parameters <passwd> and <user> need to be specified.

[0]	none
1	PAP
2	CHAP

<passwd>(str)(NV)

Parameter specifies the password used for authentication. It is required for the authentication types PAP and CHAP.
Maximum length: 127 characters.

`

Parameter specifies the user name used for authentication. It is required for the authentication types PAP and CHAP.
Maximum length: 127 characters.

12.14 AT^SGCONF Configuration of GPRS related Parameters

AT^SGCONF configures the used E/GPRS Multislot Classes. Four Multislot Classes are supported for GPRS respectively EGPRS.

Syntax

Test Command

AT^SGCONF=?

Response(s)

^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), (list of supported <msClassChangeMode>s)
OK

Read Command

AT^SGCONF?

Response(s)

^SGCONF: <llc_pdu_length_U>, <llc_pdu_length_I>, <GPRS msclass>, <EGPRS msclass>, <msClassChangeMode>
OK

Write Command

AT^SGCONF=[<llc_pdu_length_U>][, [<llc_pdu_length_I>][, [<GPRS msclass>][, [<EGPRS msclass>][, <msClassChangeMode>]]]]

Response(s)

OK
ERROR
+CME ERROR: <err>

PIN	✈	Last
+	**-**	**-**

Parameter Description

<llc_pdu_length_U>(num)

The maximum number of octets in an information field of Unnumbered (U) frames.

0(P)   No negotiation with network (A fixed number of octets will be used).

<llc_pdu_length_I>(num)

The maximum number of octets in an information field of Combined Information (I) frames.

0(P)   No negotiation with network (A fixed number of octets will be used).

<GPRS msclass>(num)(NV)

GPRS Multislot Class. The value can be one of the classes indicated with the Test command.

8   GPRS Multislot Class 8
10(D)   GPRS Multislot Class 10
11   GPRS Multislot Class 11
12   GPRS Multislot Class 12

<EGPRS msclass>^{(num)(NV)}

EGPRS Multislot Class. The value can be one of the classes indicated with the Test command.

8	EGPRS Multislot Class 8
10^(D)	EGPRS Multislot Class 10
11	EGPRS Multislot Class 11
12	EGPRS Multislot Class 12

<msClassChangeMode>^(num)

Parameter specifies wether the changed parameters <GPRS msclass> or <EGPRS msclass> shall be effective after restart of the UE or immediately.

0   Changed Multislot Class(es) settings will be applied with the next restart of UE.

12.15 AT+CSODCP Sending of originating data via the control plane

The AT+CSODCP command is used by the TE to transmit data over control plane to network via MT.

Syntax

Test Command

AT+CSODCP=?

Response(s)

+CSODCP: (range of supported <cid>s), (maximum number of bytes of the <cpdata_length>), (list of supported <RAI>s), (list of supported <type_of_user_data>s)
OK

Write Command

AT+CSODCP=<cid>, <cpdata_length>, <cpdata>[, <RAI>[, <type_of_user_data>]]

Response(s)

OK
ERROR
+CME ERROR: <err>

PIN	✈	Last		Reference(s)
+	**-**	**-**		3GPP TS 27.007 [49]

Parameter Description

<cid>(num)

PDP Context Identifier

Parameter specifies a particular PDP context definition (see AT+CGDCONT parameter <cid>). The parameter is local to the TE-MT interface and is used in other PDP context-related commands.

1...16

<cpdata_length>(num)

cpdata length

Indicates the number of octets of the <cpdata> information element. When there is no data to transmit, the value shall be set to zero.

<cpdata>(str)

string of octets. Contains the user data container contents (refer to 3GPP TS 24.301 subclause 9.9.4.24). When there is no data to transmit, the <cpdata> shall be an empty string (""). This parameter shall not be subject to conventional character conversion as per +CSCS. The coding format of the user data container and the maximum length of <cpdata> are implementation specific.

<RAI>(num)

release assistance indication

Indicates the value of the release assistance indication. Refer to 3GPP TS 24.301 subclause 9.9.4.25.

0	No information is available.
1	The MT expects that exchange of data will be completed with the transmission of the ESM DATA TRANSPORT message.
2	The MT expects that exchange of data will be completed with the receipt of an ESM DATA TRANSPORT message.

`<type_of_user_data>`^(num)

Indicates whether the user data that is transmitted is regular or exceptional.

0	Regular data
1	Exception data

12.16   AT+CRTDCP   Reporting of terminating data via the control plane

The AT+CRTDCP write command is used to enable and disable reporting of data from the network to the MT that is transmitted via the control plane in downlink direction.
The AT+CRTDCP read command returns the current settings.
The AT+CRTDCP test command returns supported values as compound values.

Syntax

Test Command
AT+CRTDCP=?
Response(s)
+CRTDCP: (list of supported <reporting>s), (range of supported <cid>s), (maximum number of bytes of the <cpdata_length>)   OK

Read Command
AT+CRTDCP?
Response(s)
+CRTDCP: <reporting>   OK

Write Command
AT+CRTDCP=<reporting>
Response(s)
OK   ERROR   +CME ERROR: <err>

PIN	✈	Last		Reference(s)
+	-	-		3GPP TS 27.007 [49]

Unsolicited Result Code

If reporting is enabled, <reporting>=1, the MT returns the unsolicited result code:

+CRTDCP:<cid>, <cpdata_length>, <cpdata>

when data is received from the network.

Parameter Description

<reporting>(num)

controlling reporting of mobile terminated control plane data events.

0	Disable reporting of MT control plane data.
1	Enable reporting of MT control plane data by the unsolicited result code +CRTDCP.

<cid>(num)

PDP Context Identifier

Parameter specifies a particular PDP context definition (see AT+CGDCONT parameter <cid>). The parameter is local to the TE-MT interface and is used in other PDP context-related commands.

1...16

`<cpdata_length>`(num)

cpdata length

Indicates the number of octets of the `<cpdata>` information element. When there is no data to receive, the value is set to 0. The maximum MT data length reported in one message is 1000 bytes when NONIP is used. Data exceeding the maximum length will be segmented.

`<cpdata>`(str)

string of octets. Contains the user data container contents (refer to 3GPP TS 24.301 subclause 9.9.4.24). When there is no data to receive, the `<cpdata>` is an empty string (""). This parameter shall not be subject to conventional character conversion as per +CSCS. The coding format of the user data container and the maximum length of `<cpdata>` are implementation specific.

Notes

- Only one message is buffered at one time.
- Terminating data via the control plane before enabling reporting will be discarded.

12.17 AT^SWWAN PDP Context Activate or Deactivate

AT^SWWAN write command can be used to activate or deactivate a WWAN connection for a PDP context defined with AT+CGDCONT.

AT^SWWAN read command shows whether a WWAN connection is active and which PDP context is used for it. If no WWAN connection is active, then read command just returns OK. To track activation errors AT^SIND indicator "ceer" can be used.

Syntax

Test Command

AT^SWWAN=?

Response(s)

^SWWAN: (list of supported <state>s), (list of supported <cid>s)
OK
ERROR
+CME ERROR: <err>

Read Command

AT^SWWAN?

Response(s)

[^SWWAN: <cid>, <state>]
OK
ERROR
+CME ERROR: <err>

Write Command

Activate/Deactivate WWAN connection

AT^SWWAN=<action>, <cid>

Response(s)

OK
ERROR
+CME ERROR: <err>

PIN → Last

| + | - | - |

Parameter Description

<action>(num)

| 0 | Deactivate |
| 1 | Activate |

<state>(num)

| 0(P) | Deactivated |
| 1 | Activated |

<cid>(num)

Parameter specifies a particular PDP context definition (see AT+CGDCONT parameter <cid>).

Notes

- PDP contexts already activated by other commands as for example `AT+CGACT` cannot be reused for WWAN, except in LTE mode where the PDP context activated for LTE attach can also be used to start a WWAN connection. For more information please refer to Section 12.2.1, Attaching to LTE Networks.
- If activation or deactivation of a WWAN connection fails, then `AT+CEER` may provide further informations about the reason.

13. USIM related Commands

AT commands described in this chapter are related to the Universal Subscriber Identity Module (USIM) connected to the EXS82-W.

 Note:
If using data from the USIM please bear in mind that the content of all Elementary Files is *subject to change* at any moment!
This is because the network can change the USIM's data in the background via USIM Application Toolkit (USAT) procedure "Data download to USIM". For a detailed description please refer to 3GPP TS 11.14 [23], 3GPP TS 31.111 [24], ETSI TS 102 223 [25].
To get informed that changing Elementary Files has taken place the Customer Application (TE) needs to hook up USAT Proactive Command "REFRESH". For more information please refer to Chapter 9., USIM Application Toolkit (USAT) Commands and Section 9.7, AT^SSTGI in particular.

13.1 AT+CRSM   Restricted USIM Access

AT+CRSM offers easy access of the Elementary Files on the USIM. Access to the USIM database is restricted to the commands listed with parameter <command>.
All parameters of AT+CRSM are used as defined by the specifications listed below. EXS82-W handles internally all required USIM interface locking and file selection routines.
As response to the command, the EXS82-W sends the actual USIM information parameters and response data. "+CME ERROR" may be returned if the command cannot be passed to the USIM, e.g. if the USIM is not inserted. Failures to execute the command on the USIM will be reported by the <sw1> and <sw2> parameters.

Please beware of *possible changes to Elementary Files* by the network at any time, refer Chapter 13., USIM related Commands.

Syntax

Test Command
AT+CRSM=?
Response(s)
OK

Write Command
AT+CRSM=<command>[, <fileID>[, <P1>, <P2>, <P3>[, <data>]]]
Response(s)
+CRSM: <sw1>,<sw2>[,<response>]
OK
ERROR
+CME ERROR: <err>

PIN	✈	Last		Reference(s)
-	+	-		3GPP TS 27.007 [49], 3GPP TS 11.11 [19], 3GPP TS 31.101 [20], 3GPP TS 31.102 [21] ETSI TS 102 221 [22]

Parameter Description

`<command>`(num)

USIM command number.

176	READ BINARY
178	READ RECORD
192	GET RESPONSE
214	UPDATE BINARY
220	UPDATE RECORD
242	STATUS

`<fileID>`(num)

Identifier for an elementary data file on USIM, if used by `<command>`.

`<P1>`(num)

Parameter to be passed on by the EXS82-W to the USIM.

0...255

`<P2>`(num)

Parameter to be passed on by the EXS82-W to the USIM.

0...255

`<P3>`(num)

Parameter to be passed on by the EXS82-W to the USIM.

0...255

`<data>`(str)

Information which shall be written to the USIM (hexadecimal character format).

`<sw1>`(num)

Status information from the USIM about the execution of the actual command. It is returned in both cases, on successful or failed execution of the command.

0...255

`<sw2>`(num)

Status information from the USIM about the execution of the actual command. It is returned in both cases, on successful or failed execution of the command.

0...255

`<response>`(str)

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 USIM Access

AT+CSIM allows direct control of the USIM.
Compared to the restricted USIM access command AT+CRSM, the definition of AT+CSIM allows to take more control over the USIM interface.
However, the USIM Application Toolkit functionality is not supported by AT+CSIM. Therefore the following USIM commands cannot be used: TERMINAL PROFILE, ENVELOPE, FETCH and TEMINAL RESPONSE.

Syntax

Test Command

```
AT+CSIM=?
```
Response(s)

```
OK
```

Write Command

```
AT+CSIM=<length>, <command>
```
Response(s)

```
+CSIM: <length>,<response>
OK
ERROR
+CME ERROR: <err>
```

PIN	✈	Last		Reference(s)
-	**+**	**-**		3GPP TS 27.007 [49], 3GPP TS 11.11 [19], 3GPP TS 31.101 [20], 3GPP TS 31.102 [21] ETSI TS 102 221 [22]

Parameter Description

<length>(num)

Number of characters in <command> or <response> string.

<command>(str)

Command passed on by the EXS82-W to the USIM.
Parameter length: maximum 260 Bytes.

<response>(str)

Response data of the command returned by the USIM.
Parameter length: maximum 258 Bytes.

Note

- Access to datafields via SELECT is only allowed to files according to 3GPP TS 11.11 [19], 3GPP TS 31.101 [20], 3GPP TS 31.102 [21].

Example

The following examples show SELECT and GET RESPONSE commands.

```
AT+CSIM=14,"A0A40000027F10"                SELECT DF-Telecom.
+CSIM: 4,"9F19"                            Command successful. Indicates that x19 bytes
                                           response data are available and can be requested by
                                           using GET RESPONSE.

OK
AT+CSIM=14,"A0A40000026F3A"                SELECT EF-ADN (Abbreviated dialing numbers).
+CSIM: 4,"9F0F"                            Command successful. Indicates that x0F bytes
                                           response data are available and can be requested by
                                           using GET RESPONSE.

OK
AT+CSIM=10,"A0C000000F"                     GET RESPONSE command requests x0F bytes EF-
                                           ADN data.
+CSIM: 34,"000002306F3A040011F0220102011C9000"
OK
```

13.3 AT^SCID USIM Identification Number

AT^SCID serves to query the USIM identification number. This information is retrieved from USIM elementary file EF_{ICCID}; for details refer to 3GPP TS 11.11 [19], 3GPP TS 31.101 [20], 3GPP TS 31.102 [21].

Syntax

Test Command
AT^SCID=?
Response(s)
OK

Exec Command
AT^SCID
Response(s)
^SCID: \<cid\>
OK
ERROR
+CME ERROR: \<err\>

PIN	✈	Last
-	+	-

Parameter Description

\<cid\>(text)

USIM identification number.

13.4 AT^SCKS Query USIM and Chip Card Holder Status

AT^SCKS write command enables or disables the presentation of URCs to report the connection status of the USIM.
AT^SCKS read command returns the URC presentation mode and the status of the USIM connection.
Also refer to AT^SIND, which supplies indicator "simstatus" to monitor the USIM status.

Syntax

Test Command

AT^SCKS=?

Response(s)

^SCKS:(list of supported <mode>s)
OK

Read Command

AT^SCKS?

Response(s)

^SCKS: <mode>,<SimStatus>
OK
ERROR
+CME ERROR: <err>

Write Command

AT^SCKS=<mode>

Response(s)

OK
ERROR
+CME ERROR: <err>

PIN	→	Last
-	+	-

Unsolicited Result Code

^SCKS: <SimStatus>

If the USIM connection status has changed an unsolicited result code (URC) is issued.

Parameter Description

<mode>(num)(&V)(&W)

0(&F)	Disable URC "^SCKS".
1	Enable URC "^SCKS".

<SimStatus>(num)(&V)

0	USIM is not inserted.
1	USIM inserted.
2	Possible reasons:
	• The USIM interface hardware has been deactivated to prevent possible damage (e.g. if a USIM with invalid or unsupported electrical specifications has been detected). The USIM interface can be reactivated only by restarting the UE, e.g. with "AT+CFUN= n,1".

- In case a 5V USIM is inserted it might be possible that the USIM is not functional at all. As a result, URC "^SCKS: 0" occurs.

Note

- If <mode>=1 ("^SCKS" URC enabled) is stored to the user profile with AT&W it may happen that the "^SCKS" URC shows up after the "^SYSSTART" URC although the (U)SIM connection status has not changed.

13.5 AT^SSET USIM Data Ready Indication

After power-up and personalization (PIN entry if required) EXS82-W starts reading data from the USIM. AT^SSET controls the presentation of "^SSIM READY" URC which indicates that the UE has finished this initial reading. Afterwards all AT commands that depend on USIM data can be used, e.g. phonebook and SMS related AT commands.

Syntax

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

Read Command
AT^SSET?
Response(s)
^SSET: <n>
OK
ERROR
+CME ERROR: <err>

Write Command
AT^SSET=<n>
Response(s)
OK
ERROR
+CME ERROR: <err>

PIN	→	Last
-	+	-

Unsolicited Result Code

^SSIM READY

This URC indicates that the UE has finished its initial USIM access.
Any attempt to access phonebook, SMS or other USIM data before having received the "^SSIM READY" URC, may either result in a "+CME: SIM busy" message or, in some cases, a couple of seconds delay before the command is executed.

Parameter Description

<n>(num)(&V)(&W)

URC presentation mode

0(&F)	Disable "^SSIM READY" URC.
1	Enable "^SSIM READY" URC.

13.6 AT+CCHO Open logical channel

AT+CCHO asks the UE to open a communication session with USIM. The UICC will open a new logical channel for the selected application identified by <dfname> and the UE shall return <sessionid> as response. The UE shall restrict the communication between the TE and the UICC to this logical channel.
The <sessionid> shall be used when sending commands with the Generic Logical Channel access AT+CGLA command. It will also be used with AT+CCHC to close the channel.

Syntax

Test Command
AT+CCHO=?
Response(s)
OK

Write Command
AT+CCHO=<dfname>
Response(s)
+CCHO: <sessionid>
OK
ERROR
+CME ERROR: <err>

PIN	✈	Last		Reference(s)
-	**+**	**-**		3GPP TS 27.007 [49], 3GPP TS 11.11 [19], 3GPP TS 31.101 [20], 3GPP TS 31.102 [21]

Parameter Description

<dfname>(str)

All selectable applications in USIM are referenced by DF name coded on 1 to 16 bytes.

<sessionid>(num)

A session Id to be used in order to target a specific application on USIM using logical channels mechanism.

13.7 AT+CCHC Close logical channel

AT+CCHC asks the UE to close a communication session with the USIM. The UE shall close the previously opened logical channel, and no more commands can be sent on this logical channel. The UICC will close the logical channel when receiving this command.

Syntax

Test Command
AT+CCHC=?
Response(s)
OK

Write Command
AT+CCHC=<sessionid>
Response(s)
OK
ERROR
+CME ERROR: <err>

PIN	✈	Last		Reference(s)
-	+	-		3GPP TS 27.007 [49], 3GPP TS 11.11 [19], 3GPP TS 31.101 [20], 3GPP TS 31.102 [21]

Parameter Description

<sessionid>(num)

Session Id to be used in order to target a specific application on the USIM using the logical channels mechanism. The number is the <sessionid> returned by the channel open command AT+CCHO.

13.8 AT+CGLA Generic logical channel access

AT+CGLA allows direct control of the USIM by a remote application on the TE. The UE manages the channel relevant bits of the class byte depending on the <sessionid> and then sends the <command> as it is to the USIM. The UE takes care of processing USIM information within the frame specified by GSM/UMTS.
For parameter and USIM result coding please refer to 3GPP TS 11.11 [19], 3GPP TS 31.101 [20], 3GPP TS 31.102 [21].

Syntax

Test Command

AT+CGLA=?

Response(s)

OK

Write Command

AT+CGLA=<sessionid>, <length>, <command>

Response(s)

+CGLA: <length>,<response>
OK
ERROR
+CME ERROR: <err>

PIN	✈	Last		Reference(s)
-	**+**	**-**		3GPP TS 27.007 [49], 3GPP TS 11.11 [19], 3GPP TS 31.101 [20], 3GPP TS 31.102 [21]

Parameter Description

<sessionid>(num)

Identifier of the session to be used in order to send the APDU commands to the USIM.
The number is the <sessionid> returned by the channel open command AT+CCHO.

<length>(num)

Number of characters of <command> or <response> string.

<command>(str)

Command passed on by the UE to the USIM.

<response>(str)

Response data of the command returned by the USIM.

14.   GNSS Commands

EXS82-W integrates a GNSS engine (Global Navigation Satellite System) which supports GPS (Global Position-ing Sytem) and GLONASS (Globalnaja Nawigazionnaja Sputnikowaja Sistema) and GALILEO and Beidou based on the NMEA 0183 protocol.

To configure, activate or deactivate the GNSS engine, to choose Standalone GNSS or A-GNSS operation, to start, stop and configure the NMEA output, please use the AT^SGPSC command.

The GNSS receiver is always capable of receiving signals from all supported satellite systems, and decides on its own whether to calculate the position from GPS only, or any combination of the systems. The AT^SGPSC sub-commands "Nmea/GPS", "Nmea/Glonass", "Nmea/Galileo" and "Nmea/Beidou" can be used to enable or dis-able the output of NMEA sentence types, but they do not switch off their usage for position calculation. Only the output of GALILEO and Beidou data will instantly be disabled when the UE gets a GPS position fix over US ter-ritory. Apart from that, it is possible to enable or disable Galileo and Beidou capabilities of the GNSS receiver. See AT^SGPSC subcommands "Engine/Galileo", "Engine/Beidou". Glonass capability of the GNSS receiver will be automatically enabled when Galileo and Beidou are disabled and disabled when one of Galileo and Beidou capabilities is enabled.

A-GNSS (Assisted GNSS) will improve the startup performance, i.e. the Time to First Fix (TTFF), if the GNSS engine has not yet precise location and time information. The GpsOneXTRA assistance data files will be down-loaded   automatically   from   GpsOneXTRA   servers   when   <StartMode>=1   with   subcommand AT^SGPSC="Engine/StartMode" is selected.
Figure 14.1, Work Flows of GNSS Engine illustrates the work flow of the GNSS Engine depending on the Start-Mode.
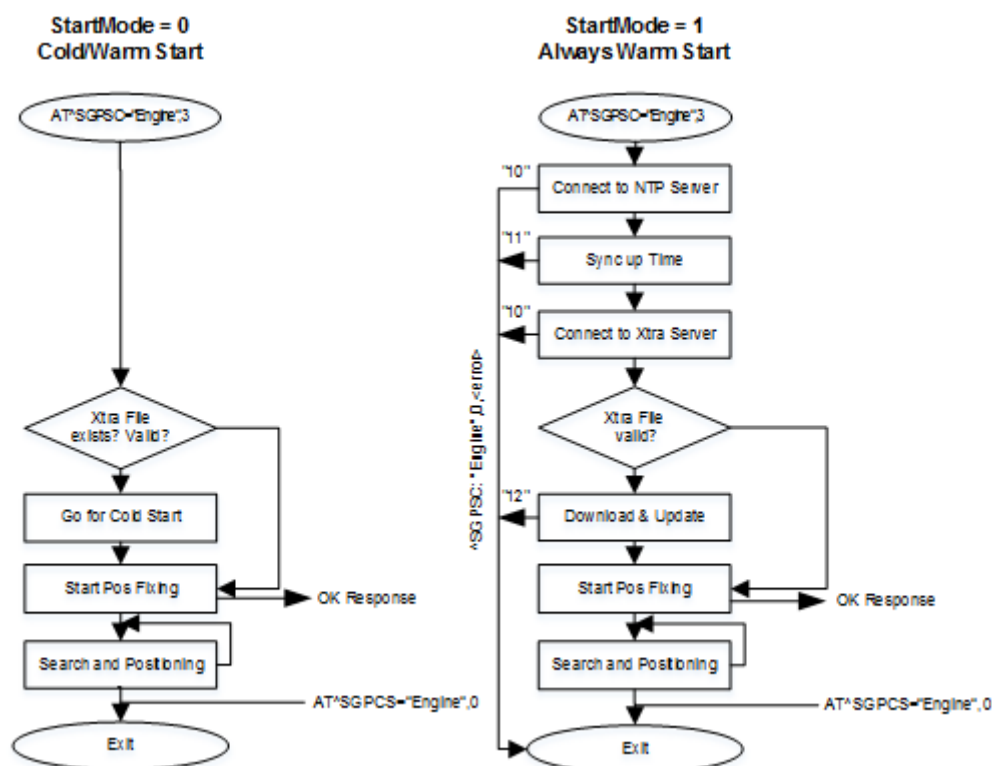
Figure 14.1: Work Flows of GNSS Engine

Concurrent LTE and GNSS operations are not supported on EXS82-W. The priority between GNSS and LTE can be controlled by AT^SCFG="MEopMode/RscMgmt/Rrc" with parameter <order>.

The UE will not enter Suspend Mode, when GNSS engine is active.

For more details refer to AT^SCFG="MEopMode/PowerMgmt/Suspend" parameter <Suspend> and "EXS82-W Hardware Interface Description, Version 01.100".

If Multiplex mode is started NMEA data will be output on the third Multiplex channel. The dedicated third Multiplex channel does not accept any AT commands. See also AT+CMUX. If Multiplex mode is not started NMEA data will be output on the interface where the command AT^SGPSC="Nmea/Output" is executed.
In addition, the commands and AT^SGPSC="Nmea/URC","on" can be used to get all GNSS information on the AT command instances(s), eliminating the need to poll the dedicated NMEA instance.

14.1 GNSS NMEA Sentences

A standard NMEA sentence set consists of the sentences listed below. Each single sentence starts with $ prefix and a Talker ID followed by a three letter Sentence ID. Both IDs are followed by data fields separated by comma. The data is provided in ASCII format.

For GPS, the Talker ID is GP. The UE supports the following GPS related NMEA sentence types:
- GPGGA - GPS Fix Data, i.e. Time, Position and fix related data of GNSS receiver
- GPRMC - Recommended minimum data for GPS
- GPGSA - GPS DOP (Dilution of Precision) and active satellites
- GPVTG - Vector track and speed over the ground

The Talker ID GP will be used also in cases where a second GNSS Engine is enabled, but the fix calculation is based only on GPS.

The output of the GNSS system specific GP/GL/GA/BD-GSV sentence can be configured by AT^SGPSC sub-commands:
- "NMEA/GPS" for GPGSV sentence
- "NMEA/GLONASS" for GLGSV sentence
- "NMEA/GALILEO" for GAGSV sentence
- "NMEA/BEIDOU" for BDGSV sentence

These sentences will be only shown, when the specific GNSS system will be used for calculation.

Talker ID "GN" indicates that GPS is used in combination with GLONASS, GALILEO, BEIDOU . The UE supports the following NMEA sentence types for mixed usage:
- GNRMC - Recommended minimum data for GNSS
- GNGSA - GPS/GLONASS /GALILEO/BEIDOU DOP (Dilution of Precision) and active satellites
- GNVTG - Vector track and speed over the ground
- GNGGA - Fix Data, i.e. Time, Position and fix related data

Note:
The GNSS engine does not allow to disable the usage of GPS satellites, in contrast to GLONASS, GALILEO, Beidou satellites which can be enabled or disabled with AT^SGPSC "Engine/...." subcommands. The GNSS engine always tries first to use GPS satellites to obtain a position fix, while other satellite systems may be used additionally depending on their AT^SGPSC settings and depending on GNSS power saving. If power saving is effective and the GPS signal is sufficient to get a fix, the GNSS engine automatically deactivates the usage and output of satellite systems in order to save power see Section 14.2.1.1, Dynamic Power Optimization (DPO). NMEA sentences of other satellite systems will be output only if enabled and used for calculation.

14.2 AT^SGPSC GNSS Configuration

AT^SGPSC is a configuration command that can be used to set GNSS parameters and to switch the GNSS engine on and off.

Syntax

Test Command

AT^SGPSC=?

Response(s)

^SGPSC: "Engine", (list of supported <EngineVal>s)
^SGPSC: "Engine/StartMode", (list of supported <StartMode>s)
^SGPSC: "Engine/Beidou", (list of supported <EngineBeidouVal>s)
^SGPSC: "Engine/Galileo", (list of supported <EngineGalileoVal>s)
^SGPSC: "Nmea/Beidou", (list of supported <BeidouVal>s)
^SGPSC: "Nmea/Galileo", (list of supported <GalileoVal>s)
^SGPSC: "Nmea/Glonass", (list of supported <GlonassVal>s)
^SGPSC: "Nmea/GPS", (list of supported <GpsVal>s)
^SGPSC: "Nmea/Output", (list of supported <OutVal>s)
^SGPSC: "Nmea/Urc", (list of supported <FixUrcVal>s)
^SGPSC: "Nmea/Version", (list of supported <Major NmeaVersion>s), (list of supported <Minor NmeaVersion>s)
^SGPSC: "Power/Psm", (list of supported <PsmVal>s)
OK
ERROR
+CME ERROR: <err>

Read Command

AT^SGPSC?

Response(s)

^SGPSC: "Engine", <EngineState>
^SGPSC: "Engine/StartMode", <StartMode>
^SGPSC: "Engine/Beidou", <EngineBeidouVal>
^SGPSC: "Engine/Galileo", <EngineGalileoVal>
^SGPSC: "Nmea/Beidou", <BeidouVal>
^SGPSC: "Nmea/Galileo", <GalileoVal>
^SGPSC: "Nmea/Glonass", <GlonassVal>
^SGPSC: "Nmea/GPS", <GpsVal>
^SGPSC: "Nmea/Output", <OutVal>
^SGPSC: "Nmea/Urc", <FixUrcVal>
^SGPSC: "Nmea/Version", <Major NmeaVersion>,<Minor NmeaVersion>
^SGPSC: "Power/Psm", <PsmVal>
OK
ERROR
+CME ERROR: <err>

Write Command

Activating or deactivating GNSS engine.

AT^SGPSC="Engine"[, <EngineVal>]

Response(s)

^SGPSC: "Engine", <EngineState>[, <AssistDataError>]
OK
ERROR
+CME ERROR: <err>

Write Command

Configures the start mode of the GNSS Engine.

AT^SGPSC="Engine/StartMode"[, <StartMode>]

Response(s)

^SGPSC: "Engine/StartMode", <StartMode>
OK
ERROR
+CME ERROR: <err>

Write Command

Activating or deactivating Beidou capability.

AT^SGPSC="Engine/Beidou"[, <EngineBeidouVal>]

Response(s)

^SGPSC: "Engine/Beidou", <EngineBeidouVal>
OK
ERROR
+CME ERROR: <err>

Write Command

Activating or deactivating Galileo capability.

AT^SGPSC="Engine/Galileo"[, <EngineGalileoVal>]

Response(s)

^SGPSC: "Engine/Galileo", <EngineGalileoVal>
OK
ERROR
+CME ERROR: <err>

Write Command

Configuring output of BEIDOU sentences.

AT^SGPSC="Nmea/Beidou"[, <BeidouVal>]

Response(s)

^SGPSC: "Nmea/Beidou", <BeidouVal>
OK
ERROR
+CME ERROR: <err>

Write Command

Configuring output of GALILEO sentences.

AT^SGPSC="Nmea/Galileo"[, <GalileoVal>]

Response(s)

^SGPSC: "Nmea/Galileo", <GalileoVal>
OK
ERROR
+CME ERROR: <err>

Write Command

Configuring output of GLONASS sentences.

AT^SGPSC="Nmea/Glonass"[, <GlonassVal>]

Response(s)

^SGPSC: "Nmea/Glonass", <GlonassVal>
OK
ERROR
+CME ERROR: <err>

Write Command

Configuring output of GPS sentences.

`AT^SGPSC="Nmea/GPS"[, <GpsVal>]`

Response(s)

`^SGPSC: "Nmea/GPS", <GpsVal>`
`OK`
`ERROR`
`+CME ERROR: <err>`

Write Command

Configuring output of NMEA sentences.

`AT^SGPSC="Nmea/Output"[, <OutVal>]`

Response(s)

`^SGPSC: "Nmea/Output", <OutVal>`
`OK`
`ERROR`
`+CME ERROR: <err>`

If `<OutVal>` is "last":
`[^SGPSC: ...]`
`[Last NMEA sentence set received from internal buffer]`
`OK`
`ERROR`
`+CME ERROR: <err>`

Write Command

Configuring "`^SGPSE`" URC type "Position fix notification".

`AT^SGPSC="Nmea/Urc"[, <FixUrcVal>]`

Response(s)

`^SGPSC: "Nmea/Urc", <FixUrcVal>`
`OK`
`ERROR`
`+CME ERROR: <err>`

Write Command

Read NMEA protocol version

`AT^SGPSC="Nmea/Version"`

Response(s)

`^SGPSC: "Nmea/Version", <Major NmeaVersion>, <Minor NmeaVersion>`
`OK`
`ERROR`
`+CME ERROR: <err>`

Write Command

Activating Sleep mode for GNSS engine (Power Save Mode).

`AT^SGPSC="Power/Psm"[, <PsmVal>]`

Response(s)

`^SGPSC: "Power/Psm", <PsmVal>`
`OK`
`ERROR`
`+CME ERROR: <err>`

PIN	→	Last
-	+	-

Unsolicited Result Code

Position fix notification (<UrcType> 1):

^SGPSE: <UrcType>, <PositionStatus>

Parameter Description

<EngineVal>(str)

Parameter of the AT^SGPSC "Engine" write command. Switches the GNSS engine on or off.

"0"(P)	GNSS engine off.
"3"	Start GNSS engine according to "Engine/StartMode" settings.

<EngineState>(str)

Parameter of the AT^SGPSC "Engine" read and write command responses. Shows the GNSS engine state.

"0"	GNSS engine off.
"3"	GNSS engine on.

<AssistDataError>(num)

In case of an error, this parameter of the AT^SGPSC "Engine" write command response gives detailed information about the failure.

8	Other error
10	Data call failed
11	NTP sync up time failed
12	XTRA file download failed

<StartMode>(num)(NV)

Parameter of the AT^SGPSC "Engine/StartMode" write command. Configures the start mode of the GNSS Engine.
The setting takes effect after restart.

0(D)	Starting GNSS (if any, valid xtra.bin and available data from last FIX will be considered). Cold/Warm Start
1	Starting GNSS system ALWAYS with GpsOneXTRA assistance data. If xtra.bin is missing, expired or cannot be downloaded or time information is not correct, the engine cannot start.

<EngineGalileoVal>(str)(NV)

Parameter of the AT^SGPSC "Engine/Galileo" write command. Configures Galileo capabilities of the GNSS receiver. Changed setting takes effect after restarting the GNSS engine

"0"(D)	Galileo capability disabled.
"1"	Galileo capability enabled. GNSS receiver checks the position to find out whether Galileo can be used in this area. This requires a position fix.

<EngineBeidouVal>(str)(NV)

Parameter of the AT^SGPSC "Engine/Beidou" write command. Configures Beidou capabilities of the GNSS receiver. Changed setting takes effect after restarting the GNSS engine

"0"(D)	Beidou capability disabled.
"1"	Beidou capability enabled. GNSS receiver checks the position to find out whether Beidou can be used in this area. This requires a position fix.

<GpsVal>(str)(NV)

Parameter of the AT^SGPSC "Nmea/GPS" subcommand.

"off"	Disables the output of GPS sentence GPGSV.
"on"(D)	Enables the output of GPS sentence GPGSV.

<GlonassVal>(str)

Parameter of the AT^SGPSC "Nmea/Glonass" subcommand.

"off"	Disables the output of GLONASS sentence GLGSV.
"on"(D)	Enables the output of GLONASS sentence GLGSV.

<GalileoVal>(str)(NV)

Parameter of the AT^SGPSC "Nmea/Galileo" subcommand.

"off"	Disables the output of GALILEO sentence GAGSV.
"on"(D)	Enables the output of GALILEO sentence GAGSV.

<BeidouVal>(str)(NV)

Parameter of the AT^SGPSC "Nmea/Beidou" subcommand.

"off"	Disables the output of BEIDOU sentence BDGSV.
"on"(D)	Enables the output of BEIDOU sentence BDGSV.

<OutVal>(str)(NV)

Parameter of the AT^SGPSC "Nmea/Output" subcommand. Configures the output of NMEA sentences (see Section 14.1, GNSS NMEA Sentences).

"off"(D)	No output. If the GNSS engine is set to Sleep mode via <PsmVal>=1 then please note that after switching <OutVal> from "off" to "on" the GNSS engine may take a couple of seconds to transmit a position fix.
"on"	NMEA sentences will be output on the interface, where this command is executed, at the frequency of 1 Hz.
"last"	This option can be used to query any time the NMEA sentence set most recently received by the GNSS engine and stored in an internal buffer. The benefit is that the NMEA data is instantly returned on the AT command instance where command was executed, eliminating the need to poll the dedicated NMEA instance. The response comes as one NMEA sentence set containing the sentences defined in Section 14.1, GNSS NMEA Sentences. It is provided in ASCII format (incl. "$" character).

<FixUrcVal>(str)

Parameter of the AT^SGPSC "NMEA/URC" subcommand. Enables / disables the "^SGPSE" URC type "Position fix notification" that reports changes of the positioning fix state. For details see "^SGPSE" parameter <PositionStatus>. The advantage is that the information on the positioning state is displayed on an AT command instance (not on the NMEA instance).

"off"(P)	Disable URC.
"on"	Enable URC.

<PsmVal>(str)(NV)

Parameter of the AT^SGPSC "Power/Psm" subcommand. Activates Sleep mode for the GNSS engine.
If Sleep mode is enabled with <PsmVal>= "1" it might be possible that GLONASS is not used for positioning when signal quality is good (NMEA sentences will not be output in this case).
See Section 14.2.1.1, Dynamic Power Optimization (DPO) for details.

"0"(D)	Off.
"1"	On.

<Major NmeaVersion>(str)(NV)

Parameter of the AT^SGPSC "Nmea/Version" subcommand. Shows the major version number of the NMEA protocol.

<Minor NmeaVersion>(str)(NV)

Parameter of the AT^SGPSC "Nmea/Version" subcommand. Shows the minor version number of the NMEA protocol.

<UrcType>(num)

1	URC type "Position fix notification". This URC type is enabled by setting the AT^SGPSC "Nmea/Urc" subcommand with parameter <FixUrcVal>= "on". <FixUrcVal>= "off" disables the URC. The URC is emitted each time when the state of the positioning fix changes, i.e. when the fix becomes valid or invalid.

<PositionStatus>(num)

0	Engine has no position fix.
1	Engine gets a fix position.

Note

- Only one additional GNSS Engine can be activated in parallel to the GPS engine.

14.2.1   Power Saving Considerations

The purpose of this section is to explain the modes provided by EXS82-W to minimize current consumption while maintaining or getting a position fix. The settings can be made by using the command AT^SGPSC="Power/ Psm",<PsmVal>.

14.2.1.1   Dynamic Power Optimization (DPO)

DPO is a power saving feature which attempts to turn off GNSS RF and other components when the components are not needed. DPO takes effect when enabled with <PsmVal>, when there is good GNSS signal visibility, and when the receiver has sufficient navigational data to perform a fix (either has GpsOneXTRA assistance data or has decoded it off-the-air). By delivery default of EXS82-W, DPO is disabled (AT^SGPSC="Power/ Psm",<PsmVal>= "0").

Preconditions for DPO to turn on:

- Have ephemeris for all SVs -> 26 dB-Hz or recent (<3.5 days) almanac corrections for those SVs provided by GpsOneXTRA assistance data.
- Health or UTC information is not transmitted over-the-air (i.e., not in subframe 4 of page 18, or subframes 4 and 5 of page 25).
- Valid position and HEPE is less than 50 m and also less than QoS timeout of 60 seconds.
- 6 SVs > 37 dB-Hz or 4 SVs > 26 dB-Hz and have almanac and health for all SVs.

Benefits and impact:

- The GNSS engine is not on continuously and the SV or navigational data cannot be decoded at that time.
- If GNSS is switched on (see AT^SGPSC parameters <EngineVal> and <OutVal>), GPS and GLONASS and GALILEO and Beidou may altogether be employed for position calculation.
  Usage of GLONASS or GALILEO or Beidou is added only if needed to get position fix. If the GPS signal is sufficient to get a fix, the GNSS engine automatically deactivates the usage and output of GALILEO, Beidou in order to reduce power consumption. The output of GPS sentences can also be switched off. See AT^SGPSC parameters, <GpsVal> <GlonassVal>, <GalileoVal>, <BeidouVal>.
- TTFF and yield should not be impacted.

14.3 Examples of How to Configure and Use GNSS

Below you can find selective examples of how to configure and use the EXS82-W's integrated GNSS engine.

14.3.1 Using the GNSS Engine StartMode=1

This example shows the process for starting the GNSS Engine with assist data. Before starting the GNSS engine make sure that the UE is connected to the network for downloading the assist data.

```
AT^SGPSC="Engine/StartMode",1          Select StartMode=1 to force download of the assist
^SGPSC: "Engine/StartMode","1"         data.
OK
AT+CFUN=1,1                             Restart UE
OK
^SYSSTART
AT^SGPSC="Engine",3                     Start GNSS Engine, assist data will be downloaded
^SGPSC: "Engine","3"                    automatically.
OK
....
$GPGSV,3,1,09,03,27,298,33,16,28,214,13,22,31,273,20,25,24,045,19,1*6C
$GPGSV,3,2,09,26,57,215,17,31,70,007,33,32,42,136,14,14,73,129,,1*65
$GPGSV,3,3,09,23,04,312,,1*58
$GLGSV,2,1,08,16,61,004,28,15,16,049,16,05,17,169,20,17,13,053,22,1*79
$GLGSV,2,2,08,07,39,319,30,06,67,225,,18,09,100,,09,34,259,,1*76
$GNGSA,A,3,03,16,22,25,31,,,,,,,,1,0,0,1*2F
$GNGSA,A,3,05,07,15,16,17,,,,,,,,1,0,0,2*2A
$GNVTG,,T,,M,0,N,0,K,A*3D
$GNRMC,073512.00,A,4010,N,11639,E,0,,020120,5,W,A,V*62
$GNGGA,073512.00,4010,N,11639,E,1,10,0,102,M,-7,M,,*7F
$GPGSV,3,1,09,03,27,298,33,16,28,214,13,22,31,273,21,25,24,045,18,1*6C
$GPGSV,3,2,09,26,57,215,17,31,70,007,33,32,42,136,14,14,73,129,,1*65
$GPGSV,3,3,09,23,04,312,,1*58
$GLGSV,2,1,08,16,61,004,29,15,16,049,14,05,17,169,20,17,13,053,21,1*79
$GLGSV,2,2,08,07,39,319,30,06,67,225,,18,09,100,,09,34,259,,1*76
$GNGSA,A,3,03,22,25,31,,,,,,,,,1,1,0,1*29
$GNGSA,A,3,05,07,15,16,17,,,,,,,,1,1,0,2*2B
$GNVTG,,T,,M,0,N,0,K,A*3D
$GNRMC,073513.00,A,4010,N,11639,E,0,,020120,5,W,A,V*63
$GNGGA,073513.00,4010,N,11639,E,1,09,1,102,M,-7,M,,*77
....
```

15.   Hardware related Commands

All AT commands described in this chapter are related to the hardware interface of the EXS82-W. Further information regarding this interface is available in the "EXS82-W Hardware Interface Description" [2].

15.1   AT+CCLK   Real Time Clock

AT+CCLK controls the real time clock (RTC) of EXS82-W.
If a network supports automatic time update the RTC is constantly updated with the network time. Any changes to the RTC using the command AT+CCLK will be wiped out by the network time. If a network does not support automatic time update the RTC can be set using AT+CCLK.
Each time the UE is restarted it may take up to two seconds to reinitialize the RTC and to update the current time. Therefore, it is recommended to delay the usage of AT+CCLK after restart.

The current setting of the clock is retained if the UE enters Power Down mode via AT^SMSO or restarts using AT+CFUN. However, it will be reset to its factory default value if the UE is totally disconnected from power.

Syntax

Test Command
AT+CCLK=?
Response(s)
OK

Read Command
AT+CCLK?
Response(s)
+CCLK: <time>
OK

Write Command
AT+CCLK=<time>
Response(s)
OK
ERROR
+CME ERROR: <err>

PIN	→	Last		Reference(s)
-	**+**	**-**		3GPP TS 27.007 [49]

Parameter Description

<time>(str)(NV)

Real time clock setting

Format is "yy/mm/dd,hh:mm:ss", where the characters yy indicate the two last digits of the year, followed by month (mm), day (dd), hour (hh, 24 hour format), minutes (mm) and seconds (ss).
For the write command the year can only set between 2000 and the end of 2037. For example the 6th of July 2017 at ten past ten in the evening equates to "17/07/06,22:10:00".
The factory delivery value, which is also used if the UE was totally disconnected from power, is "80/01/06,00:00:00", where "80" here stands for "1980".
So <time> values as reponse of the read command are ambiguous if the year part is > "79". To be sure that in such cases the correct time is used, it should be set explicitly using the AT+CCLK write command.

Note

- If automatic time zone update is enabled and a time zone update occurs additional time zone information will be appended to parameter <time> in the format +CCLK: "yy/mm/dd,hh:mm:ss+zz" or +CCLK: "yy/mm/dd,hh:mm:ss-zz". Time zone is displayed only when enabled with AT+CTZU and provided by the network. See AT+CTZU for more information.

  Please note that the AT+CCLK command, the AT+CTZU URC and the AT^SIND "nitz" URC employ different formats of time and time zone indication. The formats are compliant with 3GPP TS 27.007 [49].

  The time zone parameter (zz of AT+CCLK, <nitzTZ> of AT+CTZU and <nitzTZ> of AT^SIND "nitz") is given as a positive (east) or negative (west) offset from the UTC in units of 15 minutes. Depending on the network the AT+CTZU URC and the AT^SIND "nitz" URC may additionally show the daylight daving time (DST)expressed in hours. This parameter is not appended to the AT+CCLK response.

  Example:
  The local time Berlin *17/09/21,11:37:24* is equivalent to following network triggered time indication:
  Response +CCLK: "yy/mm/dd,hh:mm:ss+zz"
  +CCLK: "17/09/21,09:37:24+08" (= UTC + 2 hours time zone offset)

  URC: +CTZU: <nitzUT>,<nitzTZ>[,<nitzDST>]
  +CTZU: "17/09/21,09:37:18",+08,1 (= UTC + 2 hours time zone offset and 1 hour DST)

  URC: +CIEV: "nitz",<nitzUT>,<nitzTZ>[,<nitzDST>]
  +CIEV: "nitz,"17/09/21,09:37:18",+08,1 (= UTC + 2 hours time zone offset and 1 hour DST)

15.2 AT^SBV   Battery/Supply Voltage

AT^SBV allows to monitor the supply (or battery) voltage of the module. The voltage is periodically measured. The displayed value is averaged.

The measurement is related to the reference points of BATT+ and GND. For details on the reference points please refer to the Hardware Interface Description [2]. If the measured average voltage drops below or rises above the given voltage thresholds the UE will report alert messages by sending the "^SBC" URCs listed in Section 1.8.1, Common URCs.

Syntax

Test Command
AT^SBV=?
Response(s)
OK
ERROR
+CME ERROR: <err>

Exec Command
AT^SBV
Response(s)
^SBV: <Voltage>
OK
ERROR
+CME ERROR: <err>

PIN	✈	Last
-	+	-

Parameter Description

<Voltage>(num)

Supply (or battery) voltage in mV

15.3   AT^SCTM   Critical Operating Temperature Monitoring

AT^SCTM allows to monitor the operating temperature range of the EXS82-W device. Refer to "EXS82-W Hardware Interface Description" [2] for specifications on critical temperature ranges.
The AT^SCTM write command controls the presentation of URCs to report critical operating temperature limits.
Use parameter <UrcMode> to enable (1) and disable (0) URC presentation.

 Important: URC presentation depends on setting of <UrcMode>= 0 (disabled) or 1 (enabled). During guard period EXS82-W will not switch off, even if the critical temperature limit is exceeded. Automatic shutdown is a safety feature intended to prevent damage to the module. Extended usage of the deferred shutdown facilities provided may result in damage to the module, and possibly other severe consequences.

URCs indicating levels "2" or "-2" are always enabled, i.e. they will be issued even though the factory setting AT^SCTM=0 was never changed. If level "2" or "-2" URCs occur EXS82-W will trigger shutdown within 5 seconds.

URCs indicating alert levels "1" or "-1" are intended to enable the user to take appropriate precautions, such as protect EXS82-W from exposure to extreme conditions, or save or back up data etc. .

AT^SCTM read command returns:
*   The URC presentation mode.
*   Information about the current temperature range of the EXS82-W device.
*   The board temperature (in degree Celsius) if parameter <tempCtrl>=1.

Syntax

Test Command
AT^SCTM=?
Response(s)
^SCTM:(list of supported <UrcMode>s)[, (range of <temp>in Celsius)]
OK

Read Command
AT^SCTM?
Response(s)
^SCTM: <UrcMode>, <UrcCause>[, <temp>]
OK
ERROR
+CME ERROR: <err>

Write Command
AT^SCTM=<UrcMode>[, <tempCtrl>]
Response(s)
OK
ERROR
+CME ERROR: <err>

PIN	✈	Last
-	+	-

Unsolicited Result Code

URCs will be automatically sent to the TE when the temperature reaches or exceeds the critical level, or when it is back to normal.

^SCTM_B: <UrcCause>
URC for EXS82-W device temperature warning.

Parameter Description

`<UrcMode>`(num)(NV)	
URC presentation mode. Setting will not be stored during power-down, i.e. after next restart default setting will be restored.	
0	Disable URC presentation (except for `<UrcCause>` equal to -2 or +2).
1	Enable URC presentation.

`<UrcCause>`(num)	
-2	Below lowest temperature limit (causes switch-off after 5 s time).
-1	Below low temperature alert limit.
0	Normal operating temperature.
1	Above upper temperature alert limit.
2	Above uppermost temperature limit (causes switch-off after 5 s time).

`<tempCtrl>`(num)	
0(P)	Suppress output of `<temp>` in read command.
1	Output `<temp>` in test and read command.

`<temp>`(num)	
Board temperature in Celsius. Is comprised between the lowest temperature warning level and the uppermost temperature warning level.	

Examples

EXAMPLE 1

URCs issued when the operating temperature is out of range:

```
^SCTM_B: 1          Caution: Module close to overtemperature limit.
^SCTM_B: 2          Alert: Module is above overtemperature limit and switches off.
^SCTM_B: -1         Caution: Module close to undertemperature limit.
^SCTM_B: -2         Alert: Module is below undertemperature limit and switches off.
```

EXAMPLE 2

URC issued when the temperature is back to normal (URC is output once):

```
^SCTM_B: 0          Module back to normal temperature.
```

15.4 AT^SLED LED Feature

AT^SLED controls the LED function provided by the EXS82-W's STATUS line, which acts as an output and can be used to control a connected LED. The electrical specifications of the status line and advice on how to connect the LED circuit can be found in [2].

The LED indicates the operating states listed below:

Table 15.1: EXS82-W Status and Mode Indication via LED

EXS82-W Status	<mode>=1	<mode>=2
- GSM PS data transfer - LTE data transfer	Permanently on	10 ms on / 1990 ms off
UE registered to a network. No call, no data transfer	Permanently on	1250 ms on / 3750 ms off
Limited Network Service (e.g. because no SIM/ USIM, no PIN or during network search)	500 ms on / 500 ms off	500 ms on / 500 ms off

Syntax

Test Command
AT^SLED=?
Response(s)
^SLED: (list of supported <mode>s) OK

Read Command
AT^SLED?
Response(s)
^SLED: <mode> OK

Write Command
AT^SLED=<mode>
Response(s)
OK ERROR +CME ERROR: <err>

PIN	✈	Last
-	+	-

Parameter Description

<mode>(num)(&V)(&W)

LED operating mode

0(&F)(D)	LED feature is disabled.
1	LED feature is enabled.
2	LED is flashing when the UE is registered to the network or data transfer is ongoing.

Note

- In SUSPEND low-power or SLEEP mode, when the platform is not active, the LED line is powered off.

15.5 AT^SRADC Configure and Read A/D Converter

AT^SRADC controls the UE's Analog-to-Digital Converter (ADC). This allows to measure the voltage of an external device connected to the ADC input line.

AT^SRADC write command configures the parameters required for ADC measurement and returns the measurement result(s). The value(s) can be delivered once on request by using the single measurement mode, or periodically by specifying a measurement interval.

For details refer to "EXS82-W Hardware Interface Description, Version 01.100".

Syntax

Test Command

AT^SRADC=?

Response(s)

^SRADC:(list of supported <ch>s), (list of supported <op>s), (list of supported <it>s)
OK

Read Command

AT^SRADC?

Response(s)

^SRADC: <ch>, <op>, <it>
[^SRADC: <ch>, <op>, <it>]
[^SRADC: ...]
OK

Write Command

Single measurement (with automatic channel open and close):

AT^SRADC=<ch>

Response(s)

^SRADC: <ch>, <count>, <value>
OK
ERROR
+CME ERROR: <err>

Write Command

Periodic measurement:

AT^SRADC=<ch>, <op>[, <it>]

Response(s)

[^SRADC: <ch>, <count>, <value>]
OK
ERROR
+CME ERROR: <err>

PIN	✈	Last
-	+	-

Unsolicited Result Code

ADC measurement URC (only used in periodic measurement mode).

^SRADC: <ch>, <count>, <value>[, <value>[, <value>[, <value>[, <value>[, <value>[, <value>[, <value>[, <value>[, <value>[, <value>]]]]]]]]]]

Parameter Description

`<ch>`(num)

ADC channel

0	First ADC channel (ADC1_IN)

`<op>`(num)

Operation

Open or close ADC channel for measurement.
If parameter is not specified, then single measurement mode is initiated (with open and close of channel). Single measurement is not allowed if the channel is already open.

[0]	Close ADC channel (value of parameter `<it>` is ignored).
1	Open ADC channel

`<it>`(num)

Measurement interval

Parameter is used only if operation `<op>` is 1 (Open).

Single Measurement Mode:

[0]	Performs a single measurement (incl. close of channel).

Measurement interval in ms for Periodic Measurement Mode:

Measurement interval and URC output:
The URC output interval is miminum 1000 ms. This means if the measurement interval `<it>` is smaller than 1000 ms, then every second one URC will be output containing several measurement values. If `<it>` is equal 1000 ms or greater, each URC contains exactly one single measurement value. See examples below.

URC buffer mechanism:
If the interface is not free (e.g., during execution of an AT command) measurement values are buffered. Up to 5 URCs can be buffered, each containing up to 11 measurement values. After freeing the interface, all buffered URCs will be printed out. Loss of measured values, if any, is indicated by an additional 6th URC containing the value "32767". See example below.

Possible values in milliseconds (ms):

100...30000

`<value>`(num)

Measurement value
Measurement value in mV

`<count>`(num)

1...11	Number of measured samples In single measurement mode: `<count>` is always 1. In periodic measurement mode: `<count>` is the number of `<value>`s indicated by the URC "^SRADC". The higher the sample rate set with `<it>`, the more measured values are reported within the URC "^SRADC".

Examples

EXAMPLE 1

Single measurement

```
AT^SRADC=0                              Open the first ADC channel for single measurement.
^SRADC: 0,1,78
OK
```

EXAMPLE 2

Periodic measurement at low sample rate (5s):

```
AT^SRADC=0,1,5000                       Start periodic measurement mode on the first ADC
^SRADC: 0,1,76                          channel. Samples are taken every 5s. Every 5s the
^SRADC: 0,1,78                          URC "^SRADC" appears to report the measured volt-
^SRADC: 0,1,76                          ages. The second parameter represents the number
                                        of measured samples, in this case only one.
^SRADC: 0,1,76
AT^SRADC=0,0                            Stop the periodic measurement
OK
```

EXAMPLE 3

Periodic measurement at high sample rate (250ms):

```
AT^SRADC=0,1,250                        Start periodic measurement on the first ADC chan-
^SRADC: 0,4,76,76,77,76                 nel. Samples are taken every 250ms. Every second
^SRADC: 0,4,76,76,75,76                 a URC "^SRADC" appears to report the measured
^SRADC: 0,5,77,77,76,76,76              voltage. The number of samples is 4 or 5.
^SRADC: 0,4,76,76,75,76
AT^SRADC=0,0
OK                                      Stop the periodic measurement
```

EXAMPLE 4

Handling of "^SRADC" URCs and AT command execution on the same interface:

```
AT^SRADC=0,1,250                        Start periodic measurement mode on the first ADC
^SRADC: 0,4,76,76,77,76                 channel. Samples are taken every 250ms.
^SRADC: 0,5,77,77,76,76,76
^SRADC: 0,4,76,76,75,76
^SRADC: 0,4,76,76,75,76
AT^SRADC?                               Input of AT command and <CR> takes some sec-
                                        onds.
^SRADC: 0,1,250
^SRADC: 1,0,0
OK
^SRADC:                                 Some URCs were buffered during command input
0,11,75,75,75,75,75,75,75,75,75,75,75   and sent after completion.
^SRADC: 0,8,75,75,75,75,75,75,75,77
^SRADC: 0,1,75
^SRADC: 0,4,76,76,75,76                 More URCs are delivered.
^SRADC: 0,4,76,76,75,76
^SRADC: 0,5,77,77,76,76,76
^SRADC: 0,4,76,76,77,76
^SRADC: 0,4,76,76,75,76
AT^SRADC?                               Input of AT command and <CR> takes 90s.
^SRADC: 0,1,250
^SRADC: 1,0,0
OK
^SRADC:                                 some URCs were buffered during command input
0,11,75,75,75,75,75,75,75,75,75,75,75   and sent after completion
^SRADC:
0,11,73,74,73,74,73,73,73,74,74,73,73
^SRADC: 0,11,74,73,74,73,73,73,73,73,73,73,73
^SRADC: 0,11,73,73,74,74,73,73,74,73,73,74,74
^SRADC: 0,11,73,73,73,73,73,73,73,74,74,73,73
^SRADC: 0,8,73,73,74,73,73,73,73,32767  The URC indicates lost measurement results.
```

```
^SRADC: 0,4,74,74,73,73                    More URCs are delivered.
^SRADC: 0,4,75,75,75,75
......
```

16. General Purpose I/O (GPIO) Pin related Commands

This chapter describes the AT commands used to access and configure the GPIO pins of EXS82-W.

Please also refer to [2] for electrical specifications of the GPIO pins.

16.1 AT^SPIO   GPIO Driver Open/Close

AT^SPIO write command opens and closes the General Purpose I/O (GPIO) driver. The command must be executed before any GPIO related command can be used.
The command does not reserve any GPIO lines, only the driver required for their management will be started.

Syntax

Test Command
AT^SPIO=?
Response(s)
^SPIO:(list of supported <mode>s)
OK

Write Command
AT^SPIO=<mode>
Response(s)
OK
ERROR
+CME ERROR: <err>

PIN	✈	Last
-	+	-

Parameter Description

<mode>(num)(NV)	
0	Close General purpose I/O driver
1	Open General purpose I/O driver

16.2 AT^SCPIN Pin Configuration

The AT^SCPIN write command serves to configure GPIOs.

- Configuring a GPIO with AT^SCPIN.
    - Using a GPIO configured as input with AT^SCPIN to wake up the UE from power saving. Suitable GPIOs (unless otherwise assigned): GPIO21, GPIO22. Reporting of level state changes at the specified GPIO shall be enabled with AT^SCPOL.
- When GPIO direction is set as Input, GPIO PIN configuration (eg. None, Pull-up, Pull-down, Keep) is taken from AT^SGPINCA.

Syntax

Test Command

AT^SCPIN=?

Response(s)

^SCPIN:(list of supported <mode>s), (list of supported <pin_id>s), (list of supported <direction>s), (list of supported <startValue>s)

OK

Write Command

AT^SCPIN=<mode>, <pin_id>, <direction>[, <startValue>]

Response(s)

OK

ERROR

+CME ERROR: <err>

PIN	→	Last
-	+	-

Parameter Description

<mode>(num)

0	Close pin
1	Open pin

<pin_id>(num)

Pin identifier

6	GPIO6
7	GPIO7
20	GPIO20
21	GPIO21
22	GPIO22
23	GPIO23
25	GPIO25

<direction>(num)(NV)

Parameter <direction> is mandatory when opening a pin, but can be omitted when closing a pin.

0	Input
1	Output

<startValue>(num)(NV)	

Can be set only for outputs.

[0]	Low
1	High

Notes

- Please refer to AT^SPIO for information on opening and closing the pin.
- For closing a pin with the write command (<mode>=0), the parameter <direction> is not needed.
- Before changing the configuration of a pin be sure to close the pin.

16.3   AT^SCPOL   GPIO Level Polling Configuration

AT^SCPOL serves to control automatic level polling and reporting for EXS82-W's GPIOs. The GPIO shall already be configured with AT^SCPIN. Level polling is only applicable to input pins.
After polling has been activated for a specified GPIO, its latest level state transition will be reported via "^SCPOL" URC.

GPIO monitoring is interrupt handled. If a state transition is detected at a configured GPIO, a debouncing routine will start. The signal state has to stay stable for at least for proper detection of a state change.

If EXS82-W stays in power save (SLEEP) state, a transition at GPIO21, GPIO22 will wake up the UE.
For all other GPIOs the state detection will only be triggered when the UE suspends power saving state for another reason.
Refer to AT^SCFG, "MeOpMode/PwrSave" parameter <PwrSaveMode> and <PwrSaveWakeup> which allow to fine-tune power saving behaviour of the UE.

Syntax

Test Command
AT^SCPOL=?
Response(s)
^SCPOL:(list of supported <mode>s), (list of supported <ioId>s)
OK

Write Command
AT^SCPOL=<mode>, <ioId>
Response(s)
OK
ERROR
+CME ERROR: <err>

PIN	✈	Last
-	+	-

Unsolicited Result Code

^SCPOL: <ioId>, <value>

Parameter Description

<mode>(num)

0(P)	Disable level polling for a general purpose I/O pin.
1	Enable level polling for a general purpose I/O pin.

<ioId>(num)

This can be either an already configured or an already opened <pin_id>.

<value>(num)

Level state transition detected on <ioId>.

0	<pin_id> is in low state.
1	<pin_id> is in high state.

16.4 AT^SGIO Get IO state of a specified pin

AT^SGIO write command returns the state of selected GPIO Pin. AT^SGIO requires GPIO drivers opened using AT^SPIO and AT^SCPIN.

Syntax

Test Command

AT^SGIO=?

Response(s)

^SGIO:(list of supported <io_id>s)
OK

Write Command

AT^SGIO=<io_id>

Response(s)

^SGIO: <value>
OK
ERROR
+CME ERROR: <err>

PIN ✈ Last

| - | + | - |

Parameter Description

<io_id>(num)

<pin_id> shows supported GPIO.

<value>(num)

State read on this <io_id>.

0	Low for <pin_id>
1	High for <pin_id>

16.5 AT^SSIO Set IO state of a specified pin

AT^SSIO write command sets the state of GPIO Pin. AT^SSIO requires GPIO drivers opened using AT^SPIO and AT^SCPIN. GPIO Pin must be set as ouput using AT^SCPIN first otherwise command will return error.

Syntax

Test Command

AT^SSIO=?

Response(s)

^SSIO:(list of supported <io_id>s), (list of supported <value>s)

OK

Write Command

AT^SSIO=<io_id>, <value>

Response(s)

OK

ERROR

+CME ERROR: <err>

PIN	✈	Last
-	+	-

Parameter Description

<io_id>(num)

This is an already configured <pin_id>.

<value>(num)(NV)

State to be set for this <io_id>.

0	Low for <pin_id>
1	High for <pin_id>

16.6 AT^SGPINCA Pin Configuration

The AT^SGPINCA write command configures the internal pull-up, pull-down, keeper or none. The configuration updated with AT^SGPINCA will take effect after AT^SCPIN write command is used. Keep in mind that some GPIO lines share functions with other interfaces. AT^SGPINCA requires GPIO drivers opened using AT^SPIO.

Syntax

Test Command

AT^SGPINCA=?

Response(s)

^SGPINCA:(list of supported <pin_in_id>s), (list of supported <pinconf>s)
OK

Write Command

AT^SGPINCA=<pin_in_id>[, <pinconf>]

Response(s)

^SGPINCA: <pin_in_id>,<pinconf>
OK
ERROR
+CME ERROR: <err>

PIN	✈	Last
-	+	-

Parameter Description

<pinconf>(str)

Pin pull configuration

"NONE"(P)	GPIO configured as input
"KEEP"	GPIO is configured as Input and Keep
"PD"	GPIO is configured as Input and Pull down (PD)
"PU"	GPIO is configured as Input and Pull Up (PU)

<pin_in_id>(num)

Supported GPIO

<pin_id> shows supported GPIO.

16.7 AT^SGPICFG Pin Mode Configuration

AT^SGPICFG does not require GPIO drivers opened using AT^SPIO.

Syntax

Test Command
AT^SGPICFG=?
Response(s)
OK

Read Command
AT^SGPICFG?
Response(s)
^SGPICFG: "Logic/RING0"[, <trigger>] OK ERROR +CME ERROR: <err>

Write Command
Subcommand controls RING0 logic level.
AT^SGPICFG="Logic/RING0"[, <trigger>]
Response(s)
^SGPICFG: "Logic/RING0", <trigger> OK ERROR +CME ERROR: <err>

PIN	✈	Last
-	+	-

Parameter Description

<trigger>(str)(NV)

UE will support the following levels.

"low"(D)   Line uses active-low logic.

"high"   Line uses active-high logic.

Note

• The setting of AT^SGPICFG="Logic/RING0",<trigger> take effect after restart of UE.

17. Miscellaneous Commands

The AT Commands described in this chapter are related to various areas.

17.1 A/ Repeat Previous Command Line

Repeat previous AT command line.
In general, after beginning a command line with character "a" or "A" a second character "t", "T" or "/" has to follow.
"/" acts as line terminating character. In case of using a wrong second character, it is necessary to start again with character "a" or "A".

Syntax

Exec Command
A/
Response(s)

PIN	✈	Last		Reference(s)
-	+	-		V.250

17.2 ATS3 Command Line Termination

ATS3 is implemented for compatibility reasons only, and has no effect.

Syntax

Read Command
ATS3?
Response(s)
<n>
OK

Write Command
ATS3=<n>
Response(s)
OK
ERROR

PIN	✈	Last		Reference(s)
-	+	-		ITU-T V.250 [18]

Parameter Description

<n>(num)

000...013(&F)...127

Notes

- Command ATS3 is dummy, and has no effect on module behavior.
- Read command will return default value n=13.
- Write command will return OK or ERROR. OK - when parameter <n> is in range, ERROR otherwise.
- Despite OK returned in case of any parameter from range, no changes will be made.

17.3 ATS4 Response Formatting

ATS4 is implemented for compatibility reasons only, and has no effect.

Syntax

Read Command
ATS4?
Response(s)
<n>
OK

Write Command
ATS4=<n>
Response(s)
OK
ERROR

PIN	✈	Last		Reference(s)
-	+	-		ITU-T V.250 [18]

Parameter Description

<n>(num)

000...010$^{(\&F)}$...127

Notes

- Command ATS4 is dummy, and has no effect on module behavior.
- Read command will return default value n=10.
- Write command will return OK or ERROR. OK - when parameter <n> is in range, ERROR otherwise.
- Despite OK returned in case of any parameter from range, no changes will be made.

17.4 ATS5 Command Line Editing

ATS5 is implemented for compatibility reasons only, and has no effect.

Syntax

Read Command
ATS5?
Response(s)
<n>
OK

Write Command
ATS5=<n>
Response(s)
OK
ERROR

PIN	✈	Last		Reference(s)
-	**+**	**-**		ITU-T V.250 [18]

Parameter Description

<n>(num)

000...008(&F)...127

Notes

- Command ATS5 is dummy, and has no effect on module behavior.
- Read command will return default value n=8.
- Write command will return OK or ERROR. OK - when parameter <n> is in range, ERROR otherwise.
- Despite OK returned in case of any parameter from range, no changes will be made.

17.5 AT^SBNR Binary Read

Syntax

Test Command

AT^SBNR=?

Response(s)

OK

Read Command

AT^SBNR?

Response(s)

OK

Write Command

If <type>= "ciphersuites": Gets the accepted values by default for IPoverAT TLS Cipher suites:

AT^SBNR="ciphersuites", "default"

Response(s)

(default CYASSL ciphers string)
OK

Write Command

If <type>= "ciphersuites": Gets the user-accepted values for IPoverAT TLS Cipher suites, or default values if not defined:

AT^SBNR="ciphersuites", "current"

Response(s)

(ciphersuite user file contents)
OK
If no user values defined:
No Cipher Suites file found or loaded
Default Cipher Suites:
(default CYASSL ciphers string)
OK

Write Command

If <type>= "is_cert":
Read certificates for secure connection of client IP services.

AT^SBNR="is_cert"

Response(s)

^SBNR:<index>,<size>,<issuer>,<serial-number>,<subject>,<signature-algorithm>,
<thumbprint-algorithm>,<thumbprint>,<expiry-date>
[...]
OK
If error is related to ME functionality:
ERROR
+CME ERROR: <err>
If certificate file is corrupted:
<index>, certificate is corrupted

Write Command

If <type>= "preconfig_cert":
Read list of thumbprints of revoked certificates or preconfigured certificates.

AT^SBNR="preconfig_cert"[, <status>]

Response(s)

^SBNR:<index>, <size>, <issuer>, <serial-number>, <subject>, <signature-algorithm>, <thumbprint-algorithm>, <thumbprint>, <expiry-date>[, <replace-index>]
[...]
OK
If error is related to ME functionality:
ERROR
+CME ERROR: <err>

Write Command

If <type>= "management_cert":
Read certificate for local UE management.

AT^SBNR="management_cert"

Response(s)

^SBNR:<index>, <size>, <issuer>, <serial-number>, <subject>, <signature-algorithm>, <thumbprint-algorithm>, <thumbprint>, <expiry-date>
[...]
OK
If error is related to ME functionality:
ERROR
+CME ERROR: <err>

PIN ✈ Last

| - | + | - |
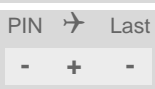
Parameter Description

<type>(str)	
"ciphersuites"	IPoverAT TLS Cipher suites
"is_cert"	Read certificate details
"preconfig_cert"	Read preconfigured certificates and list of out of date certificates. See AT^SSECUA and AT^SSECUC.
"management_cert"	Read module management certificate details. See AT^SSECUA and AT^SSE-CUC.

<status>(num)	

For list of certificates to be removed (<status>=0) only the parameters used to match the certificate will be output in the AT^SBNR response, all other parameters will be empty except for <replace-index> that will indicate preloaded certificate index to replace the revoked certificate if such is configured.

0	Read list of revoked certificates to be removed from store.
1	Read list of certificates to be added to store or empty.

<index>(num)	

Certificate index

0...20	Index 0 is handled as client certificate (only 1 allowed). Indexes from 1 to 20 are handled as server certificates.

<size>(str)

Size of certificate file in bytes

<issuer>(str)

Certificate issuer

<serial-number>(str)

Serial number of certificate

<subject>(str)

Subject of certificate

<signature-algorithm>(str)

Signature algorithm of certificate

<thumbprint-algorithm>(str)

Thumbprint algorithm of certificate

<thumbprint>(str)

Thumbprint of certificate

<expiry-date>(str)

Expiry date of certificate

<replace-index>(num)

Replace Index

17.6   AT^SBNW   Binary Write

AT^SBNW allows for writing binary or hexadecimal data to the non-volatile memory or to the Flash File System (FFS). The handling of the AT^SBNW write command varies depending on the type of data.

Syntax

Test Command

`AT^SBNW=?`

Response(s)

`^SBNW:`(list of supported <type>s), (list of supported <subtype>s)
`OK`

Write Command

Cipher suites user file modification:

`AT^SBNW="ciphersuites", `<ciphersuites_length>

Response(s)

`CONNECT`

`CIPHERSUITES: SEND FILE ...`
Indicates that UE has entered binary data mode. Data can be transferred.
When Ciphersuites file data are transferred and updated, or error occurs the UE returns one of following answers:
`CIPHERSUITES: LENGTH ERROR`
`CIPHERSUITES: FILE WRITE ERROR`
`CIPHERSUITES: SUITE NOT FOUND`
`CIPHERSUITES: UNDEFINED ERROR`
`CIPHERSUITES: INTERNAL ERROR`
`CIPHERSUITES: I/O ERROR`
`OK`

Write Command

Cipher suites user file removal:

`AT^SBNW="ciphersuites", 0`

Response(s)

`CIPHERSUITES: DELETE CIPHERSUITES FILE...`
`CIPHERSUITES: DONE`
`OK`
`+CME ERROR: `<err>

Write Command

Certificate management for secure connection of client IP services.

`AT^SBNW="is_cert", `<subtype>

Response(s)

`CONNECT`

`SECURE CMD READY: SEND COMMAND ...`
(Indicates that UE has entered binary data mode. Secure command data can be transferred.)
When secure command data is processed the UE will send one of following answers:
`SECURE CMD LENGTH ERROR`
`SECURE CMD PUBLIC CERTIFICATE IS CORRUPTED`
`SECURE CMD PRIVATE KEY WAS REMOVED`
`SECURE CMD SERVICE TIMEOUT ERROR`
`SECURE CMD TO MANY DATA ERROR`

Write Command

(Continued)

Certificate management for secure connection of client IP services.

`AT^SBNW="is_cert", <subtype>`

Response(s)

```
SECURE CMD ERROR
SECURE CMD END OK
```

Write Command

Management for preconfigured certificates delivered by Thales for secure connection of client IP services.

`AT^SBNW="preconfig_cert", <subtype>`

Response(s)

```
CONNECT

SECURE CMD READY: SEND COMMAND ...
```
(Indicates that UE has entered binary data mode. Secure command data can be transferred.)
When secure command data is processed the UE will send one of following answers:
```
SECURE CMD LENGTH ERROR
SECURE CMD PUBLIC CERTIFICATE IS CORRUPTED
SECURE CMD PRIVATE KEY WAS REMOVED
SECURE CMD SERVICE TIMEOUT ERROR
SECURE CMD TO MANY DATA ERROR
SECURE CMD ERROR
SECURE CMD END OK
```

Write Command

Certificates for local UE management.

`AT^SBNW="management_cert", <subtype>`

Response(s)

```
CONNECT

SECURE CMD READY: SEND COMMAND ...
```
(Indicates that UE has entered binary data mode. Secure command data can be transferred.)
When secure command data is processed the UE will send one of following answers:
```
SECURE CMD LENGTH ERROR
SECURE CMD PUBLIC CERTIFICATE IS CORRUPTED
SECURE CMD PRIVATE KEY WAS REMOVED
SECURE CMD SERVICE TIMEOUT ERROR
SECURE CMD TO MANY DATA ERROR
SECURE CMD ERROR
SECURE CMD END OK
```

PIN ✈ Last

| - | + | - |
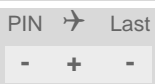
Parameter Description

`<type>`(str)

"ciphersuites"	Command for IPoverAT TLS Cipher Suite file management.
"is_cert"	Secure Command Mode (Manage Certificates). For embedded TCP IP services the certicates shall be created in DER format.

"preconfig_cert"	Secure command mode for managing preconfigured certificates. See AT^SSECUA and AT^SSECUC.
"management_cert"	Secure command mode for managing certificates for UE management. See AT^SSECUA and AT^SSECUC.

<subtype>(num)

1	Start Secure Command Block Transfer mode

<ciphersuites_length>(num)

Number of characters of ciphersuite names.

17.7 AT^SFDL Enter Firmware Download Mode

AT^SFDL allows the application manufacturer to download EXS82-W firmware into the module by starting the download process from the host application or a customer-designed download program.

This manual only describes the handling of the AT^SFDL command. All technical requirements and steps to prepare the host application for this download solution can be found in the "Application Note 16: Updating EXS82-W Firmware" [4]. An example for developing an appropriate download program is included.

The AT^SFDL execute command causes the module to enter the firmware download mode.

After entering the download mode the ME sends the start pattern HEX 0x01 ("ANSWER_OK") to the update tool to indicate its ready state. Next, the update tool shall start to send the records of the firmware file. Each record received by the ME is acknowledged to the update tool. Once all records are successfully received, the ME shuts down automatically.

Syntax

Test Command
AT^SFDL=?
Response(s)
OK

Exec Command
AT^SFDL
Response(s)
In case of success:
OK
0x01
In case of error:
ERROR
+CME ERROR: <err>

PIN	→	Last
-	+	+

Note

- The software update program sends first answer code OK and waits for data. If no data is received and after a 2 seconds timeout, the program ends with an error and the AT command interpreter outputs an error message.

17.8 AT^SFSA Flash File System Access

AT^SFSA provides access to the Flash File System. The following functionality is supported:

- Reading global status information, available storage and max. storage size
- Creating and deleting files and directories
- Reading file status information, e.g. file size, optional date
- Renaming files and directories
- Copying files and directories
- Listing directory contents
- Computation and displaying CRC of a given file
- Reading and writing an arbitrary amount of data per call
- Providing random access to the file data and a seek function

Flash File System Requirements:
AT^SFSA="gstat" shows the maximum memory space of the FFS (see <StorageSize>) and the free memory space (see <FreeSpace>). As the file system is block structured the <FreeSpace> value will decrease only in full block multiples. The block size is 2048 bytes.
Keep in mind that the entire memory space comprises both user data and internal resources for the file system infrastructure. As a result, the free memory space depends on the file size, the number of files and the number of created directories. In short, the more files / folders you create, and the more internal data is used from the system, the less memory will be available for user data. If the limit is reached, the error code ^SFSA: 28 will be returned.

Please consider the following rules for an efficient FFS management:

- The maximum number of directories altogether in the root directory and all subdirectories is limited to 100. The maximum number of files is about 1000 altogether in the root directory and all subdirectories.
  Note: *It is not possible to use* these maximum numbers of file system entries, the actual amount of files and directories may be lower, because some of them are used internally by the net service functionalities of module itself.
  Note: *Ensure not to fill up* the file system to its limits, otherwise the net service functionalities may run into trouble.
- The subdirectory depth shall not be greater than 5.
- Allowed characters for path and file names:
  - Path and file names are alphanumeric. Allowed characters: A - Z, a - z, digits, underscore, and special characters used in file URL format defined in IETF RFCs 1738 (except "*",""") and 2396. Space characters are allowed as well, but require the whole path or file name be enclosed in quotation marks (e.g. "a:/dire ctory/my file.txt" or "a:/ directory/my file.txt"), otherwise the spaces will be discarded.
  - Character "/" is a separator for directories and files, e.g. /directory/my_sub_dir/my_file.txt.
  - Both "." and ".." are illegal for directory names, "." as part of a file name is allowed. The ".." could be used to access one upper level folder only e.g. ../my_file.txt.
  - File and directory names are case-sensitive..
  - Path names start with drive prefix "a:/" or "A:/".
- Length of files and paths (incl. drive prefix "a:/" or "A:/"): The maximum usable length is 128 GSM characters.
- If the file is in open status, it must be closed first before executing other file operations such as copy, rename and remove.

Syntax

Test Command
AT^SFSA=?
Response(s)
^SFSA: "close", (range of <fh>) ^SFSA: "copy", (max. string length of <path>), (max. string length of <DestinationPath>), (list of supported <CopyFlag>s)

Test Command   (Continued)

AT^SFSA=?

Response(s)

^SFSA: "crc", (max. string length of <path>)
^SFSA: "gstat", (list of supported <drive>s)
^SFSA: "ls", (max. string length of <path>)
^SFSA: "mkdir", (max. string length of <path>)
^SFSA: "open", (max. string length of <path>), (range of <flag>)
^SFSA: "read", (range of <fh>), (max. value of <size>)
^SFSA: "remove", (max. string length of <path>)
^SFSA: "rename", (max. string length of <path>), (max. string length of <name>)
^SFSA: "rmdir", (max. string length of <path>)
^SFSA: "seek", (range of <fh>), (range of <offset>), (list of supported <SeekFlag>)
^SFSA: "stat", (max. string length of <path>)
^SFSA: "write", (range of <fh>), (max. value of <size>)
OK

Write Command

Close a file. The file has to be successfully opened before.

AT^SFSA="close", <fh>

Response(s)

In case of success:
^SFSA: <result>
OK
In case of error:
^SFSA: <result>
ERROR
+CME ERROR: <err>

Write Command

Copy a file given by the <path> parameter to the file given by the<DestinationPath>. Both names should
not be identical, otherwise copy operation returns error "path already exists".

AT^SFSA="copy", <path>, <DestinationPath>[, <CopyFlag>]

Response(s)

In case of success:
^SFSA: <result>
OK
In case of error:
^SFSA: <result>
ERROR
+CME ERROR: <err>

Write Command

Compute CRC of a file.

AT^SFSA="crc", <path>

Response(s)

In case of success:
^SFSA: <crc>,<result>
OK
In case of error:
^SFSA: <result>
ERROR
+CME ERROR: <err>

Write Command

Read global status of FFS.

AT^SFSA="gstat"[, <drive>]

Response(s)

In case of success:
^SFSA: <StorageSize>
^SFSA: <FreeSpace>
^SFSA: <result>
OK
In case of error:
^SFSA: <result>
ERROR
+CME ERROR: <err>

Write Command

Read global status of the FFS.

AT^SFSA="gstat"

Response(s)

In case of success:
^SFSA: <StorageSize>
^SFSA: <FreeSpace>
^SFSA: <result>
OK
In case of error:
^SFSA: <result>
ERROR
+CME ERROR: <err>

Write Command

List content of a directory.

AT^SFSA="ls", <path>

Response(s)

In case of success:
[^SFSA: <name>]
[...]
^SFSA: <result>
OK
In case of error:
^SFSA: <result>
ERROR
+CME ERROR: <err>

Write Command

Create a directory. The directory in which the new directory should be created must already exist, i.e. the creation of intermediate sub-directories is not supported.

AT^SFSA="mkdir", <path>

Response(s)

In case of success:
^SFSA: <result>
OK
In case of error:
^SFSA: <result>
ERROR
+CME ERROR: <err>

Write Command

Open a file.

AT^SFSA="open", <path>, <flag>

Response(s)

In case of success:
^SFSA: <fh>, <result>
OK
In case of error:
^SFSA: <result>
ERROR
+CME ERROR: <err>

Write Command

Read from a file. The file has to be opened for reading before.
The command returns <nbytes> bytes of binary data read from the file.
The number of bytes actually read can be equal or smaller than the requested number of bytes given by the
<size> parameter.

AT^SFSA="read", <fh>, <size>

Response(s)

In case of success:
<CR><LF>^SFSA: <nbytes>, <result><CR><LF>
[Binary data of <nbytes> bytes]
OK
In case of error:
^SFSA: <result>
ERROR
+CME ERROR: <err>

Write Command

Remove a file. The file has to be closed.

AT^SFSA="remove", <path>

Response(s)

In case of success:
^SFSA: <result>
OK
In case of error:
^SFSA: <result>
ERROR
+CME ERROR: <err>

Write Command

Rename a file or directory.

AT^SFSA="rename", <path>, <name>

Response(s)

In case of success:
^SFSA: <result>
OK
In case of error:
^SFSA: <result>
ERROR
+CME ERROR: <err>

Write Command

Remove a directory. The directory has not to be empty.

AT^SFSA="rmdir", <path>

Response(s)

In case of success:

^SFSA: <result>
OK
In case of error:
^SFSA: <result>
ERROR
+CME ERROR: <err>

Write Command

Move the pointer of the current position in a file.

AT^SFSA="seek", <fh>, <offset>[, <SeekFlag>]

Response(s)

In case of success:
^SFSA: <new offset>, <result>
OK
In case of error:
^SFSA: <result>
ERROR
+CME ERROR: <err>

Write Command

Read file or directory status.

AT^SFSA="stat", <path>

Response(s)

In case of success:
^SFSA: <FileSize>
^SFSA: <DateLastAccess>
^SFSA: <DateLastModification>
^SFSA: <DateLastFileStatChange>
^SFSA: <StatAttribute>
^SFSA: <result>
OK
In case of error:
^SFSA: <result>
ERROR
+CME ERROR: <err>

Write Command

Write to a file. The file has to be opened for writing before.

After entering the command, the ME enters data entry mode and is ready to receive binary data over the serial interface. The ME awaits certain number of <size> bytes to write.

There are three ways to quit the data entry mode and revert to AT command mode:

- the exact number of bytes has been received by the ME (see the <size> parameter)

- timeout has expired. The timeout value for reception of each character is 30 seconds.

- inline break +++ is entered to abort the data input before the certain number of <size> bytes input.

After invoking the command it is necessary to wait for the prompt "CONNECT" before entering data.

After the prompt a timer will be started to guard the input period.

If current position in the file is not set to the end, the data will be overwritten.

In case of timeout, the command ends with <result> 214.

AT^SFSA="write", <fh>, <size>

Response(s)

In case of success:

CONNECT

[<size> bytes of binary data]

^SFSA: <size>

^SFSA: <result>

OK

In case of error:

^SFSA: <size>

^SFSA: <result>

ERROR

+CME ERROR: <err>

PIN ✈ Last

- **+** **-**

Parameter Description

<fh>(num)

File handle

The file handle is returned by the system in the open command. It has then to be used in the following requests, e.g. read, write, close, seek. The number of opened files is limited to 32.

0...31   .

<path>(str)(+CSCS)

Path to a file or a directory

For naming restrictions please see above rules for efficient FFS management.

<DestinationPath>(str)(+CSCS)

Path to a destination file

For naming restrictions please see above rules for efficient FFS management.

<name>(str)(+CSCS)

Name of a file or a directory

The list command shows directory names with appended slash.

For naming restrictions please see above rules for efficient FFS management.

<flag>(num)	

File access flags

All available flags are divided into two groups: primary and optional. To select the desired flag combination, calculate the sum of the values and use the resulting value. Writing data to file can take up to 180 seconds due to internal flash file system data processing.

Primary group:

1	Write. When set it is still allowed to read out the file content. After applying it on the file with read-only or hidden attribute, the file attribute will not be changed.
2	Read/write. Has priority over the read-only, hidden and write flags, when set in combination with them. After applying it on the file with read-only or hidden attribute, the file attribute will be cleared.
32	Hidden.
64	Read-only.

Optional group:

4	Append. Set the current position in the file to the end of the file. If append flag is not used, current position will be set to the beginning of the file.
8	Create. Create the file if it does not exist. Otherwise the existing file will be opened.
16	Truncate. Truncate the file to the size 0. This truncate operation is not applicable on a file which has Read-only attribute and has priority over Append, Write and Read/Write when set in combination with them. The file will first be truncated to size 0, then other operation will take effect. Depending on the file size, truncating may take a couple of seconds.

<SeekFlag>(num)	

Seek flags

Determines how the new position is calculated.

[0]	Offset from the beginning of the file. The new position in the file equals <offset>. The offset has to be positive or zero.
1	Offset from the current file position. The new position in the file equals the current position + <offset>. The <offset> can be positive, zero or negative. In case the new position exceeds the allowed range for the <offset> parameter, the pointer goes to 0 or to the possible maximum position.
2	Offset from the end of the file. The new position in the file equals the file size + <offset>. The offset has to be negative or zero. In case the new position exceeds the allowed range for the <offset> parameter, the pointer goes to 0 or to the possible maximum position.

<CopyFlag>(num)	

Copy flags

Determines whether or not copy works as force copy behavior, when destination path entry already exists.

[0]	Performs normal copy, reporting error when destination path entry already exists.
1	Performs force copy, replacing destination path entry which already exists. Even when using force copy, the two path <path> and <DestinationPath> should not be identical, otherwise copy operation will return error "path already exists"; If force copy failed during operation, the <DestinationPath>'s entry file will be removed without recovery.

<result>(num)	

Result code

The result of the operation. The codes below 200 are proprietary file system error codes.

0	success
1	path not found
2	file not found
3	open file error
4	close file error
5	create file error
6	delete file error
7	truncate file error
8	rename file error
9	invalid file descriptor
10	file size error
11	change file attribute error
12	list file error
13	invalid access
14	create directory error
15	remove directory error
16	path already exist
17	file already exists
22	seek to negative file pointer attempted
23	seek to invalid file pointer attempted
24	no more file descriptors available
28	no free space available
30	sharing violation
100	invalid drive
101	invalid path
102	invalid file name
103	generic internal error
104	path too long
105	file name too long
201	command not recognized
202	incorrect parameter
203	incorrect number of input parameters
204	input parameter out of range
205	input stream open error
206	output stream open error
207	input stream read error
208	output stream write error
209	input stream close error
210	output stream close error

211	data transfer abort
214	data transfer error: timeout expired
215	data transfer error: internal error
216	directory listing error: no such directory
217	busy
218	internal error
219	unknown error

<StatAttribute>(num)

Status information attribute

Attributes of files or directories. Bitmask is composed of sum of the following values:

| 0 | Regular file |
| 16 | Directory |

<size>(num)

Number of bytes to read or write.

[reference] available read size.

1...file size

[reference] available write size.

1...free space size

<FileSize>(num)

File size

The size of the file. 32-bit value.

0...4294967295

<StorageSize>(num)

Storage Size

Maximum storage size of FFS.

<FreeSpace>(num)

Free space

Free space on FFS.

<offset>(num)

The current position in a file. 32-bit signed value.

file size - 1...negative value of file size

<new offset>(num)

The new position in a file. 32-bit signed value.

file size - 1...negative value of file size

<crc>(num)

CRC check-sum computed on a file. 16-bit value.
The check-sum is calculated using the initial value 65535 (hex 0xFFFF). The polynomial generator is $x^{16} + x^{12} + x^5 + 1$ and the final XOR value equals 65535 (hex 0xFFFF). The low-bit order is used for the whole calculation (the least-significant bit at the leftmost position in a byte).

0...65535

<nbytes>(num)

Number of bytes

The number of bytes to read.

1...file size

The number of bytes to write.

1...free space size

<drive>(str)(+CSCS)

Default "A:/". This parameter may be omitted.

<DateLastAccess>(str)

Date of last file access. Identical with <DateLastModification>. 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"

<DateLastModification>(str)

Date of last file modification

Date of last file modification is updated when the file is closed.
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"

<DateLastFileStatChange>(str)

Date of last file status change
Updated when closing file if file was modified. 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"

17.9 AT^SRVCFG Service Configuration Settings

The AT^SRVCFG can be used to query and configure various settings of extra services supported by the EXS82-W.

The AT^SRVCFG write command queries a configuration parameter (if no value is input) or sets its value(s).

All settings are stored non-volatile.

Input of parameter names is always coded in GSM character set.

Syntax

Test Command

```
AT^SRVCFG=?
```

Response(s)

```
^SRVCFG: "MODS", (list of supported <service_tag>s), (list of supported <service_tag_value>s)
OK
```

Write Command

Query/Configure Module Service settings.

```
AT^SRVCFG="MODS", <service_tag>[, <service_tag_value>]
```

Response(s)

```
^SRVCFG: "MODS", <service_tag>, <service_tag_value>[, <response_code>[,
<MODS_Error_Message>]]
OK
ERROR
+CME ERROR: <err>
```

PIN ✈ Last

| - | - | - |

Parameter Description

<service_tag>(str)

Parameter Name for Module Service

"fwdownload/deferLimit"	specifies maximum number of times defined by <service_tag_value> the module will not initiate automatic firmware download after new URL has been provided. Counter will be decreased after LwM2M client received each of L2M2M Server download request until reach to value 0 to perform the firmware download. Counter will be reset to previously configured setting after successful firmware download. Value "0"(D) means firmware will always automatically downloaded. Value "255" means that download will always be conditional.
"fwupdate/deferLimit"	specifies maximum number of times defined by <service_tag_value> the module will not initiate automatic firmware update after new firmware has already been downloaded. Counter will be decreased after LwM2M client received each of L2M2M Server update request until reach to value 0 to perform the firmware update. Counter will be reset to previously configured setting after successful firmware update. Value "0"(D) means firmware will always automatically updated. Value "255" means that update will always be conditional.

<service_tag_value>(str)

Parameter Value for Module Service

When this parameter is omitted, the write command returns the actual setting of the given <service_tag>.

`<response_code>`(num)

Response Code for Module Service

0	Configuration done successfully
1	Error occured during configuration

`<MODS_Error_Message>`(str)

Error Message for Module Service

This parameter will give more information when `<response_code>`=1:

17.10 AT^SRVCTL Extra Service Control

AT^SRVCTL provides access to extra services. The following services are supported:
- Module Service: a M2M middleware service seamlessly connects EXS82-W modules to the IoT Service Agent. The Module Service exposes a set of easy-to-use functions for Firmware update over the Air.

Syntax

Test Command

AT^SRVCTL=?

Response(s)

^SRVCTL: "MODS", (list of supported <action>s)
OK

Write Command

Control the Module Service.

AT^SRVCTL="MODS", <action>

Response(s)

^SRVCTL: "MODS", <action>, <response_code>[, <MODS_Service_Message>]
OK
ERROR
+CME ERROR: <err>

PIN ✈ Last

| - | - | - |

Parameter Description

<action>(str)

Actions for Module Service

The functionality provided by Module Service.

"start"	Start the Module Service.
"stop"	Stop the Module Service.
"status"	Display the Module Service status.

<response_code>(num)

Response Code for Module Service

| 0 | Success for <action>="start" or "stop", "not running" for <action>="status". |
| 1 | Error for <action>="start" or "stop", "running" for <action>="status". |

<MODS_Service_Message>(str)

Service Message for Module Service

This parameter will give more information when <response_code>=1.

17.11   AT^SRVACT   Extra Service Action

AT^SRVACT provides access to extra services. The following services are supported:

- Module Service (MODS) is part of the IoT Service Agent and supports the actions "fwdownload" and "fwupdate" which can be controlled by server and module side.

The following firmware download and firmware update options can be configured (see AT^SRVCFG):

- Unconditional pull download - in case the server has provided URI for FW download (i.e pull method) then download will start immediately. This is the default IoT Service Agent configuration option.
- Conditional pull download - in case the server has provided URI for FW download (i.e pull method) then download will only start after it is initiated by the host application.
- Conditional update - the host application is informed that new firmware has been downloaded and can initiate the firmware update. This is the default setting. The server does trigger the download but does not trigger the firmware update;
- Unconditional update - the Module Service will update the module firmware independently on the host application status, when the server triggers the firmware update. This can happen immediately after firmware download.

Syntax

Test Command
AT^SRVACT=?
Response(s)
^SRVACT: "MODS", (list of supported <action>s)
OK

Write Command
AT^SRVACT="MODS", <action>
Response(s)
^SRVACT: "MODS", <action>[, <response_code>][, <MODS_Error_Message>]
OK
ERROR
+CME ERROR: <err>

PIN	✈	Last
-	-	-

Unsolicited Result Code

Response from the Module Service

^SRVACT: "MODS", <action>[, <data_status>][, <data1>]

The URC will be issued when Module Service status has changed.

Parameter Description

<action>(str)

Actions for Module Service

"fwdownload"	to start the download firmware in case the URL has been provided by the server and client is configured not to start download automatically (URL provided by server cannot be changed) - In case IoT Service Agent supports conditional FW download.
"fwupdate"	to start the firmware update procedure in case the firmware is downloaded and server has not initiated firmware update (only the firmware file downloaded using IoT Service Agent can be used for the update and thus filename is not provided as parameter).

<response_code>(str)

Response Code for Module Service

"0"	Success
"1"	Error

<MODS_Error_Message>(str)

Error Message for Module Service

This parameter will give more information when <response_code>=1.

"no Package URI provided"	in case of <action>="fwdownload"
"wrong state"	in case of <action>="fwdownload" or <action>="fwupdate"

<data_status>(str)

Action Status for Module Service

"init"	to indicate the action which firmware download is starting with URL information provided in <data1>
"ready"	to indicate action is ready to be initiated if <action> is "fwdownload", <data1> could be "to download", for server initiate the download but is not starting yet; if <action> is "fwupdate", <data1> could be "to update", for client initiate the update but is not starting yet;
"progress"	to indicate download progress percentage, with downloading percentage information provided in <data1>, the URC will be printed in every 5 percent increased
"status"	to indicate final action status provided in <data1> if <action> is "fwdownload", <data1> could be "download success" or "download failed"; if <action> is "fwupdate", <data1> could be "update success" or "update failed";

<data1>(str)

Action Status additional Data for Module Service

This parameter will give additional information (see <data_status> for details).

18.   Appendix

18.1   Available AT Commands and Dependency on SIM PIN

ø ... Command not available
- ... Command does not require PIN1
+ ... Command requires PIN1
± ... Command sometimes requires PIN1

Table 18.1:   Available AT Commands and Dependency on SIM PIN

AT Command	Exec	Test	Read	Write
Configuration Commands				
AT&F	-	ø	ø	ø
AT&V	-	ø	ø	ø
AT&W	-	ø	ø	ø
ATQ	-	ø	ø	ø
ATV	-	ø	ø	ø
ATX	+	ø	ø	ø
ATZ	+	ø	ø	ø
AT+CMEE	-	-	-	-
AT+CSCS	ø	-	-	-
AT+CFUN	ø	-	-	-
AT^SCFG	ø	-	-	-
AT^SMSO	-	-	ø	-
Status Control Commands				
AT+CEER	+	+	ø	+
AT^SIND	ø	-	-	-
AT+CPAS	-	-	ø	ø
Serial Interface Control Commands				
AT&C	-	ø	ø	ø
AT&D	-	ø	ø	ø
AT&S	-	ø	ø	ø
AT\Q	-	ø	ø	ø
ATE	-	ø	ø	ø
AT+IPR	ø	-	-	-
AT+ICF	ø	-	-	-
AT+CMUX	ø	-	-	-
AT^SQPORT	-	-	-	ø
Security Commands				
AT+CPIN	ø	-	-	-

AT Command	Exec	Test	Read	Write
AT+CLCK	Ø	+	Ø	+
AT+CPWD	Ø	+	Ø	+
AT^SPIC	-	-	-	-
AT^SSECUA	Ø	-	Ø	-
AT^SSECUC	Ø	-	Ø	-
Identification Commands				
ATI	-	Ø	Ø	Ø
AT+CGMI	-	-	Ø	Ø
AT+GMI	-	-	Ø	Ø
AT+CGMM	-	-	Ø	Ø
AT+GMM	-	-	Ø	Ø
AT+CGMR	-	-	Ø	Ø
AT+CGSN	-	-	Ø	Ø
AT+CIMI	+	+	Ø	Ø
AT^SINFO	Ø	-	-	-
Call related Commands				
ATO	-	Ø	Ø	Ø
+++	-	Ø	Ø	Ø
Network Service Commands				
AT+CEDRXS	Ø	+	+	+
AT^SEDRXS	Ø	+	+	+
AT+CEDRXRDP	-	-	Ø	Ø
AT+COPN	+	+	Ø	Ø
AT+COPS	Ø	+	+	+
AT+CPLS	Ø	+	+	+
AT+CPOL	Ø	+	+	+
AT+CPSMS	Ø	-	-	-
AT+CREG	Ø	-	-	-
AT+CSQ	+	+	Ø	Ø
AT+CESQ	+	+	Ø	Ø
AT+CTZU	Ø	-	-	-
AT^SMONI	-	-	Ø	Ø
AT^SMONP	-	-	Ø	Ø
AT^SNMON	Ø	-	Ø	-
AT^SXRAT	Ø	-	-	-
AT^SNLWM2M	Ø	-	-	-
AT+CCIOTOPT	Ø	-	-	-
USIM Application Toolkit (USAT) Commands				
AT^SSTA	Ø	-	-	-

AT Command	Exec	Test	Read	Write
AT^SSTGI	∅	-	-	-
AT^SSTGI	∅	∅	∅	-
AT^SSTGI	∅	∅	∅	-
AT^SSTGI	∅	∅	∅	-
AT^SSTGI	∅	∅	∅	-
AT^SSTGI	∅	∅	∅	-
AT^SSTGI	∅	∅	∅	-
AT^SSTGI	∅	∅	∅	-
AT^SSTGI	∅	∅	∅	-
AT^SSTGI	∅	∅	∅	-
AT^SSTGI	∅	∅	∅	-
AT^SSTGI	∅	∅	∅	-
AT^SSTGI	∅	∅	∅	-
AT^SSTGI	∅	∅	∅	-
AT^SSTGI	∅	∅	∅	-
AT^SSTR	∅	-	-	-
AT^SSTR	∅	∅	∅	-
AT^SSTR	∅	∅	∅	-
AT^SSTR	∅	∅	∅	-
AT^SSTR	∅	∅	∅	-
AT^SSTR	∅	∅	∅	-
AT^SSTR	∅	∅	∅	-
AT^SSTR	∅	∅	∅	-
AT^SSTR	∅	∅	∅	-
AT^SSTR	∅	∅	∅	-
AT^SSTR	∅	∅	∅	-
AT^SSTR	∅	∅	∅	-
AT^SSTR	∅	∅	∅	-
AT^SSTR	∅	∅	∅	-
AT^SSTR	∅	∅	∅	-
AT^SSTR	∅	∅	∅	-
AT^SSTR	∅	∅	∅	-
AT^SSTR	∅	∅	∅	-
Short Message Service (SMS) Commands				
AT+CMGC	∅	+	∅	+
AT+CMGD	∅	+	∅	+
AT+CMGF	∅	+	+	+
AT+CMGL	+	+	∅	+
AT+CMGR	∅	+	∅	+

AT Command	Exec	Test	Read	Write
AT+CMGS	∅	+	∅	+
AT+CMGW	+	+	∅	+
AT+CMSS	∅	+	∅	+
AT+CNMA	+	+	∅	+
AT+CNMI	∅	+	+	+
AT+CPMS	∅	+	+	+
AT+CMMS	∅			
AT+CSCA	∅	+	+	+
AT+CSDH	∅	+	+	+
AT+CSMP	∅			
AT+CSMS	∅			
AT^SMGL	+	+	∅	+
AT^SMGR	∅	+	∅	+
AT^SSDA	∅	-	-	-
Internet Service Commands				
AT^SICA	∅	+	+	+
AT^SICS	∅	-	-	-
AT^SIPS	∅	-	∅	-
AT^SISS	∅	-	-	-
AT^SISI	∅	-	-	-
AT^SISO	∅	-	-	+
AT^SISC	∅	-	∅	+
AT^SISR	∅	-	∅	+
AT^SISW	∅	-	∅	+
AT^SIST	∅	-	∅	-
AT^SISD	∅	-	∅	-
AT^SISU	∅	-	∅	-
AT^SISH	∅	-	∅	-
AT^SISX	∅	+	∅	+
AT^SISE	∅	-	∅	-
Packet Domain Related Commands				
AT+CEMODE	∅	+	+	+
AT+CGDCONT	∅	-	-	-
AT+CGATT	∅	+	+	+
AT+CGACT	∅	+	+	+
AT+CGPADDR	+	+	∅	+
AT+CGPIAF	∅	+	+	+
AT+CGEREP	∅	+	+	+
AT+CGREG	∅	+	+	+
AT+CEREG	+	+	+	+

AT Command	Exec	Test	Read	Write
AT+CGCONTRDP	+	+	∅	+
AT+CGSMS	∅	+	+	+
ATD*99#		∅	∅	∅
AT^SGAUTH	∅	-	-	-
AT^SGCONF	∅	+	+	+
AT+CSODCP	∅	+	∅	+
AT+CRTDCP	∅	+	+	+
AT^SWWAN	∅	+	+	+
USIM related Commands				
AT+CRSM	∅	-	∅	-
AT+CSIM	∅	-	∅	-
AT^SCID	-	-	∅	∅
AT^SCKS	∅	-	-	-
AT^SSET	∅	-	-	-
AT+CCHO	∅	-	∅	-
AT+CCHC	∅	-	∅	-
AT+CGLA	∅	-	∅	-
GNSS Commands				
AT^SGPSC	∅	-	-	-
Hardware related Commands				
AT+CCLK	∅	-	-	-
AT^SBV	-	-	∅	∅
AT^SCTM	∅	-	-	-
AT^SLED	∅	-	-	-
AT^SRADC	∅	-	-	-
General Purpose I/O (GPIO) Pin related Commands				
AT^SPIO	∅	-	∅	-
AT^SCPIN	∅	-	∅	-
AT^SCPOL	∅	-	∅	-
AT^SGIO	∅	-	∅	-
AT^SSIO	∅	-	∅	-
AT^SGPINCA	∅	-	∅	-
AT^SGPICFG	∅	-	-	-
Miscellaneous Commands				
A/	-	∅	∅	∅
ATS3	∅	∅	-	-
ATS4	∅	∅	-	-
ATS5	∅	∅	-	-

AT Command	Exec	Test	Read	Write
AT^SBNR	Ø	-	-	-
AT^SBNW	Ø	-	Ø	-
AT^SFDL	-	-	Ø	Ø
AT^SFSA	Ø	-	Ø	-
AT^SRVCFG	Ø	-	Ø	-
AT^SRVCTL	Ø	-	Ø	-
AT^SRVACT	Ø	-	Ø	-

18.2 Availability of AT Commands Depending on Operating Mode of ME

- ... AT command not supported
+ ... AT command supported
± ... AT command partially supported
  See description of AT command for details.

Table 18.2: Availability of AT Commands Depending on Operating Mode of ME

AT Command	Normal Mode	✈
Configuration Commands		
AT&F	+	
AT&V	+	
AT&W	+	
ATQ	+	
ATV	+	
ATX	+	
ATZ	+	
AT+CMEE	+	
AT+CSCS	+	
AT+CFUN	+	
AT^SCFG	+	+
AT^SMSO	+	
Status Control Commands		
AT+CEER	+	
AT^SIND	+	
AT+CPAS	+	
Serial Interface Control Commands		
AT&C	+	
AT&D	+	
AT&S	+	
AT\Q	+	
ATE	+	
AT+IPR	+	
AT+ICF	+	
AT+CMUX	+	+
AT^SQPORT	+	
Security Commands		
AT+CPIN	+	+
AT+CLCK	+	±
AT+CPWD	+	±
AT^SPIC	+	+

AT Command	Normal Mode	✈
AT^SSECUA	+	+
AT^SSECUC	+	+
Identification Commands		
ATI	+	
AT+CGMI	+	
AT+GMI	+	
AT+CGMM	+	
AT+GMM	+	
AT+CGMR	+	
AT+CGSN	+	
AT+CIMI	+	
AT^SINFO	+	
Call related Commands		
ATO	+	-
+++	+	-
Network Service Commands		
AT+CEDRXS	+	
AT^SEDRXS	+	
AT+CEDRXRDP	+	
AT+COPN	+	
AT+COPS	+	-
AT+CPLS	+	-
AT+CPOL	+	
AT+CPSMS	+	-
AT+CREG	+	+
AT+CSQ	+	-
AT+CESQ	+	-
AT+CTZU	+	
AT^SMONI	+	-
AT^SMONP	+	-
AT^SNMON	+	-
AT^SXRAT	+	±
AT^SNLWM2M	+	+
AT+CCIOTOPT	+	-
USIM Application Toolkit (USAT) Commands		
AT^SSTA	+	+
AT^SSTGI	+	+
AT^SSTGI	+	+
AT^SSTGI	+	+

AT Command	Normal Mode	✈
AT^SSTGI	+	+
AT^SSTGI	+	+
AT^SSTGI	+	+
AT^SSTGI	+	+
AT^SSTGI	+	+
AT^SSTGI	+	+
AT^SSTGI	+	+
AT^SSTGI	+	+
AT^SSTGI	+	+
AT^SSTGI	+	+
AT^SSTGI	+	+
AT^SSTGI	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
Short Message Service (SMS) Commands		
AT+CMGC	+	-
AT+CMGD	+	+
AT+CMGF	+	+
AT+CMGL	+	+
AT+CMGR	+	+
AT+CMGS	+	-
AT+CMGW	+	+
AT+CMSS	+	-

AT Command	Normal Mode	✈
AT+CNMA	+	-
AT+CNMI	+	+
AT+CPMS	+	
AT+CMMS	+	
AT+CSCA	+	
AT+CSDH	+	
AT+CSMP	+	
AT+CSMS	+	
AT^SMGL	+	
AT^SMGR	+	
AT^SSDA	+	
Internet Service Commands		
AT^SICA	+	-
AT^SICS	+	
AT^SIPS	+	
AT^SISS	+	
AT^SISI	+	
AT^SISO	+	-
AT^SISC	+	-
AT^SISR	+	-
AT^SISW	+	-
AT^SIST	+	-
AT^SISD	+	-
AT^SISU	+	-
AT^SISH	+	-
AT^SISX	+	-
AT^SISE	+	-
Packet Domain Related Commands		
AT+CEMODE	+	-
AT+CGDCONT	+	+
AT+CGATT	+	-
AT+CGACT	+	-
AT+CGPADDR	+	+
AT+CGPIAF	+	
AT+CGEREP	+	+
AT+CGREG	+	+
AT+CEREG	+	+
AT+CGCONTRDP	+	-
AT+CGSMS	+	
ATD*99#	+	-

AT Command	Normal Mode	✈
AT^SGAUTH	+	+
AT^SGCONF	+	-
AT+CSODCP	+	-
AT+CRTDCP	+	-
AT^SWWAN	+	-
USIM related Commands		
AT+CRSM	+	
AT+CSIM	+	
AT^SCID	+	
AT^SCKS	+	
AT^SSET	+	
AT+CCHO	+	
AT+CCHC	+	
AT+CGLA	+	
GNSS Commands		
AT^SGPSC	+	+
Hardware related Commands		
AT+CCLK	+	
AT^SBV	+	
AT^SCTM	+	
AT^SLED	+	
AT^SRADC	+	
General Purpose I/O (GPIO) Pin related Commands		
AT^SPIO	+	
AT^SCPIN	+	
AT^SCPOL	+	
AT^SGIO	+	
AT^SSIO	+	
AT^SGPINCA	+	
AT^SGPICFG	+	
Miscellaneous Commands		
A/	+	
ATS3	+	
ATS4	+	
ATS5	+	
AT^SBNR	+	
AT^SBNW	+	
AT^SFDL	+	+

AT Command	Normal Mode	✈
AT^SFSA	+	
AT^SRVCFG	+	-
AT^SRVCTL	+	-
AT^SRVACT	+	-

18.3 AT Command Settings storable with AT&W

Table 18.3: Settings Stored to User Profile

AT Command	Stored Parameters
Configuration Commands	
ATQ	\<n>
ATV	\<value>
ATX	\<value>
AT+CMEE	\<errMode>
AT+CSCS	\<charSet>
Serial Interface Control Commands	
AT&C	\<value>
AT&D	\<value>
AT&S	\<value>
AT\Q	\<n>
ATE	\<value>
AT+ICF	\<format>, \<parity>
Network Service Commands	
AT+COPS	\<format>
AT+CREG	\<urcMode>
Short Message Service (SMS) Commands	
AT+CMGF	\<mode>
AT+CNMI	\<mode>, \<mt>, \<bm>, \<ds>, \<bfr>
AT+CSDH	\<show>
AT+CSMS	\<service>
USIM related Commands	
AT^SCKS	\<mode>
AT^SSET	\<n>
Hardware related Commands	
AT^SLED	\<mode>

18.4 Factory Default Settings Restorable with AT&F

Table 18.4: Factory Default Settings Restorable with AT&F

AT Command	Factory Defaults
Configuration Commands	
ATQ	\<n>=0
ATV	\<value>=1
ATX	\<value>=0
AT+CMEE	\<errMode>=2
AT+CSCS	\<charSet>="GSM"
Serial Interface Control Commands	
AT&C	\<value>=1
AT&D	\<value>=2
AT&S	\<value>=0
AT\Q	\<n>=3
ATE	\<value>=1
AT+ICF	\<format>=3
Network Service Commands	
AT+COPS	\<format>=0
AT+CREG	\<urcMode>=0
AT+CTZU	\<n>=0
Short Message Service (SMS) Commands	
AT+CMGF	\<mode>=0
AT+CNMI	\<mode>=0, \<mt>=0, \<bm>=0, \<ds>=0, \<bfr>=1
AT+CSDH	\<show>=0
AT+CSMP	\<fo>=17, \<vp>=167, \<pid>=0, \<dcs>=0
AT+CSMS	\<service>=0
AT^SSDA	\<da>=1
Packet Domain Related Commands	
AT+CGPIAF	\<format>=0, \<subnet>=0, \<lzeros>=0, \<czeros>=0
AT+CGREG	\<n>=0
AT+CEREG	\<n>=0
USIM related Commands	
AT^SCKS	\<mode>=0
AT^SSET	\<n>=0
Hardware related Commands	
AT^SLED	\<mode>=0

AT Command	Factory Defaults
Miscellaneous Commands	
ATS3	<n>=013
ATS4	<n>=010
ATS5	<n>=008

18.5 Summary of Unsolicited Result Codes (URC)

Table 18.5: Summary of Unsolicited Result Codes (URC)

AT Command	URC
Unsolicited Result Code Presentation	
	`^SBC`: Undervoltage Warning
	`^SBC`: Undervoltage Shutdown
	`^SBC`: Overvoltage Warning
	`^SBC`: Overvoltage Shutdown
	`^SHUTDOWN`
Configuration Commands	
`AT+CFUN`	`^SYSSTART`
`AT+CFUN`	`^SYSSTART AIRPLANE MODE`
`AT^SCFG`	`^SYSRESUME`
Status Control Commands	
`AT^SIND`	`+CIEV: <indDescr>, <indValue>`
`AT^SIND`	`+CIEV: <indDescr>, <cmdType>, <commandDetails>[, <pathLen>, <fileNum>, <fileList>, <aidList>]`
`AT^SIND`	`+CIEV: <indDescr>, <cmdType>, <commandDetails>, <text>, <iconQuali-fier>, <iconId>`
`AT^SIND`	`+CIEV: <indDescr>, <cmdType>, <commandDetails>,,,,, <status>, <statAd-dInfo>`
`AT^SIND`	`+CIEV: <indDescr>, <indValue>, <eonsOperator>, <servProvider>, <servProviderType>`
`AT^SIND`	`+CIEV: <indDescr>, <nitzUT>, <nitzTZ>[, <nitzDST>]`
`AT^SIND`	`+CIEV: <indDescr>, <indValue>, <lstaEdvs>, <lstaRssi>`
`AT^SIND`	`+CIEV: <indDescr>, <indValue>, <lstaNo>, <lstaMin>, <lstaMax>, <lsta-Mean>, <lstaVar>`
`AT^SIND`	`+CIEV: <indDescr>, <indValue>, <lstaFrRep>, <lstaBandScnd>, <lstaFr-Min>, <lstaFrMax>, <lstaMin>, <lstaMax>, <lstaMean>, <lstaGrade>`
`AT^SIND`	`+CIEV: <indDescr>, <ceerRelCauseGroup>, <ceerReport>`
`AT^SIND`	`+CIEV: <indDescr>, <srvProfileId>, <issuer>, <serialNumber>, <sub-ject>, <signatureAlgorithm>, <thumbprintAlgorithm>, <thumbprint>`
`AT^SIND`	`+CIEV: <indDescr>, <provMm>, <provCur>[, <provNext>]`
Security Commands	
`AT^SSECUA`	`^SSECUA: "CertStore/TLS/UpdateServerCerts", <index>, <action>` `[... ]`
Network Service Commands	
`AT+CEDRXS`	`+CEDRXP:<AcT-type>[, <Requested_eDRX_value>[, <NW_provided_eDRX_value>[, <Paging_time_window>]]]`
`AT^SEDRXS`	`+CEDRXP:<AcT-type>[, <Requested_eDRX_value>[, <NW_provided_eDRX_value>[, <NW_provided_Paging_time_window>]]]`

AT Command	URC
AT+CREG	+CREG: \<regStatus>
AT+CREG	+CREG: \<regStatus>[, \<netLac>, \<netCellId>[, \<AcT>]]
AT+CTZU	+CTZU:\<nitzUT>, \<nitzTZ>[, \<nitzDST>]
AT^SNLWM2M	^SNLWM2M, "procedure", \<stack_id_str>, [\<srvID>], \<procedure>, \<procedure_status>[, \<procedure_status_parameter>]
AT+CCIOTOPT	+CCIOTOPTI: \<supported_Network_opt>
USIM Application Toolkit (USAT) Commands	
^SSTN SAT Notification	^SSTN: \<cmdType>
^SSTN SAT Notification	^SSTN: \<cmdTerminateValue>
^SSTN SAT Notification	^SSTN: 254
^SSTN SAT Notification	^SSTN: 255
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	+CDS: \<length>**\<CR>\<LF>**\<pdu>
AT+CNMI	+CDS: \<fo>, \<mr>[, \<ra>][, \<tora>], \<scts>, \<dt>, \<st>
Internet Service Commands	
AT^SISR	^SISR: \<srvProfileId>, \<urcCauseId>
AT^SISW	^SISW: \<srvProfileId>, \<urcCauseId>
Internet Service URC	^SIS: \<srvProfileId>, \<urcCause>[, [\<urcInfoId>][, \<urcInfoText>]]
Packet Domain Related Commands	
AT+CGEREP	+CGEV: NW DETACH
AT+CGEREP	+CGEV: ME DETACH
AT+CGEREP	+CGEV: PDN ACT \<cid>
AT+CGEREP	+CGEV: PDN DEACT \<cid>
AT+CGREG	+CGREG: \<stat>
AT+CGREG	+CGREG: \<stat>[, \<lac>][, \<ci>][, \<AcT>]
AT+CGREG	+CGREG: \<stat>[, [\<lac>], [\<ci>], [\<AcT>][, , , [, [\<ActiveTime>], [\<PeriodicRAU>], [\<GPRSREADYTime>]]]]
AT+CEREG	+CEREG: \<stat>
AT+CEREG	+CEREG: \<stat>[, [\<tac>], [\<ci>], [\<AcT>]]
AT+CEREG	+CEREG: \<stat>[, [\<tac>], [\<ci>], [\<AcT>][, , [, [\<ActiveTime>], [\<PeriodicTAU>]]]]
AT+CRTDCP	+CRTDCP:\<cid>, \<cpdata_length>, \<cpdata>

AT Command	URC
USIM related Commands	
AT^SCKS	^SCKS: \<SimStatus\>
AT^SSET	^SSIM READY
GNSS Commands	
AT^SGPSC	^SGPSE: \<UrcType\>, \<PositionStatus\>
Hardware related Commands	
AT^SCTM	^SCTM_B: \<UrcCause\>
AT^SRADC	^SRADC: \<ch\>, \<count\>, \<value\>[, \<value\>[, \<value\>[, \<value\>[, \<value\>[, \<value\>[, \<value\>[, \<value\>[, \<value\>[, \<value\>[, \<value\>]]]]]]]]]]]
General Purpose I/O (GPIO) Pin related Commands	
AT^SCPOL	^SCPOL: \<ioId\>, \<value\>
Miscellaneous Commands	
AT^SRVACT	^SRVACT: "MODS", \<action\>[, \<data_status\>][, \<data1\>]

18.6 Alphabetical List of AT Commands

Table 18.6: Alphabetical List of AT Commands

AT Command	Description	Section and Page
+++	Escape from Data Mode to AT Command Mode	Section 7.2, page 129
A/	Repeat Previous Command Line	Section 17.1, page 416
AT&C	Set Data Carrier Detect (DCD) line mode	Section 4.1, page 95
AT&D	Set Data Terminal Ready (DTR) line mode	Section 4.2, page 96
AT&F	Reset AT Command Settings to Factory Default Values	Section 2.1, page 28
AT&S	Set Data Set Ready (DSR) line mode	Section 4.3, page 97
AT&V	Display current Configuration	Section 2.2, page 29
AT&W	Store AT Command Settings to User Defined Profile	Section 2.3, page 30
AT+CCHC	Close logical channel	Section 13.7, page 384
AT+CCHO	Open logical channel	Section 13.6, page 383
AT+CCIOTOPT	CIoT Optimization Configuration	Section 8.18, page 179
AT+CCLK	Real Time Clock	Section 15.1, page 397
AT+CEDRXRDP	Read dynamic eDRX parameters	Section 8.3, page 138
AT+CEDRXS	eDRX Setting	Section 8.1, page 130
AT+CEER	Extended Error Report	Section 3.1, page 72
AT+CEMODE	Modes of Operation for EPS	Section 12.1, page 338
AT+CEREG	EPS Network Registration Status	Section 12.9, page 357
AT+CESQ	Extended Signal Quality	Section 8.11, page 153
AT+CFUN	EXS82-W Functionality Level	Section 2.10, page 41
AT+CGACT	PDP Context Activate or Deactivate	Section 12.4, page 346
AT+CGATT	PS Attach or Detach	Section 12.3, page 345
AT+CGCONTRDP	PDP context read dynamic parameters	Section 12.10, page 360
AT+CGDCONT	Define PDP Context	Section 12.2, page 340
AT+CGEREP	Packet Domain Event Reporting	Section 12.7, page 352
AT+CGLA	Generic logical channel access	Section 13.8, page 385
AT+CGMI	Request manufacturer identification	Section 6.2, page 122
AT+CGMM	Request model identification	Section 6.4, page 123
AT+CGMR	Request revision identification of software status	Section 6.6, page 124
AT+CGPADDR	Show PDP Address	Section 12.5, page 348
AT+CGPIAF	Select Printing IP address format	Section 12.6, page 350
AT+CGREG	Packet Domain Network Registration Status	Section 12.8, page 354
AT+CGSMS	Select Service for MO Short Messages	Section 12.11, page 363
AT+CGSN	Request International Mobile Equipment Identity (IMEI)	Section 6.7, page 125
AT+CIMI	Request International Mobile Subscriber Identity (IMSI)	Section 6.8, page 126
AT+CLCK	Facility Lock	Section 5.2, page 109
AT+CMEE	Error Message Format	Section 2.8, page 35
AT+CMGC	Send an SMS command	Section 10.2, page 247
AT+CMGD	Delete short message	Section 10.3, page 248
AT+CMGF	Select SMS message format	Section 10.4, page 249

AT Command	Description	Section and Page
AT+CMGL	List SMS messages from preferred store	Section 10.5, page 250
AT+CMGR	Read SMS messages	Section 10.6, page 252
AT+CMGS	Send Short Message	Section 10.7, page 253
AT+CMGW	Write Short Messages to Memory	Section 10.8, page 254
AT+CMMS	More Messages to Send	Section 10.13, page 263
AT+CMSS	Send short messages from storage	Section 10.9, page 256
AT+CMUX	Multiplex mode	Section 4.8, page 104
AT+CNMA	New Message Acknowledgement to UE/TE	Section 10.10, page 257
AT+CNMI	SMS Event Reporting Configuration	Section 10.11, page 258
AT+COPN	Read operator names	Section 8.4, page 139
AT+COPS	Operator Selection	Section 8.5, page 140
AT+CPAS	Activity Status	Section 3.3, page 94
AT+CPIN	PIN Authentication	Section 5.1, page 107
AT+CPLS	Select Preferred Operator List	Section 8.6, page 144
AT+CPMS	Preferred SMS message storage	Section 10.12, page 261
AT+CPOL	Preferred Operator List	Section 8.7, page 145
AT+CPSMS	Enable or Disable Power Saving Mode	Section 8.8, page 147
AT+CPWD	Change Password	Section 5.3, page 111
AT+CREG	Network Registration Status	Section 8.9, page 149
AT+CRSM	Restricted USIM Access	Section 13.1, page 375
AT+CRTDCP	Reporting of terminating data via the control plane	Section 12.16, page 371
AT+CSCA	SMS Service Center Address	Section 10.14, page 264
AT+CSCS	Character Set	Section 2.9, page 40
AT+CSDH	Show SMS text mode parameters	Section 10.15, page 265
AT+CSIM	Generic USIM Access	Section 13.2, page 377
AT+CSMP	Set SMS Text Mode Parameters	Section 10.16, page 266
AT+CSMS	Select Message Service	Section 10.17, page 268
AT+CSODCP	Sending of originating data via the control plane	Section 12.15, page 369
AT+CSQ	Signal Quality	Section 8.10, page 152
AT+CTZU	Automatic Time Zone Update	Section 8.12, page 155
AT+GMI	Request manufacturer identification	Section 6.3, page 122
AT+GMM	Request model identification	Section 6.5, page 123
AT+ICF	Serial Interface Character Framing	Section 4.7, page 102
AT+IPR	Bit Rate	Section 4.6, page 100
AT\Q	Flow Control	Section 4.4, page 98
AT^SBNR	Binary Read	Section 17.5, page 420
AT^SBNW	Binary Write	Section 17.6, page 423
AT^SBV	Battery/Supply Voltage	Section 15.2, page 399
AT^SCFG	Extended Configuration Settings	Section 2.11, page 43
AT^SCID	USIM Identification Number	Section 13.3, page 379
AT^SCKS	Query USIM and Chip Card Holder Status	Section 13.4, page 380
AT^SCPIN	Pin Configuration	Section 16.2, page 409

AT Command	Description	Section and Page
AT^SCPOL	GPIO Level Polling Configuration	Section 16.3, page 411
AT^SCTM	Critical Operating Temperature Monitoring	Section 15.3, page 400
AT^SEDRXS	eDRX Setting	Section 8.2, page 134
AT^SFDL	Enter Firmware Download Mode	Section 17.7, page 426
AT^SFSA	Flash File System Access	Section 17.8, page 427
AT^SGAUTH	Set Type of Authentication for PDP-IP Connections	Section 12.13, page 365
AT^SGCONF	Configuration of GPRS related Parameters	Section 12.14, page 367
AT^SGIO	Get IO state of a specified pin	Section 16.4, page 412
AT^SGPICFG	Pin Mode Configuration	Section 16.7, page 415
AT^SGPINCA	Pin Configuration	Section 16.6, page 414
AT^SGPSC	GNSS Configuration	Section 14.2, page 389
AT^SICA	Internet Connection Activate or Deactivate	Section 11.1, page 277
AT^SICS	Internet Connection Settings	Section 11.2, page 278
AT^SIND	Extended Indicator Control	Section 3.2, page 81
AT^SINFO	Information Output	Section 6.9, page 127
AT^SIPS	Internet Profile Storage	Section 11.3, page 280
AT^SISC	Internet Service Close	Section 11.7, page 296
AT^SISD	Internet Service MQTT Dynamic Setup Profile	Section 11.11, page 305
AT^SISE	Internet Service Error Report	Section 11.15, page 313
AT^SISH	Disconnect Remote Client	Section 11.13, page 309
AT^SISI	Internet Service Information	Section 11.5, page 291
AT^SISO	Internet Service Open	Section 11.6, page 293
AT^SISR	Internet Service Read Data	Section 11.8, page 297
AT^SISS	Internet Service Setup Profile	Section 11.4, page 281
AT^SIST	Transparent Mode	Section 11.10, page 303
AT^SISU	MQTT Dynamic Send Request	Section 11.12, page 308
AT^SISW	Internet Service Write Data	Section 11.9, page 300
AT^SISX	Internet Service Execution	Section 11.14, page 310
AT^SLED	LED Feature	Section 15.4, page 402
AT^SMGL	List Short Messages from preferred store without setting status to REC READ	Section 10.18, page 270
AT^SMGR	Read short message without setting status to REC READ	Section 10.19, page 271
AT^SMONI	Monitoring Serving Cell	Section 8.13, page 157
AT^SMONP	Monitoring Neighbour Cells	Section 8.14, page 162
AT^SMSO	Switch Off EXS82-W	Section 2.12, page 71
AT^SNLWM2M	LwM2M Client Configuration / Controlling	Section 8.17, page 174
AT^SNMON	Network Monitoring	Section 8.15, page 166
AT^SPIC	Display PIN Counter	Section 5.4, page 113
AT^SPIO	GPIO Driver Open/Close	Section 16.1, page 408
AT^SQPORT	Query Port Id	Section 4.9, page 106
AT^SRADC	Configure and Read A/D Converter	Section 15.5, page 404
AT^SRVACT	Extra Service Action	Section 17.11, page 440

AT Command	Description	Section and Page
AT^SRVCFG	Service Configuration Settings	Section 17.9, page 437
AT^SRVCTL	Extra Service Control	Section 17.10, page 439
AT^SSDA	Set SMS Display Availability	Section 10.20, page 272
AT^SSECUA	Internet Service Certificate Store Actions	Section 5.5, page 116
AT^SSECUC	Internet Service Certificate Store Update Configuration	Section 5.6, page 118
AT^SSET	USIM Data Ready Indication	Section 13.5, page 382
AT^SSIO	Set IO state of a specified pin	Section 16.5, page 413
AT^SSTA	Remote-SAT Interface Activation	Section 9.4, page 191
AT^SSTGI	SAT Get Information	Section 9.6, page 195
AT^SSTGI	SAT Get Information - Refresh (1)	Section 9.7, page 196
AT^SSTGI	SAT Get Information - Set Up Event List (5)	Section 9.8, page 198
AT^SSTGI	SAT Get Information - Send Short Message (19)	Section 9.9, page 199
AT^SSTGI	SAT Get Information - Display Text (33)	Section 9.10, page 200
AT^SSTGI	SAT Get Information - Get Inkey (34)	Section 9.11, page 202
AT^SSTGI	SAT Get Information - Get Input (35)	Section 9.12, page 204
AT^SSTGI	SAT Get Information - Select Item (36)	Section 9.13, page 206
AT^SSTGI	SAT Get Information - Set up Menu (37)	Section 9.14, page 208
AT^SSTGI	SAT Get Information - Set up Idle Mode Text (40)	Section 9.15, page 210
AT^SSTGI	SAT Get Information - Language Notification (53)	Section 9.16, page 211
AT^SSTGI	SAT Get Information - Open Channel (64)	Section 9.17, page 212
AT^SSTGI	SAT Get Information - Close Channel (65)	Section 9.18, page 213
AT^SSTGI	SAT Get Information - Receive Data (66)	Section 9.19, page 214
AT^SSTGI	SAT Get Information - Send Data (67)	Section 9.20, page 215
AT^SSTR	SAT Response	Section 9.21, page 216
AT^SSTR	SAT Response - Refresh (1)	Section 9.22, page 218
AT^SSTR	SAT Response - Set Up Event List (5)	Section 9.23, page 219
AT^SSTR	SAT Response - Send Short Message (19)	Section 9.24, page 220
AT^SSTR	SAT Response - Display Text (33)	Section 9.25, page 221
AT^SSTR	SAT Response - Get Inkey (34)	Section 9.26, page 222
AT^SSTR	SAT Response - Get Input (35)	Section 9.27, page 224
AT^SSTR	SAT Response - Select Item (36)	Section 9.28, page 226
AT^SSTR	SAT Response - Set Up Menu (37)	Section 9.29, page 227
AT^SSTR	SAT Response - Set Up Idle Mode Text (40)	Section 9.30, page 228
AT^SSTR	SAT Response - Language Notification (53)	Section 9.31, page 229
AT^SSTR	SAT Response - Open Channel (64)	Section 9.32, page 230
AT^SSTR	SAT Response - Close Channel (65)	Section 9.33, page 231
AT^SSTR	SAT Response - Receive Data (66)	Section 9.34, page 232
AT^SSTR	SAT Response - Send Data (67)	Section 9.35, page 233
AT^SSTR	SAT Event - Menu Selection (211)	Section 9.36, page 234
AT^SSTR	SAT Event - User Activity (232)	Section 9.37, page 235
AT^SSTR	SAT Event - Idle Screen Available (233)	Section 9.38, page 236
AT^SSTR	SAT Event - Language Selection (235)	Section 9.39, page 237

AT Command	Description	Section and Page
AT^SSTR	SAT Event - Terminate Command (254)	Section 9.40, page 238
AT^SWWAN	PDP Context Activate or Deactivate	Section 12.17, page 373
AT^SXRAT	Selection of Radio Access Technology	Section 8.16, page 171
ATD*99#	Request Packet Domain service	Section 12.12, page 364
ATE	AT Command Echo	Section 4.5, page 99
ATI	Display product identification information	Section 6.1, page 120
ATO	Switch from command mode to data mode / PPP online mode	Section 7.1, page 128
ATQ	Result Code Presentation Mode	Section 2.4, page 31
ATS3	Command Line Termination	Section 17.2, page 417
ATS4	Response Formatting	Section 17.3, page 418
ATS5	Command Line Editing	Section 17.4, page 419
ATV	Result code format mode	Section 2.5, page 32
ATX	Result Code Selection	Section 2.6, page 33
ATZ	Restore AT Command Settings from User Defined Profile	Section 2.7, page 34

THALES DIS AIS Deutschland GmbH
Werinherstrasse 81
81541 Munich
Germany

THALES