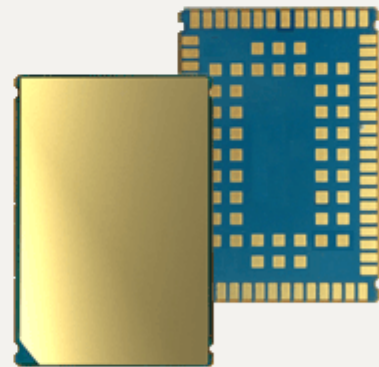


# Cinterion<sup>®</sup> EXS82-W

## AT Command Set

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## 1. Introduction

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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 01.003.*

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 01.003](#)".

### 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. However, for reasons of compatibility with other products, and for compliance with 3GPP TS specifications, some AT commands imply parameters or values related to CS data capability.

## 1.2 Related documents

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## 1.2 Related documents

- [1] EXS82-W Release Notes, Version 01.003
- [2] EXS82-W Hardware Interface Description, Version 01.003
- [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

## 1.2 Related documents

- 
- [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 36.133](#) Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management
  - [55] 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, <a href="#">Available AT Commands and Dependency on SIM PIN</a> 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 <a href="#">AT^SCFG</a> 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, <a href="#">AT Command Syntax</a> 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> <sup>(num)</sup>	Parameter value must be numeric type
<param> <sup>(str)</sup>	Parameter value must be string type enclosed in quotation marks.
<param> <sup>(text)</sup>	Parameter value is a string according to selected character set. Not enclosed in double quotes.
<param> <sup>(u)</sup>	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> <sup>(+CSCS)</sup>	Parameter value has to be (is) coded according to current setting of <charSet> (see AT+CSCS for details)
<param> <sup>(&amp;W)</sup>	Parameter value is stored to user profile in non-volatile memory after executing AT&W
<param> <sup>(&amp;V)</sup>	Parameter value is displayed by AT&V
<param> <sup>(NV)</sup>	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 <sup>(&amp;F)</sup>	Factory value restored by AT&F
x <sup>(P)</sup>	Powerup value of a parameter not stored in non-volatile memory.
x <sup>(D)</sup>	Delivery value of a parameter which may be overridden from non-volatile setting (refer to symbol <sup>(NV)</sup> and symbol <sup>(&amp;W)</sup> above).

---

## 1.4 AT Command Interpreter

EXS82-W features 2 AT command ports mapped to ASC0 and ASC1.

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
<a href="#">AT+IPR</a>	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 "ð" 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

## 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 *UCS2 16 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 "l" 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).

## 1.7 Supported character sets

**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 Supported character sets

## 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	i 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 <sup>3)</sup>	Σ 03A3	( 0028	8 0038	H 0048	X 0058	h 0068	x 0078
1	0	0	1	9	ç 00E7	⊙ 0398	) 0029	9 0039	I 0049	Y 0059	i 0069	y 0079
1	0	1	0	10/A	LF [LF] <sup>2)</sup>	⊘ 039E	* 002A	: 003A	J 004A	Z 005A	j 006A	z 007A
1	0	1	1	11/B	∅ 00D8	<sup>1)</sup>	+ 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] <sup>2)</sup>	æ 00E6	- 002D	= 003D	M 004D	Ñ 00D1	m 006D	ñ 00F1
1	1	1	0	14/E	À 00C5	ß 00DF	. 002E	> 003E	N 004E	Ü 00DC	n 006E	ü 00FC
1	1	1	1	15/F	á 00E5	É 00C9	/ 002F	? 003F	O 004F	Ş 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						
0	1	0	1	5						€ <sup>2)</sup>		
										20AC		
0	1	1	0	6								
0	1	1	1	7								
1	0	0	0	8			{					
							007B					
1	0	0	1	9			}					
							007D					
1	0	1	0	10 /A	<sup>3)</sup>	[LF]						
1	0	1	1	11 /B		<sup>4)</sup>						
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.

## 1.7 Supported character sets

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 Supported character sets

## 1.7.2.2 Input of SIM data (TE to UE)

Used character set	DCS = 7 bit GSM	DCS = 8 bit Data	DCS = 16 bit UCS2
GSM	Case 1 GSM (1:1)	Case 2 IRA to 8 bit (2:1)	Case 3 IRA to 16 bit (4:2)
UCS2	Case 4 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 `<dcsc>` 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> <sup>(num)</sup>	
[0]	Reset parameters in Section <a href="#">18.4, Factory Default Settings Restorable with AT&amp;F</a> 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
```



### 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 +CEREG: 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> <sup>(num)</sup>	
[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> <sup>(num)(&amp;V)(&amp;W)</sup>	
Result Code Presentation Mode. It is not recommended to change this value.	
[0] <sup>(&amp;F)(D)</sup>	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, then 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> <sup>(num)(&amp;V)(&amp;W)</sup>	
[0]	Information response: <text><CR><LF> Short result code format: <numeric code><CR>
1 <sup>(&amp;F)(D)</sup>	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> <sup>(num)(&amp;V)(&amp;W)</sup>	
[0] <sup>(&amp;F)(D)</sup>	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> <sup>(num)</sup>	
[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

<p>Test Command</p> <p>AT+CMEE=?</p> <p>Response(s)</p> <p>+CMEE: (list of supported&lt;errMode&gt;s)</p> <p>OK</p>	
<p>Read Command</p> <p>AT+CMEE?</p> <p>Response(s)</p> <p>+CMEE: &lt;errMode&gt;</p> <p>OK</p>	
<p>Exec Command</p> <p>AT+CMEE</p> <p>Response(s)</p> <p>OK</p> <p>ERROR</p> <p>+CME ERROR: &lt;err&gt;</p>	
<p>Write Command</p> <p>AT+CMEE=&lt;errMode&gt;</p> <p>Response(s)</p> <p>OK</p> <p>ERROR</p> <p>+CME ERROR: &lt;err&gt;</p>	
<p>PIN → Last</p> <p>- + -</p>	<p>Reference(s)</p> <p>3GPP TS 27.007 [49], 3GPP TS 27.005 [48]</p>

### Parameter Description

<errMode> <sup>(num)(&amp;V)(&amp;W)</sup>	Description
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

<p>Test Command</p> <pre>AT+CSCS=?</pre> <p>Response(s)</p> <pre>+CSCS: (list of supported&lt;charSet&gt;s) OK</pre>	
<p>Read Command</p> <pre>AT+CSCS?</pre> <p>Response(s)</p> <pre>+CSCS: &lt;charSet&gt; OK</pre>	
<p>Write Command</p> <pre>AT+CSCS=&lt;charSet&gt;</pre> <p>Response(s)</p> <pre>OK ERROR +CME ERROR: &lt;err&gt;</pre>	
<p>PIN → Last</p> <pre>- + -</pre>	<p>Reference(s)</p> <p>3GPP TS 27.007 [49]</p>

### Parameter Description

<code>&lt;charSet&gt;</code> <sup>(str)(&amp;V)(&amp;W)</sup>	
"GSM" <sup>(&amp;F)(P)</sup>	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><sup>(num)</sup>

This parameter determines the functionality level of the UE.

- |                  |  |
|------------------|--|
| 0                | Switch UE into Minimum Functionality level.<br>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 " <b>^SYSSTART AIRPLANE MODE</b> " 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.<br>Direct switches between pure and extended Airplane Modes (and vice versa) are not supported.<br>To return to Normal Functionality level use <b>AT+CFUN=1</b> or <b>AT+CFUN=1,1</b> . After this, PIN authentication may be necessary if required by the USIM. |
| 1 <sup>(P)</sup> | Switch UE into Normal Functionality level, which is indicated via " <b>^SYSSTART</b> " URC.  |
| 4                | Switch UE into pure Airplane Mode.<br>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 " <b>^SYSSTART AIR-PLANE MODE</b> " 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.<br>Direct switches between pure and extended Airplane Modes (and vice versa) are not supported.<br>To return to Normal Functionality level use <b>AT+CFUN=1</b> or <b>AT+CFUN=1,1</b> . The UE may reregister to the network, e.g. if network service is available.                         |

<rst><sup>(num)</sup>

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

## 2.11 AT^SCFG

## 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/Size", (range of supported <mtusize>s)
^SCFG: "GPRS/MTU/Mode", (list of supported <nwmode>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/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/CNS", (list of supported <cns>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: "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>

```

Read Command

(Continued)

AT^SCFG?

Response(s)

```
^SCFG: "GPRS/MTU/Size", <mtusize>
^SCFG: "GPRS/MTU/Mode", <nwmode>
^SCFG: "Ident/Manufacturer", <manufacturer>
^SCFG: "Ident/Product", <product>
^SCFG: "MEopMode/CregRoam", <mrs>
^SCFG: "MEopMode/PowerMgmt/Suspend", <Suspend>, <SuspendModeVolatility>
^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/CNS", <cns>
^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: "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
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

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

Write Command (Continued)

Enable/disable 2G radio bands.

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

Response(s)

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

Enable/Disable Continuous Network Search

AT^SCFG="Radio/CNS"[, <cns>]

Response(s)

^SCFG: "Radio/CNS", <cns>

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>

## 2.11 AT^SCFG

## 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>]
```

```
^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>

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", <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 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



Write Command (Continued)

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

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

Response(s)

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: "scfg-ip-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><sup>(str)(NV)</sup>

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"<sup>(D)</sup> SUSPEND\_MON doesn't indicate Suspend Mode

<gaa><sup>(str)(NV)</sup>

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"<sup>(D)</sup> PS Domain auto attach is enabled

<nwmode><sup>(num)(NV)</sup>

The setting will take effective after restart.

0	Ask network for MTU size
1 <sup>(D)</sup>	Don't ask network for MTU size and use default value

<mtusize><sup>(num)(NV)</sup>

MTU size in bytes.

1280...1430<sup>(D)</sup>...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.
- IPv6 connection will be limited to 1280 bytes and ignore the MTU size configuration.

<manufacturer><sup>(str)(NV)</sup>

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"<sup>(D)</sup>

<product><sup>(str)(NV)</sup>

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"<sup>(D)</sup>

<mrs><sup>(str)(NV)</sup>

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<sub>IMSI</sub> 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" <sup>(D)</sup>	Disable the Modified Roaming Status Display.
"1"	Enable the Modified Roaming Status Display.

<Suspend><sup>(str)</sup>

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 01.003](#)". See also `AT^SIND` indicators "`^SuspendAvailable`", "`^SuspendReady`".

Wakeup from SUSPEND mode is indicated by the "`^SYSRESUME`" URC.

"0" <sup>(D)</sup>	Disable SUSPEND mode.
"1"	Enable SUSPEND mode.

`<SuspendModeVolatility>`<sup>(str)</sup>

#### 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 <code>&lt;Suspend&gt;</code> is reset to 0 (SUSPEND disabled) after the next resume from SUSPEND mode.    |
| "1"            | Configuration of <code>&lt;Suspend&gt;</code> parameter is stored in non-volatile memory and restored after power-up or resume from SUSPEND mode. |

`<PwrSaveMode>`<sup>(str)(NV)</sup>

#### 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 01.003" for additional advice on power saving requirements.

The first parameter `<PwrSaveMode>` enables or disables power save mode.

- |                           |   |
|---------------------------|---|
| "disabled" <sup>(D)</sup> | <p>Power save mode is disabled.</p> <p>Under no circumstances the UE will enter its power save (SLEEP) state. <code>&lt;PwrSavePeriod&gt;</code> value is reset to zero.</p>  |
| "enabled"                 | <p>Power save mode is enabled.</p> <p>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 <code>&lt;PwrSavePeriod&gt;</code> and <code>&lt;PwrSaveWakeup&gt;</code>.</p> <p>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:</p> <ul style="list-style-type: none"> <li>• On each port, the connected TE must retrieve all data sent from the UE to the TE.</li> </ul> <p><code>&lt;PwrSavePeriod&gt;</code> and <code>&lt;PwrSaveWakeup&gt;</code> settings are non-volatile. However, each time when <code>&lt;PwrSaveMode&gt;</code> is enabled without giving <code>&lt;PwrSavePeriod&gt;</code> and <code>&lt;PwrSaveWakeup&gt;</code> the last values set are used. (Delivery default is <code>&lt;PwrSavePeriod&gt;="52"</code> and <code>&lt;PwrSaveWakeup&gt;="50"</code>).</p> |

`<PwrSavePeriod>`<sup>(str)(NV)</sup>

#### 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" <sup>(D)</sup> ..."600" | <p>Maximum power save period in 1/10 seconds.</p> <p>In SLEEP state, the CTS line stays inactive, i.e. the AT command interface is not accessible. The UART wakes up from SLEEP state after one of the following events:</p> <ul style="list-style-type: none"> <li>- cyclically after expiry of the specified <code>&lt;PwrSavePeriod&gt;</code>,</li> <li>- sending a URC (incl. for incoming calls),</li> <li>- 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),</li> <li>- toggling the RTS line (falling edge only)</li> </ul> <p>After a wakeup event, the UART stays awake (CTS line becomes active), at least for the time defined by the parameter <code>&lt;PwrSaveWakeup&gt;</code> (5.2 seconds by default).</p> <p><code>&lt;PwrSavePeriod&gt;</code> 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.</p> |
|------------------------------------|---|

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>`<sup>(str)(NV)</sup>

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

`<ringlineSig>`<sup>(str)</sup>

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 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"<sup>(P)</sup> No Ring line signalization if interface is blocked.

`<order>`<sup>(num)(NV)</sup>

#### 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 after restart.

1<sup>(D)</sup> GNSS preferred

2 WWAN (LTE/GPRS) preferred

`<sdoct>`<sup>(str)</sup>

#### 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"<sup>(P)</sup> 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>`<sup>(str)(NV)</sup>

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" <sup>(D)</sup>	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" <sup>(D)</sup>	2.80 V
"1"	2.85 V
"2"	2.90 V
"3"	2.95 V
"4"	3.00 V

`<PowerSupplyDomain>`<sup>(str)</sup>

Power Supply Domain

"0" `<vthresh>` value applies to BB domain (BATT+<sub>BB</sub> line).

`<vthresh_BB_curr>`<sup>(str)</sup>

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" <sup>(D)</sup>	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>`<sup>(str)</sup>

BB undervoltage threshold after next restart

For values see `<vthresh_BB_curr>`.

`<rba2g>`<sup>(str)(NV)</sup>

`<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>`<sup>(str)(NV)</sup>

`<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,

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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>`<sup>(str)(NV)</sup>

`<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 as 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)

"1000000000000000"            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>`<sup>(str)(NV)</sup>

`<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,



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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>`<sup>(str)(NV)</sup>

`<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 as 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.

`<cns>`<sup>(str)</sup>

## Continuous Network Search Mode

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

"0"<sup>(P)</sup>                           Normal  
When trying to register to a network the UE sleeps longer than in "Fast mode" before restarting a network scan.

"1"                             Fast  
"Fast mode" reduces the time the UE sleeps before restarting a network scan when trying to register.  
Advantage: If the UE is out of network service it may take less time to find a network.  
Disadvantage: Higher current consumption while the UE is out of network service.

Note: To monitor the search process it may be useful to have the "+CREG" URC enabled.

`<PL_mode>`<sup>(str)</sup>

## 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>`,

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- 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 limitation is deactivated after UE restart.

For an example on how to configure and trigger instant power limitation see below *Example* section.

"0" <sup>(P)</sup>	Power limitation deactivated (no further parameters are possible).
"1"	Power limitation activated. <code>&lt;PL_profile&gt;</code> 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 <code>&lt;PL_mode&gt;</code> = 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 <code>&lt;PL_profile&gt;</code> number.
"3"	Configure profile. All parameters are mandatory. Remember to restart the UE after changing the output power limits of a profile.

`<PL_profile>`<sup>(str)</sup>

## 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>`<sup>(str)</sup>

## 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>`<sup>(str)</sup>

## 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 <code>&lt;PL_band4g-2&gt;</code> (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><sup>(str)</sup>

#### 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)
"100000000000000"	LTE 700 (B85)

<PL\_limit2g><sup>(str)(NV)</sup>

#### 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><sup>(str)(NV)</sup>

#### 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><sup>(str)(NV)</sup>

#### 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><sup>(str)(NV)</sup>

#### 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" <sup>(D)</sup>	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 GSMK and 8PSK (3dB for 2 Tx).

<SuspendMode><sup>(str)(NV)</sup>

#### 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" <sup>(D)</sup>	Suspend is enabled in PSM.
"2"	Suspend is enabled in eDRX inactive period. With this option, 3gpp PSM will be disabled.

<CS><sup>(str)(+CSCS)(NV)</sup>

#### 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 01.003".

"0" <sup>(D)</sup>	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><sup>(str)(+CSCS)(NV)</sup>

#### 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 SIM\_SWITCH. SIM\_SWITCH 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" <sup>(D)</sup>	USIM Dual Mode disabled.
"1"	USIM Dual Mode enabled.

<SmsAcknl><sup>(str)</sup>

### SMS auto acknowledge

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

"0"<sup>(P)</sup>

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><sup>(str)(NV)</sup>

### Maximum Number of Retransmissions (MR)

"1"..."10"<sup>(D)</sup>..."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><sup>(str)(NV)</sup>

### Overall TCP Timer for outstanding connections (tcpOT)

"1"..."6000"<sup>(D)</sup>

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><sup>(str)(NV)</sup>

### 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>`<sup>(str)(NV)</sup>

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" <sup>(D)</sup>	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>`<sup>(str)(NV)</sup>

Minimum TLS Version allowed

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

"MIN" <sup>(D)</sup>	Automatic minimum
"1.1"	TLSv1.1
"1.2"	TLSv1.2
"MAX"	Automatic maximum

`<TLS_max_version>`<sup>(str)(NV)</sup>

Maximum TLS version allowed

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

"1.2"	TLSv1.2
"MAX" <sup>(D)</sup>	Automatic maximum

`<urcRinglineCfg>`<sup>(str)(NV)</sup>

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 `<ringline-Sig>`.

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 01.003".

"off"	URCs do not activate a ring line.
"local" <sup>(D)</sup>	Ring line will be activated on the same device where the URC appears.
"asc0"	RING0 line will be activated (low active) when an URC is sent on the current AT command port.

`<urcRinglineDuration>`<sup>(str)(NV)</sup>

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“(D) Ring line will be activated for about 100ms.  
“2“ 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.
    
```

```

.....
AT+CFUN=1,1
OK
^SYSSTART
AT^SCFG="Radio/Mtpl"
^SCFG: "Radio/Mtpl", "0"
OK
AT^SCFG="Radio/Mtpl/2G", 2, 1
^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
^SCFG: "Radio/Mtpl", "1", "1"
OK
AT^SCFG="Radio/Mtpl", 1, 2
^SCFG: "Radio/Mtpl", "1", "2"
OK
AT^SCFG="Radio/Mtpl", 0
^SCFG: "Radio/Mtpl", "0"
OK
  
```

The response returns the old values as above (therefore omitted in this example).  
 Restart UE to enable the profile 1 settings configured above.

Read "Radio/Mtpl" mode.  
 Instant power limitation is still disabled.

Query profile 1 settings. Changed values are shown now.

Activate Profile 1.  
 Instant power limitation is now enabled with profile 1 and new limits as changed above.

Switch profiles, and activate profile 2.  
 Instant power limitation is now enabled with profile 2, still using delivery default values.

Deactivate instant power limitation.  
 Instant power limitation is now disabled.

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"
^SCFG: "Radio/Mtpl/4G", "0"
OK
AT^SCFG="Radio/Mtpl/4G", 2, 1
^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", "20000000", "20"
^SCFG: "Radio/Mtpl/4G", "2", "1", "00000000", "10000000000000", "20"
OK
AT^SCFG="Radio/Mtpl/4G", 3, 1, 1, 0, 18
  
```

Read "Radio/Mtpl/4G" mode.  
 Instant power limitation is still disabled.

Query profile 1 settings. Delivery default settings are shown:

Profile 1: Configure max. RF output power limit of LTE B1 band to 18dBm.



^SCFG: "Radio/Mtpl/4G", "0" OK AT^SCFG="Radio/Mtpl/4G", 3, 1, 2, 0, 18	Instant power limitation is still disabled. Profile 1: Configure max. RF output power limit of LTE B2 band to 18dBm.
^SCFG: "Radio/Mtpl/4G", "0" OK AT^SCFG="Radio/Mtpl/4G", 3, 1, 4, 0, 18	Instant power limitation is still disabled. Profile 1: Configure max. RF output power limit of LTE B3 band to 18dBm.
^SCFG: "Radio/Mtpl/4G", "0" OK AT^SCFG="Radio/Mtpl/4G", 3, 1, 8, 0, 18	Instant power limitation is still disabled. Profile 1: Configure max. RF output power limit of LTE B4 band to 18dBm.
^SCFG: "Radio/Mtpl/4G", "0" OK AT^SCFG="Radio/Mtpl/4G", 3, 1, 10, 0, 18	Instant power limitation is still disabled. Profile 1: Configure max. RF output power limit of LTE B5 band to 18dBm.
^SCFG: "Radio/Mtpl/4G", "0" OK AT^SCFG="Radio/Mtpl/4G", 3, 1, 80, 0, 18	Instant power limitation is still disabled. Profile 1: Configure max. RF output power limit of LTE B8 band to 18dBm.
^SCFG: "Radio/Mtpl/4G", "0" OK AT^SCFG="Radio/Mtpl/4G", 3, 1, 800, 0, 18	Instant power limitation is still disabled. Profile 1: Configure max. RF output power limit of LTE B12 band to 18dBm.
^SCFG: "Radio/Mtpl/4G", "0" OK AT^SCFG="Radio/Mtpl/4G", 3, 1, 1000, 0, 18	Instant power limitation is still disabled. Profile 1: Configure max. RF output power limit of LTE B13 band to 18dBm.
^SCFG: "Radio/Mtpl/4G", "0" OK AT^SCFG="Radio/Mtpl/4G", 3, 1, 20000, 0, 18	Instant power limitation is still disabled. Profile 1: Configure max. RF output power limit of LTE B18 band to 18dBm.
^SCFG: "Radio/Mtpl/4G", "0" OK AT^SCFG="Radio/Mtpl/4G", 3, 1, 40000, 0, 18	Instant power limitation is still disabled. Profile 1: Configure max. RF output power limit of LTE B19 band to 18dBm.
^SCFG: "Radio/Mtpl/4G", "0" OK AT^SCFG="Radio/Mtpl/4G", 3, 1, 80000, 0, 18	Instant power limitation is still disabled. Profile 1: Configure max. RF output power limit of LTE B20 band to 18dBm.
^SCFG: "Radio/Mtpl/4G", "0" OK AT^SCFG="Radio/Mtpl/4G", 3, 1, 1000000, 0, 18	Instant power limitation is still disabled. Profile 1: Configure max. RF output power limit of LTE B25 band to 18dBm.
^SCFG: "Radio/Mtpl/4G", "0" OK AT^SCFG="Radio/Mtpl/4G", 3, 1, 2000000, 0, 18	Instant power limitation is still disabled. Profile 1: Configure max. RF output power limit of LTE B26 band to 18dBm.
^SCFG: "Radio/Mtpl/4G", "0" OK AT^SCFG="Radio/Mtpl/4G", 3, 1, 4000000, 0, 18	Instant power limitation is still disabled. Profile 1: Configure max. RF output power limit of LTE B27 band to 18dBm.
^SCFG: "Radio/Mtpl/4G", "0" OK AT^SCFG="Radio/Mtpl/4G", 3, 1, 8000000, 0, 18	Instant power limitation is still disabled. Profile 1: Configure max. RF output power limit of LTE B28 band to 18dBm.
^SCFG: "Radio/Mtpl/4G", "0" OK	Instant power limitation is still disabled.

AT^SCFG="Radio/Mtpl/ 4G",3,1,0,200000000,18 ^SCFG: "Radio/Mtpl/4G", "0" OK	Profile 1: Configure max. RF output power limit of LTE B66 band to 18dBm. Instant power limitation is still disabled.
AT^SCFG="Radio/Mtpl/ 4G",3,1,0,100000000000000,18 ^SCFG: "Radio/Mtpl/4G", "0" OK	Profile 1: Configure max. RF output power limit of LTE B85 band to 18dBm. Instant power limitation is still disabled.
AT^SCFG="Radio/Mtpl/4G",2,1 ..... AT+CFUN=1,1  OK ^SYSSTART	Read profile 1 settings. The response returns the old values as above (there- fore omitted in this example). Restart UE to enable the profile 1 settings configured above.
AT^SCFG="Radio/Mtpl/4G" ^SCFG: "Radio/Mtpl/4G", "0" OK	Read "Radio/Mtpl/4G" mode. Instant power limitation is still disabled.
AT^SCFG="Radio/Mtpl/4G",2,1  ^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	Read profile 1 settings. Changed values are shown now.
AT^SCFG="Radio/Mtpl",1,1 ^SCFG: "Radio/Mtpl", "1", "1"  OK	Activate Profile 1. Instant power limitation is now enabled with profile 1 and new limits as changed above.
AT^SCFG="Radio/Mtpl",1,2 ^SCFG: "Radio/Mtpl", "1", "2"  OK	Switch profiles, and activate profile 2. Instant power limitation is now enabled with profile 2, still using delivery default values.
AT^SCFG="Radio/Mtpl",0 ^SCFG: "Radio/Mtpl", "0" OK	Deactivate instant power limitation. Instant power limitation is now disabled.

## 2.12 AT^SMSO Switch Off EXS82-W

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

If `<fso>="fast"` then the Fast-Shutdown procedure will be started:

- Finalize current flash erase/program cycles
- No further schedule in system will be arranged
- Power off the module

If parameter `<fso>` is omitted then the module will execute the "normal" shutdown procedure.

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

```
AT^SMSO
```

Response(s)

```
OK
```

```
ERROR
```

```
+CME ERROR: <err>
```

Write Command

```
AT^SMSO=[<fso>]
```

Response(s)

```
OK
```

```
ERROR
```

```
+CME ERROR: <err>
```

PIN → Last

- + +

### Parameter Description

`<fso>`<sup>(str)</sup>

Fast Shutdown

"fast" start 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]

## 3.1 AT+CEER

**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

## 3.1 AT+CEER

---

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

## 3.1 AT+CEER

## 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

## 3.1 AT+CEER

---

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



## 3.1 AT+CEER

**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

## 3.1 AT+CEER

---

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
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><sub>1</sub>[, <ceerRelCauseGroup><sub>2</sub>[, ...]]

In case of <indDescr>="is\_cert"

^SIND: is\_cert, <mode>[, <srvProfileId>, <issuer>, <serialNumber>, <subject>, <signatureAlgorithm>, <thumbprintAlgorithm>, <thumbprint>]

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>]

In case of: <indDescr>="is\_cert" and <mode>=1 or 2:

^SIND: is\_cert, <mode>[, <srvProfileId>, <issuer>, <serialNumber>, <subject>, <signatureAlgorithm>, <thumbprintAlgorithm>, <thumbprint>]

Write Command	(Continued)
AT^SIND=<indDescr>, <mode>	
Response(s)	
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> <sub>1</sub> [, <ceerRelCauseGroup> <sub>2</sub> [, ...]]	
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.*

+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). Note that, parameters <pathLen>, <fileNum>, <fileList> and <aidList> are reserved for future, their values will be empty.

#### 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. 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.

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

Format of the "ceer" indicator:

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

URC 10

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.

### Parameter Description

<indDescr><sup>(str)</sup>

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.

## 3.2 AT^SIND

	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.
"rsi"		Received signal (field) strength: 0 Signal strength $\leq$ -112 dBm 1 - 4 Signal strength in 15 dB steps 5 Signal strength $\geq$ -51 dBm 99 Signal strength not known or not detectable Received signal (field) strength can also be obtained with <a href="#">AT+CSQ</a> . However, the signal strength is scaled to value range 0..31 by this command.
"simdata"		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, <a href="#">AT^SIND="simdata"</a> provides URC notification for PAC types REFRESH, OPEN_CHANNEL and CLOSE_CHANNEL: <ul style="list-style-type: none"> <li>• 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 <a href="#">AT+CRSM</a> 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 <a href="#">AT+CIMI</a>, but actually is stored in <math>EF_{IMSI}</math>, 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 <a href="#">USAT</a> 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 indicating that the content of one or more Elementary Files has been changed.</li> <li>• "+CIEV: "simdata"" URCs are also generated if PAC types OPEN_CHANNEL or CLOSE_CHANNEL are issued by the (U)SIM Application 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.</li> </ul> <p>For every PAC tracked by <a href="#">AT^SIND="simdata"</a> 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 <a href="#">AT^SIND</a> 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.</p>
"ciphcall"		Ciphering Status Change Indication: 0 Currentcall 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.



## 3.2 AT^SIND

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

If EF<sub>AD</sub> setting disables the ciphering indicator feature read command always indicates a ciphered link and no URC presentation will take place.

The following restrictions apply if the same serial channel is used for AT^SIND "ciphcall" indication and for the action triggering this URC. In general, the recommended solution is to use a dedicated channel for all status 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 no 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<sub>SST</sub> (USIM Service Table) - describes which features are active.

EF<sub>OPL</sub> (Operator PLMN List) - contains the PLMN identification and location ID together with the index of the corresponding PNN record

EF<sub>PNN</sub> (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 determines 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 <sub>OPL</sub> and EF <sub>PNN</sub> 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 <sub>ONString</sub> (Operator Name String) and EF <sub>OPShort</sub> (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+COPI 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" <ind-

## 3.2 AT^SIND

**Value**>. 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

## 3.2 AT^SIND

- 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

"Ista"

Link Stability indication (for GSM only):

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 "Ista" 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>`.

"pacsp"

PLMN mode bit status:

:

"pacsp" indicates the parsed PLMN mode bit value of the USIM Elementary File EF<sub>CSP</sub> (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<sub>CSP</sub> not accessible

The contents of the USIM Elementary File EF<sub>CSP</sub> 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<sub>ICCID</sub>.

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<sub>EUICCID</sub>.

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.

"ceer"	<p>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,&lt;ceerRelCauseGroup&gt;,&lt;ceerReport&gt;" 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.</p>				
"is_cert"	<p>Report details of the server certificate used for a secure Internet connection opened with AT^SISO.                  The following certificate details are listed: &lt;srvProfileId&gt;, &lt;issuer&gt;, &lt;serialNumber&gt;, &lt;subject&gt;, &lt;signatureAlgorithm&gt;, &lt;thumbprintAlgorithm&gt;, &lt;thumbprint&gt;                  Detailed guidelines for managing the required certificates can be found in [7].                  See also AT commands AT^SISS, AT^SBNR and AT^SBNW.</p>				
"suspendAvailable"	<p>Indication SUSPEND mode availability:                  For more details refer to AT^SCFG "MEopMode/PowerMgmt/Suspend" parameter &lt;Suspend&gt; and to "EXS82-W Hardware Interface Description, Version 01.003".</p> <table border="0"> <tr> <td style="padding-right: 20px;">0</td> <td>SUSPEND mode not available.</td> </tr> <tr> <td>1</td> <td>SUSPEND mode available.</td> </tr> </table>	0	SUSPEND mode not available.	1	SUSPEND mode available.
0	SUSPEND mode not available.				
1	SUSPEND mode available.				
"suspendReady"	<p>Indication of module readiness to enter SUSPEND mode:</p> <table border="0"> <tr> <td style="padding-right: 20px;">0</td> <td>The module is NOT ready to enter SUSPEND mode.</td> </tr> <tr> <td>1</td> <td>The module is ready to enter SUSPEND mode.</td> </tr> </table>	0	The module is NOT ready to enter SUSPEND mode.	1	The module is ready to enter SUSPEND mode.
0	The module is NOT ready to enter SUSPEND mode.				
1	The module is ready to enter SUSPEND mode.				

<indValue><sup>(num)</sup>

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

<mode><sup>(num)</sup>

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 <sup>(P)</sup>	Disables the presentation of a specific URC.
1	<p>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.</p>
2	Requests the presentation mode of the URC status and the current value of a single indicator type.

<aidList><sup>(str)</sup>

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><sup>(str)(+CSCS)</sup>

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><sup>(str)(+CSCS)</sup>

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<sub>SPN</sub>. Service Provider Display Information (SPDI) will be read from EF<sub>SPDI</sub> list.

<servProviderType><sup>(num)</sup>

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 <sub>SPN</sub> 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><sup>(str)(+CSCS)</sup>

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

<nitzTZ><sup>(num)</sup>

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

<nitzDST><sup>(num)</sup>

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

<lstaLevel><sup>(num)</sup>

Warning Level

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

Refer to <indDescr>.

<lstaEdvs><sup>(num)</sup>

EDVS (0-11)

Error Downcounter value scaled. Refer to <indDescr>.

<lstaRssi><sup>(num)</sup>

Value in dBm

Received signal strength indication value. Refer to <indDescr>.

<lstaNo><sup>(num)</sup>

Number of reported channels. Refer to <indDescr>.

<lstaMin><sup>(num)</sup>

Value in dBm

Minimal received signal strength value. Refer to <indDescr>.

<lstaMax><sup>(num)</sup>

Value in dBm

Maximal received signal strength value. Refer to <indDescr>.

<lstaMean><sup>(num)</sup>

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

<lstaVar><sup>(num)</sup>

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

<ceerRelCauseGroup><sup>(num)</sup>

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 <sup>(P)</sup>	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 <ceerRelCauseGroup> "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><sup>(str)</sup>

Release cause information given by the network in textual format.

<srvProfileId><sup>(num)</sup>

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

<issuer><sup>(str)</sup>

Certificate's issuer. Refer to <indDescr>.

<serialNumber><sup>(str)</sup>

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

<subject><sup>(str)</sup>

Certificate's subject. Refer to <indDescr>.

<signatureAlgorithm><sup>(str)</sup>

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

<thumbprintAlgorithm><sup>(str)</sup>

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

<thumbprint><sup>(str)</sup>

Certificate's thumbprint. Refer to <indDescr>.

<cmdType><sup>(num)</sup>

Proactive command ID, see Section 9.1, Remote-SAT Command Types and Table 9.1.

<commandDetails><sup>(num)</sup>

0	USIM Initialization and Full File Change Notification
1	File Change Notification
2	USIM Initialization and File Change Notification
3	USIM Initialization
4	USIM Reset
5...255	Reserved values

For PACs OPEN\_CHANNEL and CLOSE\_CHANNEL this byte is RFU.

<pathLen><sup>(num)</sup>

Number of bytes coded in <fileList>

<fileNum><sup>(num)</sup>

Number of updated Elementary Files (EF) with path given in <fileList>

<fileList><sup>(str)</sup>

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.

<text><sup>(str)</sup>

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><sup>(num)</sup>**

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><sup>(num)</sup>**

0...255	
0	No Icon

**<status><sup>(num)</sup>**

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].

**<statAddInfo><sup>(num)</sup>**

Optional additional command status; for possible values refer to 3GPP TS 11.14 [23], 3GPP TS 31.111 [24], ETSI TS 102 223 [25].

**Notes**

- If the AT^SIND indicator "Ista" 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 "Ista" URC's <indValue> equals "1" and <lstaNo> is high, the following assumption is possible:
  - High <lstaMean> and low <lstaVar> 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><sup>(num)</sup>

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> <sup>(num)(&amp;V)(&amp;W)</sup>	Description
[0]	DCD line shall always be on.
1 <sup>(&amp;F)(D)</sup>	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 <a href="#">AT^SISI</a> , parameter <a href="#">&lt;srvState&gt;</a> or <a href="#">AT^SISO</a> , parameter <a href="#">&lt;srvState&gt;</a> . <ul style="list-style-type: none"> <li>• Transparent TCP or Transparent UDP client, SOCKET, HTTP,: DCD shall be on when <a href="#">&lt;srvState&gt;</a>="Connecting" or "Up".</li> <li>• Transparent TCP Listener: DCD shall be on when <a href="#">&lt;srvState&gt;</a>="Up", "Alerting", "Connected" and "Released".</li> <li>• FTP: DCD shall be on when data channel is connected, i.e. <a href="#">&lt;srvState&gt;</a>="Up".</li> </ul>

## 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><sup>(num)(&V)(&W)</sup>

[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 <a href="#">AT^SIST</a> DTR ON-OFF transition changes to command mode. For more details see <a href="#">AT^SISS</a> and <a href="#">AT^SIST</a> .

## 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> <sup>(num)(&amp;V)(&amp;W)</sup>	
[0] <sup>(&amp;F)(D)</sup>	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 (UART). It is strongly recommended to always use RTS/CTS hardware flow control.

### Syntax

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

PIN → Last  
- + -

### Parameter Description

<n> <sup>(num)(&amp;V)(&amp;W)</sup>	
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] <sup>(&amp;F)(D)</sup>	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> <sup>(num)(&amp;V)(&amp;W)</sup>	
0	Echo mode off
[1] <sup>(&amp;F)(D)</sup>	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 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

<p>Test Command</p> <p>AT+IPR=?</p> <p>Response(s)</p> <p>+IPR: ( ) , (list of supported selectable <code>&lt;rate&gt;</code>s)</p> <p>OK</p>	
<p>Read Command</p> <p>AT+IPR?</p> <p>Response(s)</p> <p>+IPR: <code>&lt;rate&gt;</code></p> <p>OK</p>	
<p>Write Command</p> <p>AT+IPR=<code>&lt;rate&gt;</code></p> <p>Response(s)</p> <p>OK</p> <p>ERROR</p> <p>+CME ERROR: <code>&lt;err&gt;</code></p>	
<p>PIN → Last</p> <p>- + -</p>	<p>Reference(s)</p> <p>V.250</p>

### Parameter Description

<p><code>&lt;rate&gt;</code><sup>(num)(&amp;V)(NV)</sup></p> <p>Bit rate per second (bps)</p> <p>300</p> <p>1200</p> <p>2400</p> <p>4800</p> <p>9600</p> <p>19200</p> <p>38400</p>	
--	--

57600

115200<sup>(D)</sup>

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>`<sup>(num)(&V)(&W)</sup>

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] <sup>(&amp;F)(D)</sup>	8 data 1 stop
5	7 data 1 parity 1 stop

`<parity>`<sup>(num)(&V)(&W)</sup>

#### 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:

- 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 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

<p>Test Command</p> <pre>AT+CMUX=?</pre> <p>Response(s)</p> <pre>+CMUX: (list of supported&lt;mode&gt;s) OK</pre>	
<p>Read Command</p> <pre>AT+CMUX?</pre> <p>Response(s)</p> <pre>+CMUX: &lt;mode&gt; OK ERROR +CME ERROR: &lt;err&gt;</pre>	
<p>Write Command</p> <pre>AT+CMUX=&lt;mode&gt;</pre> <p>Response(s)</p> <pre>OK ERROR +CME ERROR: &lt;err&gt;</pre>	
<p>PIN → Last</p> <pre>- + +</pre>	<p>Reference(s)</p> <pre>3GPP TS 27.007 [49] 3GPP TS 27.010 [13]</pre>

---

### Parameter Description

<mode><sup>(num)</sup>

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.

## 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> <sup>(str)</sup> 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>.
--

## 5.1 AT+CPIN

`<new pin>^(str)`

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

`<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 corporate 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 <i>&lt;facility&gt;</i> s	
OK	
Write Command	
AT+CLCK= <i>&lt;facility&gt;</i> , <i>&lt;mode&gt;</i> [, <i>&lt;password&gt;</i> ]	
Response(s)	
If <i>&lt;mode&gt;</i> is 0 or 1 and command successful:	
OK	
If <i>&lt;mode&gt;</i> = 2 and command successful:	
+CLCK: <i>&lt;status&gt;</i>	
OK	
ERROR	
+CME ERROR: <i>&lt;err&gt;</i>	
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>*<sup>(str)</sup>

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. <i>&lt;password&gt;</i> : SIM PIN1.
------	---

*<mode>*<sup>(num)</sup>

0	Unlock (parameter <i>&lt;password&gt;</i> is mandatory).
1	Lock (parameter <i>&lt;password&gt;</i> is mandatory).
2	Query status.

*<status>*<sup>(num)</sup>

0	Lock is inactive
1	Lock is active

<password><sup>(str)</sup>

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

AT+CLCK="SC",0,"9999" OK	Unlocks SIM card. 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 +CLCK: 1 OK	Query the status of SIM card lock. SIM card is locked. SIM PIN1 must be entered to enable UE to register to the network.
----------------------------------	---



## 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

<p>Test Command</p> <p>AT+CPWD=?</p> <p>Response(s)</p> <p>+CPWD : list of supported (&lt;facility&gt;, &lt;password length&gt;)</p> <p>OK</p>	
<p>Write Command</p> <p>AT+CPWD=&lt;facility&gt;, &lt;old password&gt;, &lt;new password&gt;</p> <p>Response(s)</p> <p>New password has been registered for the facility lock function.</p> <p>OK</p> <p>If parameter &lt;old password&gt; was not correct:</p> <p>+CME ERROR: 16 (+CME ERROR: incorrect password)</p> <p>If the password for the selected &lt;facility&gt; has been invalidated due to too many failed attempts:</p> <p>+CME ERROR: ...</p> <p>If the network provider or network operator doesn't supply the Network Password:</p> <p>+CME ERROR: 258 (+CME ERROR: retry operation)</p> <p>If error is related to ME functionality:</p> <p>+CME ERROR: &lt;err&gt;</p>	
<p>PIN → Last</p> <p>+ ± -</p>	<p>Reference(s)</p> <p>3GPP TS 27.007 [49]</p>

### Parameter Description

<facility> <sup>(str)</sup>	<p>Phone security locks set by client or factory:</p> <p>Primarily intended for the client to take safety precautions, password "SC" (SIM PIN) is usually predefined, but can be configured individually.</p> <p>"SC" SIM PIN. SIM requests password upon ME power-up and when this lock command is issued.</p> <p>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.</p> <p>&lt;password length&gt;: 4 to 8 digits.</p>
<password length> <sup>(num)</sup>	<p>Length of password. The range of permitted length for a password depends on the associated &lt;facility&gt;. It is available from the test command response, or in the description of parameter &lt;facility&gt;. If the entered password is longer than the maximum password length it will be stripped to the maximum length and the remaining digits will be ignored.</p>

<old password><sup>(str)</sup>

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><sup>(str)</sup>

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

### **Example**

To change PIN1

```
AT+CPWD="SC", "1111", "2222"  
OK
```

(where "1111" = old PIN1 and "2222" = new PIN1)  
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, SIM PIN2 or SIM PUK2.

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 PIN2, SIM PUK or SIM PUK2.

To check whether or not you need to enter a password use the read commands `AT+CPIN?` or `AT^SPIC?`. If the response to `AT+CPIN?` is "READY" the counter of the execute command `AT^SPIC` relates to PIN2. See [last example](#). If PIN and PIN2 are entered successfully no password is currently required and `AT^SPIC` read and execute commands return only OK.

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>`<sup>(num)</sup>

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



```
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.
```

EXAMPLE 2

Though a mobile is locked to Network Personalisation ("PN"), the user attempts to operate it with another SIM card. The user correctly enters the SIM PIN of the SIM card currently inserted:

```
at+cpin="9999"  
OK  
at+cpin?  
+CPIN: PH-NET PIN ME is waiting for the Network Personalisation password.  
  
OK  
at^spic  
^SPIC: 10 10 attempts left.  
OK  
at^spic="PN",1  
^SPIC: 10 Maximum retries PIN counter.  
OK  
at+cpin="11110000"  
+CME ERROR: operation failed  
at^spic  
^SPIC: 9 9 attempts left.  
OK  
at+cpin="11110000"  
+CME ERROR: operation failed  
and so on ...  
at^spic  
^SPIC: 1 1 attempt left.  
OK  
at^spic?  
^SPIC: PH-NET PIN Displayed counter refers to Network Personalisation password.  
  
OK  
  
at+cpin="12345678"  
OK The password is a self defined module specific password.
```

EXAMPLE 3

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

```
+CREG: 0  
at+cpin="1234"  
OK  
+CREG: 2  
  
+CREG: 1 The mobile ist properly registered to the network.
```

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

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

## 5.5 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 firm-ware 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 thumb-print 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

<signature><sup>(str)</sup>

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><sup>(num)</sup>

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

<preloaded-index><sup>(num)</sup>

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

<action><sup>(num)</sup>

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><sup>(str)</sup>

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><sup>(str)(NV)</sup>

"0"	disable manual/automatic Internet Service certificate store update with pre configured set.
"1" <sup>(D)</sup>	allow manual Internet Service certificate store update.
"2"	perform automatic Internet Service certificate store update after each firmware update.

---

<secmode><sup>(str)</sup>

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 `<certUpdateMode>` 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	ATI176	Response(s)	<imeisv_number> OK
PIN → Last	- + -	Reference(s)	ITU-T V.250 [18]

#### Parameter Description

<imeisv\_number><sup>(num)</sup>

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.

6.1 ATI

---

- 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> <sup>(text)</sup>
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> <sup>(text)</sup>
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><sup>(text)</sup>

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><sup>(str)</sup>

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

## 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><sup>(num)</sup>

[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

<p>Test Command</p> <pre>AT+CEDRXS=?</pre> <p>Response(s)</p> <pre>+CEDRXS: (list of supported &lt;mode&gt;s), (list of supported &lt;AcT-type&gt;s), (list of supported &lt;Requested_eDRX_value&gt;s) OK</pre>	
<p>Read Command</p> <pre>AT+CEDRXS?</pre> <p>Response(s)</p> <pre>[+CEDRXS: &lt;AcT-type&gt;, &lt;Requested_eDRX_value&gt;] [+CEDRXS: &lt;AcT-type&gt;, &lt;Requested_eDRX_value&gt;] [+CEDRXS: ...] OK ERROR +CME ERROR: &lt;err&gt;</pre>	
<p>Write Command</p> <pre>AT+CEDRXS=[&lt;mode&gt;[, &lt;AcT-type&gt;[, &lt;Requested_eDRX_value&gt;]]]</pre> <p>Response(s)</p> <pre>OK ERROR +CME ERROR: &lt;err&gt;</pre>	
<p>PIN → Last</p> <pre>+ + -</pre>	<p>Reference(s)</p> <p>3GPP TS 27.007 [49]</p>

### 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>`<sup>(num)(NV)</sup>

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 <code>&lt;Requested_eDRX_value&gt;</code> to default.

`<AcT-type>`<sup>(num)</sup>

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 <code>AT+CEDRXRDP</code> exec command.
2	GSM (A/Gb mode)
4	E-UTRAN Cat.M1
5	E-UTRAN Cat.NB

`<Requested_eDRX_value>`<sup>(str)(NV)</sup>

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><sup>(str)</sup>

Half a byte in a 4 bit format. The values are coded in the same way as for <Requested\_eDRX\_value>

<Paging\_time\_window><sup>(str)</sup>

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

<p>Test Command</p> <pre>AT^SEDRXS=?</pre> <p>Response(s)</p> <pre>^SEDRXS:(list of supported &lt;mode&gt;s), (list of supported &lt;AcT-type&gt;s), (list of supported &lt;Requested_eDRX_value&gt;s), (list of supported &lt;Requested_Paging_time_window&gt;s) OK</pre>	
<p>Read Command</p> <pre>AT^SEDRXS?</pre> <p>Response(s)</p> <pre>[^SEDRXS:&lt;AcT-type&gt;, &lt;Requested_eDRX_value&gt;, &lt;Requested_Paging_time_window&gt;] [^SEDRXS:&lt;AcT-type&gt;, &lt;Requested_eDRX_value&gt;, &lt;Requested_Paging_time_window&gt;] [^SEDRXS:...]</pre> <p>OK ERROR +CME ERROR: <code>&lt;err&gt;</code></p>	
<p>Write Command</p> <pre>AT^SEDRXS=[&lt;mode&gt;[, &lt;AcT-type&gt;[, &lt;Requested_eDRX_value&gt;][, &lt;Requested_Paging_time_window&gt;]]</pre> <p>Response(s)</p> <pre>OK ERROR +CME ERROR: &lt;err&gt;</pre>	
<p>PIN → Last</p> <p>+ + -</p>	<p>Reference(s)</p> <p>3GPP TS 27.007 [49]</p>

### 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><sup>(num)(NV)</sup>**

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><sup>(num)</sup>**

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><sup>(str)(NV)</sup>**

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><sup>(str)</sup>

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><sup>(str)(NV)</sup>

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: <code>&lt;err&gt;</code>	
Exec Command	
AT+COPN	
Response(s)	
+COPN: <code>&lt;numericn&gt;</code> , <code>&lt;alphan&gt;</code>	
[+COPN: ...]	
OK	
ERROR	
+CME ERROR: <code>&lt;err&gt;</code>	
PIN → Last	Reference(s)
+ + -	3GPP TS 27.007 [49]

### Parameter Description

<code>&lt;numericn&gt;</code> <sup>(str)</sup>
Operator in numeric format
<code>&lt;alphan&gt;</code> <sup>(str)(+CSCS)</sup>
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>`<sup>(num)</sup>

Operator Status

0	Unknown
1	Operator available
2	Current operator
3	Operator forbidden

`<opName>`<sup>(str)(+CSCS)(&V)</sup>

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>`<sup>(num)(&V)(NV)</sup>

Only Parameter values 0 and 1 are stored in the non-volatile memory of the EXS82-W.

0 <sup>(D)</sup>	Automatic mode; <code>&lt;opName&gt;</code> field is ignored.
1	Manual operator selection The <code>AT+COPS</code> write command requires <code>&lt;opName&gt;</code> in numeric format, i.e. <code>&lt;format&gt;</code> shall be 2. When using this mode keep in mind that only the <code>&lt;mode&gt;</code> parameter is non-volatile, but not the selected <code>&lt;opName&gt;</code> . 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 <code>&lt;mode&gt;=0</code> or 1 or 4 is selected. After setting command <code>AT+COPS=2</code> wait for <code>&lt;regStatus&gt;</code> 0, e.g. indicated by the "+CREG: 0" URC before executing any further network service related AT commands.
3	Set only <code>&lt;format&gt;</code> (for <code>AT+COPS</code> read command).
4	Manual / automatic selection ( <code>&lt;opName&gt;</code> field shall be present); if manual selection fails, automatic mode ( <code>&lt;mode&gt;=0</code> ) is entered. This mode cannot be selected in restricted mode (see note below).

`<rat>`<sup>(num)(&V)(NV)</sup>

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 <a href="#">AT+COPS</a> write command.
7	E-UTRAN Cat.M1
9	E-UTRAN Cat.NB1

**<format>** <sup>(num)(&V)(&W)</sup>

0(&F)(D)	Long alphanumeric format of <a href="#">&lt;opName&gt;</a> .
1	Short alphanumeric format of <a href="#">&lt;opName&gt;</a> .
2	Numeric format of <a href="#">&lt;opName&gt;</a> . 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

<p>Test Command</p> <p>AT+CPLS=?</p> <p>Response(s)</p> <p>+CPLS: (list of USIM supported &lt;plmn-selector&gt;s)</p> <p>OK</p>	
<p>Read Command</p> <p>AT+CPLS?</p> <p>Response(s)</p> <p>+CPLS: &lt;plmn-selector&gt;</p> <p>OK</p> <p>ERROR</p> <p>+CME ERROR: &lt;err&gt;</p>	
<p>Write Command</p> <p>AT+CPLS=&lt;plmn-selector&gt;</p> <p>Response(s)</p> <p>OK</p> <p>ERROR</p> <p>+CME ERROR: &lt;err&gt;</p>	
<p>PIN → Last</p> <p>+ - -</p>	<p>Reference(s)</p> <p>3GPP TS 27.007 [49]</p>

### Parameter Description

<plmn-selector> <sup>(num)</sup>	
0 <sup>(P)</sup>	User controlled PLMN with EF <sub>PLMNwAcT</sub> /EF <sub>PLMNsel</sub>
1	Operator controlled PLMN selector with EF <sub>OPLMNwAcT</sub>
2	HPLMN selector with EF <sub>HPLMNwAcT</sub>

## 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

<p>Test Command</p> <p>AT+CPOL=?</p> <p>Response(s)</p> <p>+CPOL: (list of supported <b>&lt;index&gt;</b>s), (list of supported <b>&lt;format&gt;</b>s)</p> <p>OK</p> <p>ERROR</p> <p>+CME ERROR: <b>&lt;err&gt;</b></p>	
<p>Read Command</p> <p>AT+CPOL?</p> <p>Response(s)</p> <p>+CPOL: <b>&lt;index&gt;</b>, <b>&lt;format&gt;</b>, <b>&lt;operator&gt;</b>[, <b>&lt;gsm&gt;</b>, <b>&lt;gsm_compact&gt;</b>, <b>&lt;utran&gt;</b>, <b>&lt;e-utran&gt;</b>]</p> <p>+CPOL: ...</p> <p>OK</p> <p>ERROR</p> <p>+CME ERROR: <b>&lt;err&gt;</b></p>	
<p>Write Command</p> <p>AT+CPOL=[<b>&lt;index&gt;</b>][, <b>&lt;format&gt;</b>][, <b>&lt;operator&gt;</b>][, <b>&lt;gsm&gt;</b>, <b>&lt;gsm_compact&gt;</b>, <b>&lt;utran&gt;</b>, <b>&lt;e-utran&gt;</b>]]]</p> <p>Response(s)</p> <p>OK</p> <p>ERROR</p> <p>+CME ERROR: <b>&lt;err&gt;</b></p>	
<p>PIN → Last</p> <p>+ + -</p>	<p>Reference(s)</p> <p>3GPP TS 27.007 [49]</p>

### Parameter Description

<b>&lt;index&gt;</b> <sup>(num)</sup>	
The order number of the operator in the SIM preferred operator list.	
<b>&lt;format&gt;</b> <sup>(num)</sup>	
0	Long alphanumeric format <b>&lt;operator&gt;</b>
1	Short alphanumeric format <b>&lt;operator&gt;</b>
2	Numeric format <b>&lt;operator&gt;</b>
<b>&lt;operator&gt;</b> <sup>(str)</sup>	
The operator in the format specified in <b>&lt;format&gt;</b> .	

---

<gsm><sup>(num)</sup>

0	AcT GSM disabled
1	AcT GSM enabled

<gsm\_compact><sup>(num)</sup>

0	AcT GSM Compact disabled
---	--------------------------

<utran><sup>(num)</sup>

0	AcT UTRAN disabled
1	AcT UTRAN enabled

<e-utran><sup>(num)</sup>

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

<p>Test Command</p> <p>AT+CPSMS=?</p> <p>Response(s)</p> <p>+CPSMS: (list of supported <code>&lt;mode&gt;s</code>), (list of supported <code>&lt;RequestedPeriodicRAU&gt;s</code>), (list of supported <code>&lt;RequestedGprsReadyTime&gt;s</code>), (list of supported <code>&lt;RequestedPeriodicTAU&gt;s</code>), (list of supported <code>&lt;RequestedActiveTime&gt;s</code>)</p> <p>OK</p> <p>ERROR</p> <p>+CME ERROR: <code>&lt;err&gt;</code></p>	
<p>Read Command</p> <p>AT+CPSMS?</p> <p>Response(s)</p> <p>+CPSMS: <code>&lt;mode&gt;</code>[, <code>&lt;RequestedPeriodicRAU&gt;</code>][, <code>&lt;RequestedGprsReadyTime&gt;</code>][, <code>&lt;RequestedPeriodicTAU&gt;</code>][, <code>&lt;RequestedActiveTime&gt;</code>]</p> <p>OK</p> <p>ERROR</p> <p>+CME ERROR: <code>&lt;err&gt;</code></p>	
<p>Write Command</p> <p>AT+CPSMS=[<code>&lt;mode&gt;</code>[, <code>&lt;RequestedPeriodicRAU&gt;</code>[, <code>&lt;RequestedGprsReadyTime&gt;</code>][, <code>&lt;RequestedPeriodicTAU&gt;</code>[, <code>&lt;RequestedActiveTime&gt;</code>]]]]</p> <p>Response(s)</p> <p>OK</p> <p>ERROR</p> <p>+CME ERROR: <code>&lt;err&gt;</code></p>	
<p>PIN → Last</p> <p>- - -</p>	<p>Reference(s)</p> <p>3GPP TS 27.007 [49]</p> <p>3GPP TS 24.008 [43]</p>

### Parameter Description

<code>&lt;mode&gt;</code> <sup>(num)(NV)</sup>	
0 <sup>(D)</sup>	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" <sup>(D)</sup>	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" <sup>(D)</sup>	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 network registration status. Information can be reported by the AT+CREG? read command and by +CREG: URCs.

### Syntax

<p>Test Command</p> <p>AT+CREG=?</p> <p>Response(s)</p> <p>+CREG: (list of supported&lt;urcMode&gt;s)</p> <p>OK</p>	
<p>Read Command</p> <p>AT+CREG?</p> <p>Response(s)</p> <p>+CREG: &lt;urcMode&gt;, &lt;regStatus&gt;[, &lt;netLac&gt;, &lt;netCellId&gt;[, &lt;AcT&gt;]]</p> <p>OK</p> <p>ERROR</p> <p>+CME ERROR: &lt;err&gt;</p>	
<p>Write Command</p> <p>AT+CREG=&lt;urcMode&gt;</p> <p>Response(s)</p> <p>OK</p> <p>ERROR</p> <p>+CME ERROR: &lt;err&gt;</p>	
<p>PIN → Last</p> <p>- + -</p>	<p>Reference(s)</p> <p>3GPP TS 27.007 [49]</p>

### 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> <sup>(num)(&amp;V)(&amp;W)</sup>	
[0] <sup>(&amp;F)</sup>	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: <ul style="list-style-type: none"><li>• no SIM card available</li><li>• no PIN entered</li><li>• no valid Home PLMN entry found on the SIM</li></ul>  |
| 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: <ul style="list-style-type: none"><li>• No network available or insufficient Rx level.</li><li>• UE has no access rights to the networks available.</li><li>• Networks from the SIM list of allowed networks are around, but login fails due to one of the following reasons:<ul style="list-style-type: none"><li>- #11 ... PLMN not allowed</li><li>- #12 ... Location area not allowed</li><li>- #13 ... Roaming not allowed in this location area</li></ul></li></ul> After this, the search will be resumed (if automatic network search is enabled). <ul style="list-style-type: none"><li>• The Home PLMN or an allowed PLMN is available, but login is rejected by the cell (reasons: Access Class or LAC).</li></ul> If at least one network is available, emergency calls can be made.   |
| 3 | Registration denied <ul style="list-style-type: none"><li>• If automatic network search is enabled:<br/>Authentication or registration fails after Location Update Reject due to one of the following reasons:<ul style="list-style-type: none"><li>- #2 ... IMSI unknown at HLR</li><li>- #3 ... Illegal MS</li><li>- #6 ... Illegal UE</li></ul></li></ul> 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. <ul style="list-style-type: none"><li>• Only if manual network search is enabled:<br/>Manual registration fails after Location Update Reject due to the following reasons:<ul style="list-style-type: none"><li>- #2 ... IMSI unknown at HLR</li><li>- #3 ... Illegal MS</li><li>- #6 ... Illegal UE</li><li>- #11 ... PLMN not allowed</li><li>- #12 ... Location area not allowed</li><li>- #13 ... Roaming not allowed in this location area</li></ul></li></ul> 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.<br>UE is registered at a foreign network (national or international network)   |

<netLac><sup>(str)</sup>

Two byte location area code in hexadecimal format (e.g. "00C1" equals 193 in decimal).

<netCellId><sup>(str)</sup>

Cell ID in hexadecimal format:

- 16 bit for 2G
- 28 bit for 4G

<AcT><sup>(num)</sup>

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

<p>Test Command</p> <pre>AT+CSQ=?</pre> <p>Response(s)</p> <pre>+CSQ: (list of supported &lt;rssi&gt;s), (list of supported &lt;ber&gt;s) OK</pre>	
<p>Exec Command</p> <pre>AT+CSQ</pre> <p>Response(s)</p> <pre>+CSQ: &lt;rssi&gt;,&lt;ber&gt; OK</pre>	
<p>PIN → Last</p> <p>+ - -</p>	<p>Reference(s)</p> <p>3GPP TS 27.007 [49]</p>

### Parameter Description

<code>&lt;rssi&gt;</code> <sup>(num)</sup>	
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+CBSQ` instead, or `AT^SMONI`.

<code>&lt;ber&gt;</code> <sup>(num)</sup>	
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

<p>Test Command</p> <p>AT+CESQ=?</p> <p>Response(s)</p> <p>+CESQ: (list of supported <code>&lt;rxlev&gt;</code>s), (list of supported <code>&lt;ber&gt;</code>s), (list of supported <code>&lt;rscp&gt;</code>s), (list of supported <code>&lt;ecno&gt;</code>s), (list of supported <code>&lt;rsrq&gt;</code>s), (list of supported <code>&lt;rsrp&gt;</code>s)</p> <p>OK</p>	
<p>Exec Command</p> <p>AT+CESQ</p> <p>Response(s)</p> <p>+CESQ: <code>&lt;rxlev&gt;</code>, <code>&lt;ber&gt;</code>, <code>&lt;rscp&gt;</code>, <code>&lt;ecno&gt;</code>, <code>&lt;rsrq&gt;</code>, <code>&lt;rsrp&gt;</code></p> <p>OK</p> <p>ERROR</p>	
<p>PIN → Last</p> <p>+ - -</p>	<p>Reference(s)</p> <p>3GPP TS 27.007 [49]</p>

### Parameter Description

<code>&lt;rxlev&gt;</code> <sup>(num)</sup>	
Received signal strength level (see 3GPP TS 45.008 [53] subclause 8.1.4). For 2G networks only	
0	rssl < -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
<code>&lt;ber&gt;</code> <sup>(num)</sup>	
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
<code>&lt;rscp&gt;</code> <sup>(num)</sup>	
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

## 8.11 AT+CESQ

**<ecno><sup>(num)</sup>**

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><sup>(num)</sup>**

Reference signal received quality (see 3GPP TS 36.133 [54] 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><sup>(num)</sup>**

Reference signal received power (see 3GPP TS 36.133 [54] 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

<p>Test Command</p> <pre>AT+CTZU=?</pre> <p>Response(s)</p> <pre>+CTZU: (list of supported &lt;n&gt;s) OK</pre>	
<p>Read Command</p> <pre>AT+CTZU?</pre> <p>Response(s)</p> <pre>+CTZU: &lt;n&gt; OK ERROR +CME ERROR: &lt;err&gt;</pre>	
<p>Write Command</p> <pre>AT+CTZU=&lt;n&gt;</pre> <p>Response(s)</p> <pre>OK ERROR +CME ERROR: &lt;err&gt;</pre>	
<p>PIN → Last</p> <pre>- + -</pre>	<p>Reference(s)</p> <p>3GPP TS 27.007 [49]</p>

### 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> <sup>(num)</sup>	
0(&F)(P)	Disable automatic time zone update via NITZ. Suppress unsolicited result codes.
1	Enable automatic time zone update via NITZ. Output unsolicited result codes.

---

<nitzUT><sup>(str)</sup>

Universal Time delivered as part of the NITZ message.

<nitzTZ><sup>(num)</sup>

Time Zone delivered as part of the NITZ message.

Positive (east) or negative (west) offset from the UTC in units of 15 minutes.

<nitzDST><sup>(num)</sup>

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
<code>AT^SMONI=?</code>
Response(s)
OK
Exec Command
<code>AT^SMONI</code>
Response(s)
See: Section 8.13.1, <a href="#">AT^SMONI Responses</a>
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,ChMod`  
*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,Srxlev,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,Srxlev,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:



## 8.13 AT^SMONI

*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,ChMod
```

*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,ChMod
```

*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:

## 8.13 AT^SMONI

*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

## 8.13 AT^SMONI

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

<p>Test Command</p> <p>AT^SMONP=?</p> <p>Response(s)</p> <p>OK</p>
<p>Exec Command</p> <p>AT^SMONP</p> <p>Response(s)</p> <p>See: Section <a href="#">8.14.1, AT^SMONP Responses</a></p> <p>OK</p>
<p>PIN → Last</p> <p>- - -</p>

### 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<sub>1</sub>, rs<sub>1</sub>, dBm<sub>1</sub>, MCC<sub>1</sub>, MNC<sub>1</sub>, NCC<sub>1</sub>, BCC<sub>1</sub>, C1<sub>1</sub>, C2<sub>1</sub>, LAC<sub>1</sub>, cell<sub>1</sub>, C31<sub>1</sub>, C32<sub>1</sub>  
ARFCN<sub>2</sub>, rs<sub>2</sub>, dBm<sub>2</sub>, MCC<sub>2</sub>, MNC<sub>2</sub>, NCC<sub>2</sub>, BCC<sub>2</sub>, C1<sub>2</sub>, C2<sub>2</sub>, LAC<sub>2</sub>, cell<sub>2</sub>, C31<sub>2</sub>, C32<sub>2</sub>  
...  
ARFCN<sub>n</sub>, rs<sub>n</sub>, dBm<sub>n</sub>, MCC<sub>n</sub>, MNC<sub>n</sub>, NCC<sub>n</sub>, BCC<sub>n</sub>, C1<sub>n</sub>, C2<sub>n</sub>, LAC<sub>n</sub>, cell<sub>n</sub>, C31<sub>n</sub>, C32<sub>n</sub>

4G:  
EARFCN<sub>1</sub>, RSRQ<sub>1</sub>, RSRP<sub>1</sub>, PCI<sub>1</sub>  
EARFCN<sub>2</sub>, RSRQ<sub>2</sub>, RSRP<sub>2</sub>, PCI<sub>2</sub>  
...  
EARFCN<sub>n</sub>, RSRQ<sub>n</sub>, RSRP<sub>n</sub>, PCI<sub>n</sub>

*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

## 8.14 AT^SMONP

```

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:
EARFCN1,RSRQ1,RSRP1,Srxlev1,PCI1,RSSI1,Cell ID1,MCC1,MNC1,TAC1
EARFCN2,RSRQ2,RSRP2,Srxlev2,PCI2,RSSI2,Cell ID2,MCC2,MNC2,TAC2
...
EARFCNn,RSRQn,RSRPn,Srxlevn,PCIn,RSSIn,Cell IDn,MCCn,MNCn,TACn

```

*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:
EARFCN1,NRSRQ1,NRSRP1,Srxlev1,PCI1,NRSSI1,Cell ID1,MCC1,MNC1,TAC1
EARFCN2,NRSRQ2,NRSRP2,Srxlev2,PCI2,NRSSI2,Cell ID2,MCC2,MNC2,TAC2
...
EARFCNn,NRSRQn,NRSRPn,Srxlevn,PCIn,NRSSIn,Cell IDn,MCCn,MNCn,TACn

```

*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^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><sup>(num)(NV)</sup>

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 <sup>(D)</sup>	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><sup>(num)(NV)</sup>

Access technology 1st preferred

0	RAT GSM
7 <sup>(D)</sup>	RAT LTE CAT.M1
8	RAT LTE CAT.NB1

<AcT\_pref2><sup>(num)(NV)</sup>

Access technology 2nd preferred

0	RAT GSM
7	RAT LTE CAT.M1
8 <sup>(D)</sup>	RAT LTE CAT.NB1

### Examples

#### EXAMPLE 1

If **AT+COPS=0** is executed, 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 triple 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 triple mode and 1st preferred Access technology is GSM. 2nd preferred Access technology is CAT.M1.
OK	

EXAMPLE 2

If **AT+COPS=1** is executed 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 triple 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	

## 8.16 AT^SNLWM2M LwM2M Client Configuration

AT^SNLWM2M is used to manage LwM2M Client configuration.

### Syntax

Write Command

The following command shall be used to configure LwM2M Client:

```
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 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>], <rsc_flags>[, <rsc_size>]
```

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 to control LwM2M Client:

```
AT^SNLWM2M="act" , <stack_id_str>, <action>[, <start_parameters>]
```

Response(s)

```
^SNLWM2M: "act" , <action>, <action_status>
```

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>[, <start_parameters>]
```

Response(s)

```
^SNLWM2M: "cfg/stack" , <stack_id_str>, autostart, <autostart>
```

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", [<srvID>], <stack\_id\_str>, <procedure>, <procedure\_status>[, <procedure\_status\_parameter>]

URCs indicate execution status of LwM2M action procedure.

### Parameter Description

<stack\_id\_str><sup>(text)</sup>

This parameter is used for identification of the client

MODS Identification of the client Module Service.

<mgmt\_rsc><sup>(str)</sup>

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/resource[/resource instance].

"/" to configure default value.

<rsc\_value><sup>(str)</sup>

This parameter represent the value of resource and is omitted when the management object has the status uninitialized, not printable or Secure Read (see <rsc\_flags>).

<rsc\_flags><sup>(str)</sup>

This parameter represents status of the resource.

"0" Uninitialized - Resource value has not been set yet

"1" Valid

"2" Not printable - value is valid but is too large or contains characters not printable on AT interface

"4" Secure Read - value is valid but cannot be read over plain AT interface

`<rsc_size>`<sup>(str)</sup>

This parameter represent size of the resource value `<rsc_value>`.

`<rsc_operation>`<sup>(str)</sup>

This parameter determines if a management object will be created or deleted.

“new“	creation of object instance
“del“	deletion of object instance

`<ext_param>`<sup>(str)</sup>

This parameter is used for identification of the management object parameter.

“conID“	for context ID
---------	----------------

`<ext_value>`<sup>(str)</sup>

This parameter is used for identification of the management object value, eg. parameter `<cid>` of `AT+CGDCONT`.

`<action>`<sup>(str)</sup>

This parameter determines if a management object will be created or deleted.

“start“	start LwM2M Client
“stop“	stop LwM2M Client

`<action_status>`<sup>(str)</sup>

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

`<start_parameters>`<sup>(str)</sup>

the parameter range will be decided during development phase.

`<autostart>`<sup>(str)</sup>

the parameter controls the autostart of the LwM2M Client.

“on“	autostart switched on
“off“	autostart switched off

`<stack_status>`<sup>(str)</sup>

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. <code>AT^SNLWM2M="status/srv"</code> will return status only of the bootstrap server connection.

`<status_parameter>`<sup>(str)</sup>

the parameter shows additional status information of the LwM2M Client.

`<srvID>`<sup>(str)</sup>

LwM2M Server Identification is integer value of short server id or empty for bootstrap server

`<server_status>`<sup>(str)</sup>

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>`<sup>(str)</sup>

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>`<sup>(str)</sup>

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>`<sup>(str)</sup>

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 <a href="#">&lt;procedure_status_parameter&gt;</a>
“ready“	to indicate action is ready to be initiated
“progress“	to indicate download progress percentage, with downloading percentage information provided in <a href="#">&lt;procedure_status_parameter&gt;</a> , the URC will be printed in every 5 percent increased
“status“	to indicate final action status

`<procedure_status_parameter>`<sup>(str)</sup>

The parameter shows additional status information of the procedure in progress.

## 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.

### 9.1 Remote-SAT Command Types

The Command Type value (cmdType) identifies the type of command or associated response passed between the TE and the UE.

[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 9.1:** Command Type Table

Proactive Toolkit command
REFRESH (1)
SET UP EVENT LIST (5)
SEND SHORT MESSAGE (19)
OPEN CHANNEL (64)
CLOSE CHANNEL (65)
RECEIVE DATA (66)
SEND DATA (67)



## 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 containing two IRA characters (e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65)).

In case of CBS: 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 hexadecimal 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"

## 10.1 SMS parameters

**<ieia>**<sup>(num)</sup>

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>**<sup>(num)</sup>

Integer type; value in the range of location numbers supported by the associated memory.

**<length>**<sup>(num)</sup>

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 **<dc>** parameter in following way:

- If **<dc>** indicates that GSM 7 bit default alphabet is used: every character counts as 1, i.e. for "ABC" **<length>**= 3.
- If **<dc>** 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 **<dc>** 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  $(140 - (6 \text{ or } 7)) * 8/7 = 153 \text{ or } 152$  characters. In the case of 16 bit UCS2 data, the maximum length of the short message is:  $(140 - (6 \text{ or } 7))/2 = 67 \text{ or } 66$  characters.

**<max>**<sup>(num)</sup>

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>**<sup>(str)(NV)</sup>

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>**<sup>(str)(NV)</sup>

Memory to be used when writing and sending messages:

"SM"	SIM message storage
"ME"	UE message storage

## 10.1 SMS parameters

“MT“ Same as "ME" storage  
 “SR“ Status report storage

<mem3><sup>(str)(NV)</sup>

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><sup>(num)</sup>

Message Identifier

3GPP TS 23.041 [\[40\]](#) CBM Message Identifier in integer format

<mn><sup>(num)</sup>

Message Number

3GPP TS 23.040 [\[39\]](#) TP-Message-Number in integer format

<mr><sup>(num)</sup>

Message Reference

3GPP TS 23.040 [\[39\]](#) TP-Message-Reference in integer format

<oa><sup>(str)(+CSCS)</sup>

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 <toa>

<pdu><sup>(num)</sup>

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

<ra><sup>(str)(+CSCS)</sup>

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><sup>(num)</sup>

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

## 10.1 SMS parameters

`<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 ( <code>&lt;mode&gt;=1</code> )	PDU mode ( <code>&lt;mode&gt;=0</code> )	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><sup>(num)</sup>

Type of Recipient Address

3GPP TS 24.011 [42] TP-Recipient-Address Type-of-Address octet in integer format (default refer <toda>)

<tosca><sup>(num)</sup>

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 <a href="#">&lt;index&gt;</a> s)	
OK	
Write Command	
AT+CMGD= <a href="#">&lt;index&gt;</a>	
Response(s)	
OK	
ERROR	
+CMS ERROR: <a href="#">&lt;err&gt;</a>	
PIN → Last	Reference(s)
+ + -	3GPP TS 27.005 <a href="#">[48]</a>

### 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> <sup>(num)(&amp;V)(&amp;W)</sup>	
[0] <sup>(&amp;F)</sup>	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>`][, `<toa>/<tda>`, `<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]

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### 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

<p>Test Command</p> <p>AT+CMGR=?</p> <p>Response(s)</p> <p>OK</p>	
<p>Write Command</p> <p>AT+CMGR=&lt;index&gt;</p> <p>Response(s)</p> <p>Output if text mode (<code>AT+CMGF=1</code>) and command successful:</p> <p>For SMS-DELIVER</p> <p>+CMGR: &lt;stat&gt;, &lt;oa&gt;, , &lt;scts&gt;[, &lt;toa&gt;, &lt;fo&gt;, &lt;pid&gt;, &lt;dcs&gt;, &lt;sca&gt;, &lt;tosca&gt;, &lt;length&gt;] &lt;data&gt; [... ] OK</p> <p>For SMS-SUBMIT</p> <p>+CMGR: &lt;stat&gt;, &lt;da&gt;, [, &lt;toda&gt;, &lt;fo&gt;, &lt;pid&gt;, &lt;dcs&gt;, [&lt;vp&gt;], &lt;sca&gt;, &lt;tosca&gt;, &lt;length&gt;] &lt;data&gt; [... ] OK</p> <p>For SMS-Commands</p> <p>+CMGR: &lt;stat&gt;, &lt;fo&gt;, &lt;ct&gt;[, &lt;pid&gt;[&lt;mn&gt;], [&lt;da&gt;], [&lt;toda&gt;], &lt;length&gt; &lt;data&gt;] [... ] OK</p> <p>Output if PDU mode (<code>AT+CMGF=0</code>) and command successful:</p> <p>For SMS-SUBMITs and/or SMS-DELIVERs</p> <p>+CMGR: &lt;stat&gt;, , &lt;length&gt; &lt;pdu&gt; [... ] OK ERROR +CMS ERROR: &lt;err&gt;</p>	<p>Reference(s)</p> <p>3GPP TS 27.005 [48]</p>

### 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 <a href="#">AT+CMGF=1</a> ) 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 <a href="#">AT+CMGF=0</a> ) 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) <a href="#">3GPP TS 27.005 [48]</a>

### 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>`[, [`<toa>/<oda>`]], [`<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 <code>&lt;n&gt;</code> s) OK	
Exec Command AT+CNMA Response(s) OK ERROR +CMS ERROR: <code>&lt;err&gt;</code>	
Write Command AT+CNMA= <code>&lt;n&gt;</code> Response(s) OK ERROR +CMS ERROR: <code>&lt;err&gt;</code>	
PIN → Last + - -	Reference(s) 3GPP TS 27.005 [48]

### Parameter Description

<code>&lt;n&gt;</code> <sup>(num)</sup>	
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

<p>Test Command</p> <p>AT+CNMI=?</p> <p>Response(s)</p> <p>+CNMI: (list of supported &lt;mode&gt;s), (list of supported &lt;mt&gt;s), (list of supported &lt;bm&gt;s), (list of supported &lt;ds&gt;s), (list of supported &lt;bfr&gt;s)</p> <p>OK</p>	
<p>Read Command</p> <p>AT+CNMI?</p> <p>Response(s)</p> <p>+CNMI: &lt;mode&gt;, &lt;mt&gt;, &lt;bm&gt;, &lt;ds&gt;, &lt;bfr&gt;</p> <p>OK</p>	
<p>Write Command</p> <p>AT+CNMI=[&lt;mode&gt;][, &lt;mt&gt;][, &lt;bm&gt;][, &lt;ds&gt;][, &lt;bfr&gt;]</p> <p>Response(s)</p> <p>OK</p> <p>ERROR</p> <p>+CMS ERROR: &lt;err&gt;</p>	
<p>PIN → Last</p> <p>+ + -</p>	<p>Reference(s)</p> <p>3GPP TS 27.005 [48]</p>

### 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>[, <toa>, <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**

<b>&lt;mode&gt;<sup>(num)(&amp;V)(&amp;W)</sup></b>	
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>.
<b>&lt;mt&gt;<sup>(num)(&amp;V)(&amp;W)</sup></b>	
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.
<b>&lt;bm&gt;<sup>(num)(&amp;V)(&amp;W)</sup></b>	
Cell Broadcast settings. Not supported by EXS82-W.	
0(&F)(D)	No CBM indications are routed to the TE.
<b>&lt;ds&gt;<sup>(num)(&amp;V)(&amp;W)</sup></b>	
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>`<sup>(num)(&V)(&W)</sup>

1(&F)(D)

UE's buffer of SMS related URCs is cleared when `<mode>` changes from 0 to 1, 2.

`<index>`<sup>(num)</sup>

Integer type; value in the range of location numbers supported by the associated memory

### Notes

- With `<mt>=2,3` and `<ds>=1` messages routed directly to the TE (either short messages or status reports) have to be acknowledged with [AT+CNMA](#). To do this, GSM Phase 2+ has to be enabled (see [AT+CSMS](#)).
- If Phase 2+ is enabled and either a short message or a status report is not acknowledged within the required time, then `<mt>` and `<ds>` will be set to zero. See [AT+CNMA](#) for further detail.
- 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>](#)<sup>(num)</sup>

Number of messages currently in [<mem1>](#)

[<used2>](#)<sup>(num)</sup>

Number of messages currently in [<mem2>](#)

[<used3>](#)<sup>(num)</sup>

Number of messages currently in [<mem3>](#)

[<total1>](#)<sup>(num)</sup>

Number of messages storable in [<mem1>](#)

[<total2>](#)<sup>(num)</sup>

Number of messages storable in [<mem2>](#)

---

<total3><sup>(num)</sup>

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 <dc3> 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> <sup>(num)</sup>	
[0]	Feature disabled.
1	Keep link open until the time between the response of the latest message's send command ( <a href="#">AT+CMGS</a> , <a href="#">AT+CMSS</a> , 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 ( <a href="#">AT+CMGS</a> , <a href="#">AT+CMSS</a> , 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: <code>&lt;sca&gt;</code> , <code>&lt;tosca&gt;</code>	
OK	
Write Command	
AT+CSCA= <code>&lt;sca&gt;</code> [, <code>&lt;tosca&gt;</code> ]	
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 +CME ERROR: <err>	
PIN → Last + + -	Reference(s) 3GPP TS 27.005 [48]

### Parameter Description

<show> <sup>(num)(&amp;V)(&amp;W)</sup>	
0 <sup>(&amp;F)(D)</sup>	Do not show header values defined in commands <a href="#">AT+CSCA</a> and <a href="#">AT+CSMP</a> (<sca>, <tosca>, <fo>, <vp>, <pid> and <dcs>) nor <length>, <toda> or <tooa> in "+CMT", <a href="#">AT+CMGL</a> , <a href="#">AT+CMGR</a> 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>, <dc> OK	
Write Command AT+CSMP=<fo>[, <vp>/<scts>[, <pid>[, <dc>]]] Response(s) OK ERROR +CMS ERROR: <err>	
PIN → Last + + -	Reference(s) 3GPP TS 27.005 [48]

### Parameter Description

<fo> <sup>(num)</sup> 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 <sup>(&amp;F)(P)</sup> ...255
<vp> <sup>(num)</sup> 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 <sup>(&amp;F)(P)</sup> ...255
<pid> <sup>(num)(NV)</sup> Protocol Identifier 3GPP TS 23.040 [39] TP-Protocol-Identifier in integer format. 0 <sup>(&amp;F)</sup> ...255

---

<dcS><sup>(num)(NV)</sup>

Data Coding Scheme

3GPP TS 23.038 [38] SMS Data Coding Scheme, or Cell Broadcast Data Coding Scheme in integer format.

0<sup>(&F)</sup>...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

<p>Test Command</p> <p>AT+CSMS=?</p> <p>Response(s)</p> <p>+CSMS: (list of supported&lt;service&gt;s)</p> <p>OK</p>	
<p>Read Command</p> <p>AT+CSMS?</p> <p>Response(s)</p> <p>+CSMS: &lt;service&gt;, &lt;mt&gt;, &lt;mo&gt;, &lt;bm&gt;</p> <p>OK</p>	
<p>Write Command</p> <p>AT+CSMS=&lt;service&gt;</p> <p>Response(s)</p> <p>+CSMS: &lt;mt&gt;, &lt;mo&gt;, &lt;bm&gt;</p> <p>OK</p> <p>ERROR</p> <p>+CMS ERROR: &lt;err&gt;</p>	
<p>PIN → Last</p> <p>+ + -</p>	<p>Reference(s)</p> <p>3GPP TS 27.005 [48]</p>

### Parameter Description

<b>&lt;service&gt;</b> <sup>(num)(&amp;V)(&amp;W)</sup>	
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).

<b>&lt;mt&gt;</b> <sup>(num)(&amp;V)</sup>	
Mobile Terminated Messages:	
0	Type not supported
1	Type supported

<b>&lt;mo&gt;</b> <sup>(num)(&amp;V)</sup>	
Mobile Originated Messages:	
0	Type not supported
1	Type supported



## 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 `unread` (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 <a href="#">AT+CMGR</a>
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

<b>&lt;da&gt;</b> <sup>(num)(NV)</sup>	
Display Availability	
0	Application is not able to display incoming short message
1(&F)(D)	Application is able to display incoming short message

## 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](#), especially 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 "mqttps://"

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 socktcp, sockudp, 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 `<urcCause>=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".

## 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><sup>(num)</sup>

0	Deactivate(d)
---	---------------

1	Activate(d)
---	-------------

<cid><sup>(num)</sup>

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>
    
```

### Parameter Description

<conProfileId> <sup>(num)(NV)</sup>	Internet connection profile as specified with AT+CGDCONT parameter <cid>.
<conParmTag> <sup>(str)(NV)</sup>	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><sup>(str)(NV)</sup>

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

<p>Test Command</p> <p>AT^SIPS=?</p> <p>Response(s)</p> <p>^SIPS: (list of supported &lt;type&gt;s), (list of supported &lt;action&gt;s), (list of supported &lt;ProfileId&gt;s)</p> <p>OK</p>
<p>Write Command</p> <p>AT^SIPS=&lt;type&gt;, &lt;action&gt;[, &lt;ProfileId&gt;]</p> <p>Response(s)</p> <p>OK</p> <p>ERROR</p> <p>+CME ERROR: &lt;err&gt;</p>
<p>PIN → Last</p> <p>- + -</p>

### Parameter Description

<b>&lt;type&gt;<sup>(str)</sup></b>	
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”.
<b>&lt;action&gt;<sup>(str)</sup></b>	
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.
<b>&lt;ProfileId&gt;<sup>(num)</sup></b>	
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).

**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
tcpMR	o	o	o	
tcpOT	o	o	o	
cmd		m	m	m
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	
clientId				m
keepAlive				o
willFlag				o
lastWillTopic				o
lastWillMessage				o
lastWillQos				o
lastWillRetain				o
cleanSession				o
Topic				Publish: m
Qos				Publish: o
Retain				Publish: o



<srvParmTag>	Socket	FTP	HTTP	MQTT
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><sup>(num)</sup>**  
 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><sup>(u)</sup>**  
 Internet service profile parameter.

srvType	Type of Internet service to be configured with consecutive usage of <a href="#">AT^SISS</a> . For supported values of <srvParmValue> refer to <a href="#">&lt;srvParmValue-srvType&gt;</a> .
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 <a href="#">&lt;srvParmValue-alphabet&gt;</a> .

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
conld	Internet connection profile as defined with AT+CGDCONT. The value is one of the PDP context IDs set with parameter <cid>.
address	String value containing the URL for the specific service:

1. Socket Service URLs:

- TCP Client URL:  
 "socketcp[s]://<host>:<remotePort>[;etx[=<etx-Char>];timer=<value>];bufsize=<value>]]];keepidle=<value>];keepcnt=<value>];keepintvl=<value>]"
- UDP Client URL:  
 "sockudp[s]://<host>:<remotePort>[;etx[=<etx-Char>];timer=<value>];bufsize=<value>]]];port=<localPort>]"
- UDP Endpoint URL:  
 "sockudp://:<localPort>"
- Standard TCP Listener URL:  
 "socketcp://listener:<localPort>[;keepidle=<value>];keepcnt=<value>];keepintvl=<value>]"
- Transparent TCP Listener URL:  
 "socketcp://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<sup>16</sup>-1 for the remote port number.
- <localPort>: 1 ... 2<sup>16</sup>-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 Transparent 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^SISS`, 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

"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...255  
"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 CONNACK 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.

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^SISSW.
  - dir: List the directory on the FTP server and show file size.
  - list: List the directory on the FTP server without showing file size.
  - 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

---

	<ul style="list-style-type: none"><li>- "subscribe": The MQTT client that wants to receive data must subscribe to it by SUBSCRIBE control packet</li><li>- "unsubscribe": The MQTT client that doesn't want to receive subscribed data anymore must unsubscribe specified topic by sending UNSUBSCRIBE control packet</li></ul>
ftpath	Specifies the path of the remote FTP server after login. If no path is set the default path will be used.
files	Name of a 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 <ul style="list-style-type: none"><li>- with "get" or "post" in case of HTTP,</li><li>- with "get", "put" or "del" in case of FTP,</li></ul> In case of FTP and HTTP only a single file can be handled.
hcContent	HTTP "POST": Variable mode. Optional parameter if HTTP "post" is set with <code>&lt;srvParmTag&gt;</code> 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 <code>AT^SISW</code> . Usage example: <code>AT^SISS=x,cmd,"POST"</code>  <code>AT^SISS=x,hcContent,"This text will be sent to the server now ..... response OK"</code> <code>OK</code>  <code>AT^SISS=x,hcContLen,0</code>  <code>AT^SISO=x</code> <code>OK</code>  <code>^SIS: x,0,2200,"Http connect 10.42.228.61:80"</code> <code>^SISW: x,2</code>  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 <code>AT^SISW</code> . 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 <code>AT^SISW</code> .
hcContLen	HTTP "POST": Fixed mode. Mandatory parameter if HTTP "post" is set with <code>&lt;srvParmTag&gt;</code> parameter "cmd". Length: $0 \dots 2^{31} - 1$ 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 <code>AT^SISW</code> 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 <code>^SISW: x, 1</code> , then the <code>AT^SISW</code> 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 "^SISSW: 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^SISSW command.

Length: 0...128

If "hcContLen" = 0 then the data given in the "hcContent" string will be posted.

If "hcContLen" > 0 then the AT^SISSW 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.

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 "0123456789abcdefghijklmnopqrstuvwxyABCDEFGHIJKLMNOPQRSTUVWXYZWXYZ"

---

keepAlive	Define keep alive time interval defined in seconds. range: [0]...65535 seconds
willFlag	Definition of will flag bit. <ul style="list-style-type: none"><li>• 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:</li><li>• 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:</li></ul>
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. <ul style="list-style-type: none"><li>• 0: At most once delivery</li><li>• 1: At least once delivery</li><li>• 2: Exactly once delivery</li></ul> If this parameter is not set, default Qos 0 is used.
lastWillRetain	Definition if last will message is to be retained by server. <ul style="list-style-type: none"><li>• 0: Retained message must not be stored as a retained message on the Server</li><li>• 1: The Server must store the Application Message</li></ul> If this parameter is not set, default Retain 0 is used.
cleanSession	Definition of session type to be initiated with server. <ul style="list-style-type: none"><li>• 0: Server will try to resume current session with client</li><li>• 1: Server will start new clean session</li></ul> If this parameter is not set, default value 1 is used.
Qos	Definition of Qos level of publishing application message. <ul style="list-style-type: none"><li>• 0: At most once delivery</li><li>• 1: At least once delivery</li><li>• 2: Exactly once delivery</li></ul> 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. <ul style="list-style-type: none"><li>• 0: Retained message MUST NOT be stored as a retained message on the Server</li><li>• 1: The Server MUST store the Application Message</li></ul> 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><sup>(str)(+CSCS)</sup>

Parameter value; type and supported content depend on related <srvParmTag>.

<srvParmValue-srvType><sup>(str)</sup>

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 <a href="#">AT^SISO</a> .

<srvParmValue-alphabet><sup>(str)</sup>

Supported string parameter character set selections in <srvParmValue> for <srvParmTag> value "alphabet".

["0"]	Applicable character set is determined by current setting of <a href="#">AT+CSCS</a> .
"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>`<sup>(num)</sup>

Internet service profile identifier as defined by `AT^SISS (<srvProfileId>)`.

0...9

`<srvState>`<sup>(num)</sup>

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>`<sup>(num)</sup>

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>`<sup>(num)</sup>

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>`<sup>(num)</sup>

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>`<sup>(num)</sup>

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 `AT^SICA`. The command may be aborted by any character sent from the TE to the UE during execution.

### Syntax

<p>Test Command</p> <pre>AT^SISO=?</pre> <p>Response(s)</p> <pre>OK</pre>
<p>Read Command</p> <pre>AT^SISO?</pre> <p>Response(s)</p> <p>If response is related to service profile(s) created / opened on this interface:  <code>^SISO: &lt;srvProfileId&gt;, &lt;srvType&gt;, &lt;srvState&gt;, &lt;socketState&gt;, &lt;rxCount&gt;, &lt;txCount&gt;, &lt;locAddr&gt;, &lt;remAddr&gt;[, &lt;rejCounter&gt;]</code>  <code>[^SISO: ...]</code></p> <p>If response is related to service profile(s) created / opened on other interface(s):  <code>^SISO: &lt;srvProfileId&gt;, &lt;srvType&gt;</code>  <code>[^SISO: ...]</code>  <pre>OK</pre> </p>
<p>Write Command</p> <pre>AT^SISO=&lt;srvProfileId&gt;[, &lt;optParam&gt;]</pre> <p>Response(s)</p> <pre>OK ERROR +CME ERROR: &lt;err&gt;</pre>
<p>PIN → Last</p> <pre>- - -</pre>

### Parameter Description

`<srvProfileId>`<sup>(num)</sup>

`<srvProfileId>` 0 ... 9 specified with `AT^SISS`.

`<srvType>`<sup>(str)</sup>

The type of the internet service as specified by the `AT^SISS` parameter `<srvParmValue-srvType>`.

`<srvState>`<sup>(num)</sup>

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	<p>Allocated</p> <p>Service profile resources are allocated, i.e. at least the service type has been set (parameter <code>&lt;srvParmTag&gt;</code>, value "srvType" of <code>AT^SISS</code>). The service is not opened, but ready for configuration.</p>
---	--

- 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>`<sup>(num)</sup>

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>`<sup>(num)</sup>

Number of bytes received via `AT^SISR` or `AT^SIST` since last successful `AT^SISO` write command.

`<txCount>`<sup>(num)</sup>

Number of bytes sent via `AT^SISW` or `AT^SIST` since last successful `AT^SISO` write command.

`<locAddr>`<sup>(str)</sup>

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>`<sup>(str)</sup>

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>`<sup>(num)</sup>

Number of automatically rejected client connect attempts to a Transparent TCP Listener service because the service is already connected with a client.

`<optParam>`<sup>(num)</sup>

[0]	MQTT service: Connect and use static setup defined by <code>AT^SISS</code>
1	Show only parameters of service profile for given <code>&lt;srvProfileId&gt;</code> .
2	MQTT service: Connect and use dynamic setup defined by <code>AT^SISD</code>

## 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>`<sup>(num)</sup>

0...9

`<srvProfileId>` specified with `AT^SISO`.

## 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^SISR` command and the "`^SISR`" 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^SISR` 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>`<sup>(num)</sup>

`<srvProfileId>` 0 ... 9 specified with `AT^SISR`. Transparent TCP Listener services are not supported.

<reqReadLength><sup>(num)</sup>

- 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><sup>(num)</sup>

- 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><sup>(num)</sup>

- 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><sup>(num)</sup>

Optional third parameter of the AT^SISR write command response displayed only if the Socket service uses the UDP protocol.  
 The reception of each datagram must be completed before the next datagram can be received. This may be a problem if the buffer of the host application is limited and not designed to handle the maximum packet size of 1500 bytes. To compensate this, the host is advised to request, via <reqReadLength>, an amount less or equal its maximum buffer capacity and wait for the resulting AT^SISR write command response with parameter <remainUdpPacketLength>. The benefit of this approach is that the host may properly receive all parts of a UDP datagram, as after each received data part the number of remaining bytes is synchronized, until reading the datagram is finished.



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If the currently read datagram is smaller than the number of bytes requested by the host the `<remainUdpPacketLength>` parameter is omitted.

Further write attempts with `AT^SISR` are denied as long as the `<remainUdpPacketLength>` is unequal 0 or is not omitted. In this case the service returns "+CME ERROR: operation of service temporary not allowed".

0	Indicates that all bytes of the current UDP datagram are read.
(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. <code>&lt;remainUdpPacketLength&gt;</code> is unequal 0 until reading all parts of the current datagram is finished.

`<Udp_RemClient>`<sup>(str)</sup>

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")

<code>^SISR: 0,1</code>	Service profile 0 is configured for Socket service and UDP. The URC notifies host that data is available for reading.
<code>at^sizr=0,6</code>	The host requests to read 6 bytes.
<code>^SISR: 0,6,12</code>	The first 6 bytes of datagram A are confirmed and transmitted. Another 12 bytes are still available.
<code>THIS_I</code>	
<code>OK</code>	
<code>at^sizr=0,6</code>	The host requests to read the next part of 6 bytes.
<code>^SISR: 0,6,6</code>	The next 6 bytes of datagram A are confirmed and transmitted. Another 6 bytes are still available.
<code>S_DATA</code>	
<code>OK</code>	
<code>at^sizr=0,6</code>	The host requests to read the next part of 6 bytes.
<code>^SISR: 0,6,0</code>	Last part of datagram A was received, no remainder is left.
<code>GRAM_A</code>	
<code>OK</code>	
<code>at^sizr=0,6</code>	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 <code>&lt;remainUdpPacketLength&gt;</code> .
<code>^SISR: 0,3</code>	3 bytes are confirmed and transmitted. Datagram B was properly received.
<code>NEW</code>	
<code>OK</code>	

## 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)
<b>^SISW</b> : <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><sup>(num)</sup>

<srvProfileId> 0 ... 9 specified with AT^SISS. Transparent TCP Listener services are not supported.

<reqWriteLength><sup>(num)</sup>

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:

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- 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 explicitly 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>`<sup>(num)</sup>

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 <code>&lt;Udp_RemClient&gt;</code> parameter although <code>&lt;eodFlag&gt;</code> is not effective for UDP Endpoint. - <code>&lt;eodFlag&gt;</code> is not intended and not usable for HTTP.  1: End of data is signalled to the Internet Service. Further <code>AT^SISW</code> write commands return an error response. However, reading data may be possible. The <code>&lt;eodFlag&gt;</code> is effective only if the <code>&lt;reqWriteLength&gt;</code> equals <code>&lt;cnfWriteLength&gt;</code> , in particular if the <code>&lt;reqWriteLength&gt;</code> 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>`<sup>(str)</sup>

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><sup>(num)</sup>

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><sup>(num)</sup>

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><sup>(num)</sup>

- 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 intended and not usable for HTTP.

## 11.10 AT^SIST

## 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><sup>(num)</sup>

<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
<i>Publish</i>	
"Cmd"	m
"Qos"	o
"Topic"	m
"Retain"	o
"hcContent"	o
"hcContLen"	o
<i>Subscribe</i>	
"Cmd"	m
"topicFilter"	m
"topicQos"	o
<i>Unsubscribe</i>	
"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>`<sup>(num)</sup>

Internet service profile identifier as defined by AT^SISS `<srvProfileId>`.

0...9

`<dynOption>`<sup>(str)</sup>

Parameter `<dynOption>` define action in dynamic setup of request parameters.

“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.

“none” If `<dynOption>` not be set, get all dynamic parameters of service.

`<dynParamTag>`<sup>(u)</sup>

MQTT service profile parameter.

cmd refer to `<srvParmTag>`.

Qos refer to `<srvParmTag>`.

Topic refer to `<srvParmTag>`.

Retain refer to `<srvParmTag>`.



---

hcContent	refer to <a href="#">&lt;srvParmTag&gt;</a> .
hcContLen	refer to <a href="#">&lt;srvParmTag&gt;</a> .
topicFilter	refer to <a href="#">&lt;srvParmTag&gt;</a> .
topicQos	refer to <a href="#">&lt;srvParmTag&gt;</a> .

[<dynParamValue>](#)<sup>(str)(+CSCS)</sup>

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><sup>(num)</sup>

Internet service profile identifier as defined by AT^SISD <srvProfileId>.

0...9

<dynReqType><sup>(str)</sup>

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><sup>(str)(+CSCS)</sup>

Parameter <dynReqValue> define all request parameters separated by ";" character.

- PUBLISH: Qos;Topic;Retain;hcContent;hcContLen
- SUBSCRIBE: topicFilter;topicQos
- UNSUBSCRIBE: topicFilter

Parameter value and supported content depend on related <dynParamTag>.

## 11.13 AT^SISH Disconnect Remote Client

[AT^SISH](#) is intended 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>](#)<sup>(num)</sup>

0...9

A Transparent TCP Listener service [<srvProfileId>](#) defined with [AT^SISS](#).

[<mode>](#)<sup>(num)</sup>

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>**<sup>(str)</sup>

"Ping"	Ping host.
"HostByName"	Get first address from a host.
"Ntp"	Network time protocol.

**<conProfileId>**<sup>(num)</sup>

Internet connection profile to be used as specified with [AT+CGDCONT](#) parameter **<cid>**.

**<address>**<sup>(str)(+CSCS)</sup>

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 "HostByName" this is the FQDN to be resolved into the IP address.

**<ip-address>**<sup>(str)</sup>

The IP address of the host (i.e. "192.168.1.3").

**<request>**<sup>(num)</sup>

[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>**<sup>(num)</sup>

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>**<sup>(num)</sup>

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 <a href="#">&lt;request&gt;</a> 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 <a href="#">&lt;pingInfoType&gt;</a> =1.
3	one row time statistics calculated from the ping response(s) received for <a href="#">&lt;pingInfoType&gt;</a> =1 (displayed only if at least one Echo response message was received).

**<roundTripTime>**<sup>(num)</sup>

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>**<sup>(num)</sup>

Number of sent packets.

**<received>**<sup>(num)</sup>

Number of received packets.

---

<lost><sup>(num)</sup>

Number of lost packets.

<lostPercent><sup>(num)</sup>

Lost packets in percent.

<minRTT><sup>(num)</sup>

Minimum Round Trip Time in milliseconds.

<maxRTT><sup>(num)</sup>

Maximum Round Trip Time in milliseconds.

<meanRTT><sup>(num)</sup>

Average Round Trip Time in milliseconds.

<ntp><sup>(num)</sup>

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

<code>&lt;srvProfileId&gt;</code> <sup>(num)</sup>	
Internet service profile identifier as defined by <code>AT^SISS &lt;srvProfileId&gt;</code> .	
0...9	
<code>&lt;infoMode&gt;</code> <sup>(num)</sup>	
Information Mode	
0	Return current error status in response parameter <code>&lt;infoID&gt;</code> and <code>&lt;info&gt;</code> .
1	Return oldest unread event in response parameter <code>&lt;infoID&gt;</code> and <code>&lt;info&gt;</code> – used for polling
<code>&lt;infoID&gt;</code> <sup>(num)</sup>	
Reason for Internet service error. This is a subset of the <code>&lt;urcInfoId&gt;</code> s which can be found in Section 11.16, <a href="#">Internet Service URC</a> .	
The value 0 indicates there is no special Internet service error. In this case the application may use <code>AT+CEER</code> to check for general network problems.	
<code>&lt;info&gt;</code> <sup>(str)</sup>	
Information text related to <code>&lt;infoID&gt;</code> . This is a subset of the <code>&lt;urcInfoText&gt;</code> s which can be found in Section 11.16, <a href="#">Internet Service URC</a> .	

**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> <sup>(num)</sup>	
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

## 11.16 Internet Service URC

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>`<sup>(num)</sup>

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>`<sup>(str)</sup>

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 information elements which may be returned by all supported services within the "`^SIS`" URC and the command response of `AT^SISE`. It should be noted that TCP/IP socket problems may occur in all Internet service connections (Socket, Transparent TCP or Transparent UDP, FTP,HTTP).

<code>&lt;urcInfoId&gt;</code>	<code>&lt;urcInfoText&gt;</code>	Description
<i>Information Elements Returned by the TCP/IP socket</i>		
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
<i>General Information Elements</i>		
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	Internal 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 controlling task	
90	PDP: internal error 1	
91	PDP: internal error 2	
92	PDP: no authentication req	
93	PDP: internal error 3	
94	PDP: connection 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	
<i>General Information Elements</i>		

<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
<i>Error URCs</i>		
100	FTP-ERR: <FTP Response Str>	<FTP Response Str> text depends on FTP server implementation
<i>Info URCs</i>		
2100	<info>	<info> text depends on FTP server implementation

### 11.16.3 Information Elements Related to HTTP Service

<urcInfoId>	<urcInfoText>	Description
<i>Error URCs</i>		
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	
<i>Info URCs</i>		
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
<i>Error URCs</i>		
140	MQTT: publish received cannot be processed	Received publish packet payload over 4k
<i>Info URCs</i>		
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>`.

<code>at^scfg=tcp/withurcs</code>	Query the current setting.
<code>^SCFG: "Tcp/WithURCs", "on"</code>	URC mode is enabled (delivery default).
OK	
<code>at^scfg=tcp/withurcs,off</code>	Select polling mode (by switching off URC mode).
<code>^SCFG: "Tcp/WithURCs", "off"</code>	Polling mode is accepted.
OK	

### 11.17.2 Configuring an Internet Connection Profile

<code>AT+COPS?</code>	Checking network registration.
<code>+COPS: 0,0,"E-Plus",0</code>	ME is registered to German provider E-Plus.
OK	
<code>AT+CGATT=1</code>	Attaching to GPRS network (optional).
OK	
<code>AT+CGDCONT=1,"IP","internet.eplus.de"</code>	Specifying PDP context 1 with APN for E-Plus.
OK	
<code>AT^SICS=1,"dns1","198.023.097.002"</code>	Specifying primary DNS address (optional).
OK	
<code>AT^SICS=1,"dns2","212.023.097.003"</code>	Specifying secondary DNS address (optional).
OK	
<code>AT^SICA=1,1</code>	Activating PDP context 1.
OK	
<code>AT+CGPADDR=1</code>	Requesting dynamic IP address assigned to local client for context 1.
<code>+CGPADDR: 1,"10.129.137.217"</code>	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:

<code>AT^SISS=4, srvType, "Socket"</code>	Select service type Socket.
OK	
<code>AT^SISS=4, conId, "1"</code>	Select connection profile.
OK	

## 11.17 Examples of how to Configure and Use Internet Service Profiles

```
AT^SISS=4,address,"socktcp://lis-
tener:65534"
```

The host specifies its local port 65534 to be used for the Socket listener service. The local IP address will be dynamically assigned when the service is opened with [AT^SISO](#).

```
OK
```

Open the Listener service and query the IP address dynamically assigned to the Listener:

```
AT^SISO=4
```

Open the Listener service.

```
OK
```

```
AT^SISO?
```

Query the current status of services. All service profiles are unused, except for service profile 4 which is running in listener mode, where `<srvState>=3` (listening) and `<socketState>=3` (LISTENER). The response also indicates the IP address dynamically assigned to the listener.

```
^SISO: 0,""
```

```
^SISO: 1,""
```

```
^SISO: 2,""
```

```
^SISO: 3,""
```

```
^SISO: 4,"Socket",3,3,0,0,"10.10.0.187:65534","0.0.0.0"
```

```
^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,svrType,"Socket"
```

Select service type Socket.

```
OK
```

```
AT^SISS=1,conId,"1"
```

Select connection profile.

```
OK
```

```
AT^SISS=1,address,"socktcp://
10.10.0.187:65534"
```

Add the IP address and the TCP port of the remote host (from example in Section [11.17.3, Configuring Non-Transparent Listener](#)).

```
OK
```

### 11.17.5 Transparent TCP Listener: Accepting / Rejecting Incoming Remote Client

Host 1: Configure Transparent TCP Listener with Autoconnect disabled:

```
AT^SISS=1,"svrType","Socket"
```

Select service type Socket.

```
OK
```

```
AT^SISS=1,conId,"1"
```

Select connection profile.

```
OK
```

```
AT^SISS=1,"address","socktcp://lis-
tener:2000;etx=26;autoconnect=0"
```

"etx" configures Transparent mode. Autoconnect disabled.

```
OK
```

```
AT^SISS=1,"tcpMR","3"
```

```
OK
```

```
AT^SISS=1,"tcpOT","5555"
```

```
OK
```

Host 1: Open Transparent TCP Listener and query IP address dynamically assigned to Listener:



## 11.17 Examples of how to Configure and Use Internet Service Profiles

```

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
.0.0:0"          <srvState>=4 (listening) and <socketState>=3
                 (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://
10.10.0.187:65534"          Set Listener's IP address.
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
.0.0:0"          Listener is listening again.
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.
66.90.165:46723",0 Service connected (value 8) and in Server mode /
                 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"           Select service type Socket.
OK
AT^SISS=1,conId,"1"                     Select connection profile.
OK
AT^SISS=1,"address","socktcp://lis-    "etx" configures Transparent mode. Autoconnect
tener:2000;etx=26;autoconnect=1"       enabled.
OK
AT^SISS=1,"tcpMR","3"
OK
AT^SISS=1,"tcpOT","5555"
OK
```

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:                                   Listener ready, listening (value 4). Dynamic IP
1,"Socket",4,3,0,0,"10.10.0.187:2000", address is shown.
"0.0:0"
OK
^SISW: 1,1
```

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.
10.10.0.187:2000"
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
```

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 Transpar-
                                          ent 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
                                          Type +++ to return to AT command mode (+++ not
                                          visible in example).
OK
AT^SISO=1,1                             Query status of profile 1.
```

## 11.17 Examples of how to Configure and Use Internet Service Profiles

```

^SISO:                                Transparent TCP Listener connected to client (value
1, "Socket", 8, 4, 0, 0, "10.10.0.187:2000", "10.6 8) and in Server mode (value 4).
6.90.165:46723", 0
OK

```

### 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                               The host opens service profile 0.
OK                                       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                                The service is still in <srvState> "Connecting".
^SISI: 0,3,0,0,0,0
OK
AT^SISI=0                                The service is now in <srvState> "Up" and is
^SISI: 0,4,0,0,0,0                       ready to accept data.
OK
AT^SISW=0,10                             The host requests to write 10 bytes.
^SISW: 0,10,10                           Response that 10 bytes can be sent and are unac-
                                       knowledged.

0123456789
OK
AT^SISW=0,10,1                             The host requests to write next 10 bytes and enables
^SISW: 0,0,10                             the <eodFlag>.
                                       But the service refuses the request, even the end-of-
                                       data flag remains without effect.

OK
AT^SISW=0,10,1                             Next try (polling).
^SISW: 0,10,20                             Response that the service accepts 10 bytes and this
                                       data and the previously sent data are unacknowl-
                                       edged.

0123456789
OK
AT^SISW=0,0,0                               Polling to request unacknowledged data.
^SISW: 0,0,10                             There are 10 bytes still unacknowledged.
OK
AT^SISI=0                                   Polling for <srvState> change ("Closing" ->
^SISI: 0,5,0,20,10,10                     "Down").
                                       20 bytes are transfered via serial interface, 10 bytes
                                       are acknowledged by remote peer, 10 bytes are on
                                       the way.

OK
AT^SISI=0                                   Polling for <srvState> change ("Closing" ->
^SISI: 0,6,0,20,20,0                     "Down").
                                       The Service is in state "Down" and all data is con-
                                       firmed by the remote peer.

OK
AT^SISC=0                                   Closing the Socket service.
OK

```

### 11.17.8 Socket Client Sends Data via TCP Connection with URCS

The example uses service profile 0 configured for Socket service and TCP.

## 11.17 Examples of how to Configure and Use Internet Service Profiles

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, srvttype, 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, srvttype, 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	

## 11.17 Examples of how to Configure and Use Internet Service Profiles

Part 3 - host 1 opens the service and communicates with host 2:

AT^SISO=0	Open the service.
OK	
^SIS: 0,5	URC indicates that host 1 is waiting (on UDP port 6666).
AT^SISO=0,1	
^SISO:	Request connection status.
0,"Socket",4,3,0,0,"10.10.0.219:6666","0.0.0.0:0"	
OK	
^SISR: 0,1	URC indicates that host 2 has opened the connection to host 1 and has sent some data.
AT^SISR=0,100	Host 1 requests to read 100 bytes.
OK	
^SISR: 0,22,"10.10.0.222:6561"	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.
Hello, I'm the client!	
OK	
AT^SISW=0,25,0,"10.10.0.222:6561"	Host 1 starts sending 25 bytes to host 2.
^SISW: 0,25,0	Host 1 is sending the message "Hi, I'm the UDP endpoint!" (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	URC confirms that host 1 can send data again.
AT^SISC=0	Close the service.
OK	

Part 4 - host 2 opens the service and communicates with host 1:

AT^SISO=1	Open the service.
OK	
^SISW: 1,1	URC indicates that host 2 can send data.
AT^SISO=1,1	
^SISO:	Request connection status.
1,"Socket",4,2,0,0,"10.10.0.222:6561","10.10.0.219:6666"	
OK	
AT^SISW=1,22	Host 2 starts to write 22 bytes.
^SISW: 1,22,0	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	URC confirms that host 2 could send data.
^SISR: 1,1	URC indicates that host 2 has received data from host 1.
AT^SISR=1,100	Host 2 requests to read 100 bytes.
^SISR: 1,25	Response indicates that host 2 has received 25 characters from host 1.
Hi, I'm the UDP endpoint!	
OK	
AT^SISC=1	Close the service.
OK	

## 11.17 Examples of how to Configure and Use Internet Service Profiles

## 11.17.10 Creating Transparent TCP Socket Client

AT^SISS=1, srvType, "Socket "	Select service type "Socket".
OK	
AT^SISS=1, conId, 1	Select connection profile 1.
OK	
AT^SISS=1, address, "socktcp:// 10.10.0.110:9996;etx;timer=200"	Specify server address. Add "etx" parameter to set Transparent mode.
OK	

## 11.17.11 Opening and Closing Transparent TCP Service

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. 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:	Service is in state "Up" (4). Socket is assigned. 0 bytes received, 16 bytes sent. Local and remote IP address are assigned.
1, "Socket", 4, 2, 0, 16, "10.10.0.200:1024", "10. 10.0.108:65532"	
^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:	Service is in state "Allocated" (2). Socket not assigned.
1, "Socket", 2, 1, 0, 0, "0.0.0.0:0", "0.0.0.0:0"	
^SISO: 2, ""	
^SISO: 3, ""	
^SISO: 4, ""	
^SISO: 5, ""	
^SISO: 6, ""	

## 11.17 Examples of how to Configure and Use Internet Service Profiles

```

^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:	Service is in state "Up" (4). Socket is assigned. 12 bytes received, 6 bytes sent. Local and remote IP address are assigned.
1, "Socket", 4, 2, 12, 6, "10.10.0.200:1025", "10.10.0.108:65532"	
^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:	Service is in state "Allocated" (2). Socket not assigned.
1, "Socket", 2, 1, 0, 0, "0.0.0.0:0", "0.0.0.0:0"	
^SISO: 2, ""	
^SISO: 3, ""	

## 11.17 Examples of how to Configure and Use Internet Service Profiles

```

^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:	Service is in state "Down" (6). Socket is assigned. 6 bytes received. 12 bytes sent. Local and remote IP address are assigned.
1, "Socket", 6, 2, 12, 0, "10.10.0.200:1026", "10.10.0.108:65532"	
^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.



## 11.17 Examples of how to Configure and Use Internet Service Profiles

<pre> OK ^SISR: 1,1  at^sisi=1 OK ^SISI: 1,4,12,3,3,0  OK AT^SISO? ^SISO: 0,"" ^SISO: 1,"Socket",4,2,12,3,"10.10.0.200:1027","10. 10.0.108:65532" ^SISO: 2,"" ^SISO: 3,"" ^SISO: 4,"" ^SISO: 5,"" ^SISO: 6,"" ^SISO: 7,"" ^SISO: 8,"" ^SISO: 9,"" OK at^sist=1 CONNECT Good bye NO CARRIER at^sisi? ^SISI: 1,6,20,3,3,0  OK AT^SISO? ^SISO: 0,"" ^SISO: 1,"Socket",20,3,"10.10.0.200:1027","10.10.0. 108:65532" ^SISO: 2,"" ^SISO: 3,"" ^SISO: 4,"" ^SISO: 5,"" ^SISO: 6,"" ^SISO: 7,"" ^SISO: 8,"" ^SISO: 9,"" OK AT^SISC=1 OK at^sisi=1 ^SISI: 1,2,0,0,0,0 OK AT^SISO? ^SISO: 0,"" ^SISO: 1,"Socket",2,1,0,0,"0.0.0.0:0","0.0.0.0:0" ^SISO: 2,"" </pre>	<p>Client types +++ to return to AT command mode (not visible in example).</p> <p>Remote server has sent data and closed the connection (not visualized in this example). URC indicates that remaining data is available for reading. Check service state of service profile 1.</p> <p>Service profile 1 is in state "Up" (4). 12 bytes received. 3 bytes sent and acknowledged.</p> <p>Check the service state of service profile 1.</p> <p>Service is in state "Up" (4). Socket is assigned. 12 bytes received. 3 bytes sent. Local and remote IP address are assigned.</p> <p>Return to transparent access mode. Service is ready to send or receive data. Client reads remaining data. Then client gets NO CARRIER in AT command mode. Check service state of service profile 1. Service is in service "Down" state (6). 20 bytes received. 3 bytes sent and acknowledged.</p> <p>Check the service state of service profile 1.</p> <p>Service is in state "Down" (6). Socket is assigned. 20 bytes received. 3 bytes sent. Local and remote IP address are assigned.</p> <p>Close the service.</p> <p>Check service state of service profile 1. Service profile 1 is in state "Allocated" (2).</p> <p>Check the service state of service profile 1.</p> <p>Service is in state "Allocated" (2). Socket is not assigned. Local and remote IP address not assigned.</p>
---	--

## 11.17 Examples of how to Configure and Use Internet Service Profiles

```

^SISO: 3, ""
^SISO: 4, ""
^SISO: 5, ""
^SISO: 6, ""
^SISO: 7, ""
^SISO: 8, ""
^SISO: 9, ""
OK

```

## 11.17.15 FTP Upload Single File (URC Mode)

Configure the service profile 2 for FTP:

AT^SISS=2, "srvType", "Ftp"	Select service type FTP.
OK	
AT^SISS=2, conId, "1"	Select connection profile 1.
OK	
AT^SISS=2, "address", "ftp:// myname:mypasswd@testnetwork/upload"	Specify FTP address with individual user name and password.
OK	
AT^SISS=2, "cmd", "put"	Select command type upload for single file.
OK	
AT^SISS=2, "files", "newdata.txt"	File "newdata.txt" shall be put on FFTP server.
OK	

Make an FTP connection:

AT^SISO=2	Open the service.
OK	Bearer is established, service is getting started.
^SIS: 2,0,2100,"Ftp open(testnetwork:21)"	"^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	User data is transferred.
OK	
^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	User data is transferred.
OK	
^SISW: 2,1	URC indicates that the FTP service is ready to transfer more data.
AT^SISW=2,0,1	No more data available. <eodFlag> set. File "newdata.txt" shall be closed on FTP server.
^SISW: 2,0,0	
OK	
^SIS: 2,0,2100,"226 Transfer complete."	
^SISW: 2,2	URC indicates that data transfer finished successfully. Connection to the FTP server closes.

## 11.17 Examples of how to Configure and Use Internet Service Profiles

AT^SISC=2	Close the FTP service.
OK	

### 11.17.16 HTTP Download Using TLS

Configure the service profile 4 for HTTPS:

AT^SISS=4, srvType, "Http"	Select service type HTTP.
OK	
AT^SISS=4, conId, "1"	Select connection profile 1.
OK	
AT^SISS=4, address, "https://www.facebook.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 successfully. Connection to the HTTP server closes.
AT^SISC=4	Close the HTTP service.
OK	

### 11.17.17 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/cgi/first.pl"	Specify URL.
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.

## 11.17 Examples of how to Configure and Use Internet Service Profiles

```

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

```

## 11.17.18 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

```

## 11.17.19 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

```

## 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><sup>(num)(NV)</sup>

Indicates the mode of operation.

0	PS mode 2 of operation
2 <sup>(D)</sup>	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..

### 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)

+CGDCONT: (range of supported **<cid>**s), "IPV6", , , (list of supported **<d\_comp>**s), (list of supported **<h\_comp>**s)

+CGDCONT: (range of supported **<cid>**s), "IPV4V6", , , (list of supported **<d\_comp>**s), (list of supported **<h\_comp>**s)

OK

ERROR

+CME ERROR: **<err>**

#### Read Command

AT+CGDCONT?

Response(s)

[+CGDCONT: **<cid>**, **<PDP\_type>**, **<APN>**, **<PDP\_addr>**, **<d\_comp>**, **<h\_comp>**]

[+CGDCONT: **<cid>**, **<PDP\_type>**, **<APN>**, **<PDP\_addr>**, **<d\_comp>**, **<h\_comp>**]

[+CGDCONT: ...]

OK

ERROR

+CME ERROR: **<err>**

#### Write Command

AT+CGDCONT=**<cid>**[, **<PDP\_type>**[, **<APN>**[, **<PDP\_addr>**[, **<d\_comp>**[, **<h\_comp>**]]]]]

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><sup>(num)(NV)</sup>

#### PDP Context Identifier

Parameter specifies a particular PDP context definition. This parameter is used in other PDP context-related commands.

1...16

<PDP\_type><sup>(str)(NV)</sup>

#### 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).

<APN><sup>(str)(NV)</sup>

#### 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><sup>(str)(NV)</sup>

#### 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><sup>(num)(NV)</sup>

#### 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><sup>(num)(NV)</sup>

#### 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



### Note

- EXS82-W doesn't support to define same APN and same IP type on different PDP context.

## 12.2.1 Attaching to LTE Networks

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..

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> <sup>(num)</sup>	
Indicates the state of PS attachment.	
0 <sup>(P)</sup>	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

<p>Test Command</p> <pre>AT+CGACT=?</pre> <p>Response(s)</p> <pre>+CGACT: (list of supported &lt;state&gt;s) OK ERROR +CME ERROR: &lt;err&gt;</pre>	
<p>Read Command</p> <pre>AT+CGACT?</pre> <p>Response(s)</p> <pre>+CGACT: [&lt;cid&gt;, &lt;state&gt;] [+CGACT: &lt;cid&gt;, &lt;state&gt;] ... OK ERROR +CME ERROR: &lt;err&gt;</pre>	
<p>Write Command</p> <pre>AT+CGACT=&lt;state&gt;[,&lt;cid&gt;[,&lt;cid&gt;[ ...]]]</pre> <p>Response(s)</p> <pre>OK ERROR +CME ERROR: &lt;err&gt;</pre>	
<p>PIN → Last</p> <pre>+ - -</pre>	<p>Reference(s)</p> <p>3GPP TS 27.007 [49]</p>

### Parameter Description

<p><b>&lt;state&gt;</b><sup>(num)</sup></p> <p>Indicates the state of PDP context activation.</p> <table> <tr> <td>0</td> <td>Deactivated</td> </tr> <tr> <td>1</td> <td>Activated</td> </tr> </table>	0	Deactivated	1	Activated
0	Deactivated			
1	Activated			
<p><b>&lt;cid&gt;</b><sup>(num)</sup></p> <p>Parameter specifies a particular PDP context definition (see <b>AT+CGDCONT</b> parameter <b>&lt;cid&gt;</b>).</p>				

---

### 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.
- 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

<p>Test Command</p> <pre>AT+CGPADDR=?</pre> <p>Response(s)</p> <pre>[+CGPADDR: (list of defined &lt;cid&gt;s)] OK</pre>	
<p>Exec Command</p> <pre>AT+CGPADDR</pre> <p>Response(s)</p> <pre>[+CGPADDR: &lt;cid&gt;[, &lt;PDP_address_1&gt;[, &lt;PDP_address_2&gt;]]] [+CGPADDR: ...] OK ERROR +CME ERROR: &lt;err&gt;</pre>	
<p>Write Command</p> <pre>AT+CGPADDR=[&lt;cid&gt;[,&lt;cid&gt;[, ...]]]</pre> <p>Response(s)</p> <pre>[+CGPADDR: &lt;cid&gt;[, &lt;PDP_address_1&gt;[, &lt;PDP_address_2&gt;]]] [+CGPADDR: ...] OK ERROR +CME ERROR: &lt;err&gt;</pre>	
<p>PIN → Last</p> <pre>+ + -</pre>	<p>Reference(s)</p> <p>3GPP 27.007</p>

### Parameter Description

`<cid>`<sup>(num)</sup>

Parameter specifies a particular PDP context definition (see [AT+CGDCONT](#) parameter `<cid>`).

`<PDP_address_1>`<sup>(str)</sup>

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><sup>(str)</sup>

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 `<czeros>` 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

<p>Test Command</p> <pre>AT+CGPIAF=?</pre> <p>Response(s)</p> <pre>+CGPIAF: (list of supported &lt;format&gt;s), (list of supported &lt;subnet&gt;s), (list of supported &lt;lzeros&gt;s), (list of supported &lt;czeros&gt;s) OK</pre>	
<p>Read Command</p> <pre>AT+CGPIAF?</pre> <p>Response(s)</p> <pre>+CGPIAF: &lt;format&gt;, &lt;subnet&gt;, &lt;lzeros&gt;, &lt;czeros&gt; OK</pre>	
<p>Write Command</p> <pre>AT+CGPIAF=[&lt;format&gt;[, &lt;subnet&gt;[, &lt;lzeros&gt;[, &lt;czeros&gt;]]]]</pre> <p>Response(s)</p> <pre>OK ERROR +CME ERROR: &lt;err&gt;</pre>	
<p>PIN → Last</p> <pre>+ + -</pre>	<p>Reference(s)</p> <pre>3GPP 27.007</pre>

### Parameter Description

<p><code>&lt;format&gt;</code><sup>(num)</sup></p> <p>A numeric parameter which decides the IPv6 address format. Relevant for all AT command parameters that can hold an IPv6 address.</p> <p>0(&amp;F)(P)</p>	<p>Use IPv4-like dot-notation. IP address, and subnetwork mask if applicable, are dot-separated, e.g. "32.1.13.184.0.0.205.48.0.0.0.0.0.0.0.0.255.255.255.255.255.255.240.0.0.0.0.0.0" 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.</p>
--	---

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><sup>(num)</sup>

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><sup>(num)</sup>

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><sup>(num)</sup>

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>`<sup>(num)</sup>

0 <sup>(P)</sup>	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>`<sup>(num)</sup>

0	MT buffer of unsolicited result codes defined within this command is cleared when <code>&lt;mode&gt;</code> 1 or 2 is entered
1	MT buffer of unsolicited result codes defined within this command is flushed to the TE when <code>&lt;mode&gt;</code> 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>][, , , [, [<ActiveTime>], [<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

<p>Test Command</p> <p>AT+CGREG=?</p> <p>Response(s)</p> <p>+CGREG: (list of supported &lt;n&gt;s)</p> <p>OK</p>	
<p>Read Command</p> <p>AT+CGREG?</p> <p>Response(s)</p> <p>+CGREG: &lt;n&gt;, &lt;stat&gt;[, [&lt;lac&gt;], [&lt;ci&gt;], [&lt;Act&gt;][, , , [, [&lt;ActiveTime&gt;], [&lt;PeriodicRAU&gt;], [&lt;GPRSREADYTime&gt;]]]]</p> <p>OK</p>	
<p>Write Command</p> <p>AT+CGREG=&lt;n&gt;</p> <p>Response(s)</p> <p>OK</p> <p>ERROR</p> <p>+CME ERROR: &lt;err&gt;</p>	
<p>PIN → Last</p> <p>+ + -</p>	<p>Reference(s)</p> <p>3GPP 27.007</p>

### 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.

URC 3

+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><sup>(num)</sup>

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><sup>(num)</sup>

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><sup>(str)</sup>

Two byte location area code in hexadecimal format.

<ci><sup>(str)</sup>

Cell ID in hexadecimal format:  
- 16 bit for 2G

<AcT><sup>(num)</sup>

Radio access technology	
0	GSM
3	GSM w/EGPRS
7	E-UTRAN
9	E-UTRAN Cat.NB1

<ActiveTime><sup>(str)</sup>

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><sup>(str)</sup>

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><sup>(str)</sup>

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>], [<ActT>]]" 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>], [<ActT>][, [, [, [<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

<p>Test Command</p> <p>AT+CEREG=?</p> <p>Response(s)</p> <p>+CEREG: (list of supported &lt;n&gt;s)</p> <p>OK</p>	
<p>Read Command</p> <p>AT+CEREG?</p> <p>Response(s)</p> <p>+CEREG: &lt;n&gt;, &lt;stat&gt;[, [&lt;tac&gt;], [&lt;ci&gt;], [&lt;ActT&gt;][, [, [, [&lt;ActiveTime&gt;], [&lt;PeriodicTAU&gt;]]]]</p> <p>OK</p>	
<p>Exec Command</p> <p>AT+CEREG</p> <p>Response(s)</p> <p>OK</p>	
<p>Write Command</p> <p>AT+CEREG=&lt;n&gt;</p> <p>Response(s)</p> <p>OK</p> <p>ERROR</p> <p>+CME ERROR: &lt;err&gt;</p>	
<p>PIN → Last</p> <p>+ + -</p>	<p>Reference(s)</p> <p>3GPP TS 27.007 [49]</p>

### Unsolicited Result Codes

#### URC 1

+CEREG: <stat>

Indicates a change in the UE's EPS network registration status.

#### URC 2

+CEREG: <stat>[, [<tac>], [<ci>], [<ActT>]]

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> <sup>(num)</sup>	
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>], [<PeriodicTAU>]]]"

<stat> <sup>(num)</sup>	
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><sup>(str)</sup>  
Two byte tracking area code in hexadecimal format (e.g. "00C3" equals 195 in decimal)

<ci><sup>(str)</sup>  
Four byte LTE cell ID in hexadecimal format.

<AcT> <sup>(num)</sup>	
Radio access technology	
0	GSM (not applicable)
3	GSM w/EGPRS (not applicable)
7	E-UTRAN
9	E-UTRAN Cat.NB1

<ActiveTime><sup>(str)</sup>  
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><sup>(str)</sup>

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

<p>Test Command</p> <pre>AT+CGCONTRDP=?</pre> <p>Response(s)</p> <pre>+CGCONTRDP: (list of supported &lt;cid&gt;s) associated with active contexts OK</pre>	
<p>Exec Command</p> <pre>AT+CGCONTRDP</pre> <p>Response(s)</p> <pre>+CGCONTRDP: &lt;cid&gt;, &lt;Bearer_ID&gt;, &lt;APN&gt;[, &lt;LocalAddr and SubNetMask&gt;[, &lt;GwAddr&gt;[, &lt;DNS_prim_addr&gt;[, &lt;DNS_sec_addr&gt;[, &lt;P_CSCF_prim_addr&gt;[, &lt;P_CSCF_sec_addr&gt;]]]]]] +CGCONTRDP: &lt;cid&gt;, &lt;Bearer_ID&gt;, &lt;APN&gt;[, &lt;LocalAddr and SubNetMask&gt;[, &lt;GwAddr&gt;[, &lt;DNS_prim_addr&gt;[, &lt;DNS_sec_addr&gt;[, &lt;P_CSCF_prim_addr&gt;[, &lt;P_CSCF_sec_addr&gt;]]]]]] [+CGCONTRDP: ...] OK ERROR +CME ERROR: &lt;err&gt;</pre>	
<p>Write Command</p> <pre>AT+CGCONTRDP=&lt;cid&gt;</pre> <p>Response(s)</p> <pre>+CGCONTRDP: &lt;cid&gt;, &lt;Bearer_ID&gt;, &lt;APN&gt;[, &lt;LocalAddr and SubNetMask&gt;[, &lt;GwAddr&gt;[, &lt;DNS_prim_addr&gt;[, &lt;DNS_sec_addr&gt;[, &lt;P_CSCF_prim_addr&gt;[, &lt;P_CSCF_sec_addr&gt;]]]]]] OK ERROR +CME ERROR: &lt;err&gt;</pre>	
<p>PIN → Last</p> <pre>+ - -</pre>	<p>Reference(s)</p> <p>3GPP TS 27.007 [49]</p>

### Parameter Description

<p><code>&lt;cid&gt;</code><sup>(num)</sup></p> <p>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 <a href="#">AT+CGDCONT</a>.</p>
<p><code>&lt;Bearer_ID&gt;</code><sup>(num)</sup></p> <p>Identifies the bearer, EPS Bearer in EPS and NSAPI.</p>
<p><code>&lt;APN&gt;</code><sup>(str)</sup></p> <p>Access Point Name</p> <p>Logical name used to select the GGSN or the external packet data network.</p>

<LocalAddr and SubNetMask><sup>(str)</sup>

Shows the IP address and subnet mask of the UE in the format specified by [AT+CGPIAF](#).

<GwAddr><sup>(str)</sup>

Shows the Gateway Address of the UE in the format specified by [AT+CGPIAF](#).

<DNS\_prim\_addr><sup>(str)</sup>

Shows the IP address of the primary DNS server.  
The settings of [AT+CGPIAF](#) influences the format of this parameter.

<DNS\_sec\_addr><sup>(str)</sup>

Shows the IP address of the secondary DNS server.  
The settings of [AT+CGPIAF](#) influences the format of this parameter.

<P\_CSCF\_prim\_addr><sup>(str)</sup>

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><sup>(str)</sup>

Shows the IP address of the secondary P-CSCF server.  
The settings of [AT+CGPIAF](#) influences the format of this parameter.

## 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> <sup>(num)&amp;(V)(NV)</sup>	
A numeric parameter which indicates the service or service preference to be used.	
1 <sup>(D)</sup>	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	
+CME ERROR: <err>	
PIN → Last	Reference(s)
+ - +	3GPP TS 27.007 [49]

### Parameter Description

<called\_address><sup>(str)</sup>

This parameter is not supported by EXS82-W.

<L2P><sup>(str)</sup>

Layer 2 protocol to be used between the TE and MT.

["PPP"]	layer 2 protocol PPP
"1"	layer 2 protocol PPP

<cid><sup>(num)</sup>

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.

### Note

- The UE will not enter the SUSPEND mode if PPP session is established on given serial interface.
- The UE will not enter the SUSPEND mode 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.

## 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><sup>(num)(NV)</sup>

Parameter specifies a particular PDP context definition (see [AT+CGDCONT](#) parameter <cid>).

<auth\_type><sup>(num)(NV)</sup>

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><sup>(str)(NV)</sup>

Parameter specifies the password used for authentication. It is required for the authentication types PAP and CHAP.

Maximum length: 127 characters.

`<user>`<sup>(str)(NV)</sup>

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+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

<p>Test Command</p> <pre>AT+CSODCP=?</pre> <p>Response(s)</p> <pre>+CSODCP: (range of supported &lt;cid&gt;s), (maximum number of bytes of the &lt;cpdata_length&gt;), (list of supported &lt;RAI&gt;s), (list of supported &lt;type_of_user_data&gt;s) OK</pre>	
<p>Write Command</p> <pre>AT+CSODCP=&lt;cid&gt;, &lt;cpdata_length&gt;, &lt;cpdata&gt;[, &lt;RAI&gt;[, &lt;type_of_user_data&gt;]]</pre> <p>Response(s)</p> <pre>OK ERROR +CME ERROR: &lt;err&gt;</pre>	
<p>PIN → Last</p> <p>+ - -</p>	<p>Reference(s)</p> <p>3GPP TS 27.007 [49]</p>

### Parameter Description

**<cid><sup>(num)</sup>**

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><sup>(num)</sup>**

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><sup>(str)</sup>**

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><sup>(num)</sup>**

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><sup>(num)</sup>

Indicates whether the user data that is transmitted is regular or exceptional.

0	Regular data
1	Exception data



## 13. USIM related Commands

## 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".

### 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

<code>&lt;command&gt;</code> <sup>(num)</sup>	
USIM command number.	
176	READ BINARY

---

178	READ RECORD
192	GET RESPONSE
214	UPDATE BINARY
220	UPDATE RECORD
242	STATUS

<fileID><sup>(num)</sup>

Identifier for an elementary data file on USIM, if used by <command>.

<P1><sup>(num)</sup>

Parameter to be passed on by the EXS82-W to the USIM.

0...255

<P2><sup>(num)</sup>

Parameter to be passed on by the EXS82-W to the USIM.

0...255

<P3><sup>(num)</sup>

Parameter to be passed on by the EXS82-W to the USIM.

0...255

<data><sup>(str)</sup>

Information which shall be written to the USIM (hexadecimal character format).

<sw1><sup>(num)</sup>

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><sup>(num)</sup>

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><sup>(str)</sup>

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>`<sup>(num)</sup>

Number of characters in `<command>` or `<response>` string.

`<command>`<sup>(str)</sup>

Command passed on by the EXS82-W to the USIM.  
Parameter length: maximum 260 Bytes.

`<response>`<sup>(str)</sup>

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"  
+CSIM: 4,"9F19"
```

SELECT DF-Telecom.  
Command successful. Indicates that x19 bytes response data are available and can be requested by using GET RESPONSE.

```
OK  
AT+CSIM=14,"A0A40000026F3A"  
+CSIM: 4,"9F0F"
```

SELECT EF-ADN (Abbreviated dialing numbers).  
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<sub>ICCID</sub>; 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><sup>(text)</sup>

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

<p>Test Command</p> <p>AT^SCKS=?</p> <p>Response(s)</p> <p>^SCKS: (list of supported &lt;mode&gt;s)</p> <p>OK</p>
<p>Read Command</p> <p>AT^SCKS?</p> <p>Response(s)</p> <p>^SCKS: &lt;mode&gt;, &lt;SimStatus&gt;</p> <p>OK</p> <p>ERROR</p> <p>+CME ERROR: &lt;err&gt;</p>
<p>Write Command</p> <p>AT^SCKS=&lt;mode&gt;</p> <p>Response(s)</p> <p>OK</p> <p>ERROR</p> <p>+CME ERROR: &lt;err&gt;</p>
<p>PIN → Last</p> <p>- + -</p>

### Unsolicited Result Code

^SCKS: <SimStatus>

If the USIM connection status has changed an unsolicited result code (URC) is issued.

### Parameter Description

<mode> <sup>(num)(&amp;V)(&amp;W)</sup>	
0(&F)	Disable URC " <b>^SCKS</b> ".
1	Enable URC " <b>^SCKS</b> ".
<SimStatus> <sup>(num)(&amp;V)</sup>	
0	USIM is not inserted.
1	USIM inserted.
2	Possible reasons: <ul style="list-style-type: none"> <li>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 "<b>AT+CFUN= n,1</b>".</li> </ul>

- 
- 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><sup>(num)(&V)(&W)</sup>

URC presentation mode

0(&F)

Disable "`^SSIM READY`" URC.

1

Enable "`^SSIM READY`" URC.



## 14. GNSS Commands

EXS82-W integrates a GNSS engine (Global Navigation Satellite System) which supports GPS (Global Positioning System) 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` subcommands "Nmea/GPS", "Nmea/Glonass", "Nmea/Galileo" and "Nmea/Beidou" can be used to enable or disable 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 territory. 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 downloaded 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.

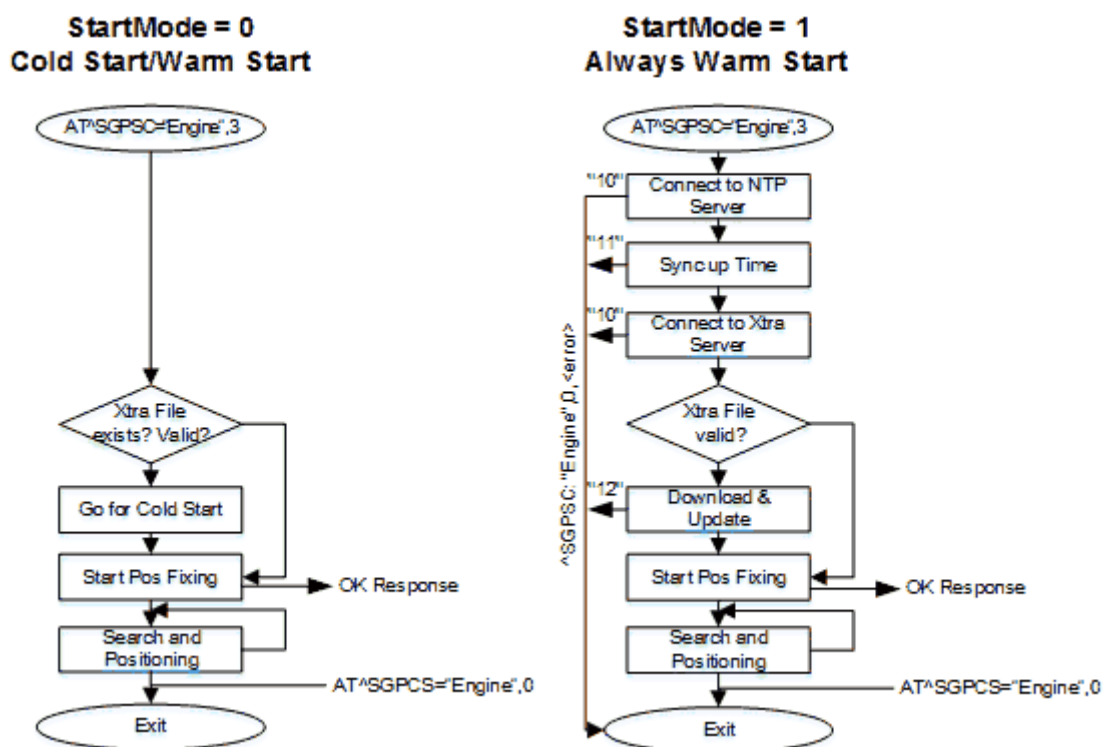


Figure 14.1: Work Flows of GNSS Engine

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>`.

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><sup>(str)</sup>

Parameter of the AT^SGPSC "Engine" write command. Switches the GNSS engine on or off.

- "0"<sup>(P)</sup> GNSS engine off.
- "3" Start GNSS engine according to "Engine/StartMode" settings.

<EngineState><sup>(str)</sup>

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><sup>(num)</sup>

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><sup>(num)(NV)</sup>

Parameter of the AT^SGPSC "Engine/StartMode" write command. Configures the start mode of the GNSS Engine.

The setting takes effect after restart.

- 0<sup>(D)</sup> 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><sup>(str)(NV)</sup>

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"<sup>(D)</sup> 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><sup>(str)(NV)</sup>

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"<sup>(D)</sup> 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><sup>(str)(NV)</sup>

Parameter of the AT^SGPSC "Nmea/GPS" subcommand.

"off" Disables the output of GPS sentence GPGSV.  
"on"<sup>(D)</sup> Enables the output of GPS sentence GPGSV.

<GlonassVal><sup>(str)</sup>

Parameter of the AT^SGPSC "Nmea/Glonass" subcommand.

"off" Disables the output of GLONASS sentence GLGSV.  
"on"<sup>(D)</sup> Enables the output of GLONASS sentence GLGSV.

<GalileoVal><sup>(str)(NV)</sup>

Parameter of the AT^SGPSC "Nmea/Galileo" subcommand.

"off" Disables the output of GALILEO sentence GAGSV.  
"on"<sup>(D)</sup> Enables the output of GALILEO sentence GAGSV.

<BeidouVal><sup>(str)(NV)</sup>

Parameter of the AT^SGPSC "Nmea/Beidou" subcommand.

"off" Disables the output of BEIDOU sentence BDGSV.  
"on"<sup>(D)</sup> Enables the output of BEIDOU sentence BDGSV.

<OutVal><sup>(str)(NV)</sup>

Parameter of the AT^SGPSC "Nmea/Output" subcommand. Configures the output of NMEA sentences (see Section 14.1, GNSS NMEA Sentences).

"off"<sup>(D)</sup> 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><sup>(str)</sup>

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"<sup>(P)</sup> Disable URC.  
"on" Enable URC.



<PsmVal><sup>(str)(NV)</sup>

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" <sup>(D)</sup>	Off.
"1"	On.

<Major NmeaVersion><sup>(str)(NV)</sup>

Parameter of the [AT^SGPSC](#) "Nmea/Version" subcommand. Shows the major version number of the NMEA protocol.

<Minor NmeaVersion><sup>(str)(NV)</sup>

Parameter of the [AT^SGPSC](#) "Nmea/Version" subcommand. Shows the minor version number of the NMEA protocol.

<UrcType><sup>(num)</sup>

1	URC type "Position fix notification". This URC type is enabled by setting the <a href="#">AT^SGPSC</a> "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><sup>(num)</sup>

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 data.
^SGPSC: "Engine/StartMode","1"	
OK	
AT+CFUN=1,1	Restart UE
OK	
^SYSSTART	
AT^SGPSC="Engine",3	Start GNSS Engine, assist data will be downloaded automatically.
^SGPSC: "Engine","3"	
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

## 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><sup>(str)(NV)</sup>

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 saving 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><sup>(num)</sup>

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

<p>Test Command</p> <p>AT^SCTM=?</p> <p>Response(s)</p> <p>^SCTM: (list of supported &lt;UrcMode&gt;s)[, (range of &lt;temp&gt;in Celsius)]</p> <p>OK</p>
<p>Read Command</p> <p>AT^SCTM?</p> <p>Response(s)</p> <p>^SCTM: &lt;UrcMode&gt;, &lt;UrcCause&gt;[, &lt;temp&gt;]</p> <p>OK</p> <p>ERROR</p> <p>+CME ERROR: &lt;err&gt;</p>
<p>Write Command</p> <p>AT^SCTM=&lt;UrcMode&gt;[, &lt;tempCtrl&gt;]</p> <p>Response(s)</p> <p>OK</p> <p>ERROR</p> <p>+CME ERROR: &lt;err&gt;</p>
<p>PIN → Last</p> <p>- + -</p>

### 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><sup>(num)</sup>

URC presentation mode. Setting will not be stored during power-down, i.e. after next restart default setting will be restored.

- 0(&F)(P) Disable URC presentation (except for <UrcCause> equal to -2 or +2).
- 1 Enable URC presentation.

#### <UrcCause><sup>(num)</sup>

- 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><sup>(num)</sup>

- 0(P) Suppress output of <temp> in read command.
- 1 Output <temp> in test and read command.

#### <temp><sup>(num)</sup>

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> <sup>(num)(&amp;V)(&amp;W)</sup>	
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 01.003".

### 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>[, <value>]]]]]]]]]]

## Parameter Description

**<ch><sup>(num)</sup>**

ADC channel

0 First ADC channel (ADC1\_IN)

**<op><sup>(num)</sup>**

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><sup>(num)</sup>**

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 minimum 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><sup>(num)</sup>**

Measurement value

Measurement value in mV

**<count><sup>(num)</sup>**

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 channel. Samples are taken every 5s. Every 5s the URC " <a href="#">^SRADC</a> " appears to report the measured voltages. The second parameter represents the number of measured samples, in this case only one.
^SRADC: 0,1,76	
^SRADC: 0,1,78	
^SRADC: 0,1,76	
^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 channel. Samples are taken every 250ms. Every second a URC " <a href="#">^SRADC</a> " appears to report the measured voltage. The number of samples is 4 or 5.
^SRADC: 0,4,76,76,77,76	
^SRADC: 0,4,76,76,75,76	
^SRADC: 0,5,77,77,76,76,76	
^SRADC: 0,4,76,76,75,76	
AT^SRADC=0,0	Stop the periodic measurement
OK	

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 channel. Samples are taken every 250ms.
^SRADC: 0,4,76,76,77,76	
^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 seconds.
^SRADC: 0,1,250	
^SRADC: 1,0,0	
OK	
^SRADC: 0,11,75,75,75,75,75,75,75,75,75,75,75,75,75	Some URCs were buffered during command input 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: 0,11,75,75,75,75,75,75,75,75,75,75,75,75,75	some URCs were buffered during command input and sent after completion
^SRADC: 0,11,73,74,73,74,73,73,73,74,74,73,73	
^SRADC: 0,11,74,73,74,73,73,73,73,73,73,73,73,73,73	
^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. Special Interface Configuration

This chapter describes the configuration of special interface signals of EXS82-W.

### 16.1 AT^SGPICFG Pin Mode Configuration

#### 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><sup>(str)(NV)</sup>

UE will support the following levels.

- |                      |                              |
|----------------------|------------------------------|
| "low" <sup>(D)</sup> | 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> <sup>(num)</sup>
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> <sup>(num)</sup>
000...010 <sup>(&amp;F)</sup> ...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)	
<a href="#">&lt;n&gt;</a> OK	
Write Command	
ATS5= <a href="#">&lt;n&gt;</a>	
Response(s)	
OK ERROR	
PIN → Last	Reference(s)
- + -	ITU-T V.250 [18]

### Parameter Description

<a href="#">&lt;n&gt;</a> <sup>(num)</sup>
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>`<sup>(str)</sup>

"ciphersuites"	IOverAT TLS Cipher suites
"is_cert"	Read certificate details
"preconfig_cert"	Read preconfigured certificates and list of out of date certificates. See <a href="#">AT^SSECUA</a> and <a href="#">AT^SSECUC</a> .
"management_cert"	Read module management certificate details. See <a href="#">AT^SSECUA</a> and <a href="#">AT^SSECUC</a> .

`<status>`<sup>(num)</sup>

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>`<sup>(num)</sup>

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><sup>(str)</sup>

Size of certificate file in bytes

<issuer><sup>(str)</sup>

Certificate issuer

<serial-number><sup>(str)</sup>

Serial number of certificate

<subject><sup>(str)</sup>

Subject of certificate

<signature-algorithm><sup>(str)</sup>

Signature algorithm of certificate

<thumbprint-algorithm><sup>(str)</sup>

Thumbprint algorithm of certificate

<thumbprint><sup>(str)</sup>

Thumbprint of certificate

<expiry-date><sup>(str)</sup>

Expiry date of certificate

<replace-index><sup>(num)</sup>

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)

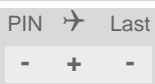
CONNECT

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



### Parameter Description

<type><sup>(str)</sup>

"ciphersuites"	Command for IOverAT TLS Cipher Suite file management.
"is_cert"	Secure Command Mode (Manage Certificates). For embedded TCP IP services the certificates 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><sup>(num)</sup>

1    Start Secure Command Block Transfer mode

<ciphersuites\_length><sup>(num)</sup>

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 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 and 2396. Space characters are allowed as well, but require the whole path or file name be enclosed in quotation marks (e.g. "a:/directory/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: <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

Write Command

(Continued)

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)

[`<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>`<sup>(num)</sup>

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>`<sup>(str)(+CSCS)</sup>

Path to a file or a directory

For naming restrictions please see above rules for efficient FFS management.

`<DestinationPath>`<sup>(str)(+CSCS)</sup>

Path to a destination file

For naming restrictions please see above rules for efficient FFS management.

`<name>`<sup>(str)(+CSCS)</sup>

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><sup>(num)</sup>

#### 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><sup>(num)</sup>

#### 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><sup>(num)</sup>

#### 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><sup>(num)</sup>

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><sup>(num)</sup>**

Status information attribute

Attributes of files or directories. Bitmask is composed of sum of the following values:

0	Regular file
16	Directory

**<size><sup>(num)</sup>**

Number of bytes to read or write.

The number of bytes to read.

1...file size

The number of bytes to write.

1...free space size

**<FileSize><sup>(num)</sup>**

File size

The size of the file. 32-bit value.

0...4294967295

**<StorageSize><sup>(num)</sup>**

Storage Size

Maximum storage size of FFS.

**<FreeSpace><sup>(num)</sup>**

Free space

Free space on FFS.

**<offset><sup>(num)</sup>**

The current position in a file. 32-bit signed value.

file size - 1...negative value of file size

**<new offset><sup>(num)</sup>**

The new position in a file. 32-bit signed value.

file size - 1...negative value of file size

<crc><sup>(num)</sup>

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><sup>(num)</sup>

Number of bytes

The number of bytes to read.

1...file size

The number of bytes to write.

1...free space size

<drive><sup>(str)(+CSCS)</sup>

Default "A:". This parameter may be omitted.

<DateLastModification><sup>(str)</sup>

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><sup>(str)</sup>

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>`<sup>(str)</sup>

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"<sup>(D)</sup> 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 download 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"<sup>(D)</sup> means firmware will always automatically updated.

Value "255" means that download will always be conditional.

`<service_tag_value>`<sup>(str)</sup>

Parameter Value for Module Service

When this parameter is omitted, the write command returns the actual setting of the given `<service_tag>`.

---

`<response_code>`<sup>(num)</sup>

Response Code for Module Service

0	Configuration done successfully
1	Error occurred during configuration

`<MODS_Error_Message>`<sup>(str)</sup>

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><sup>(str)</sup>

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><sup>(num)</sup>

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><sup>(str)</sup>

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>[, <data_status>][, <data1>]
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> <sup>(str)</sup>	
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).



<data\_status><sup>(str)</sup>

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><sup>(str)</sup>

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

- ∅ ... 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	-	∅	∅	∅
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	∅	-	-	-
Security Commands				
AT+CPIN	∅	-	-	-
AT+CLCK	∅	+	∅	+

## 18.1 Available AT Commands and Dependency on SIM PIN

AT Command	Exec	Test	Read	Write
AT+CPWD	∅	+	∅	+
AT^SPIC	-	-	-	-
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^SXRAT	∅	-	-	-
AT^SNLWM2M	∅	∅	∅	-
Short Message Service (SMS) Commands				
AT+CMGC	∅	+	∅	+
AT+CMGD	∅	+	∅	+
AT+CMGF	∅	+	+	+
AT+CMGL	+	+	∅	+

## 18.1 Available AT Commands and Dependency on SIM PIN

AT Command	Exec	Test	Read	Write
AT+CMGR	∅	+	∅	+
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 Command	Exec	Test	Read	Write
AT+CEREG	+	+	+	+
AT+CGCONTRDP	+	+	∅	+
AT+CGSMS	∅	+	+	+
ATD*99#		∅	∅	∅
AT^SGAUTH	∅	-	-	-
AT+CSODCP	∅	+	∅	+
USIM related Commands				
AT+CRSM	∅	-	∅	-
AT+CSIM	∅	-	∅	-
AT^SCID	-	-	∅	∅
AT^SCKS	∅	-	-	-
AT^SSET	∅	-	-	-
GNSS Commands				
AT^SGPSC	∅	-	-	-
Hardware related Commands				
AT+CCLK	∅	-	-	-
AT^SBV	-	-	∅	∅
AT^SCTM	∅	-	-	-
AT^SLED	∅	-	-	-
AT^SRADC	∅	-	-	-
Special Interface Configuration				
AT^SGPICFG	∅	-	-	-
Miscellaneous Commands				
A/	-	∅	∅	∅
ATS3	∅	∅	-	-
ATS4	∅	∅	-	-
ATS5	∅	∅	-	-
AT^SBNR	∅	-	-	-
AT^SBNW	∅	-	∅	-
AT^SFDL	-	-	∅	∅
AT^SFSA	∅	-	∅	-
AT^SRVCFG	∅	-	∅	-
AT^SRVCTL	∅	-	∅	-
AT^SRVACT	∅	-	∅	-

## 18.2 Availability of AT Commands Depending on Operating Mode of ME

## 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	+	+
Security Commands		
AT+CPIN	+	+
AT+CLCK	+	±
AT+CPWD	+	±
AT^SPIC	+	+
AT^SSECUA	+	+

## 18.2 Availability of AT Commands Depending on Operating Mode of ME

AT Command	Normal Mode	→
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^SXRAT	+	±
AT^SNLWM2M	+	+
Short Message Service (SMS) Commands		
AT+CMGC	+	-
AT+CMGD	+	+
AT+CMGF	+	+
AT+CMGL	+	+
AT+CMGR	+	+
AT+CMGS	+	-
AT+CMGW	+	+

## 18.2 Availability of AT Commands Depending on Operating Mode of ME

AT Command	Normal Mode	→
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+CGCONTRDP	+	-
AT+CGSMS	+	



## 18.2 Availability of AT Commands Depending on Operating Mode of ME

AT Command	Normal Mode	→
ATD*99#	+	-
AT^SGAUTH	+	+
AT+CSODCP	+	-
USIM related Commands		
AT+CRSM	+	
AT+CSIM	+	
AT^SCID	+	
AT^SCKS	+	
AT^SSET	+	
GNSS Commands		
AT^SGPSC	+	+
Hardware related Commands		
AT+CCLK	+	
AT^SBV	+	
AT^SCTM	+	
AT^SLED	+	
AT^SRADC	+	
Special Interface Configuration		
AT^SGPICFG	+	
Miscellaneous Commands		
A/	+	
ATS3	+	
ATS4	+	
ATS5	+	
AT^SBNR	+	
AT^SBNW	+	
AT^SFDL	+	+
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^SCTM	<UrcMode>=0
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	
	<code>^SBC: Undervoltage Warning</code>
	<code>^SBC: Undervoltage Shutdown</code>
	<code>^SBC: Overvoltage Warning</code>
	<code>^SBC: Overvoltage Shutdown</code>
	<code>^SHUTDOWN</code>
Configuration Commands	
<code>AT+CFUN</code>	<code>^SYSSTART</code>
<code>AT+CFUN</code>	<code>^SYSSTART AIRPLANE MODE</code>
<code>AT^SCFG</code>	<code>^SYSRESUME</code>
Status Control Commands	
<code>AT^SIND</code>	<code>+CIEV: &lt;indDescr&gt;, &lt;indValue&gt;</code>
<code>AT^SIND</code>	<code>+CIEV: &lt;indDescr&gt;, &lt;cmdType&gt;, &lt;commandDetails&gt;[, &lt;pathLen&gt;, &lt;fileNum&gt;, &lt;fileList&gt;, &lt;aidList&gt;]</code>
<code>AT^SIND</code>	<code>+CIEV: &lt;indDescr&gt;, &lt;cmdType&gt;, &lt;commandDetails&gt;, &lt;text&gt;, &lt;iconQualifier&gt;, &lt;iconId&gt;</code>
<code>AT^SIND</code>	<code>+CIEV: &lt;indDescr&gt;, &lt;cmdType&gt;, &lt;commandDetails&gt;, , , , &lt;status&gt;, &lt;statAddInfo&gt;</code>
<code>AT^SIND</code>	<code>+CIEV: &lt;indDescr&gt;, &lt;indValue&gt;, &lt;eonsOperator&gt;, &lt;servProvider&gt;, &lt;servProviderType&gt;</code>
<code>AT^SIND</code>	<code>+CIEV: &lt;indDescr&gt;, &lt;nitzUT&gt;, &lt;nitzTZ&gt;[, &lt;nitzDST&gt;]</code>
<code>AT^SIND</code>	<code>+CIEV: &lt;indDescr&gt;, &lt;indValue&gt;, &lt;lstaEdvs&gt;, &lt;lstaRssi&gt;</code>
<code>AT^SIND</code>	<code>+CIEV: &lt;indDescr&gt;, &lt;indValue&gt;, &lt;lstaNo&gt;, &lt;lstaMin&gt;, &lt;lstaMax&gt;, &lt;lstaMean&gt;, &lt;lstaVar&gt;</code>
<code>AT^SIND</code>	<code>+CIEV: &lt;indDescr&gt;, &lt;ceerRelCauseGroup&gt;, &lt;ceerReport&gt;</code>
<code>AT^SIND</code>	<code>+CIEV: &lt;indDescr&gt;, &lt;srvProfileId&gt;, &lt;issuer&gt;, &lt;serialNumber&gt;, &lt;subject&gt;, &lt;signatureAlgorithm&gt;, &lt;thumbprintAlgorithm&gt;, &lt;thumbprint&gt;</code>
Security Commands	
<code>AT^SSECUA</code>	<code>^SSECUA: "CertStore/TLS/UpdateServerCerts", &lt;index&gt;, &lt;action&gt; [...]</code>
Network Service Commands	
<code>AT+CEDRXS</code>	<code>+CEDRXP:&lt;AcT-type&gt;[, &lt;Requested_eDRX_value&gt;[, &lt;NW_provided_eDRX_value&gt;[, &lt;Paging_time_window&gt;]]]</code>
<code>AT^SEDRXS</code>	<code>+CEDRXP:&lt;AcT-type&gt;[, &lt;Requested_eDRX_value&gt;[, &lt;NW_provided_eDRX_value&gt;[, &lt;NW_provided_Paging_time_window&gt;]]]</code>
<code>AT+CREG</code>	<code>+CREG: &lt;regStatus&gt;</code>
<code>AT+CREG</code>	<code>+CREG: &lt;regStatus&gt;[, &lt;netLac&gt;, &lt;netCellId&gt;[, &lt;AcT&gt;]]</code>
<code>AT+CTZU</code>	<code>+CTZU:&lt;nitzUT&gt;, &lt;nitzTZ&gt;[, &lt;nitzDST&gt;]</code>



## 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 124
A/	Repeat Previous Command Line	Section 17.1, page 320
AT&C	Set Data Carrier Detect (DCD) line mode	Section 4.1, page 90
AT&D	Set Data Terminal Ready (DTR) line mode	Section 4.2, page 91
AT&F	Reset AT Command Settings to Factory Default Values	Section 2.1, page 27
AT&S	Set Data Set Ready (DSR) line mode	Section 4.3, page 92
AT&V	Display current Configuration	Section 2.2, page 28
AT&W	Store AT Command Settings to User Defined Profile	Section 2.3, page 29
AT+CCLK	Real Time Clock	Section 15.1, page 308
AT+CEDRXRDP	Read dynamic eDRX parameters	Section 8.3, page 133
AT+CEDRXS	eDRX Setting	Section 8.1, page 125
AT+CEER	Extended Error Report	Section 3.1, page 68
AT+CEMODE	Modes of Operation for EPS	Section 12.1, page 261
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