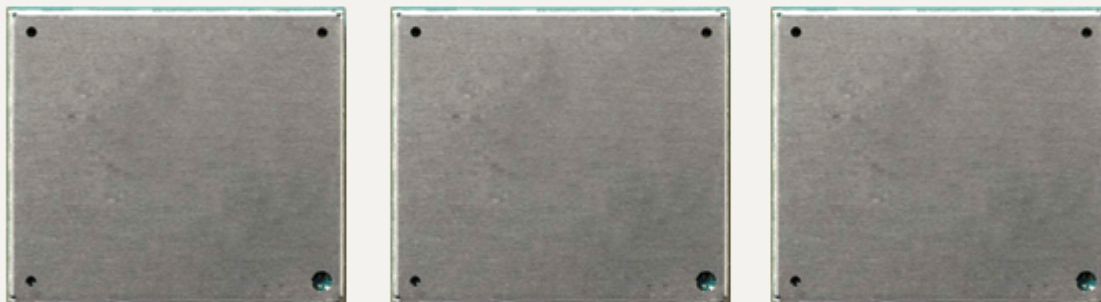


# Cinterion<sup>®</sup> PLS8-E

## AT Command Set

Version: 01.090  
DocId: PLS8-E\_ATC\_V01.090



Document Name: **Cinterion® PLS8-E AT Command Set**

Version: **01.090**

Date: **December 2, 2013**

DocId: **PLS8-E\_ATC\_V01.090**

Status **Confidential / Released**

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# 1. Introduction

## 1.1 Scope of the document

This document presents the AT Command Set for  
*PLS8-E GSM/UMTS/LTE Mobile Engine, Release 01.090.*

Before using the PLS8-E or upgrading to a new firmware version please read the latest product information provided in "[PLS8-E Release Notes, Version 01.090](#)".

More information is available at <http://m2m.gemalto.com/>.

### DISCLAIMER:

AT commands or parameters not documented in this document are subject to change and reserved for future use. Gemalto M2M GmbH reserves the right to modify or even eliminate these options in later releases.



## 1.2 Related documents

- [1] PLS8-E Release Notes, Version 01.090
- [2] PLS8-E Hardware Interface Description, Version 01.090
- [3] User's Guide: Getting Started with PLS8-E
- [4] Application Note 16: Updating PLS8-E Firmware
- [5] Application Note 39: USB Interface Description for PLS8-E
- [6] [3GPP TR 21.905](#) (descendant of 3GPP TR 01.04): Vocabulary for 3GPP Specifications
- [7] 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](#)
- [8] The [Unicode Consortium](#): [Mapping of ETSI GSM 03.38 7-bit default alphabet characters into Unicode \[..TXT!\]](#)
- [9] [ITU-T V.24](#) List of definitions for interchange circuits between data terminal equipment (DTE) and data circuit-terminating equipment (DCE)
- [10] [ITU-T V.250](#) Serial asynchronous automatic dialling and control
- [11] [3GPP TS 11.11](#): Specification of the Subscriber Identity Module - Mobile Equipment (SIM - ME) interface
- [12] [3GPP TS 31.101](#): UICC-terminal interface; Physical and logical characteristics
- [13] [3GPP TS 31.102](#): UICC-terminal interface; Physical and logical characteristics
- [14] [ETSI TS 102 221](#): Smart Cards; UICC-Terminal interface; Physical and logical characteristics
- [15] [3GPP TS 11.14](#): Specification of the SIM Application Toolkit for the Subscriber Identity Module - Mobile Equipment (SIM - ME) interface
- [16] [3GPP TS 31.111](#): Universal Subscriber Identity Module (USIM) Application Toolkit (USAT)
- [17] [ETSI TS 102 223](#): Smart Cards; Card Application Toolkit (CAT)
- [18] [3GPP TS 22.002](#) (descendant of 3GPP TS 22.02): Circuit Bearer Services (BS) supported by a Public Land Mobile Network (PLMN)
- [19] [3GPP TS 22.004](#) (descendant of 3GPP TS 02.04): General on supplementary services
- [20] [3GPP TS 22.030](#) (descendant of 3GPP TS 02.30): Man-Machine Interface (MMI) of the Mobile Station (MS)
- [21] [3GPP TS 22.060](#) (descendant of 3GPP TS 02.60): General Packet Radio Service (GPRS); Service description; Stage 1
- [22] [3GPP TS 23.060](#) (descendant of 3GPP TS 03.60): General Packet Radio Service (GPRS); Service description; Stage 2
- [23] [3GPP TS 22.081](#) (descendant of 3GPP TS 02.81): Line Identification Supplementary Services; Stage 1
- [24] [3GPP TS 22.082](#) (descendant of 3GPP TS 02.82): Call Forwarding (CF) Supplementary Services; Stage 1
- [25] [3GPP TS 22.083](#) (descendant of 3GPP TS 02.83): Call Waiting (CW) and Call Holding (HOLD); Supplementary Services; Stage 1
- [26] [3GPP TS 22.085](#) (descendant of 3GPP TS 02.85): Closed User Group (CUG) supplementary services; Stage 1
- [27] [3GPP TS 22.088](#) (descendant of 3GPP TS 02.88): Call Barring (CB) supplementary services; Stage 1
- [28] [3GPP TS 22.090](#) (descendant of 3GPP TS 02.90): Unstructured Supplementary Service Data (USSD); Stage 1
- [29] [3GPP TS 23.038](#) (descendant of 3GPP TS 03.38): Alphabets and language specific information
- [30] [3GPP TS 23.107](#): Quality of Service (QoS) concept and architecture
- [31] [3GPP TS 24.008](#) (descendant of 3GPP TS 04.08): Mobile radio interface Layer 3 specification; Core network protocols; Stage 3
- [32] [3GPP TS 24.080](#) (descendant of 3GPP TS 04.80): Mobile radio interface layer 3 supplementary services specification; Formats and coding
- [33] [3GPP TS 25.133](#) Requirements for support of radio resource management
- [34] [3GPP TS 25.304](#) User Equipment (UE) procedures in idle mode and procedures for cell reselection in con-

1.2 Related documents

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nected mode

- [35] [3GPP TS 25.331](#) Radio Resource Control (RRC)
- [36] [3GPP TS 27.007](#) (descendant of 3GPP TS 07.07): AT command set for User Equipment (UE)
- [37] [3GPP TS 27.060](#) (descendant of 3GPP TS 07.60): Mobile Station (MS) supporting Packet Switched Services
- [38] [3GPP TS 45.008](#) (descendant of GSM 05.08): Radio subsystem link control
- [39] [Universal Serial Bus Revision 2.0 Specification \[.ZIP!\]](#)
- [40] USB Class Definitions for Communication Devices, Version 1.1 January 19, 1999

## 1.3 Document Conventions

Throughout this document PLS8-E is also referred to as GSM/UMTS/LTE Mobile 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 PLS8-E. 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 [6].

### 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 15.1, <a href="#">Available AT Commands and Dependency on SIM PIN</a> uses the same symbols.
Last:	If commands are concatenated, this AT command must be the last one.
	+ Yes
	- No
	Note: See also Section 1.4, <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;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> above).

## 1.4 AT Command Syntax

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

**Table 1.4:** Types of AT commands and responses

AT command type	Syntax	Function
Test command	AT+CXXX=?	The mobile equipment returns the list of parameters and value ranges set with the corresponding Write command or by internal processes.
Read command	AT+CXXX?	This command returns the currently set value of the parameter 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.

### 1.4.1 Using Parameters

- Multiple parameters are separated by commas. This applies to write commands, command responses, URCs and result codes. 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, the current settings are used until you change them.
- Optional parameters or subparameters can be omitted unless they are followed by other parameters. If you want to omit a parameter in the middle of a string it must be replaced by a comma.
- 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.

### 1.4.2 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 [10]).

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 1.5, [Communication between Customer Application and PLS8-E](#) 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)
Commands starting with AT&	To be used standalone

## 1.5 Communication between Customer Application and PLS8-E

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 PLS8-E's signal lines refer to the Hardware Interface Description [2].

Leaving hardware flow control unconsidered the Customer Application (TE) is coupled with the PLS8-E (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 PLS8-E 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 PLS8-E the opportunity to the transmission of pending URCs and get necessary service.
- The TE shall communicate with the PLS8-E using activated echo ([ATE1](#)), i.e. the PLS8-E 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 PLS8-E is designed to use the character "08" (hex 0x08) as backspace for command line input. This allows the user to easily erase the last character when writing an AT command. On the other hand, this solution requires entering the escape sequence \08 for writing the "ò" character in GSM character string parameters.
- If command echo is enabled ([ATE1](#)) Backspace may cause 08 - 32 - 08 (decimal) character sequence or no echo, depending on serial interface and speed of character input.

## 1.6 Supported character sets

PLS8-E supports three character sets: *GSM 7 bit*, also referred to as GSM alphabet or SMS alphabet (3GPP TS 23.038 [29]) *UCS2 16 bit* (ISO-10646 [7]), and *IRA* (International Reference Alphabet, ITU T T.50). 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 PLS8-E, an escape sequence appears like any other byte received or sent.
- **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.
- **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).



## 1.6 Supported character sets

**Table 1.5:** Exemplary escape sequences generated by PLS8-E 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 USC2 alphabet and PDU mode.

## 1.6 Supported character sets

## 1.6.1 GSM alphabet tables and UCS2 character values

This section provides tables for the GSM default alphabet (3GPP TS 23.038 [29]) supported by the PLS8-E. 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" [8].

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	Θ 0398	) 0029	9 0039	I 0049	Y 0059	i 0069	y 0079
1	0	1	0	10/A	LF [LF] <sup>2)</sup>	Ξ 039E	* 002A	: 003A	J 004A	Z 005A	j 006A	z 007A
1	0	1	1	11/B	Ø 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 1.5 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>1)</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.

## 1.6 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](#)).

### 1.6.2 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, 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.

#### 1.6.2.1 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 USC2 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"

## 1.6 Supported character sets

## 1.6.2.2 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.

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.

---

## 1.7 Unsolicited Result Code Presentation

URC stands for Unsolicited Result Code and is a report message issued by the PLS8-E 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. Descriptions of these URCs are provided with the associated AT command. Only the URCs related to automatic undervoltage and overvoltage shutdown are not user definable. These URCs are described in Section [1.7.1, Common URCs](#). A summary of all URCs can be found in Section [15.3, Summary of Unsolicited Result Codes \(URC\)](#).

---

## 1.7.1 Common URCs

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

### URC 1

`^SBC: Undervoltage`

The URC indicates that the UE is close to the undervoltage threshold. If undervoltage persists the UE keeps sending the URC several times before switching off automatically.

### URC 2

`^SBC: Overvoltage Warning`

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

### URC 3

`^SBC: Overvoltage Shutdown`

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

---

## 1.8 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 [2.5.1](#), [CME Error Code Overview](#)
- Section [2.4.1](#), [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 PLS8-E'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.  
For a list of affected parameters refer to [Section 15.2, Factory Default Settings Restorable with AT&F](#).

**Syntax**

Exec Command		
AT&F[<value>]		
Response(s)		
OK		
PIN Last		Reference(s)
- -		ITU-T V.250 <a href="#">[10]</a>

**Parameter Description**

<value> <sup>(num)</sup>	
[0]	Reset parameters in <a href="#">Section 15.2, 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.

### Syntax

Exec Command

AT&V

Response(s)

Setting of many AT command parameters applicable to the current operating mode.

OK

PIN Last

+ -

## 2.3 ATQ Result Code Presentation Mode

**ATQ** controls if the PLS8-E 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)</sup>	
Result Code Presentation Mode. It is not recommended to change this value.	
[0] <sup>(&amp;F)(P)</sup>	UE transmits result code.
1	Result codes are suppressed and not transmitted.

## 2.4 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 2.4.1, [Verbose and numeric result codes](#).

### Syntax

Exec Command	
ATV[<value>]	
Response(s)	
OK	
ERROR	
PIN Last	Reference(s)
- -	ITU-T V.250 <a href="#">[10]</a>

### Parameter Description

<value> <sup>(num)(&amp;V)</sup>	
[0]	Information response: <text><CR><LF> Short result code format: <numeric code><CR>
1(&F)(P)	Information response: <CR><LF><text><CR><LF> Long result code format: <CR><LF><verbose code><CR><LF>

### 2.4.1 Verbose and numeric result codes

Verbose format	Numeric format	Meaning
OK	0	command executed, no errors
NO CARRIER	3	link not established or disconnected
ERROR	4	invalid command or command line too long

## 2.5 AT+CMEE Error Message Format

[AT+CMEE](#) controls the format of error result codes that indicates errors related to PLS8-E functionality. Format can be selected between plain "ERROR" output, error numbers or verbose "+CME ERROR: <err>". Possible error result codes are listed in [Table 2.1, General "CME ERROR" Codes \(3GPP TS 27.007\)](#), [Table 2.2, GPRS related "CME ERROR" Codes \(3GPP TS 27.007\)](#). The [AT+CMEE](#) exec command performs a write command with factory default parameter setting.

### Syntax

Test Command	
AT+CMEE=?	
Response(s)	
+CMEE: (list of supported<errMode>s)	
OK	
Read Command	
AT+CMEE?	
Response(s)	
+CMEE: <errMode>	
OK	
Exec Command	
AT+CMEE	
Response(s)	
OK	
ERROR	
+CME ERROR:<err>	
Write Command	
AT+CMEE=<errMode>	
Response(s)	
OK	
ERROR	
+CME ERROR:<err>	
PIN Last	Reference(s)
- -	3GPP TS 27.007 <a href="#">[36]</a>

### Parameter Description

<errMode> <sup>(num)(&amp;V)</sup>	
0	Disable result code, i.e. only "ERROR" will be displayed.
1	Enable error result code with numeric values.
2(&F)(P)	Enable error result code with verbose (string) values.

## 2.5.1 CME Error Code Overview

**Table 2.1:** 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 2.2:** 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
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 2.3:** 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
320	call barred

---

<err> Code	Text (if <a href="#">AT+CMEE=2</a> )
330	SMSC address unknown
340	call index error
341	call state error
342	sys state error
343	parameters error
767	operation failed



## 2.6 AT+CSCS Character Set

**AT+CSCS** write command informs the PLS8-E 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 1.6, [Supported character sets](#).

### Syntax

Test Command	
AT+CSCS=?	
Response(s)	
+CSCS: (list of supported<charSet>s)	
OK	
Read Command	
AT+CSCS?	
Response(s)	
+CSCS: <charSet>	
OK	
Write Command	
AT+CSCS=<charSet>	
Response(s)	
OK	
ERROR	
+CME ERROR: <err>	
PIN Last	Reference(s)
+ -	3GPP TS 27.007 [36]

### Parameter Description

<charSet> <sup>(str)</sup>	
"GSM"	GSM default alphabet (3GPP TS 23.038 [29], subclause 6.2.1).
"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.
"IRA" <sup>(&amp;F)(P)</sup>	International reference alphabet (ITU T T.50).

## 2.7 AT+CFUN PLS8-E Functionality Level

[AT+CFUN](#) controls PLS8-E's functionality level. The command can also be used to reset 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 [36]

### Parameter Description

<fun> <sup>(num)</sup>	
0	Minimum functionality. Shuts down TX and RX RF-circuits whereby PLS8-E logs off from the network. Access to the USIM is disabled. All AT commands whose execution requires a radio connection or USIM access will return only a simple error response. To return to normal mode the command <a href="#">AT+CFUN=1</a> can be used. After this, SIM PIN authentication is necessary for registering to a network.
1 <sup>(P)</sup>	Normal functionality level.
4	Airplane mode. Shuts down TX and RX RF-circuits whereby PLS8-E logs off from the network. USIM remains accessible. All AT commands whose execution requires a radio connection will return an error response (such as "NO CARRIER" or "+CME ERROR: NO NETWORK SERVICE". To return to normal mode the command <a href="#">AT+CFUN=1</a> can be used. The UE will re-register to the network (if network available and UE was registered before).
5	Do not use.
6	Do not use.
7	Do not use.

---

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

[0]	UE switches to <fun> level without reset.
1	UE resets and restarts. Restart is only possible with <fun>= 1 which activates normal functionality.

## 2.8 AT+GCAP Capabilities List

[AT+GCAP](#) displays a list of basic capabilities supported by the PLS8-E. This allows the TE to determine which groups of extended-syntax AT commands can be used with the UE.

### Syntax

Test Command	
AT+GCAP=?	
Response(s)	
OK	
Exec Command	
AT+GCAP	
Response(s)	
+GCAP: <a href="#">&lt;name&gt;</a>	
OK	
PIN Last	Reference(s)
+ -	ITU-T V.250 <a href="#">[10]</a>

### Parameter Description

<a href="#">&lt;name&gt;</a> <sup>(str)</sup>
e.g. +CGSM

## 2.9 AT^SMSO Switch Off PLS8-E

[AT^SMSO](#) initiates PLS8-E's power-off procedure. Do not send any other AT command after this. For further detail please refer to [\[2\]](#).

### Syntax

Test Command

AT^SMSO=?

Response(s)

OK

Exec Command

AT^SMSO

Response(s)

OK

ERROR

+CME ERROR: [<err>](#)

PIN Last

- +

## 2.10 AT^SCFG Extended Configuration Settings

AT^SCFG can be used to query and configure various settings of the PLS8-E.

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: "MEopMode/NonBlock/Cops", (list of supported <com>s)

^SCFG: "Misc/CId", (max. string length of <CId>)

^SCFG: "Radio/Band", (list of supported <rba>s), (list of supported <rbe>s)

OK

#### Read Command

AT^SCFG?

Response(s)

^SCFG: "MEopMode/NonBlock/Cops", <com>

^SCFG: "Misc/CId", <CId>

^SCFG: "Radio/Band", <rba>

OK

#### Write Command

AT^SCFG="MEopMode/NonBlock/Cops"[, <com>]

Response(s)

^SCFG: "MEopMode/NonBlock/Cops", <com>

OK

ERROR

+CME ERROR: <err>

#### Write Command

Query/Configure Customer Id.

AT^SCFG="Misc/CId"[, <CId>]

Response(s)

^SCFG: "Misc/CId", <CId>

OK

ERROR

+CME ERROR: <err>

#### Write Command

Enable/disable radio bands.

AT^SCFG="Radio/Band"[, <rba>][, <rbe>]

Response(s)

^SCFG: "Radio/Band", <rba>

OK

ERROR

+CME ERROR: <err>

PIN Last

- -

## Parameter Description

<com><sup>(str)</sup>

AT+COPS operation mode

Parameter determines whether to use the UE's standard AT+COPS write command (default) or the non-blocking AT+COPS write command. In non-blocking mode the AT+COPS write command immediately returns OK. In this mode, the AT command interface will not be blocked till the search is finished. The status of the search will be indicated by the "+CREG" URC.

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

"0" <sup>(D)</sup>	Normal mode The standard mode of AT+COPS write command.
"1"	Non-blocking mode AT+COPS write command immediately returns OK.

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

Customer Id

Setting allows customers to store an identification string. It is not used by the UE itself. The maximum length of the string is 290 characters (GSM or UCS2 depending on the setting of AT+CSCS). The delivery value is an empty string.

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

Parameter determines frequency band usage of the UE.

Please note that the band selection implementation of PLS8-E is based on a single band group that includes all frequency bands it is capable to use.

Factory default of <rba> 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, <rba> may be one of the supported single values listed below or the sum of the values of all desired bands. For example, for GSM 900 MHz (1) and GSM 1800 MHz (2) please enter the value 3.

When changing the <rba> value you can use the additional <rbe> parameter to make the changes take effect immediately without reboot being required (<rbe>="1") or after reboot only (<rbe>="0").

If you wish to configure a specific band or band configuration take care that the selected value complies with the <rat> value selected with AT+COPS. Otherwise, if the settings of <rba> and <rat> are incompatible all bands supported by PLS8-E will be enabled after power-up.

"1"	GSM 900
"2"	GSM 1800
"16"	WCDMA 2100 (BC1)
"128"	WCDMA 900 (BC8)
"4096"	WCDMA 1800 (BC3)
"32768"	LTE 1800 (B3)
"262144"	LTE 2600 (B7)
"524288"	LTE 900 (B8)
"2097152"	LTE 800 (B20)

<rbe><sup>(str)</sup>

Radio/Band: Set frequency band(s) immediately effective

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

"0"	<rba> takes effect after next restart.
-----	----------------------------------------

“1”

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

<rbe>= 1 is not usable while the UE is set to AT+CFUN=0 or 4 (TX and RX RF switched off). In this case, the AT^SCFG write command returns an ERROR message.



## 3. Status Control Commands

The AT Commands described in this chapter allow the external application to obtain various status information from the PLS8-E.

### 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: <b>&lt;err&gt;</b>	
Exec Command	
AT+CEER	
Response(s)	
+CEER: <b>&lt;report&gt;</b>	
OK	
ERROR	
+CME ERROR: <b>&lt;err&gt;</b>	
PIN Last	Reference(s)
+ -	3GPP TS 27.007 [36] 3GPP TS 24.008 [31]

#### Parameter Description

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

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.

### 3.1.1 List of status codes for extended error report

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

CS network cause
Call rejected
Number changed
Non selected user clearing
Nestination out of order
Invalid/incomplete number
Facility rejected
Response to status enquiry
Normal, unspecified
No circuit/channel available
Network out of order
Temporary failure
Switching equipment congestion
Access information discarded
Requested circuit/channel not available
Resources unavailable, unspecified
Quality of service unavailable
Requested facility not subscribed
Incoming calls barred within the CUG
Bearer capability not authorized
Bearer capability not available
Service/option not available
Bearer service not implemented
ACM >= ACM max
Requested facility not implemented
Only RDI bearer is available
Service/option not implemented
Invalid transaction identifier value
User not member of CUG
Incompatible destination
Invalid transit network selection
Semantically incorrect message
Invalid mandatory information
Message non-existent/not implemented
Message type not compatible with state
IE non-existent/not implemented
Conditional IE error
Message not compatible with state
Recovery on timer expiry
Protocol error, unspecified
Interworking, unspecified

CS network reject
IMSI unknown in HLR
Illegal MS
IMSI unknown in VLR
IMEI not accepted
Illegal ME
GPRS services not allowed
GPRS and non GPRS services not allowed
MS identity cannot be derived
Implicitly detached
PLMN not allowed
Location area not allowed
Roaming not allowed
GPRS services not allowed in PLMN
No suitable cells in location area
MSC temporary not reachable
Network failure
MAC failure
Synch failure
Congestion
GSM authentication unacceptable
Service option not supported
Requested service option not subscribed
Service option temporary out of order
Call cannot be identified
No PDP context activated
Semantically incorrect message
Invalid mandatory information
Message type non-existent
Message type not compatible with state
Information element non-existent
Message not compatible with state
RR release indication
RR random access failure
RRC release indication
RRC close session indication
RRC open session failure
Low level failure
Low level failure no redial allowed
Invalid SIM
No service
Timer T3230 expired

---

**CS network reject**

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

SNDTCP 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 SNDTCP failure

Insufficient resources

Missing or unknown APN

Unknown PDP address or PDP type

User authentication failed

Activation rejected by GGSN

Activation rejected, unspecified

Service option not supported

Requested service option not subscribed

Service option temporary out of order

NSAPI already used (not sent)

Regular deactivation

QoS not accepted

Network failure

---

PS network cause
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

## 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 PLS8-E 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>="nitz"

^SIND: nitz, <mode>, <nitzUT>, <nitzTZ>, <nitzDST>

In case of <indDescr>="ceer"

^SIND: ceer, <mode>, <ceerRelCauseGroup>[, <ceerRelCauseGroupList>]

OK

ERROR

+CME ERROR: <err>

#### Write Command

AT^SIND=<indDescr>, <mode>

#### Response(s)

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

In case of: <indDescr>="nitz" and <mode>=2

^SIND: <indDescr>, <mode>, <nitzUT>, <nitzTZ>, <nitzDST>

OK

ERROR

+CME ERROR: <err>

#### Write Command

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

#### Response(s)

^SIND: "ceer", <mode>, <ceerRelCauseGroup>[, <ceerRelCauseGroupList>]

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

Format of the "nitz" indicator:

+CIEV: *<indDescr>*, *<nitzUT>*, *<nitzTZ>*, *<nitzDST>*

### URC 3

Format of the "ceer" indicator:

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

## 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.

"signal"	Channel bit error rate of the signal received: The parameter is always set to value 99. See also AT+CSQ.
"service"	Service availability: 0 Not registered to any network. 1 Registered to home network or, if "roam"=1 then registered to another network.
"roam"	Roaming indicator: 0 Registered to home network or not registered. 1 Registered to other network.
"nitz"	<p>Network Identity and Time Zone indication: This indicator shows the time relevant information elements of an MM Information (MMI) or GMM Information (GMMI) message received from the network (see 3GPP TS 24.008 [31], ch. 9.2.15a and 9.4.19). The network usually sends a NITZ indicator when the mobile attaches to the network, when it enters a location area with different time zone or when a daylight change occurs. A NITZ indicator may consist of the following parameters: Universal Time (UT), local Time Zone (TZ), Daylight Saving Time (DST). All information elements of MMI/GMMI are optional and therefore, the presentation of the parameters <i>&lt;nitzUT&gt;</i>, <i>&lt;nitzTZ&gt;</i>, <i>&lt;nitzDST&gt;</i> varies with the network. For example, the network may send all three parameters UT, TZ, DST, or only UT and TZ or only TZ.</p> <p>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.</p> <p>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</p>



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 Indication:

The USIM status indicator allows the PLS8-E to output the status of the Universal Subscriber Identity Module via URC.

0 USIM removed.

Note: Another way to verify the USIM connection is the "[^SCKS](#)" URC enabled with [AT^SCKS](#).

1 USIM inserted.

5 USIM initialization completed - UE has finished reading USIM data.

"simlocal"

USIM availability:

0 USIM removed.

1 USIM inserted.

The [AT^SIND](#) "simlocal" URC indicates that the USIM is available.

"psinfo"

Packet Switched Status Indication

"psinfo" indicates the status of the UE related to packet switched data calls. Please consider that some providers don't support the indication of HSDPA/HSUPA.

0 GPRS/EGPRS not available in currently used cell

1 GPRS available in currently used cell

2 GPRS attached

3 EGPRS available in currently used cell

4 EGPRS attached

5 camped on WCDMA cell

6 WCDMA PS attached

7 camped on HSDPA capable cell

8 PS attached in HSDPA capable cell

9 camped on HSDPA/HSUPA capable cell

10 PS attached in HSDPA/HSUPA capable cell

16 camped on EUTRAN capable cell

17 attached in EUTRAN capable cell

"steerroam"

Steering-of-roaming Indication:

The "steerroam" Indication supports so called "steering-of-roaming" ("SOR") techniques of some providers.

If a UE roaming within a certain country tries to register to a VPLMN (visited PLMN), the VPLMN will ask the HLR of the subscribers home operator for authorization credentials of the subscriber. Steering-of-roaming means that instead of sending those credentials, the HLR sends back an error message which will make the VPLMN send back a location update reject to the UE. This location updating procedure is described in 3GPP TS 24.008 [\[31\]](#) chapter 4.4.4.9.

When UE is attempting to register into a PLMN and get updating rejected with reject cause 17 then UE stays in limited service on the configured network, UE may reattempt network registration four times, and after that UE will inform the TE via Steering-of-roaming Indication URC "steerroam" that the registration attempt has failed.

When the UE is in manual PLMN selection mode (see [AT+COPS](#)) the TE has

to start a new manual PLMN search to select a different network or switch to automatic PLMN selection mode.  
When UE is in automatic PLMN selection mode (see [AT+COPS](#)) UE itself attempts a PLMN search to select a different network.

"ceer"

Extended Error Report  
"ceer" delivers an extended error / release cause report as a single line containing the cause information given by the network in textual format.  
The URC "CIEV: <ceerRelCauseGroup>,<ceerRelCauseGroupList>" 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.

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

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

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

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

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

<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. Refer to <indDescr>.

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

Release Cause Group.

- |    |                      |
|----|----------------------|
| 0  | No Release Cause.    |
| 1  | CS Internal Cause.   |
| 2  | CS Network Cause.    |
| 3  | CS Network Reject.   |
| 4  | PS Internal Cause.   |
| 5  | PS Network Cause.    |
| 6  | PS LTE Cause.        |
| 7  | PS LTE Local Cause.  |
| 8  | Other Release Cause. |
| 99 | All Release Causes.  |

---

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

List of Release Cause Groups, activated. Refer to [<ceerRelCauseGroup>](#).

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

Release cause information given by the network in textual format.

## 4. Serial Interface Control Commands

The AT Commands described in this chapter allow the external application to determine various settings related to the PLS8-E's serial interface.

### 4.1 ATE AT Command Echo

[ATE](#) controls if the PLS8-E echoes characters received from TE during AT command state.

#### Syntax

Exec Command	
ATE[<value>]	
Response(s)	
OK	
PIN Last	Reference(s)
- -	V.250

#### Parameter Description

<value> <sup>(num)(&amp;V)</sup>	
0	Echo mode off
[1] <sup>(&amp;F)(P)</sup>	Echo mode on

## 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

**AT+CPIN** controls network authentication of the PLS8-E.

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

The write **AT+CPIN** command allows the PLS8-E to store the entered password. This may be for example the SIM PIN1 to register to a GSM or UMTS or 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 no PIN1 request is pending (for example if PIN1 authentication has been done and the same PIN1 is entered again) PLS8-E responds "+CME ERROR: operation not allowed"; no further action is required.

#### 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 [36]

#### Parameter Description

<pin><sup>(str)</sup>

Password (string type), usually SIM PIN1.

If the requested password was a PUK, such as SIM PUK1 or PH-FSIM PUK or another password, then <pin> must be followed by <new pin>.

## 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. PLS8-E 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.
- See [AT+CPBS](#) for information on write access to the FD phonebook with PIN2

## 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

<p>Test Command</p> <p>AT+CLCK=?</p> <p>Response(s)</p> <p>+CLCK: list of supported <b>&lt;facility&gt;</b>s</p> <p>OK</p>	
<p>Write Command</p> <p>AT+CLCK=<b>&lt;facility&gt;</b>, <b>&lt;mode&gt;</b>[, <b>&lt;password&gt;</b>][, <b>&lt;class&gt;</b>]</p> <p>Response(s)</p> <p>if <b>&lt;mode&gt;</b> is not equal 2 and command successful:</p> <p>OK</p> <p>if <b>&lt;mode&gt;</b>= 2 and command successful:</p> <p>+CLCK: <b>&lt;status&gt;</b>[, <b>&lt;class&gt;</b>]</p> <p>[+CLCK: <b>&lt;status&gt;</b>[, <b>&lt;class&gt;</b>]]</p> <p>[+CLCK: ...]</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 [36], 3GPP TS 22.004 [19], 3GPP TS 22.088 [27], 3GPP TS 23.088, 3GPP TS 24.088</p>

### Parameter Description

<b>&lt;facility&gt;</b> <sup>(str)</sup>	
<p>Phone security locks set by client or factory:</p> <p>Primarily intended for the client to take safety precautions, "SC" can be configured individually. Parameter <b>&lt;class&gt;</b> is not applicable to security locks. See examples below for further details.</p>	
"SC"	<p>SIM (lock SIM card).</p> <p>SIM requests password upon UE power-up and when this lock command is issued.</p> <p><b>&lt;password&gt;</b>: SIM PIN1.</p>
"FD"	<p>SIM Fixed Dialing lock.</p> <p>If "FD" lock is enabled numbers or public MMI *# codes can be used only if they start with matching numbers or characters stored in the "FD" phonebook. Numbers stored to the "FD" phonebook must not contain the call modifiers "I","i","*31#", "#31#".</p> <p>The capacity of the "FD" phonebook is depending on the SIM card.</p> <p><b>&lt;password&gt;</b>: SIM PIN2.</p> <p>Any attempt to dial a string not specified in the "FD" phonebook will be denied, causing an error result code. The type of result code varies depending on the type of service:</p> <p>"+CME ERROR: call barred" for voice calls, packet switched connections and</p>

\*# codes for Supplementary Services and USSD.  
"NO CARRIER" for circuit switched data calls.

If "FD" lock is enabled the following applies:

- Handling of USSD:  
Access to Unstructured Supplementary Services is possible with ATD if the ATD dial string starts with a matching \*# code stored in the "FD" phone-book. The USSD command [AT+CUSS](#), however, is not barred by an "FD" lock.

### Supplementary Service Call Barring:

Supplementary Service "Call Barring" allows to specify conditions under which calls will be disallowed by the network.

The availability of the Supplementary Services varies with the network. To benefit from call barring the client will need to subscribe them, though a limited number of call barring types may be included in the basic tariff package.

When you attempt to set a [<facility>](#) or [<class>](#) which is not provisioned, not yet subscribed to, or not supported by the module, the setting will not take effect regardless of the response returned. The responses in these cases vary with the network (for example "OK", "+CME ERROR: operation not allowed", "+CME ERROR: operation not supported" etc.). To make sure check the extended error response with [AT+CEER](#) and the lock status with [<mode>=2](#).

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

"AO"	BAOC (Bar All Outgoing Calls)
"OI"	BOIC (Bar Outgoing International Calls)
"OX"	BOIC-exHC (Bar Outgoing International Calls except to Home Country)
"AI"	BAIC (Bar All Incoming Calls)
"IR"	BIC-Roam (Bar Incoming Calls when Roaming outside the Home Country)
"AB"	All Barring services (applicable only for <a href="#">&lt;mode&gt;=0</a> )
"AG"	All outGoing barring services (applicable only for <a href="#">&lt;mode&gt;=0</a> )
"AC"	All inComing barring services (applicable only for <a href="#">&lt;mode&gt;=0</a> )

<a href="#">&lt;mode&gt;</a> <sup>(num)</sup>	
0	Unlock
1	Lock
2	Query status

<a href="#">&lt;status&gt;</a> <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](#).

[<class>](#)<sup>(num)</sup>  
Integer or sum of integers each representing a class of information, i.e. a bearer service, telecommunication service or bearer service group as defined in 3GPP TS 22.004 [19].

1	Voice
---	-------



## 5.2 AT+CLCK

2	Class 2 ("Data") comprises all those individual data classes between 16 and 128, that are supported both by the network and the MS. This means, a setting made for class 2 applies to all individual data classes (if supported). In addition, you can assign a different setting to a specific class. For example, you can activate Call Forwarding for all data classes, but deactivate it for data class 64, "dedicated packet access".
4	Fax (only for compatibility reasons, not supported by PLS8-E)
8	SMS (only for compatibility reasons, not supported by PLS8-E)
16	Data circuit sync
32	Data circuit async
64	Dedicated packet access
128	Dedicated PAD access
1...[7]...255	Combination of some of the above classes. For example, the default setting 7 represents the sum of the integers 1, 2 and 4 for voice, data and fax (fax only for compatibility reasons) . The value 255 covers all classes. If parameter "class" is omitted, the default value 7 is used.

**Notes**

- The **AT+CLCK** command offers the full range of **<class>** parameters according to the 3GPP Technical Specifications. However, when you attempt to use a service option which is not provisioned or not yet subscribed to, the setting will not take effect regardless of the response returned. The responses in these cases vary with the network (for example "OK", "Operation not allowed", "Operation not supported" etc.). To make sure check the extended error response with **AT+CEER** and the lock status with **<mode>=2**.
- The command has been implemented with the full set of **<class>** parameters according to 3GPP TS 27.007 [36]. For actual applicability of a desired Call barring service to a specific service or service group (a specific **<class>** value) please consult table A.1 of 3GPP TS 22.004 [19].
- If an outgoing Data Call is rejected due to an active **<facility>="FD"** barring supplementary service, the call will be terminated with result code NO CARRIER. Under the same conditions, an outgoing Voice call will be terminated with result code NO DIALTONE.
- If an invalid **<password>** is entered several times in succession, a delay incremented after each failed attempt will increase the time to wait before the input of the **<password>** is accepted. To avoid blocking the serial interface the running **AT+CLCK** command is aborted after a short timeout and returns "+CME ERROR: unknown" (+CME ERROR: 100). If then the **AT+CLCK** command is issued once again execution is denied with "+CME ERROR: operation temporary not allowed" (+CME ERROR: 256).
- If the user tries to set a lock although it is already active or, the other way round, tries to unlock an inactive lock, the response will be OK, but the **<password>** will not be checked or verified.
- The parameter **<class>** will not be sent to the network if **<mode>=2**. Therefore it may happen that the response of the query command contains information about classes which were not requested, or it shows only the inactive status of the class 1 or 255. This means that the status is valid for all classes.
- Upper-case and lower-case characters cannot be used together for the **<facility>** parameter. For example, you can write either "FD" or "fd", but not "Fd".
- Parameter **<class>** is also allowed by **<mode>=2**.

**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.

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

### Syntax

Test Command	
AT+CPWD=?	
Response(s)	
+CPWD: list of supported ( <b>&lt;facility&gt;</b> , <b>&lt;password length&gt;</b> )	
OK	
Write Command	
AT+CPWD= <b>&lt;facility&gt;</b> , <b>&lt;old password&gt;</b> [, <b>&lt;new password&gt;</b> ]	
Response(s)	
New password has been registered for the facility lock function.	
OK	
If parameter <b>&lt;old password&gt;</b> was not correct:	
+CME ERROR: 16 (+CME ERROR: incorrect password)	
If the password for the selected <b>&lt;facility&gt;</b> has been invalidated due to too many failed attempts:	
+CME ERROR: ...	
If the network provider or network operator doesn't supply the Network Password:	
+CME ERROR: 258 (+CME ERROR: retry operation)	
If error is related to ME functionality:	
+CME ERROR: <b>&lt;err&gt;</b>	
PIN Last	Reference(s)
+ -	3GPP TS 27.007 [36]

### Parameter Description

<b>&lt;facility&gt;</b> <sup>(str)</sup>	
Phone security locks set by client or factory:	
Primarily intended for the client to take safety precautions, passwords "SC" (SIM PIN) and "P2" (SIM PIN2) are usually predefined, but can be configured individually.	
"SC"	<p>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 <b>AT+CPIN</b>.</p> <p><b>&lt;password length&gt;</b>: 4 to 8 digits.</p>
"P2"	<p>SIM PIN 2, e.g. required for authentication with facility lock "FD" (cf. <b>AT+CLCK</b>).</p> <p>If incorrectly entered three times, the SIM PUK 2 is required to perform authentication. Input of the SIM PUK 2 password is possible only with AT command <b>AT+CPIN</b>.</p> <p><b>&lt;password length&gt;</b>: 4 to 8 digits.</p>

### Supplementary Service Call Barring:

The call barring supplementary service allows to specify conditions under which calls will be disallowed by the network.

The availability of the supplementary services varies with the network. To benefit from call barring the client will need to subscribe them, though a limited number of call barring types may be included in the basic tariff package.

**<password length>**: ThenNetwork password needs to be supplied from the network provider or network operator. Usually there is one 4 digit password which applies to all call barring options. For details contact your provider.

"AO"	BAOC (Bar All Outgoing Calls)
"OI"	BOIC (Bar Outgoing International Calls)
"OX"	BOIC-exHC (Bar Outgoing International Calls except to Home Country)
"AI"	BAIC (Bar All Incoming Calls)
"IR"	BIC-Roam (Bar Incoming Calls when Roaming outside the home country)
"AB"	All Barring services
"AG"	All outGoing barring services
"AC"	All inComing barring services

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

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

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

Password specified for the facility.

Parameter **<old password>** can be ignored if no old password was allocated to the facility.

Take into account that a password may have already been set by factory, or that the service is subject to a password issued by the provider. See notes above or contact provider.

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

New password. Mandatory, if **<old password>** was an unblocking key (PUK).

### Note

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

### Examples

#### EXAMPLE 1

To change PIN2

```
AT+CPWD="P2","0000","8888"
OK
```

(where "0000" = old PIN2 and "8888" = new PIN2)  
PIN2 password has been changed to "8888"

#### EXAMPLE 2

To set the password used to enable or disable Call Barring:

```
AT+CPWD="AB","0000","3333"
OK
```

Requests the network to change the password for the call barring supplementary service.  
Even though issued for "AB" only the request applies to all other call barring services, too.

## 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, PH-SIM PIN etc.

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

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 (e. g. `AT+CPBS="FD","PIN2"`) are entered successfully no password is currently required and the referrer of the `AT^SPIC` read and execute command returns only OK.

If no USIM card is inserted the `AT^SPIC` test, read and execute commands return only OK.

### 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>[, <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.

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

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

"SC"	SIM PIN when no parameter <b>&lt;puk&gt;</b> or set <b>&lt;puk&gt;</b> to 0. SIM PUK when parameter <b>&lt;puk&gt;</b> is set 1.
"PS"	PH-SIM PIN when no parameter <b>&lt;puk&gt;</b> or set <b>&lt;puk&gt;</b> to 0. PH-SIM PUK when parameter <b>&lt;puk&gt;</b> is set 1. For details see AT command <a href="#">AT+CLCK</a> .
"P2"	SIM PIN2 when no parameter <b>&lt;puk&gt;</b> or set <b>&lt;puk&gt;</b> to 0. SIM PUK2 when parameter <b>&lt;puk&gt;</b> is set 1.
"PN"	Network Personalisation. PH-NET PIN when no parameter <b>&lt;puk&gt;</b> or set <b>&lt;puk&gt;</b> to 0. PH-NET PUK when parameter <b>&lt;puk&gt;</b> is set 1.

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

PUK is displayed.

Is a display of the PUK count from **<facility>** required?

[0]	Show PIN count from the corresponding <b>&lt;facility&gt;</b> .
1	Show PUK count from the corresponding <b>&lt;facility&gt;</b> .

**<code><sup>(text)</sup>**

Identification of the currently required password.

SIM PIN	ME is waiting for SIM PIN1.
SIM PUK	ME is waiting for SIM PUK1 if PIN1 was disabled after three failed attempts to enter PIN1.
SIM PIN2	ME is waiting for PIN2, when the attempt to access PIN2 requiring features was acknowledged with "+CME ERROR: SIM PIN2 required" (e.g. if the user attempts to edit the FD phonebook by using <a href="#">AT+CPBS="FD","PIN2"</a> ).
SIM PUK2	ME is waiting for PUK2 to unblock a disabled PIN2. Necessary if preceding command was acknowledged with "+CME ERROR: SIM PUK2 required".
PH-SIM PIN	ME is waiting for 8-digit code to unlock the UE to a SIM/UICC if "PS" lock is active and user inserts other SIM card than the one used for the lock. For details see <a href="#">AT+CLCK="PS"</a> .
PH-SIM PUK	ME is waiting for 8-digit code to unblock the UE, if the above "PS" lock password was incorrectly entered 32 times.
PH-NET PIN	ME is waiting for Network Personalisation.
PH-NET PUK	ME is waiting for Network Personalisation unblocking password.

## Notes

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

## Examples

### EXAMPLE 1

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

```
at+cpin?
+CPIN: SIM PIN
OK
at^spic?
```

Currently required password is PIN1.

^SPIC: SIM PIN	
OK	Currently required password is PIN1.
at^spic	
^SPIC: 3	
OK	3 attempts left.
at+cpin=9999	
+CME ERROR: incorrect password	
at^spic	
^SPIC: 2	2 attempts left.
OK	
at+cpin=9999	
+CME ERROR: incorrect password	
OK	
at^spic	
^SPIC: 1	1 attempt left.
OK	
at+cpin=9999	
+CME ERROR: incorrect password	
at+cpin?	
+CPIN: SIM PUK	
OK	Now required password is PUK1.
at^spic	
^SPIC: 10	
OK	10 attempts left for PUK1.
at+cpin=01234567,1234	
+CME ERROR: incorrect password	
at^spic	
^SPIC: 9	
OK	9 attempts left for PUK1.

#### 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, but then fails to give the "PN" unblock password (PH-NET PUK):

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+cpin=11110000	
+CME ERROR: incorrect password	
at^spic?	
^SPIC: 9	9 attempts left.
OK	
at+cpin=11111111	
+CME ERROR: incorrect password	
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=11119999
+CME ERROR: incorrect password
at^spic
^SPIC: 32
OK
at^spic?
^SPIC: PH-NET PUK
```

Displayed counter refers to Network Personalisation unblock password.

```
OK
at+cpin=22220000
+CME ERROR: incorrect password
at^spic
^SPIC: 31
OK
```

#### EXAMPLE 3

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

```
+CREG: 0
at+cpin=1234
OK
+CREG: 2

+CREG: 1
at+cpin?
+CPIN: READY

at^spic
^SPIC: 3

OK
AT^SPIC?

^SPIC: SIM PIN2
OK
at+clck="SC",0,456789
+CME ERROR: incorrect password
at^spic
^SPIC: 3

at+clck="SC",0,456789
+CME ERROR: incorrect password
at^spic
^SPIC: 3

at+clck="SC",0,456789
+CME ERROR: incorrect password

+CREG: 0
```

The mobile is properly registered to the network.

The [AT+CPIN?](#) read command confirms that SIM PIN1 authentication was successful.

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.

Likewise, the read command notifies that the ME is waiting for SIM PIN2.

First attempt to enter a wrong SIM PIN1.

SIM PIN1 authentication is still valid, and the counter relates to SIM PIN2.  
Second attempt to enter a wrong SIM PIN1.

SIM PIN1 authentication is still valid, and the counter relates to SIM PIN2.  
Third attempt to enter a wrong SIM PIN1.

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".

## 6. Identification Commands

The AT Commands described in this chapter allow the external application to obtain various identification information related to the PLS8-E and linked entities.

### 6.1 ATI Display product identification information

The [ATI](#) execute command delivers a product information text.

The 'Revision' information consists of the following parts: Version xx and variant yy of software release.

#### Syntax

Exec Command	
ATI[<value>]	
Response(s)	
Cinterion	
PLS8-E	
REVISION xx.yyy	
OK	
Exec Command	
ATI1	
Response(s)	
Cinterion	
PLS8-E	
REVISION xx.yyy	
A-REVISION xx.zzz.cc	
OK	
PIN Last	Reference(s)
- -	V.250

#### Parameter Description

<value><sup>(num)</sup>

Values are not supported and only return OK.

#### Note

- "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.

## 6.2 AT+CGMM Request model identification

[AT+CGMM](#) returns a product model identification text.

### Syntax

Test Command	
AT+CGMM=?	
Response(s)	
OK	
Exec Command	
AT+CGMM	
Response(s)	
PLS8-E	
OK	
PIN Last	Reference(s)
- -	3GPP TS 27.007 <a href="#">[36]</a>

## 6.3 AT+CGMR Request revision identification of software status

[AT+CGMR](#) delivers a product firmware version identification. Command is identical with [AT+GMR](#).

### 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 [36]

### Parameter Description

<xx.yyy> <sup>(str)</sup>
Version xx and variant yyy of software release.

## 6.4 AT+GMR Request revision identification of software status

[AT+GMR](#) delivers a product firmware version identification. Command is identical with [AT+CGMR](#).

### Syntax

Test Command	
AT+GMR=?	
Response(s)	
OK	
Exec Command	
AT+GMR	
Response(s)	
REVISION <xx.yyy>	
OK	
PIN Last	Reference(s)
- -	ITU-T V.250 [10]

### Parameter Description

<xx.yyy> <sup>(text)</sup>
Version xx and variant yyy of software release.

## 6.5 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 <a href="#">[36]</a>

### Parameter Description

<sn> <sup>(str)</sup>
IMEI used to identify mobile equipment when used on a mobile network

## 6.6 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 [\[36\]](#)

### Parameter Description

[<imsi>](#)<sup>(str)</sup>

International Mobile Subscriber Identity (string without quotes)

## 7. Network Service Commands

The AT Commands described in this chapter are related to various network services. More commands related to this area can be found in Chapter 8., [Supplementary Service Commands](#).

### 7.1 AT+COPS Operator Selection

[AT+COPS](#) queries the present status of the PLS8-E'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  
PLS8-E searches for the home operator automatically. If successful the PLS8-E registers to the home network. If the home network is not found, PLS8-E goes on searching. If a permitted operator is found, PLS8-E registers to this operator.  
If no operator is found the PLS8-E remains unregistered.
- Manual  
Desired operator can be determined using the [AT+COPS](#) write command. If the operator is found, PLS8-E registers to it immediately. If the selected operator is forbidden, the PLS8-E 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 dependent on the the settings made with [<mode>](#) and [<rat>](#). If [<mode>](#) equals "0" and [<rat>](#) is omitted (automatic selection mode for both parameters) the [AT+COPS](#) test command will return a list of operators with the supported [<rat>s](#). If [<rat>](#) is explicitly set (i.e. restricted to UTRAN or GSM) the [AT+COPS](#) the response contains only a list of operators with the selected RAT type.

The response to the [AT+COPS](#) read command depends on the registration status. If the UE is not registered, the read command returns only the current [<mode>](#). If the UE is registered the response returns the currently selected operator, 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.

The [AT+COPS](#) exec command returns OK and has no effect on the current [<mode>](#).

## 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>

PIN Last

+ -

Reference(s)

3GPP TS 27.007 [36]

## Parameter Description

<opStatus><sup>(num)</sup>

### Operator Status

0	Unknown
1	Operator available
2	Current operator
3	Operator forbidden

<opName><sup>(str)(&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 PLS8-E.

0 <sup>(D)</sup>	Automatic mode; <opName> field is ignored.
1	Manual operator selection The AT+COPS write command requires <opName> in numeric format, i.e. <format> shall be 2. <opName> can be omitted when changing only the <rat> parameter and retaining the network already manually selected. The AT+COPS read command returns the current <mode>, the currently



## 7.1 AT+COPS

selected `<opName>` and the currently used `<rat>`. If the UE is not registered the `AT+COPS` read command returns only the currently set `<mode>`. A manually selected PLMN is volatile as long as the network registration has not been successful.

- 2 Manually deregister from network and remain unregistered until `<mode>=0` or 1 or 4 is selected.  
After setting command `AT+COPS=2` wait for the "+CREG: 0" URC before executing any further network service related AT commands.
- 3 Set only `<format>` (for `AT+COPS` read command).
- 4 Manual / automatic selection; if manual selection fails, automatic mode (`<mode>=0`) is entered (`<opName>` field will be present).

`<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 either UTRAN (UMTS) or GSM or E-UTRAN, depending on the network coverage. This automatic mode for selecting `<rat>` remains enabled until you explicitly set either 0 for GSM or 2 for UTRAN or 7 for E-UTRAN. This means, setting the `<rat>` parameter is a restriction, i.e. it forces the UE to select either UTRAN only or GSM only or 7 for E-UTRAN. The selected `<rat>` value 0 or 2 or 7 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>`. Values 3, 4 and 6 occur only in read command responses and are not intended for the `AT+COPS` write command.

If you wish to modify `<rat>` and also the `<rba>` parameter of `AT+SCFG` take care that both values are compatible.

0	GSM
2	UTRAN
3	GSM w/EGPRS
4	UTRAN w/HSDPA
6	UTRAN w/HSDPA and HSUPA
7	E-UTRAN

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

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

**Note**

- `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).

## 7.2 AT+CREG Network Registration Status

**AT+CREG** serves to monitor the PLS8-E's network registration status. Information can be reported by the **AT+CREG?** read command and by +CREG: URCs.

### Syntax

#### Test Command

AT+CREG=?

#### Response(s)

+CREG: (list of supported<urcMode>s)

OK

#### Read Command

AT+CREG?

#### Response(s)

+CREG: <urcMode>, <regStatus>[, <netLac>, <netCellId>[, <AcT>]]

OK

ERROR

+CME ERROR: <err>

#### Write Command

AT+CREG=<urcMode>

#### Response(s)

OK

ERROR

+CME ERROR: <err>

#### PIN Last

- -

#### Reference(s)

3GPP TS 27.007 [36]

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

[0]<sup>(&F)(P)</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> and <AcT> will only be displayed if available.

<regStatus><sup>(num)(&V)</sup>

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> <p>After this, the search will be resumed (if automatic network search is enabled).</p> <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> <p>If at least one network is available, emergency calls can be made.</p>
3	Registration denied <ul style="list-style-type: none"> <li>• 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> <p>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.</p>
4	Unknown, e.g. out of GSM/UMTS/LTE coverage.
5	Registered, roaming. UE is registered at a foreign network (national or international network)
6	Registered for "SMS only", home network (applicable only when <AcT> indicates LTE.)
7	Registered for "SMS only", roaming (applicable only when <AcT> indicates LTE.)
8	Registered for "SMS only", roaming (applicable only when <AcT> indicates LTE.)
9	Registered for CSFB not preferred", home network (applicable only when <AcT> indicates LTE.)
10	Registered for CSFB not preferred", roaming (applicable only when <AcT> indicates LTE.)

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

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

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

16 bit (2G) or 28 bit (3G) cell ID in hexadecimal format.

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

Radio access technology

0	GSM
2	UTRAN
3	GSM w/EGPRS
4	UTRAN w/HSDPA
5	UTRAN w/HSUPA
6	UTRAN w/HSDPA and w/HSUPA
7	E-UTRAN

### 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.

## 7.3 AT+CSQ Signal Quality

The [AT+CSQ](#) execute command indicates the received signal strength [<rssi>](#) and the channel bit error rate [<ber>](#).

### Syntax

Test Command	
AT+CSQ=?	
Response(s)	
+CSQ: (list of supported <a href="#">&lt;rssi&gt;</a> s), (list of supported <a href="#">&lt;ber&gt;</a> s)	
OK	
Exec Command	
AT+CSQ	
Response(s)	
+CSQ: <a href="#">&lt;rssi&gt;</a> , <a href="#">&lt;ber&gt;</a>	
OK	
PIN Last	Reference(s)
+ -	3GPP TS 27.007 <a href="#">[36]</a>

### Parameter Description

<a href="#">&lt;rssi&gt;</a> <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 <a href="#">[36]</a> , the <a href="#">&lt;rssi&gt;</a> value is not applicable to 3G networks. Yet, with a view to employing <a href="#">AT+CSQ</a> for all networks the PLS8-E has been designed to show a <a href="#">&lt;rssi&gt;</a> value derived from the 3G specific RSCP parameter shown by <a href="#">AT^SMONI</a> . Nevertheless, please consider that connection quality in 3G networks is depending on further factors. For example, despite good <a href="#">&lt;rssi&gt;</a> or RSCP values for signal quality, data throughput may vary depending on the number of subscribers sharing the same cell. It is therefore recommended to use also <a href="#">AT^SMONI</a> which delivers additional information, in particular the values RSCP, EC/n0, SQual and SRxLev RX level.	
<a href="#">&lt;ber&gt;</a> <sup>(num)</sup>	
0..7	as RXQUAL values in the table in 3GPP TS 45.008 <a href="#">[38]</a> , section 8.2.4 (for GSM network only).
99	not known or not detectable (for GSM and UMTS networks).

### Note

- The [AT+CSQ](#) exec command is case sensitive. The response prefix +CSQ exactly matches the upper and lower case characters used for exec command input. For example, at+csq returns +csq: xx,xx and AT+CSQ returns +CSQ: xx,xx.

## 7.4 AT^SMONI Monitoring Serving Cell

The [AT^SMONI](#) command supplies information of the serving cell.

### Syntax

Test Command

AT^SMONI=?

Response(s)

OK

Exec Command

AT^SMONI

Response(s)

See: Section 7.4.1, [AT^SMONI Responses](#)

OK

Write Command

AT^SMONI=255

Response(s)

See: Section 7.4.2, [AT^SMONI Enhanced Responses](#)

OK

ERROR

+CME ERROR: <err>

PIN Last

- -

### Notes

- The parameters LAC and cell are presented as hexadecimal digits, the remaining parameters are composed of decimal digits.
- If the BS supports frequency hopping during a connection, the dedicated channel (ARFCN) is not stable. This mode is indicated by chann = 'h'.
- It may happen for a short time that following parameters have no values after an inter-system change from GSM to UMTS: EC/n0, RSCP, SQual and SRxLev. In this case these parameter values are displayed with the "-" character.
- The service state 'SEARCH' (Searching) could mean a PLMN search or a cell search. This can also happen for a short time when UE is leaving connected mode.

### 7.4.1 AT^SMONI Responses

*UE is not connected:*

- UE is camping on a 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,71,-61,262,02,0143,83BA,33,33,3,6,G,NOCONN

- UE is camping on a UMTS (3G) cell:

Syntax:

^SMONI: ACT,UARFCN,PSC,EC/n0,RSCP,MCC,MNC,LAC,cell,SQual,SRxLev,PhysCh,SF,Slot,EC/n0,RSCP,ComMod,HSUPA,HSDPA

## 7.4 AT^SMONI

*Example:*

```
^SMONI: 3G,10564,296,-7.5,-79,262,02,0143,00228FF,-92,-78,NOCONN
```

- UE is camping on a LTE (4G) cell:

*Syntax:*

```
^SMONI: ACT,EARFCN,Band,DL_bandwidth,UL_bandwidth,Mode,MCC,MNC,TAC,Global_Cell_ID,Physical_Cell_ID,Srxlev,RSRP,RSRQ,Conn_state
```

*Example:*

```
^SMONI: 4G,6300,20,10,10,FDD,262,02,BF75,0345103,350,33,-94,-7,NOCONN
```

- 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 UMTS (3G) cell:

*Syntax:*

```
^SMONI: ACT,UARFCN,PSC,EC/n0,RSCP,MCC,MNC,LAC,cell,SQual,SRxLev,PhysCh,SF,Slot,EC/n0,RSCP,ComMod,HSUPA,HSDPA
```

*Example:*

```
^SMONI: 3G,SEARCH,SEARCH
```

- UE is searching and could not (yet) find a suitable LTE; (4G) cell:

*Syntax:*

```
^SMONI: ACT,EARFCN,Band,DL_bandwidth,UL_bandwidth,Mode,MCC,MNC,TAC,Global_Cell_ID,Physical_Cell_ID,Srxlev,RSRP,RSRQ,Conn_state
```

*Example:*

```
^SMONI: 4G,SEARCH
```

*UE is connected (call in progress):*

- 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,673,-80,262,07,4EED,A500,35,35,7,4,G,643,4,0,-80,0,S_FR
```

- UMTS (3G) cell:

*Syntax:*

```
^SMONI: ACT,UARFCN,PSC,EC/n0,RSCP,MCC,MNC,LAC,cell,SQual,SRxLev,PhysCh,SF,Slot,EC/n0,RSCP,ComMod,HSUPA,HSDPA
```

*Example:*

```
^SMONI: 3G,10737,131,-5,-93,260,01,7D3D,C80BC9A,21,11,EDCH,256,4,-5,-93,0,01,06
```

- LTE (4G) cell:

*Syntax:*

```
^SMONI: ACT,EARFCN,Band,DL_bandwidth,UL_bandwidth,Mode,MCC,MNC,TAC,Global_Cell_ID,Physical_Cell_ID,TX_power,RSRP,RSRQ,Conn_state
```

*Example:*

```
^SMONI: 4G,6300,20,10,10,FDD,262,02,BF75,0345103,350,90,-94,-7,CONN
```

*Columns for GSM (2) 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
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

*Columns for UMTS (3G) Serving Cell parameters:*

Column	Description
ACT	Access Technology
UARFCN	UARFCN (UTRAN Absolute Radio Frequency Channel Number) of the BCCH carrier
PSC	Primary Scrambling Code
EC/n0	Carrier to noise ratio in dB = measured Ec/Io value in dB. Please refer to 3GPP 25.133, section 9.1.2.3, Table 9.9 for details on the mapping from EC/n0 to EC/Io.
RSCP	Received Signal Code Power in dBm
MCC	Mobile Country Code (first part of the PLMN code)
MNC	Mobile Network Code (second part of the PLMN code)
LAC	Location Area Code
cell	Cell ID
SQual	Quality value for base station selection in dB (see 3GPP 25.304)
SRxLev	RX level value for base station selection in dB (see 3GPP 25.304)

*Columns for LTE; (4G) Dedicated Channel parameters:*

Column	Description
EARFCN	E-UTRA Absolute Radio Frequency Channel Number
Band	E-UTRA frequency band (see 3GPP 36.101)
DL bandwidth	DL bandwidth
UL bandwidth	UL bandwidth
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



## 7.4 AT^SMONI

Column	Description
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
Conn_state	Connection state. Can be one of following: CONN, LIMSRV, NOCONN or SEARCH

Columns for UMTS (3) Dedicated Channel parameters:

Note: Physical channels in downlink are considered.

Column	Description
PhysCh	Physical Channel Type (DPCH, FDPCH)
SF	Spreading Factor (4,8,16,32,64,128,256,512)
Slot	Slot Format for DPCH (0-16) (see 3GPP TS 25.211 V7.10.0 Table 11) Slot Format for FDPCH (0-9) (see 3GPP TS 25.211 V7.10.0 Table 16C)
EC/n0	Carrier to noise ratio in dB
RSCP	Received Signal Code Power in dBm
ComMod	Compressed Mode (0-1) (indicates valid transmission gap pattern)
HSUPA	HSUPA Status (a.k.a. E-DCH Status) indicated by xy: x = Cell Capability Indicator: 0 - HSUPA capability not indicated, 1 - HSUPA Capable Cell. Please consider that some providers/MNOs don't support this flag and that it is provided "for display indication only", see 3GPP TS 25.331 [35] (later than version 6.9.0) section 10.2.48.8.8. y = UE Call Status: 0 - HSUPA inactive, 1 - HSUPA active
HSDPA	HSDPA Status indicated by xy: x = Cell Capability Indicator: 0 - HSDPA capability not indicated, 1 - HSDPA Capable Cell. Please consider that some providers/MNOs don't support this flag and that it is provided "for display indication only", see 3GPP TS 25.331 [35] (later than version 6.8.0), section 10.2.48.8.8. y = UE Call Status: 0 - HSDPA inactive, 1 - HSDPA suspended, 2 - HSDPA active, 6 - HSDPA+ active

## 7.4.2 AT^SMONI Enhanced Responses

The `AT^SMONI=255` write command supplies information of the serving and dedicated cell.

*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 UMTS (3G) cell and registered to the network:

## 7.4 AT^SMONI

*Syntax:*

```
^SMONI: ACT,UARFCN,PSC,EC/n0,RSCP,MCC,MNC,LAC,cell,SQual,SRxLev,PhysCh, SF,Slot,EC/n0,RSCP,ComMod,HSUPA,HSDPA
```

*Example:*

```
^SMONI: 3G,10737,131,-7.5,-103,260,01,7D3D,C80BC9A,21,11,NOCONN
```

- UE is camping on a LTE (4G) cell and registered to the network:

*Syntax:*

```
^SMONI: ACT,EARFCN,Band,DL bandwidth,UL bandwidth,Mode,MCC,MNC,TAC,Global Cell ID,Physical Cell ID,Srxlev,RSRP,RSRQ,Conn_state
```

*Example:*

```
^SMONI: 4G,6300,20,10,10,FDD,262,02,BF75,0345103,350,33,-94,-7,NOCONN
```

- UE is camping on a GSM cell but not registered to the network (only emergency call allowed):

*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 UMTS cell but not registered to the network (only emergency call allowed):

*Syntax:*

```
^SMONI: ACT,UARFCN,PSC,EC/n0,RSCP,MCC,MNC,LAC,cell,SQual,SRxLev,PhysCh, SF,Slot,EC/n0,RSCP,ComMod,HSUPA,HSDPA
```

*Example:*

```
^SMONI: 3G,10564,96,-7.5,-79,262,02,0143,00228FF,-92,-78,LIMSRV
```

- UE is camping on a LTE (4G) cell but not registered to the network (only emergency call allowed):

*Syntax:*

```
^SMONI: ACT,EARFCN,Band,DL bandwidth,UL bandwidth,Mode,MCC,MNC,TAC,Global Cell ID,Physical Cell ID,Srxlev,RSRP,RSRQ,Conn_state
```

*Example:*

```
^SMONI: 4G,6300,20,10,10,FDD,262,02,BF75,0345103,350,33,-94,-7,LIMSRV
```

*UE is connected (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
```

- UMTS (3G) cell:

*Syntax:*

```
^SMONI: ACT,UARFCN,PSC,EC/n0,RSCP,MCC,MNC,LAC,cell,SQual,SRxLev,PhysCh, SF,Slot,EC/n0,RSCP,ComMod,HSUPA,HSDPA
```

*Example:*

```
^SMONI: 3G,10737,131,-5,-93,260,01,7D3D,C80BC9A,21,11,DPCH,256,4,-5,-93,0,00,00
```

- LTE (4G) cell:

*Syntax:*

```
^SMONI: ACT,EARFCN,Band,DL bandwidth,UL bandwidth,Mode,MCC,MNC,TAC,Global Cell ID,Physical Cell ID,TX_power,RSRP,RSRQ,Conn_state
```

Example:

```
^SMONI: 4G,6300,20,10,10,FDD,262,02,BF75,0345103,350,90,-94,-7,CONN
```

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
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 UMTS (3G) Serving Cell parameters:

Column	Description
ACT	Access Technology
UARFCN	UARFCN (UTRAN Absolute Radio Frequency Channel Number) of the BCCH carrier
PSC	Primary Scrambling Code
EC/n0	Carrier to noise ratio in dB = measured Ec/Io value in dB. Please refer to 3GPP 25.133, section 9.1.2.3, Table 9.9 for details on the mapping from EC/n0 to EC/Io.
RSCP	Received Signal Code Power in dBm
MCC	Mobile Country Code (first part of the PLMN code)
MNC	Mobile Network Code (second part of the PLMN code)
LAC	Location Area Code, see note
cell	Cell ID
SQual	Quality value for base station selection in dB (see 3GPP 25.304)
SRxLev	RX level value for base station selection in dB (see 3GPP 25.304)

Columns for LTE (4G) Dedicated Channel parameters:

Column	Description
EARFCN	E-UTRA Absolute Radio Frequency Channel Number
Band	E-UTRA frequency band (see 3GPP 36.101)
DL bandwidth	DL bandwidth

Column	Description
UL bandwidth	UL bandwidth
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
Conn_state	Connection state. Can be one of following: CONN, LIMSRV, NOCONN or SEARCH

*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 UMTS (3) Dedicated Channel parameters):

Note: Physical channels in downlink are considered.

Column	Description
PhysCh	Physical Channel Type (DPCH, FDPCH)
SF	Spreading Factor (4,8,16,32,64,128,256,512)
Slot	Slot Format for DPCH (0-16) (see 3GPP TS 25.211 V7.10.0 Table 11) Slot Format for FDPCH (0-9) (see 3GPP TS 25.211 V7.10.0 Table 16C)
EC/n0	Carrier to noise ratio in dB
RSCP	Received Signal Code Power in dBm
ComMod	Compressed Mode (0-1) (indicates valid transmission gap pattern)

Column	Description
HSUPA	HSUPA Status (a.k.a. E-DCH Status) indicated by xy: x = Cell Capability Indicator: 0 - HSUPA capability not indicated, 1 - HSUPA Capable Cell. Please consider that some providers/MNOs don't support this flag and that it is provided "for display indication only", see 3GPP TS 25.331 [35] (later than version 6.9.0) section 10.2.48.8.8. y = UE Call Status: 0 - HSUPA inactive, 1 - HSUPA active
HSDPA	HSDPA Status indicated by xy: x = Cell Capability Indicator: 0 - HSDPA capability not indicated, 1 - HSDPA Capable Cell. Please consider that some providers/MNOs don't support this flag and that it is provided "for display indication only", see 3GPP TS 25.331 [35] (later than version 6.8.0), section 10.2.48.8.8. y = UE Call Status: 0 - HSDPA inactive, 1 - HSDPA suspended, 2 - HSDPA active, 6 - HSDPA+ active

### 7.4.3 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. Only emergency calls are allowed. The MS enters this state, for example, when
  - no SIM card is inserted, or PIN has not been given,
  - neither Home PLMN nor any other allowed PLMN are found,
  - registration request was not answered or denied by the network (use command [AT+CREG](#) to query the registration status),
  - authentication failed.

## 7.5 AT^SNMON Network monitoring

The **AT^SNMON** command can be used to monitor various network information. Please note, that the write command only returns a line with the current parameter values, if **<mode>** is set to 2 (Query current values).

### Syntax

#### Test Command

AT^SNMON=?

#### Response(s)

^SNMON: "PDM", (list of supported **<mode>**s), (list of supported **<ta>**s), (list of supported **<nom>**s), (list of supported **<rac>**s), (list of supported **<dsac\_avail>**s), (list of supported **<dsac\_cs>**s), (list of supported **<dsac\_ps>**s), (list of supported **<tac\_avail>**s), (range of supported **<tac>**s)

OK

ERROR

+CME ERROR: **<err>**

#### Write Command

#### Packet Data Monitor

AT^SNMON="PDM", **<mode>**

#### Response(s)

[^SNMON: "PDM", **<mode>**, **<ta>**, **<nom>**, **<rac>**, **<dsac\_avail>**, **<dsac\_cs>**, **<dsac\_ps>**, **<tac\_avail>**, **<tac>**]

OK

ERROR

+CME ERROR: **<err>**

#### PIN Last

- -

#### Reference(s)

3GPP TS 45.008 [38]

### Parameter Description

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

This parameter determines the action to be taken for the monitoring command.

0 <sup>(P)</sup>	Disable ^SNMON URC
1	Enable ^SNMON URC (currently not supported)
2	Query current values

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

Timing Advance (TA)

-1 <sup>(P)</sup>	Information is not available
0...63	

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

Network Operation Mode (NOM)

-1 <sup>(P)</sup>	Information is not available
1	NOM1
2	NOM2
3	NOM3

<rac><sup>(num)</sup>

Routing Area Code (RAC)

-1	Information is not available
0...255	

<dsac\_avail><sup>(num)</sup>

Domain Specific Access Control (DSAC) availability

0	DSAC not available
1	DSAC available

<dsac\_cs><sup>(num)</sup>

Cell access status for CS domain

-1 <sup>(P)</sup>	Information is not available
1	Normal access
2	Emergency calls only
3	No calls allowed
4	All calls allowed

<dsac\_ps><sup>(num)</sup>

Cell access status for PS domain

-1 <sup>(P)</sup>	Information is not available
1	Normal access
2	Emergency calls only
3	No calls allowed
4	All calls allowed

<tac\_avail><sup>(num)</sup>

Tracking Area Code (TAC) availability

0	TAC not available
1	TAC available

<tac><sup>(num)</sup>

Tracking Area Code (TAC)

Hexadecimal encoded Tracking Area Code (see 3GPP 23.003 Section 19.4.2.3)

0000...FFFF

## 8. Supplementary Service Commands

The AT commands described in this chapter are related to Supplementary Services.

### 8.1 AT+CUSD Unstructured Supplementary Service Data

**AT+CUSD** allows to control the handling of Unstructured Supplementary Service Data (USSD) according to 3GPP TS 22.090 [28]. Both network and mobile initiated operations are supported. The interaction of this command with other AT commands based on other supplementary services is described in the related technical specifications.

Parameter `<ussdMode>` is used to control the presentation of "+CUSD" URCs to the TE, which will be caused by a USSD response from the network or by different network or **USAT** initiated operations. Therefore, it is recommended to always have "+CUSD" URCs enabled.

If parameter `<ussdReq>` is given, a mobile initiated USSD send request or a USSD response to a network or **USAT** initiated operation is sent to the network. A possible response USSD of the network is again presented by a subsequent "+CUSD" URC.

#### Syntax

Test Command	
AT+CUSD=?	
Response(s)	
+CUSD: (list of supported<ussdMode>s)	
OK	
Read Command	
AT+CUSD?	
Response(s)	
+CUSD: <ussdMode>	
OK	
Write Command	
AT+CUSD=<ussdMode>[, <ussdReq>[, <ussdDCS>]]	
Response(s)	
OK	
ERROR	
+CME ERROR: <err>	
PIN Last	Reference(s)
+ -	3GPP TS 27.007 [36], 3GPP TS 22.090 [28], 3GPP TS 24.090

#### Unsolicited Result Code

+CUSD: <ussdStatus>[, <ussdRsp>[, <ussdDCS>]]

"+CUSD" URC indicates a USSD response from the network, respectively caused by a network or **USAT** initiated operation.



## Parameter Description

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

0(&F)(P)	Disable "+CUSD" URC presentation.
1	Enable "+CUSD" URC presentation.
2	Cancel session (not applicable to read command response).

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

Unstructured Supplementary Service Data (USSD) to be sent to the network.  
If **<ussdReq>** parameter is not given, network is not interrogated. **AT+CUSD** write command only supports setting **<ussdDCS>=15**.

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

Unstructured Supplementary Service Data (USSD) received from the network.  
If **<ussdDCS>** indicates that 3GPP TS 23.038 [29] GSM 7 bit default alphabet is used, the UE converts GSM alphabet into current TE character set according to rules of 3GPP TS 27.005 , Annex A. See also Section 1.6, [Supported character sets](#). However, in case of invalid or omitted **<ussdDCS>**, conversion of **<ussdRsp>** is not possible.

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

3GPP TS 23.038 [29] Cell Broadcast Data Coding Scheme (default 15).  
In case of an incoming USSD with invalid or omitted data coding scheme information **<ussdDCS>** will not be presented.

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

0	No further user action required (network initiated USSD notification, or no further information needed after mobile initiated operation).
1	Further user action is required (network initiated USSD request, or further information is needed after mobile initiated operation). If <b>&lt;ussdStatus&gt;=1</b> the user input needs to be sent via an additional <b>AT+CUSD</b> action <b>&lt;ESC&gt;</b> .
2	USSD exchange is terminated by network.

## Notes

- It is recommended to finalize or escape a pending USSD user interaction before further actions are done to prevent blocking situations.
- If a network initiated operation is left unanswered, several error codes may be issued by the UE. The first error code is given when the AT command has timed out. Other network dependent indications may follow.

## 9. 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.

### 9.1 AT+CGACT PDP Context Activate or Deactivate

The [AT+CGACT](#) write command is used to activate or deactivate the specified PDP context(s). After the command has completed, the MT remains in V.250 command state. If any PDP context is already in the requested state, the state for that context remains unchanged. If the MT is not PS attached when the activation form of the command is executed, the MT first 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.

The [AT+CGACT](#) read command returns the current activation states for all the defined PDP contexts.

The [AT+CGACT](#) test command is used for requesting information on the supported PDP context activation states.

#### Syntax

##### Test Command

```
AT+CGACT=?
Response(s)
+CGACT: (list of supported <state>s)
OK
ERROR
+CME ERROR: <err>
```

##### Read Command

```
AT+CGACT?
Response(s)
+CGACT: [<cid>, <state>]
[+CGACT: <cid>, <state>]
...
OK
ERROR
+CME ERROR: <err>
```

##### Write Command

```
AT+CGACT=<state>[, <cid>[, <cid>]]
Response(s)
OK
ERROR
+CME ERROR: <err>
```

##### PIN Last

```
+ -
```

##### Reference(s)

3GPP TS 27.007 [36]

---

### Parameter Description

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

Indicates the state of PDP context activation.

0	Deactivated
1	Activated

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

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

### Notes

- A maximum of 3 contexts can be activated at the same time, no matter on which interface. 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.

## 9.2 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 <a href="#">&lt;state&gt;s</a> )	
OK	
Read Command	
AT+CGATT?	
Response(s)	
+CGATT: <a href="#">&lt;state&gt;</a>	
OK	
Write Command	
AT+CGATT=[ <a href="#">&lt;state&gt;</a> ]	
Response(s)	
OK	
ERROR	
+CME ERROR: <a href="#">&lt;err&gt;</a>	
PIN Last	Reference(s)
+ -	3GPP TS 27.007 <a href="#">[36]</a>

### Parameter Description

<a href="#">&lt;state&gt;</a> <sup>(num)</sup>	
Indicates the state of PS attachment.	
0 <sup>(P)</sup>	Detached
[1]	Attached

## 9.3 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.

It is not allowed to change the definition of 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)

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 27.007

### 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)

<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. 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. IP V4 address for PDP type IP). If the value is null or omitted, then a value may be provided by the TE during the PDP startup procedure or, failing that, a dynamic address will be requested. The read command will continue to return the null string even if an address has been allocated during the PDP startup procedure.

<d\_comp><sup>(num)(NV)</sup>

#### Data Compression

Controls the PDP data compression (applicable for Subnetwork Dependent Convergence Protocol (SNDTCP) only) 3GPP TS 44.065

[0]	off
-----	-----

<h\_comp><sup>(num)(NV)</sup>

#### Header Compression

Controls the PDP header compression 3GPP TS 44.065, 3GPP TS 25.323

[0]	off
1	on
2	RFC1144
3	RFC2507
4	RFC3095

## 9.4 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 GSM or UMTS changes, or URC "+CGREG: <stat>[, <lac>][, <ci>][, <AcT>]" when <n>=2 and the current network cell in GSM or UMTS changes.

**AT+CGREG** read command queries the current URC presentation status <n> and an integer <stat> which shows whether the network has currently indicated the registration of the ME.

Location information elements <lac>, <ci> and <AcT> are sent only if available, if <n>=2 and if ME is registered to the network.

### Syntax

Test Command	
AT+CGREG=?	
Response(s)	
+CGREG: (list of supported <n>s)	
OK	
Read Command	
AT+CGREG?	
Response(s)	
+CGREG: <n>, <stat>[, <lac>][, <ci>][, <AcT>]	
OK	
Write Command	
AT+CGREG=<n>	
Response(s)	
OK	
ERROR	
+CME ERROR: <err>	
PIN Last	Reference(s)
+ -	3GPP 27.007

### Unsolicited Result Codes

URC 1

+CGREG: <stat>

Indicates a change in the ME's Packet Domain network registration status.

URC 2

+CGREG: <stat>[, <lac>][, <ci>][, <AcT>]

Indicates a change in the ME's Packet Domain network registration status or a change of the network cell including location information.

### 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>]"

<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>

Two byte cell ID in hexadecimal format.

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

Radio access technology

0	GSM
2	UTRAN
3	GSM w/EGPRS
4	UTRAN w/HSDPA
5	UTRAN w/HSUPA
6	UTRAN w/HSDPA and w/HSUPA
7	E-UTRAN (not applicable)



## 9.5 AT+CEREG EPS Network Registration Status

**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>][, <rac>][, <ci>][, <AcT>]" when <n>=2 and the current network cell in LTE changes.

**AT+CEREG** execute command restores default value "0" for parameter <n>.

**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>, <rac> and <ci> are returned only if <n>=2 and ME is registered to the network.

### Syntax

#### Test Command

AT+CEREG=?

Response(s)

+CEREG: (list of supported <n>s)

OK

#### Read Command

AT+CEREG?

Response(s)

+CEREG: <n>, <stat>[, <tac>][, <rac>][, <ci>][, <AcT>]

OK

#### Exec Command

AT+CEREG

Response(s)

OK

#### Write Command

AT+CEREG=<n>

Response(s)

OK

ERROR

+CME ERROR: <err>

PIN Last

+ -

Reference(s)

3GPP TS 27.007 [36]

### Unsolicited Result Codes

URC 1

+CEREG: <stat>

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

URC 2

+CEREG: <stat>[, <tac>][, <rac>][, <ci>][, <AcT>]

Indicates a change in the UE's EPS network registration status or a change of the network cell including location information.

### 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>][, <rac>][, <ci>][, <AcT>]"

<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)

<rac><sup>(str)</sup>

One-byte routing area code in hexadecimal format

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

Four byte LTE cell ID in hexadecimal format.

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

Radio access technology

- |   |                                            |
|---|--------------------------------------------|
| 0 | GSM (not applicable)                       |
| 2 | UTRAN (not applicable)                     |
| 3 | GSM w/EGPRS (not applicable)               |
| 4 | UTRAN w/HSDPA (not applicable)             |
| 5 | UTRAN w/HSUPA (not applicable)             |
| 6 | UTRAN w/HSDPA and w/HSUPA (not applicable) |
| 7 | E-UTRAN                                    |

## 9.6 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.

### Syntax

#### Test Command

AT+CGCONTRDP=?

#### Response(s)

+CGCONTRDP: (list of supported `<cid>`s) associated with active contexts

OK

#### Exec Command

AT+CGCONTRDP

#### Response(s)

+CGCONTRDP: `<cid>`, `<Bearer_ID>`, `<APN>`[, `<LocalAddr and SubNetMask>`], `<GwAddr>`[,  
`<DNS_prim_addr>`], `<DNS_sec_addr>`], `<P_CSCF_prim_addr>`], `<P_CSCF_sec_addr>`],  
`<IM_CN_Signalling_Flag>`], `<LipaIndication>`]]]]]]]]

+CGCONTRDP: `<cid>`, `<Bearer_ID>`, `<APN>`[, `<LocalAddr and SubNetMask>`], `<GwAddr>`[,  
`<DNS_prim_addr>`], `<DNS_sec_addr>`], `<P_CSCF_prim_addr>`], `<P_CSCF_sec_addr>`],  
`<IM_CN_Signalling_Flag>`], `<LipaIndication>`]]]]]]]]

[+CGCONTRDP: ...]

OK

ERROR

+CME ERROR: `<err>`

#### Write Command

AT+CGCONTRDP=`<cid>`

#### Response(s)

+CGCONTRDP: `<cid>`, `<Bearer_ID>`, `<APN>`[, `<LocalAddr and SubNetMask>`], `<GwAddr>`[,  
`<DNS_prim_addr>`], `<DNS_sec_addr>`], `<P_CSCF_prim_addr>`], `<P_CSCF_sec_addr>`],  
`<IM_CN_Signalling_Flag>`], `<LipaIndication>`]]]]]]]]

OK

ERROR

+CME ERROR: `<err>`

#### PIN Last

+ -

#### Reference(s)

3GPP TS 27.007 [36]

### Parameter Description

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

Specifies a particular non-secondary PDP context definition. The parameter is local to the TE-MT interface and is used in other PDP context-related commands. See [AT+CGDCONT](#).

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

Identifies the bearer, EPS Bearer in EPS and NSAPI in UMTS/GPRS.

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

Access Point Name

Logical name used to select the GGSN or the external packet data network.

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

Shows the IP address and subnet mask of the UE. The string is given as dot-separated numeric (0-255) parameters on the form:

"a1.a2.a3.a4.m1.m2.m3.m4" for IPv4 or

"a1.a2.a3.a4.a5.a6.a7.a8.a9.a10.a11.a12.a13.a14.a15.a16.m1.m2.m3.m4.m5.m6.m7.m8.m9.m10.m11.m12.m13.m14.m15.m16" for IPv6.

0.0.0.0.0.0.0.0...255.255.255.255.255.255.255.255

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

Shows the Gateway Address of the UE. The string is given as dot-separated numeric (0-255) parameters.

0.0.0.0.0.0.0.0...255.255.255.255.255.255.255.255

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

Shows the IP address of the primary DNS server.

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

Shows the IP address of the secondary DNS server.

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

Shows the IP address of the primary P-CSCF server.

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

Shows the IP address of the secondary P-CSCF server.

<IM\_CN\_Signalling\_Flag><sup>(num)</sup>

Shows whether the PDP context is for IM CN subsystem-related signalling only or not.

<LipaIndication><sup>(num)</sup>

Indicates that the PDP context provides connectivity using a LIPA PDN connection. This parameter cannot be set by the TE.

0	Indication not received that the PDP context provides connectivity using a LIPA PDN connection.
1	Indication received that the PDP context provides connectivity using a LIPA PDN connection.

## 9.7 AT+CGEQOS Define EPS Quality of Service

The write command allows the UE to specify the EPS Quality of Service parameters for a PDP context or Traffic Flows. When in UMTS/GPRS the MT applies a mapping function to UMTS/GPRS Quality of Service. A special form of the write command, [AT+CGEQOS=<cid>](#), causes the values for context number [<cid>](#) to become undefined.

### Syntax

Test Command	
AT+CGEQOS=?	
Response(s)	
+CGEQOS: (range of supported <a href="#">&lt;cid&gt;s</a> ), (list of supported <a href="#">&lt;QCI&gt;s</a> ), (list of supported <a href="#">&lt;DL_GBR&gt;s</a> ), (list of supported <a href="#">&lt;UL_GBR&gt;s</a> ), (list of supported <a href="#">&lt;DL_MBR&gt;s</a> ), (list of supported <a href="#">&lt;UL_MBR&gt;s</a> )	
OK	
Read Command	
AT+CGEQOS?	
Response(s)	
[+CGEQOS: <a href="#">&lt;cid&gt;</a> , <a href="#">&lt;QCI&gt;</a> , [ <a href="#">&lt;DL_GBR&gt;</a> , <a href="#">&lt;UL_GBR&gt;</a> ], [ <a href="#">&lt;DL_MBR&gt;</a> , <a href="#">&lt;UL_MBR&gt;</a> ]]	
[+CGEQOS: ...]	
OK	
Write Command	
AT+CGEQOS=[ <a href="#">&lt;cid&gt;</a> [, <a href="#">&lt;QCI&gt;</a> [, <a href="#">&lt;DL_GBR&gt;</a> , <a href="#">&lt;UL_GBR&gt;</a> [, <a href="#">&lt;DL_MBR&gt;</a> , <a href="#">&lt;UL_MBR&gt;</a> ]]]]	
Response(s)	
OK	
ERROR	
+CME ERROR: <a href="#">&lt;err&gt;</a>	
PIN Last	Reference(s)
+ -	3GPP TS 27.007 <a href="#">[36]</a>

### Parameter Description

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

Specifies a particular EPS Traffic Flows definition in EPS and a PDP Context definition in UMTS/GPRS (see [AT+CGDCONT](#)).

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

Specifies a class of EPS QoS.

0	QCI is selected by network
1...4	Value range for guaranteed bit rate Traffic Flows
5...9	Value range for non-guaranteed bit rate Traffic Flows
128...254	Value range for for Operator-specific QCIs

[<DL\\_GBR>](#)<sup>(num)</sup>

Indicates DL GBR in case of GBR QCI. The value is in kbit/s. This parameter is omitted for a non-GBR QCI.

[<UL\\_GBR>](#)<sup>(num)</sup>

Indicates UL GBR in case of GBR QCI. The value is in kbit/s. This parameter is omitted for a non-GBR QCI.

<DL\_MBR><sup>(num)</sup>

Indicates DL MBR in case of GBR QCI. The value is in kbit/s. This parameter is omitted for a non-GBR QCI.

<UL\_MBR><sup>(num)</sup>

Indicates UL MBR in case of GBR QCI. The value is in kbit/s. This parameter is omitted for a non-GBR QCI.

## 9.8 AT+CGEQOSRDP EPS Quality of Service Read Dynamic Parameters

The write command returns Quality of Service parameters of the active PDP context associated to the provided context identifier `<cid>`.

If the parameter `<cid>` is omitted, the Quality of Service parameters for all non-secondary active PDP contexts are returned.

The test command returns a list of `<cid>`s associated with active PDP contexts. Parameters of both network and MT/TA initiated PDP contexts will be returned.

### Syntax

#### Test Command

AT+CGEQOSRDP=?

#### Response(s)

+CGEQOSRDP: (list of `<cid>`s associated with active contexts)  
OK

#### Write Command

AT+CGEQOSRDP=[`<cid>`]

#### Response(s)

[+CGEQOSRDP: `<cid>`, `<QCI>`, [`<DL_GBR>`, `<UL_GBR>`], [`<DL_MBR>`, `<UL_MBR>`][, `<DL_AMBR>`, `<UL_AMBR>`]]  
[+CGEQOSRDP: ...]  
OK  
ERROR  
+CME ERROR: `<err>`

#### PIN Last

+ -

#### Reference(s)

3GPP TS 27.007 [36]

### Parameter Description

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

Specifies a particular EPS Traffic Flows definition in EPS and a PDP Context definition in UMTS/GPRS (see [AT+CGDCONT](#)).

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

Specifies a class of EPS QoS.

0	QCI is selected by network
1...4	Value range for guaranteed bit rate Traffic Flows
5...9	Value range for non-guaranteed bit rate Traffic Flows
128...254	Value range for for Operator-specific QCIs

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

Indicates DL GBR in case of GBR QCI. The value is in kbit/s. This parameter is omitted for a non-GBR QCI.

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

Indicates UL GBR in case of GBR QCI. The value is in kbit/s. This parameter is omitted for a non-GBR QCI.

---

<DL\_MBR><sup>(num)</sup>

Indicates DL MBR in case of GBR QCI. The value is in kbit/s. This parameter is omitted for a non-GBR QCI.

<UL\_MBR><sup>(num)</sup>

Indicates UL MBR in case of GBR QCI. The value is in kbit/s. This parameter is omitted for a non-GBR QCI.

<DL\_AMBR><sup>(num)</sup>

Indicates DL APN aggregate MBR. The value is in kbit/s.

<UL\_AMBR><sup>(num)</sup>

Indicates UL APN aggregate MBR. The value is in kbit/s.

### **Note**

- If multiple lines in a response belong to the same PDN connection they contain the same <DL\_AMBR> <UL\_AMBR> values.



## 9.9 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 type PAP and CHAP.

Maximum length: 127 characters.

## 9.10 AT^SWWAN PDP Context Activate or Deactivate

The [AT^SWWAN](#) write command is used to activate or deactivate a WWAN connection for a previously defined PDP context.

The [AT^SWWAN](#) read command shows whether a WWAN connection is active and which PDP context is used for it. If no WWAN connection is active, then the read command just returns OK.

### Syntax

#### Test Command

```
AT^SWWAN=?  
Response(s)  
^SWWAN: (list of supported <state>s), (list of supported <cid>s)  
OK  
ERROR  
+CME ERROR: <err>
```

#### Read Command

```
AT^SWWAN?  
Response(s)  
[^SWWAN: <cid>, <state>]  
OK  
ERROR  
+CME ERROR: <err>
```

#### Write Command

```
AT^SWWAN=<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>).

### Notes

- Contexts already activated by other commands as for example [AT+CGACT](#), can not be reused for WWAN, except in LTE mode where the always activated default context 1 can be used to start a WWAN connection.
- If activation or deactivation of a WWAN connection fails, then [AT+CEER](#) may provide further informations about the reason.

## 10. USIM related Commands

AT commands described in this chapter are related to the Universal Subscriber Identity Module (USIM) connected to the PLS8-E.

### 10.1 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. PLS8-E handles internally all required USIM interface locking and file selection routines.

As response to the command, the PLS8-E 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.

#### 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 [36], 3GPP TS 11.11 [11], 3GPP TS 31.101 [12], 3GPP TS 31.102 [13] ETSI TS 102 221 [14]

#### Parameter Description

<command> <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 PLS8-E to the USIM.

0...255

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

Parameter to be passed on by the PLS8-E to the USIM.

0...255

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

Parameter to be passed on by the PLS8-E 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.

## 10.2 AT^SCKS Query USIM and Chip Card Holder Status

[AT^SCKS](#) write command enables or disables the presentation of URCs to report the connection status of the USIM.

[AT^SCKS](#) read command returns the URC presentation mode and the status of the USIM connection. Also refer to [AT^SIND](#), which supplies indicator "simstatus" to monitor the USIM status.

### Syntax

#### Test Command

AT^SCKS=?

#### Response(s)

^SCKS: (list of supported <mode>s)  
OK

#### Read Command

AT^SCKS?

#### Response(s)

^SCKS: <mode>, <SimStatus>  
OK  
ERROR  
+CME ERROR: <err>

#### Write Command

AT^SCKS=<mode>

#### Response(s)

OK  
ERROR  
+CME ERROR: <err>

#### PIN Last

- -

### Unsolicited Result Code

^SCKS: <SimStatus>

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

### Parameter Description

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

0(&F)(P)	Disable URC " <a href="#">^SCKS</a> ".
1	Enable URC " <a href="#">^SCKS</a> ".

<SimStatus><sup>(num)</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 "<a href="#">AT+CFUN</a>= n,1".</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.

## 10.3 AT^SSET USIM Data Ready Indication

After power-up and personalization (PIN entry if required) PLS8-E 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 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 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)</sup>

URC presentation mode

0(&F)

Disable "**^SSIM READY**" URC.

1

Enable "**^SSIM READY**" URC.



## 10.4 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 [\[11\]](#), 3GPP TS 31.101 [\[12\]](#), 3GPP TS 31.102 [\[13\]](#).

### 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>(str)</sup>

USIM identification number.

## 11. Phonebook Commands

The AT commands described in this chapter allow the external application to access the phonebooks located in the PLS8-E's memory or on the attached Subscriber Identity Module (SIM).

### 11.1 AT+CPBS Select phonebook memory storage

**AT+CPBS** selects the active phonebook storage, i.e. the phonebook storage that all subsequent phonebook commands will be operating on.

The read command returns the currently selected **<storage>**, the number of **<used>** entries and the **<total>** number of entries available for this storage.

The test command returns all supported **<storage>**s as compound value.

As PLS8-E does not support voice calls no entries will be stored in "MC", "RC", "LD" phonebooks. Also no numbers will be stored to the "DC" phonebook.

#### Syntax

##### Test Command

AT+CPBS=?

Response(s)

+CPBS: (list of supported **<storage>**s)

OK

ERROR

+CME ERROR: **<err>**

##### Read Command

AT+CPBS?

Response(s)

+CPBS: **<storage>**, **<used>**, **<total>**

OK

ERROR

+CME ERROR: **<err>**

##### Exec Command

All records of the "MC", "RC", "DC" and "LD" phonebooks will be deleted.

AT+CPBS

Response(s)

OK

ERROR

+CME ERROR: **<err>**

##### Write Command

AT+CPBS=**<storage>**

Response(s)

OK

ERROR

+CME ERROR: **<err>**

#### Write Command

For write access to FD phonebook

AT+CPBS=<storage>, <pin>

#### Response(s)

OK

ERROR

+CME ERROR: <err>

PIN Last

+ -

Reference(s)

3GPP TS 27.007 [36]

### Parameter Description

<storage><sup>(str)</sup>

"SM"	USIM phonebook Capacity: depending on USIM Location: USIM
"DC"	Dialed calls list Capacity: max. 10 entries Location: ME
"FD"	Fixed dialing phonebook Capacity: depending on USIM Location: USIM
"LD"	Last number dialed phonebook.
"MC"	Missed (unanswered received) voice calls list
"ME" <sup>((&amp;F)(P))</sup>	Mobile equipment phonebook Capacity: max. 100 entries Location: ME
"RC"	Received voice calls list
"EN"	Emergency number Capacity: depending on USIM or ME Location: USIM or ME
"ON"	MSISDN list Capacity: depending on USIM Location: USIM

<used><sup>(num)</sup>

Value indicating the number of used locations in selected memory storage.

<total><sup>(num)</sup>

Value indicating the maximum number of locations allowed in the selected memory storage.

---

### Notes

- Users should be aware that when using this AT command quickly after USIM PIN authentication the USIM data may not yet be accessible, resulting in a short delay before the requested AT command response is returned.
- To get write access to the "FD" phonebook the following input is required: `AT+CPBS="FD","PIN2"`
- When using "EN" phonebook the numbers 911 and 112 must always be output by using `AT+CPBR` write command.
- "LD" phonebook is only supported when corresponding Elementary File is available on USIM. Elementary Files belonging to "LD" phonebook are optional on USIM.

## 11.2 AT+CPBR Read from phonebook

[AT+CPBR](#) serves to read one or more entries from the phonebook selected with AT command [AT+CPBS](#).

The [AT+CPBR](#) test command returns the location range supported by the current phonebook storage, the maximum length of [<number>](#) field and the maximum length of [<text>](#) field.

Note: Length information may not be available while SIM storage is selected. If storage does not offer format information, the format list contains empty parentheses.

The [AT+CPBR](#) write command determines the phonebook entry to be displayed with [<location1>](#) or a location range from [<location1>](#) to [<location2>](#). Hence, if no [<location2>](#) is given only the entry at [<location1>](#) will be displayed.

If no entries are found at the selected location "+CME ERROR: not found" will be returned.

### Syntax

#### Test Command

AT+CPBR=?

#### Response(s)

```
+CPBR: (1-<maxloc>), <nlength>, <tlength>
OK
ERROR
+CME ERROR: <err>
```

#### Write Command

AT+CPBR=<location1>[, <location2>]

#### Response(s)

```
[+CPBR: <location1>, <number>, <type>, <text>]
[+CPBR: <location2>, <number>, <type>, <text>]
OK
ERROR
+CME ERROR: <err>
```

#### PIN Last

+ -

#### Reference(s)

3GPP TS 27.007 [36],  
3GPP TS 24.008 [31],  
3GPP TS 11.11 [11], 3GPP TS  
31.101 [12], 3GPP TS 31.102 [13]

### Parameter Description

[<location1>](#)<sup>(num)</sup>

The first (lowest) location number within phonebook memory where to start reading. The maximum range supported by the current phonebook is given in the test command response.

If [<location1>](#) exceeds the upper bound [<maxloc>](#) (as indicated by the test command), command will respond with "+CME ERROR: invalid index".

[<location2>](#)<sup>(num)</sup>

The last (highest) location number within phonebook memory where to stop reading. The maximum range supported by the current phonebook is given in the test command response.

If both [<location1>](#) and [<location2>](#) are in the range indicated by the test command parameter [<maxloc>](#), the list of entries will be output and terminated with "OK". If [<location2>](#) exceeds the range indicated by the test command parameter [<maxloc>](#), the command returns only "+CME ERROR: invalid index".

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

Phone number in format specified by `<type>`, it may be an empty string.

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

Type of address octet, which defines the used type of number (ton) and the numbering plan identification (npi). Possible values are:

128	Restricted <code>&lt;number&gt;</code> includes unknown type and format.
145	Dialing string <code>&lt;number&gt;</code> includes international access code character '+'. National number <code>&lt;number&gt;</code> . Network support of this type is optional.
161	Dialing string <code>&lt;number&gt;</code> has been saved as ASCII string and includes non-digit characters other than "*", "#" or "+". Note that phonebook entries saved with this type cannot be dialed.
209	Dialing string <code>&lt;number&gt;</code> contains "*", "#" characters for Supplementary Service codes. Network support of this type is optional.
255	Otherwise.
129	

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

Text assigned to a phone number. The maximum length for this parameter is given with test command response parameter `<tlength>`.

If using an ASCII terminal characters which are coded differently in ASCII and GSM have to be entered via escape sequences as described in Section 1.6, [Supported character sets](#).

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

Maximum location number for the currently selected storage. For phonebooks located on SIM, this value varies depending on the SIM card. See [AT+CPBS](#) for typical values.

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

Maximum length of phone number for "normal" locations. Depending on the storage a limited number of locations with extended memory is available per phonebook. These locations allow storing numbers with twice the standard length, which is 2\*`<nlength>` digits for normal numbers, but only `<nlength>` digits for numbers saved with `<type>`=209.

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

Maximum length of `<text>` assigned to the telephone number. The value indicated by the test command is given in octets. If the `<text>` string is given in GSM characters, each character corresponds to one octet. If the `<text>` string is given in UCS2, the maximum number of characters depends on the coding scheme used for the alpha field of the SIM. In the worst case the number of UCS2 characters is at least one less than half the number of GSM characters. If the `<text>` string is given in IRA characters, each character corresponds to one octet. In some cases, e.g. escape sequence, it is not possible to store the full `<tlength>` on SIM.

For a detailed description please refer to 3GPP TS 11.11 [11], 3GPP TS 31.101 [12], 3GPP TS 31.102 [13], Annex B.

### Notes

- Users should be aware that when using this AT command quickly after SIM PIN authentication the SIM data may not yet be accessible, resulting in a short delay before the requested AT command response is returned.
- When a supplementary service command was stored to the phonebook along with a "+" within the phone number please note that the UE will not display the "+" after restart, but correctly handles the phone number as international type.
- When emergency number ("EN") phonebook is selected by [AT+CPBS](#) write command the numbers 911 and 112 must always be output by using [AT+CPBR](#) write command.
- There is no restriction reading unsupported values for [<type>](#).

### Example

```
AT+CPBR=?
```

```
+CPBR: (1-100),20,17
```

```
AT+CPBR=1,3
```

```
+CPBR: 1,"+999999",145,"Charlie"
```

```
+CPBR: 2,"+777777",145,"Bill"
```

```
+CPBR: 3,"+888888",145,"Arthur"
```

First run the [AT+CPBR](#) test command to find out the maximum range of entries stored in the active phonebook.

PLS8-E returns the supported values, where 100 is the supported range of location numbers, 20 is the length of the phone number and 17 is the maximum length of the associated text.

Then use the [AT+CPBR](#) write command to display the phonebook entries sorted by location numbers.

## 12. Hardware related Commands

All AT commands described in this chapter are related to the hardware interface of the PLS8-E. Further information regarding this interface is available in the "PLS8-E Hardware Interface Description" [2].

### 12.1 AT+CCLK Real Time Clock

[AT+CCLK](#) controls the real time clock (RTC) of PLS8-E.

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.

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.

If the clock is set into the past, then it is recommended to reset the UE using [AT+CFUN](#) to avoid blocked calls because of the autocal restriction.

#### 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 [36]

#### 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 base of the year part is 2000. For example the 6th of July 2011 at ten past ten in the evening equates to "11/07/06,22:10:00".

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.



## 12.2 AT^SBV Battery/Supply Voltage

[AT^SBV](#) allows to monitor the supply (or battery) voltage of the module. The voltage is continuously measured at intervals depending on the operating mode of the RF interface. The duration of a measurement period ranges from 0.5s in TALK / DATA mode up to 50s when PLS8-E is in IDLE mode or Limited Service (deregistered). The displayed value is averaged over the last measuring period before the [AT^SBV](#) command was executed.

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 [\[2\]](#).

### Syntax

Test Command

AT^SBV=?

Response(s)

OK

ERROR

+CME ERROR: [<err>](#)

Exec Command

AT^SBV

Response(s)

^SBV: [<value>](#)

OK

ERROR

+CME ERROR: [<err>](#)

PIN Last

- -

### Parameter Description

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

Supply (or battery) voltage in mV

## 12.3 AT^SCTM Critical Operating Temperature Monitoring

AT^SCTM allows to monitor the operating temperature range of the PLS8-E device. Refer to "PLS8-E Hardware Interface Description" [2] for specifications on critical temperature ranges.

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:* Even if setting is <UrcMode>=0 URC presentation is enabled for a period of 15 seconds after PLS8-E was switched on. After expiry URC presentation will be disabled, i.e. no URCs will be generated.

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 PLS8-E will instantly switch off.

URCs indicating alert levels "1" or "-1" are intended to enable the user to take appropriate precautions, such as protect PLS8-E 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 PLS8-E device.
- The board temperature (in degree Celsius) if parameter <tempCtrl>=1.

### Syntax

#### Test Command

AT^SCTM=?

Response(s)

^SCTM: (list of supported <UrcMode>s)[, (range of <temp>in Celsius)]  
OK

#### Read Command

AT^SCTM?

Response(s)

^SCTM: <UrcMode>, <UrcCause>[, <temp>]  
OK  
ERROR  
+CME ERROR: <err>

#### Write Command

AT^SCTM=<UrcMode>[, <tempCtrl>]

Response(s)

OK  
ERROR  
+CME ERROR: <err>

PIN Last

- -

### Unsolicited Result Code

URCs will be automatically sent to the TE when the temperature reaches or exceeds the critical level, or when it is back to normal.

^SCTM\_B: <UrcCause>

URC for PLS8-E 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 <sup>(P)</sup>	Disable URC presentation (except for <UrcCause> equal to -2 or +2).
1	Enable URC presentation.

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

-2	Below lowest temperature limit (URC is instantly followed by orderly shut-down).
-1	Below low temperature alert limit.
0	Normal operating temperature.
1	Above upper temperature alert limit.
2	Above uppermost temperature limit (URC is instantly followed by orderly shut-down).

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

0(&F)(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

URCs issued when the temperature is back to normal (URC is output once):

^SCTM_B: 0	Module back to normal temperature.
------------	------------------------------------

## 12.4 AT^SRADC Configure and Read ADC Measurement

The [AT^SRADC](#) command controls the module's Analog-to-Digital Converter (ADC). The ADC can be used to measure the voltage of external devices connected to the ADC inputs. The [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 the measurement interval.

Note that the PLS8-E Module uses an unbalanced input with two pins. This requires different pin names as listed below (see also [\[2\]](#)):

- First ADC channel of PLS8-E Module: ADC1\_IN.
- Second ADC channel of PLS8-E Module: ADC2\_IN.

### 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 (incl. 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

- -

Reference(s)

CINTERION

### 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>]]]]]]]]]

## Parameter Description

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

ADC channel

0	First ADC channel (ADC1_IN)
1	Second ADC channel (ADC2_IN)
2	Not supported for PLS8-E. Do not use this value.

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

Operation

Open or close ADC channel for measurement.

If parameter is not specified, then single measurement mode is initiated (incl. open and close of channel). Single measurement is not allowed if the channel is already open.

[0]	Close ADC channel (value of parameter <b>&lt;it&gt;</b> is ignored).
1	Open ADC channel

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

Measurement interval

Parameter is used only if operation **<op>** is 1 (Open).

[0]	Single measurement mode (incl. close of channel)
100...30,000	Measurement interval in ms for periodic measurement mode.

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.

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.

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

Measurement value

Measurement value in mV

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

1...11	Number of measured samples In single measurement mode: <b>&lt;count&gt;</b> is always 1. In periodic measurement mode: <b>&lt;count&gt;</b> is the number of <b>&lt;value&gt;</b> s indicated by the URC " <b>^SRADC</b> ". The higher the sample rate set with <b>&lt;it&gt;</b> , the more measured values are reported within the URC " <b>^SRADC</b> ".
--------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

## 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
^SRADC: 0,1,76
^SRADC: 0,1,78
^SRADC: 0,1,76

^SRADC: 0,1,76
AT^SRADC=0,0
OK
```

Start periodic measurement mode on the first ADC channel. Samples are taken every 5s. Every 5s the URC "[^SRADC](#)" appears to report the measured voltages. The second parameter represents the number of measured samples, in this case only one.

Stop the periodic measurement

#### EXAMPLE 3

Periodic measurement at high sample rate (250ms):

```
AT^SRADC=0,1,250
^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
OK
```

Start periodic measurement on the first ADC channel. Samples are taken every 250ms. Every second a URC "[^SRADC](#)" appears to report the measured voltage. The number of samples is 4 or 5.

Stop the periodic measurement

#### EXAMPLE 4

Handling of "[^SRADC](#)" URCs and AT command execution on the same interface:

```
AT^SRADC=0,1,250
^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?

^SRADC: 0,1,250
^SRADC: 1,0,0
OK
^SRADC:
0,11,75,75,75,75,75,75,75,75,75,75,75
^SRADC: 0,8,75,75,75,75,75,75,75,77
^SRADC: 0,1,75
^SRADC: 0,4,76,76,75,76
^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?

^SRADC: 0,1,250
^SRADC: 1,0,0
OK
^SRADC:
0,11,75,75,75,75,75,75,75,75,75,75
^SRADC:
0,11,73,74,73,74,73,73,73,74,74,73,73
^SRADC: 0,11,74,73,74,73,73,73,73,73,73,73,73
^SRADC: 0,11,73,73,74,74,73,73,74,73,73,74,74
^SRADC: 0,11,73,73,73,73,73,73,73,74,74,73,73
^SRADC: 0,8,73,73,74,73,73,73,73,32767
^SRADC: 0,4,74,74,73,73
```

Start periodic measurement mode on the first ADC channel. Samples are taken every 250ms.

Input of AT command and <CR> takes some seconds.

some URCs were buffered during command input and sent after completion.

More URCs are delivered.

Input of AT command and <CR> takes 90s.

some URCs were buffered during command input and sent after completion

The URC indicates lost measurement results.  
More URCs are delivered.

```
^SRADC: 0,4,75,75,75,75  
.....
```

## 13. General Purpose I/O (GPIO) Pin related Commands

This chapter describes the AT commands used to access and configure the GPIO pins of PLS8-E.

Please also refer to [2] for electrical specifications of the GPIO pins.

### 13.1 AT^SPIO GPIO Driver Open/Close

**AT^SPIO** write command opens and closes the General Purpose I/O (GPIO) driver. The command must be executed before any GPIO related command can be used.

The command does not reserve any GPIO lines, only the driver required for their management will be started.

#### Syntax

Test Command

AT^SPIO=?

Response(s)

^SPIO: (list of supported <mode>s)

OK

Write Command

AT^SPIO=<mode>

Response(s)

OK

ERROR

+CME ERROR: <err>

PIN Last

- -

#### Parameter Description

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

0	Close General purpose I/O driver
1	Open General purpose I/O driver



## 13.2 AT^SCPIN Pin Configuration

The **AT^SCPIN** write command serves to add (or remove) and configure pins.

### Syntax

Test Command

AT^SCPIN=?

Response(s)

^SCPIN: (list of supported <mode>s), (list of supported <pin\_id>s), (list of supported <direction>s), (list of supported <startValue>s)

OK

Write Command

AT^SCPIN=<mode>, <pin\_id>, <direction>[, <startValue>]

Response(s)

OK

ERROR

+CME ERROR: <err>

PIN Last

- -

### Parameter Description

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

0	Close pin
1	Open pin

<pin\_id><sup>(num)</sup>

Pin identifier

0	GPIO1
1	GPIO2
2	GPIO3
3	GPIO4
4	GPIO5
5	GPIO6
6	GPIO7
7	GPIO8
8	GPIO9
9	GPIO10

<direction><sup>(num)</sup>

Parameter <direction> is mandatory when opening a pin, but can be omitted when closing a pin

0	Input
1	Output

---

`<startValue>(num)`

Can be set only for outputs.

[0]	Low
1	High

### Notes

- For closing a pin with the write command (`<mode>=0`), the parameter `<direction>` is not needed.
- Before changing the configuration of a pin be sure to close the pin.

## 13.3 AT^SCPOL GPIO Level Polling Configuration

[AT^SCPOL](#) serves to control automatic level polling and reporting for PLS8-E's general purpose I/O pins. The I/O pin needs already to be configured via [AT^SCPIN](#). Level polling is only applicable to input pins. After polling has been activated for a specified pin, its latest level state transition will be reported via "[^SCPOL](#)" URC.

Pin monitoring is interrupt handled. If a state transition is detected at a configured pin, a debouncing routine will start. The signal state has to stay stable for at least 50 ms for proper detection of a state change.

### Syntax

Test Command

```
AT^SCPOL=?
```

Response(s)

```
^SCPOL: (list of supported <mode>s), (list of supported <ioId>s)  
OK
```

Write Command

```
AT^SCPOL=<mode>, <ioId>
```

Response(s)

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

PIN Last

```
- -
```

### Unsolicited Result Code

```
^SCPOL: <ioId>, <value>
```

### Parameter Description

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

0 <sup>(P)</sup>	Disable level polling for a general purpose I/O pin.
1	Enable level polling for a general purpose I/O pin.

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

This can be either an already configured or an already opened [<pin\\_id>](#).

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

Level state transition detected on [<ioId>](#):

0	<a href="#">&lt;pin_id&gt;</a> is in low state.
1	<a href="#">&lt;pin_id&gt;</a> is in high state.

## 13.4 AT^SGIO Get IO state of a specified pin

### Syntax

Test Command

```
AT^SGIO=?
```

Response(s)

```
^SGIO:(list of supported <io_id>s)  
OK
```

Write Command

```
AT^SGIO=<io_id>
```

Response(s)

```
^SGIO: <value>  
OK  
ERROR  
+CME ERROR: <err>
```

PIN Last

- -

### Parameter Description

<io\_id><sup>(num)</sup>

This is an already configured <pin\_id>.

<value><sup>(num)</sup>

State read on this <io\_id>.

0	Low for <pin_id>
1	High for <pin_id>

## 13.5 AT^SSIO Set IO state of a specified pin

### Syntax

Test Command

AT^SSIO=?

Response(s)

^SSIO: (list of supported <io\_id>s), (list of supported <value>s)

OK

Write Command

AT^SSIO=<io\_id>, <value>

Response(s)

OK

ERROR

+CME ERROR: <err>

PIN Last

- -

### Parameter Description

<io\_id><sup>(num)</sup>

This is an already configured <pin\_id>.

<value><sup>(num)</sup>

State to be set for this <io\_id>.

0 Low for <pin\_id>

1 High for <pin\_id>

## 14. Miscellaneous Commands

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

### 14.1 AT^SFDL Enter Firmware Download Mode

[AT^SFDL](#) allows the application manufacturer to download PLS8-E 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 "Updating Firmware". An example for developing an appropriate download program is included.

The [AT^SFDL](#) execute command causes the module to enter the firmware download mode.

#### Syntax

Test Command

AT^SFDL=?

Response(s)

OK

Exec Command

AT^SFDL

Response(s)

OK

PIN Last

- +

## 15. Appendix

### 15.1 Available AT Commands and Dependency on SIM PIN

∅ ... Command not available  
- ... Command does not require PIN1  
+ ... Command requires PIN1  
± ... Command sometimes requires PIN1

**Table 15.1:** Available AT Commands and Dependency on SIM PIN

AT Command	Exec	Test	Read	Write
Configuration Commands				
AT&F	-	∅	∅	∅
AT&V	+	∅	∅	∅
ATQ	-	∅	∅	∅
ATV	-	∅	∅	∅
AT+CMEE	-	-	-	-
AT+CSCS	∅	+	+	+
AT+CFUN	∅	-	-	-
AT+GCAP	+	+	∅	∅
AT^SMSO	-	-	∅	∅
AT^SCFG	∅	-	-	-
Status Control Commands				
AT+CEER	+	+	∅	∅
AT^SIND	∅	-	-	-
Serial Interface Control Commands				
ATE	-	∅	∅	∅
Security Commands				
AT+CPIN	∅	-	-	-
AT+CLCK	∅	+	∅	+
AT+CPWD	∅	+	∅	+
AT^SPIC	-	-	-	-
Identification Commands				
ATI	-	∅	∅	∅
AT+CGMM	-	-	∅	∅
AT+CGMR	-	-	∅	∅
AT+GMR	-	-	∅	∅
AT+CGSN	-	-	∅	∅
AT+CIMI	+	+	∅	∅

## 15.1 Available AT Commands and Dependency on SIM PIN

AT Command	Exec	Test	Read	Write
Network Service Commands				
AT+COPS	Ø	+	+	+
AT+CREG	Ø	-	-	-
AT+CSQ	+	+	Ø	Ø
AT^SMONI	-	-	Ø	-
AT^SNMON	Ø	-	Ø	-
Supplementary Service Commands				
AT+CUSD	Ø	+	+	+
Packet Domain Related Commands				
AT+CGACT	Ø	+	+	+
AT+CGATT	Ø	+	+	+
AT+CGDCONT	Ø	+	+	+
AT+CGREG	Ø	+	+	+
AT+CEREG	+	+	+	+
AT+CGCONTRDP	+	+	Ø	+
AT+CGEQOS	Ø	+	+	+
AT+CGEQOSRDP	Ø	+	Ø	+
AT^SGAUTH	Ø	+	+	+
AT^SWWAN	Ø	+	+	+
USIM related Commands				
AT+CRSM	Ø	-	Ø	-
AT^SCKS	Ø	-	-	-
AT^SSET	Ø	-	-	-
AT^SCID	-	-	Ø	Ø
Phonebook Commands				
AT+CPBS	+	+	+	+
AT+CPBR	Ø	+	Ø	+
Hardware related Commands				
AT+CCLK	Ø	-	-	-
AT^SBV	-	-	Ø	Ø
AT^SCTM	Ø	-	-	-
AT^SRADC	Ø	-	-	-
General Purpose I/O (GPIO) Pin related Commands				
AT^SPIO	Ø	-	Ø	-
AT^SCPIN	Ø	-	Ø	-
AT^SCPOL	Ø	-	Ø	-
AT^SGIO	Ø	-	Ø	-



## 15.1 Available AT Commands and Dependency on SIM PIN

---

AT Command	Exec	Test	Read	Write
AT <sup>^</sup> SSIO	Ø	-	Ø	-
Miscellaneous Commands				
AT <sup>^</sup> SFDL	-	-	Ø	Ø

## 15.2 Factory Default Settings Restorable with AT&F

**Table 15.2:** Factory Default Settings Restorable with AT&F

AT Command	Factory Defaults
Configuration Commands	
ATQ	<n>=0
ATV	<value>=1
AT+CMEE	<errMode>=2
AT+CSCS	<charSet>="IRA"
Serial Interface Control Commands	
ATE	<value>=1
Network Service Commands	
AT+CREG	<urcMode>=0
Supplementary Service Commands	
AT+CUSD	<ussdMode>=0
Packet Domain Related Commands	
AT+CGREG	<n>=0
AT+CEREG	<n>=0
USIM related Commands	
AT^SCKS	<mode>=0
AT^SSET	<n>=0
Phonebook Commands	
AT+CPBS	<storage>="ME"
Hardware related Commands	
AT^SCTM	<tempCtrl>=0

## 15.3 Summary of Unsolicited Result Codes (URC)

**Table 15.3:** Summary of Unsolicited Result Codes (URC)

AT Command	URC
Unsolicited Result Code Presentation	
	<code>^SBC: Undervoltage</code>
	<code>^SBC: Overvoltage Warning</code>
	<code>^SBC: Overvoltage Shutdown</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;nitzUT&gt;, &lt;nitzTZ&gt;, &lt;nitzDST&gt;</code>
<code>AT^SIND</code>	<code>+CIEV: &lt;indDescr&gt;, &lt;ceerRelCauseGroup&gt;, &lt;ceerReport&gt;</code>
Network Service Commands	
<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>
Supplementary Service Commands	
<code>AT+CUSD</code>	<code>+CUSD: &lt;ussdStatus&gt;[, &lt;ussdRsp&gt;[, &lt;ussdDCS&gt;]]</code>
Packet Domain Related Commands	
<code>AT+CGREG</code>	<code>+CGREG: &lt;stat&gt;</code>
<code>AT+CGREG</code>	<code>+CGREG: &lt;stat&gt;[, &lt;lac&gt;][, &lt;ci&gt;][, &lt;AcT&gt;]</code>
<code>AT+CEREG</code>	<code>+CEREG: &lt;stat&gt;</code>
<code>AT+CEREG</code>	<code>+CEREG: &lt;stat&gt;[, &lt;tac&gt;][, &lt;rac&gt;][, &lt;ci&gt;][, &lt;AcT&gt;]</code>
USIM related Commands	
<code>AT^SCKS</code>	<code>^SCKS: &lt;SimStatus&gt;</code>
<code>AT^SSET</code>	<code>^SSIM READY</code>
Hardware related Commands	
<code>AT^SCTM</code>	<code>^SCTM_B: &lt;UrcCause&gt;</code>
<code>AT^SRADC</code>	<code>^SRADC: &lt;ch&gt;, &lt;count&gt;, &lt;value&gt;[, &lt;value&gt;[, &lt;value&gt;[, &lt;value&gt;[, &lt;value&gt;[, &lt;value&gt;[, &lt;value&gt;[, &lt;value&gt;[, &lt;value&gt;]]]]]]]]</code>
General Purpose I/O (GPIO) Pin related Commands	
<code>AT^SCPOL</code>	<code>^SCPOL: &lt;ioId&gt;, &lt;value&gt;</code>

## 15.4 Alphabetical List of AT Commands

**Table 15.4:** Alphabetical List of AT Commands

AT Command	Description	Section and Page
<a href="#">AT&amp;F</a>	Reset AT Command Settings to Factory Default Values	Section 2.1, page 25
<a href="#">AT&amp;V</a>	Display current Configuration	Section 2.2, page 26
<a href="#">AT+CCLK</a>	Real Time Clock	Section 12.1, page 120
<a href="#">AT+CEER</a>	Extended Error Report	Section 3.1, page 41
<a href="#">AT+CEREG</a>	EPS Network Registration Status	Section 9.5, page 97
<a href="#">AT+CFUN</a>	PLS8-E Functionality Level	Section 2.7, page 34
<a href="#">AT+CGACT</a>	PDP Context Activate or Deactivate	Section 9.1, page 90
<a href="#">AT+CGATT</a>	PS Attach or Detach	Section 9.2, page 92
<a href="#">AT+CGCONTRDP</a>	PDP context read dynamic parameters	Section 9.6, page 99
<a href="#">AT+CGDCONT</a>	Define PDP Context	Section 9.3, page 93
<a href="#">AT+CGEQOS</a>	Define EPS Quality of Service	Section 9.7, page 101
<a href="#">AT+CGEQOSRDP</a>	EPS Quality of Service Read Dynamic Parameters	Section 9.8, page 103
<a href="#">AT+CGMM</a>	Request model identification	Section 6.2, page 67
<a href="#">AT+CGMR</a>	Request revision identification of software status	Section 6.3, page 68
<a href="#">AT+CGREG</a>	Packet Domain Network Registration Status	Section 9.4, page 95
<a href="#">AT+CGSN</a>	Request International Mobile Equipment Identity (IMEI)	Section 6.5, page 69
<a href="#">AT+CIMI</a>	Request International Mobile Subscriber Identity (IMSI)	Section 6.6, page 70
<a href="#">AT+CLCK</a>	Facility Lock	Section 5.2, page 55
<a href="#">AT+CMEE</a>	Error Message Format	Section 2.5, page 29
<a href="#">AT+COPS</a>	Operator Selection	Section 7.1, page 71
<a href="#">AT+CPBR</a>	Read from phonebook	Section 11.2, page 117
<a href="#">AT+CPBS</a>	Select phonebook memory storage	Section 11.1, page 114
<a href="#">AT+CPIN</a>	PIN Authentication	Section 5.1, page 53
<a href="#">AT+CPWD</a>	Change Password	Section 5.3, page 59
<a href="#">AT+CREG</a>	Network Registration Status	Section 7.2, page 74
<a href="#">AT+CRSM</a>	Restricted USIM Access	Section 10.1, page 108
<a href="#">AT+CSCS</a>	Character Set	Section 2.6, page 33
<a href="#">AT+CSQ</a>	Signal Quality	Section 7.3, page 77
<a href="#">AT+CUSD</a>	Unstructured Supplementary Service Data	Section 8.1, page 88
<a href="#">AT+GCAP</a>	Capabilities List	Section 2.8, page 36
<a href="#">AT+GMR</a>	Request revision identification of software status	Section 6.4, page 68
<a href="#">AT^SBV</a>	Battery/Supply Voltage	Section 12.2, page 121
<a href="#">AT^SCFG</a>	Extended Configuration Settings	Section 2.10, page 38
<a href="#">AT^SCID</a>	USIM Identification Number	Section 10.4, page 113
<a href="#">AT^SCKS</a>	Query USIM and Chip Card Holder Status	Section 10.2, page 110
<a href="#">AT^SCPIN</a>	Pin Configuration	Section 13.2, page 129
<a href="#">AT^SCPOL</a>	GPIO Level Polling Configuration	Section 13.3, page 131
<a href="#">AT^SCTM</a>	Critical Operating Temperature Monitoring	Section 12.3, page 122
<a href="#">AT^SFDL</a>	Enter Firmware Download Mode	Section 14.1, page 134

## 15.4 Alphabetical List of AT Commands

AT Command	Description	Section and Page
<a href="#">AT^SGAUTH</a>	Set Type of Authentication for PDP-IP Connections	Section <a href="#">9.9</a> , page <a href="#">105</a>
<a href="#">AT^SGIO</a>	Get IO state of a specified pin	Section <a href="#">13.4</a> , page <a href="#">132</a>
<a href="#">AT^SIND</a>	Extended Indicator Control	Section <a href="#">3.2</a> , page <a href="#">47</a>
<a href="#">AT^SMONI</a>	Monitoring Serving Cell	Section <a href="#">7.4</a> , page <a href="#">78</a>
<a href="#">AT^SMSO</a>	Switch Off PLS8-E	Section <a href="#">2.9</a> , page <a href="#">37</a>
<a href="#">AT^SNMON</a>	Network monitoring	Section <a href="#">7.5</a> , page <a href="#">86</a>
<a href="#">AT^SPIC</a>	Display PIN Counter	Section <a href="#">5.4</a> , page <a href="#">61</a>
<a href="#">AT^SPIO</a>	GPIO Driver Open/Close	Section <a href="#">13.1</a> , page <a href="#">128</a>
<a href="#">AT^SRADC</a>	Configure and Read ADC Measurement	Section <a href="#">12.4</a> , page <a href="#">124</a>
<a href="#">AT^SSET</a>	USIM Data Ready Indication	Section <a href="#">10.3</a> , page <a href="#">112</a>
<a href="#">AT^SSIO</a>	Set IO state of a specified pin	Section <a href="#">13.5</a> , page <a href="#">133</a>
<a href="#">AT^SWWAN</a>	PDP Context Activate or Deactivate	Section <a href="#">9.10</a> , page <a href="#">107</a>
<a href="#">ATE</a>	AT Command Echo	Section <a href="#">4.1</a> , page <a href="#">52</a>
<a href="#">ATI</a>	Display product identification information	Section <a href="#">6.1</a> , page <a href="#">66</a>
<a href="#">ATQ</a>	Result Code Presentation Mode	Section <a href="#">2.3</a> , page <a href="#">27</a>
<a href="#">ATV</a>	Result code format mode	Section <a href="#">2.4</a> , page <a href="#">28</a>

## About Gemalto

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