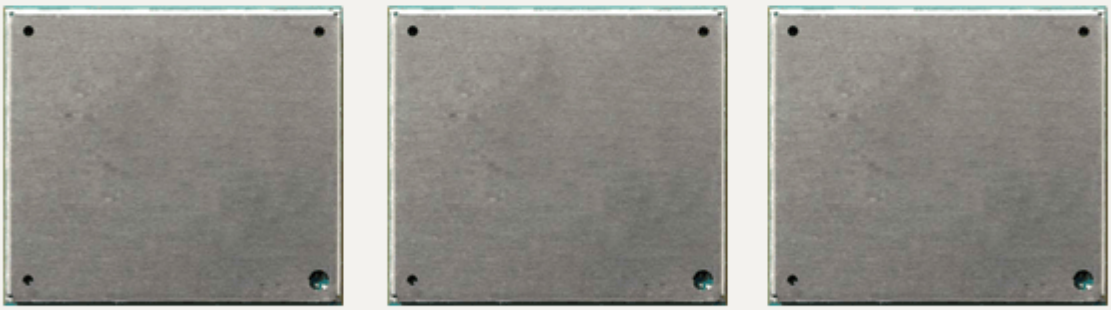
Cinterion® PLS8-US-R4

AT Command Set

Version: 04.001
DocId: PLS8-US-R4_ATC_V04.001



Document Name:	**Cinterion® PLS8-US-R4 AT Command Set**
Version:	**04.001**
Date:	**July 7, 2017**
DocId:	**PLS8-US-R4_ATC_V04.001**
Status	**Confidential / Preliminary**

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1. Introduction

1.1 Scope of the document

This document presents the AT Command Set for
PLS8-US-R4 GSM/UMTS/LTE Mobile Engine, Release 04.001.

Before using the PLS8-US-R4 or upgrading to a new firmware version please read the latest product information provided in "PLS8-US-R4 Release Notes, Version 04.001".

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.

PLS8-US-R4 features packet switched (PS) data capability, but does not support circuit switched (CS) data transmission. Hoewever, for reasons of compatibility with other products, and for compliance with 3GPP TS specificatiions, some AT commands imply parameters or values related to CS data capability.

1.2 Related documents

[1] PLS8-US-R4 Release Notes, Version 04.001

[2] PLS8-US-R4 Hardware Interface Description, Version 04.001

[3] User's Guide: Getting Started with PLS8-US-R4

[4] Application Note 16: Updating PLS8-US-R4 Firmware

[5] Application Note 22: Using TTY / CTM equipment with PLS8-US-R4

[6] Application Note 37: GPS Antenna Integration for PLS8-US-R4

[7] Application Note 39: USB Interface Description for PLS8-US-R4

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

[9] 3GPP TR 21.905 (descendant of 3GPP TR 01.04): Vocabulary for 3GPP Specifications

[10] Multiplexer User's Guide

[11] 3GPP TS 27.010 (descendant of 3GPP TS 07.10): Terminal Equipment to User Equipment (TE-UE) multiplexer protocol

[12] Multiplex Driver Developer's Guide

[13] Multiplex Driver Installation Guide

[14] 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

[15] The Unicode Consortium: Mapping of ETSI GSM 03.38 7-bit default alphabet characters into Unicode [.TXT!]

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

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

[18] 3GPP TS 11.11: Specification of the Subscriber Identity Module - Mobile Equipment (SIM - ME) interface

[19] 3GPP TS 31.101: UICC-terminal interface; Physical and logical characteristics

[20] 3GPP TS 31.102: Characteristics of the Universal Subscriber Identity Module (USIM) application

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

[22] 3GPP TS 11.14: Specification of the SIM Application Toolkit for the Subscriber Identity Module - Mobile Equipment (SIM - ME) interface

[23] 3GPP TS 31.111: Universal Subscriber Identity Module (USIM) Application Toolkit (USAT)

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

[25] 3GPP TS 31.124: Mobile Equipment (ME) conformance test specification - Universal Subscriber Identity Module Application Toolkit (USAT) conformance test specification

[26] 3GPP TS 22.002 (descendant of 3GPP TS 22.02): Circuit Bearer Services (BS) supported by a Public Land Mobile Network (PLMN)

[27] 3GPP TS 22.004 (descendant of 3GPP TS 02.04): General on supplementary services

[28] 3GPP TS 22.030 (descendant of 3GPP TS 02.30): Man-Machine Interface (MMI) of the Mobile Station (MS)

[29] 3GPP TS 22.060 (descendant of 3GPP TS 02.60): General Packet Radio Service (GPRS); Service description; Stage 1

[30] 3GPP TS 23.060 (descendant of 3GPP TS 03.60): General Packet Radio Service (GPRS); Service description; Stage 2

[31] 3GPP TS 22.081 (descendant of 3GPP TS 02.81): Line Identification Supplementary Services; Stage 1

[32] 3GPP TS 22.082 (descendant of 3GPP TS 02.82): Call Forwarding (CF) Supplementary Services; Stage 1

[33] 3GPP TS 22.083 (descendant of 3GPP TS 02.83): Call Waiting (CW) and Call Holding (HOLD); Supplementary Services; Stage 1

[34] 3GPP TS 22.085 (descendant of 3GPP TS 02.85): Closed User Group (CUG) supplementary services; Stage 1

[35] 3GPP TS 22.088 (descendant of 3GPP TS 02.88): Call Barring (CB) supplementary services; Stage 1

[36] 3GPP TS 22.090 (descendant of 3GPP TS 02.90): Unstructured Supplementary Service Data (USSD); Stage 1

[37] 3GPP TS 23.038 (descendant of 3GPP TS 03.38): Alphabets and language specific information

[38] 3GPP TS 23.040 (descendant of 3GPP TS 03.40): Technical realization of the Short Message Service (SMS)

[39] 3GPP TS 23.041 (descendant of 3GPP TS 03.41): Technical realization of Cell Broadcast Service (CBS)

[40] 3GPP TS 23.107: Quality of Service (QoS) concept and architecture

[41] 3GPP TS 24.011 (descendant of 3GPP TS 04.11): Point-to-Point (PP) Short Message Service (SMS) support on mobile radio interface

[42] 3GPP TS 24.008 (descendant of 3GPP TS 04.08): Mobile radio interface Layer 3 specification; Core network protocols; Stage 3

[43] 3GPP TS 24.080 (descendant of 3GPP TS 04.80): Mobile radio interface layer 3 supplementary services specification; Formats and coding

[44] 3GPP TS 24.301 Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS)

[45] 3GPP TS 25.133 Requirements for support of radio resource management

[46] 3GPP TS 25.304 User Equipment (UE) procedures in idle mode and procedures for cell reselection in connected mode

[47] 3GPP TS 25.331 Radio Resource Control (RRC)

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

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

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

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

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

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

[54] 3GPP TS 36.133 Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management

[55] Documents posted on website of USB Implementers Forum

[56] USB Language Identifiers (LANGIDs) [.PDF!].

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

1.3 Document Conventions

Throughout this document PLS8-US-R4 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-US-R4. 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 [9].

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 21.2, `Available AT Commands and Dependency on SIM PIN` uses the same symbols.

MDM: Is the AT command supported on the Modem instance?
- **+** Yes
- **-** No

APP: Is the AT command supported on the Application instance?
- **+** Yes
- **-** No

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

Last: If commands are concatenated, this AT command must be the last one.
- **+** Yes
- **-** No

Note: See also Section 1.5, AT Command Syntax for details on concatenated AT commands.

Example:

PIN	MDM	APP	✈	Last
-	+	+	-	-

1.3.2 Superscript Notation for Parameters And Values

Table 1.1: Symbols used to mark the type of parameters

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

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

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

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

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

1.4 AT Command Interpreter

PLS8-US-R4 features two instances for processing AT commands: Application and Modem instances. Their assignment to the PLS8-US-R4's devices is dependent on the setting of AT^SSRVSET and whether Multiplex mode is active or not. See in particular Table 2.6, Validated and released Service/Device Mappings.

Application instance:
Auxiliary AT command instance designed especially for controlling the PLS8-US-R4, i.e. for entering AT commands, receiving URCs, or sending and receiving short messages. It is not recommended for data transmission. This instance is referred to as "Application" if queried with AT^SQPORT. In the quick reference tables it is named APP.

Modem instance:
Main AT command instance intended for data transmission.
All URCs are, by default, issued only on the Application instance, but call related URCs (RING, NO CARRIER) as well as the "^SYSSTART" URC are additionally issued on the Modem instance.
This instance is referred to as "Modem" if queried with AT^SQPORT. In the quick reference tables it is named MDM.

Please note that URCs are normally issued only on the Application instance, no matter whether the Modem instance or the Application instance was used to send the AT commands for activating their presentation. This URC management scheme is the default configuration recommended for a typical PLS8-US-R4 application. For further detail on URCs please refer to Section 1.8, Unsolicited Result Code Presentation, and the configuration command AT^SCFG, parameter <urcDestIfc>.

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

When a data connection is established over the Modem instance, the Application instance can still be used for any control functions.

For further details on Multiplex mode refer to AT+CMUX.

1.5 AT Command Syntax

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

Table 1.4: Types of AT commands and responses

AT command type	Syntax	Function
Test command	AT+CXXX=?	The mobile equipment returns the list of parameters and value ranges set with the corresponding Write command or by internal processes.
Read command	AT+CXXX?	This command returns the currently set value of the parameter or parameters.
Write command	AT+CXXX=<...>	This command sets user-definable parameter values.
Exec(ution) command	AT+CXXX	The execution command reads non-variable parameters determined by internal processes in the UE.

1.5.1 Using Parameters

- 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, e.g. `<text>` or `<number>`, the string must be enclosed in quotation marks, e.g. "Charlie Brown" or "+49030xxxx". Symbols in quotation marks will be recognized as strings.
- All spaces will be ignored when using strings without quotation marks.
- It is possible to omit the leading zeros of strings which represent numbers.
- If an optional parameter of a ITU-T V.250 command is omitted, its value is assumed to be 0.

1.5.2 Concatenating AT Commands

Concatenating AT commands on the same line is possible, though not recommended because of restrictions listed below (for more details see ITU-T V.250 [17]).
When concatenating AT commands you need to enter the "AT" or "at" prefix only once at the beginning of a command line. Basic commands (i.e., ITU-T V.250 commands) are concatenated without delimiter. Extended commands (i.e., commands starting with AT+ or AT^) use a semicolon as delimiter.

Disadvantages and restrictions:

- There is no way to control the minimum time to wait between finishing an AT command and sending the next one. Please refer to Section 1.6, Communication between Customer Application and PLS8-US-R4 for details about timing.
- The sequence of processing the AT commands may be different from the sequential order of command input.
- Many AT commands cannot be concatenated (see list below). Concatenating these commands might end up with an error result code, or leads to an unexpected order of responses.

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

1.6 Communication between Customer Application and PLS8-US-R4

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-US-R4's signal lines refer to the Hardware Interface Description [2].

Leaving hardware flow control unconsidered the Customer Application (TE) is coupled with the PLS8-US-R4 (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-US-R4 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-US-R4 the opportunity to the transmission of pending URCs and get necessary service.
- The TE shall communicate with the PLS8-US-R4 using activated echo (ATE1), i.e. the PLS8-US-R4 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-US-R4 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.

1.7 Supported character sets

PLS8-US-R4 supports three character sets: *GSM 7 bit*, also referred to as GSM alphabet or SMS alphabet (3GPP TS 23.038 [37]) *UCS2 16 bit* (ISO-10646 [14]), 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-US-R4, an escape sequence appears like any other byte received or sent.

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

When you enter characters that are not valid characters of the supported alphabets the behavior is undefined.
If GSM alphabet is selected, all characters sent over the serial line (between TE and UE) must be in the range from 0 to 127 (7 bit range).
Note: If the UE is configured for GSM alphabet, but the Customer Application (TE) uses ASCII, bear in mind that some characters have different code values, such as the following:

- "@" character with GSM alphabet value 0 is not displayable by an ASCII terminal program, e.g. Microsoft© Hyperterminal®.
- "@" character with GSM alphabet value 0 will terminate any C string! This is because value 0 is defined as C string end tag. Therefore, the GSM Null character will cause problems on application level when using 'C'-functions, e.g. "strlen()". Using an escape sequence as shown in the table below solves the problem. By the way, this may be the reason why even network providers sometimes replace '@' with "@=*" in their SIM application.
- Some other characters of the GSM alphabet may be misinterpreted by an ASCII terminal program. For example, GSM "ö" (as in "Börse") is assumed to be "|" in ASCII, thus resulting in "B|rse". This is because in both alphabets there are different characters assigned to value 7C (hexadecimal).

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

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

Table 1.5: Exemplary escape sequences generated by PLS8-US-R4 for its non-UCS2 output

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

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

1.7.1 GSM alphabet tables and UCS2 character values

This section provides tables for the GSM default alphabet (3GPP TS 23.038 [37]) supported by the PLS8-US-R4. 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" [15].

Main character table of GSM 7 bit default alphabet				b7	0	0	0	0	1	1	1	1
				b6	0	0	1	1	0	0	1	1
				b5	0	1	0	1	0	1	0	1
b4	b3	b2	b1		0	1	2	3	4	5	6	7
0	0	0	0	0	@ 0040	Δ 0394	SP 0020	0 0030	¡ 00A1	P 0050	¿ 00BF	p 0070
0	0	0	1	1	£ 00A3	_ 005F	! 0021	1 0031	A 0041	Q 0051	a 0061	q 0071
0	0	1	0	2	$ 0024	Φ 03A6	" 0022	2 0032	B 0042	R 0052	b 0062	r 0072
0	0	1	1	3	¥ 00A5	Γ 0393	# 0023	3 0033	C 0043	S 0053	c 0063	s 0073
0	1	0	0	4	è 00E8	Λ 039B	¤ 00A4	4 0034	D 0044	T 0054	d 0064	t 0074
0	1	0	1	5	é 00E9	Ω 03A9	% 0025	5 0035	E 0045	U 0055	e 0065	u 0075
0	1	1	0	6	ù 00F9	Π 03A0	& 0026	6 0036	F 0046	V 0056	f 0066	v 0076
0	1	1	1	7	ì 00EC	Ψ 03A8	' 0027	7 0037	G 0047	W 0057	g 0067	w 0077
1	0	0	0	8	ò 00F2 [3]	Σ 03A3	(0028	8 0038	H 0048	X 0058	h 0068	x 0078
1	0	0	1	9	ç 00E7	Θ 0398	) 0029	9 0039	I 0049	Y 0059	i 0069	y 0079
1	0	1	0	10/A	LF [LF] [2]	Ξ 039E	* 002A	: 003A	J 004A	Z 005A	j 006A	z 007A
1	0	1	1	11/B	Ø 00D8	[1]	+ 002B	; 003B	K 004B	Ä 00C4	k 006B	ä 00E4
1	1	0	0	12/C	ø 00F8	Æ 00C6	, 002C	< 003C	L 004C	Ö 00D6	l 006C	ö 00F6
1	1	0	1	13/D	CR [CR] [2]	æ 00E6	- 002D	= 003D	M 004D	Ñ 00D1	m 006D	ñ 00F1
1	1	1	0	14/E	Å 00C5	ß 00DF	. 002E	> 003E	N 004E	Ü 00DC	n 006E	ü 00FC
1	1	1	1	15/F	å 00E5	É 00C9	/ 002F	? 003F	O 004F	§ 00A7	o 006F	à 00E0

Figure 1.1: Main character table of GSM 7 bit default alphabet

1) This code is an escape to the following extension of the 7 bit default alphabet table.
2) This code is not a printable character and therefore not defined for the UCS2 alphabet. It shall be treated as the accompanying control character.
3) See Section 1.6 for further details on using backspace and "ò" character.

Extension character table of GSM 7 bit default alphabet				b7	0	0	0	0	1	1	1	1
				b6	0	0	1	1	0	0	1	1
				b5	0	1	0	1	0	1	0	1
b4	b3	b2	b1		0	1	2	3	4	5	6	7
0	0	0	0	0					| 007C			
0	0	0	1	1								
0	0	1	0	2								
0	0	1	1	3								
0	1	0	0	4		^ 005E						
0	1	0	1	5							€ 2) 20AC	
0	1	1	0	6								
0	1	1	1	7								
1	0	0	0	8			{ 007B					
1	0	0	1	9			} 007D					
1	0	1	0	10 /A	3) [LF]							
1	0	1	1	11 /B		1)						
1	1	0	0	12 /C				[005B				
1	1	0	1	13 /D				~ 007E				
1	1	1	0	14 /E				] 005D				
1	1	1	1	15 /F			\ 005C					

Figure 1.2: Extension character table of GSM 7 bit default alphabet

1) This code value is reserved for the extension to another extension table. On receipt of this code, a receiving entity shall display a space until another extension table is defined.
2) This code represents the EURO currency symbol. The code value is the one used for the character 'e'. Therefore a receiving entity which is incapable of displaying the EURO currency symbol will display the character 'e' instead.
3) This code is defined as a Page Break character and may be used for example in compressed CBS messages. Any mobile which does not understand the 7 bit default alphabet table extension mechanism will treat this character as Line Feed.

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

1.7.2 UCS2 and GSM character coding and conversion

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

1.7.2.1 Output of SIM data (UE to TE)

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

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

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

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

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

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

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

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

1.7.2.2 Input of SIM data (TE to UE)

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

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

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

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

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

Case 4
Every GSM character is sent as 4 IRA characters representing one UCS2 character.
Example: To store text "ABC" using UCS2 character set you have to type "004100420043".
This is sent as 30'H,30'H,34'H,31'H, 30'H,30'H,34'H,32'H, 30'H,30'H,34'H,33'H → detected as IRA representation of 3 UCS2 characters, converted to GSM character set and stored as 41'H, 42'H, 43'H.
Maximum input is 640 IRA characters representing 160 UCS2 characters when compression is active. These are converted to 160 GSM 7-bit characters.
Without compression only 140 GSM characters can be stored which are put in as 560 IRA characters.
Values of UCS2 characters must be smaller than 80'H (128 decimal) to be valid GSM characters.
Number of IRA characters must be a multiple of four. Problems:
- "41" → Error, there are four IRA characters (two bytes) needed
- "0000" → Error, not an UCS2 character
- "4142" → Error, value of UCS2 character > 7F'H
- "008B" → Error, value of UCS2 character > 7F'H
  This affects the maximum input length of a string)

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

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

1.8 Unsolicited Result Code Presentation

URC stands for Unsolicited Result Code and is a report message issued by the PLS8-US-R4 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 1.8.1, Common URCs. A summary of all URCs can be found in Section 21.6, Summary of Unsolicited Result Codes (URC).

As specified in Section 1.4, AT Command Interpreter the Modem instance is dedicated for data transmission , whereas the Application instance is designed primarily for control functions. This implies that all URCs are issued on the Application instance, no matter which of the AT instances was used to send the AT command for activating their presentation. URCs related to data calls (RING, NO CARRIER) are additionally issued on the Modem instance to ensure compatibility with existing modem applications. The "^SYSSTART" URC and the "^SYSSTART AIRPLANE MODE" URC will also be output both on the Application and Modem instance.

Enabled by default when the UE is powered up, the above URC management scheme is the recommended approach for a typical PLS8-US-R4 application. However, as an alternative to this approach, AT^SCFG, "URC/DstIfc", <urcDestIfc> provides the option to determine the instance used for URC output.

Important: If the instance used for URC output is reserved by an active data connection or a long running AT command, URCs are buffered internally and will be issued after the instance becomes idle again. A pending URC will be signaled on the URC output instance via RING line. For detailed information regarding configuration of URC signaling refer to AT^SCFG, "URC/Ringline", <urcRinglineCfg>.

1.8.1 Common URCs

This section contains all URCs not associated to a certain AT command. They cannot be defined by the user and appear automatically when the 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.

1.9 Errors and Messages

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

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

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

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

See also:

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

2. Configuration Commands

The AT Commands described in this chapter allow the external application to determine the PLS8-US-R4'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.
However, the command does not change the current bit rate of PLS8-US-R4's asynchronous serial interface (UART).
For a list of affected parameters refer to Section 21.5, Factory Default Settings Restorable with AT&F.

Syntax

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

PIN	MDM	APP	✈	Last
-	+	+	+	-

Reference(s)
ITU-T V.250 [17]

Parameter Description

<value>(num)	
[0]	Reset parameters in Section 21.5, Factory Default Settings Restorable with AT&F to their factory default values.

2.2 AT&V Display current Configuration

AT&V returns the setting of several AT command parameters applicable to the current operating mode, including the single-letter AT command parameters which are not readable otherwise.

Syntax

Exec Command

AT&V

Response(s)

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

PIN	MDM	APP	✈	Last
-	+	+	+	-

2.2.1 AT&V Response

Table 2.1: AT&V Response

ACTIVE PROFILE:
E1 Q0 V1 X0 &C1 &D2 &S0 \Q3 S0:000 +CR: 0 +CRC: 0 +CMGF: 0 +CSDH: 0 +CNMI: 0,0,0,0,1 +IPR: 115200 +CMEE: 2 +CSMS: 0,1,1,1 ^SLCC: 0 ^SCKS: 0,1 ^SSET: 0 +CREG: 0,1 +CLIP: 0 +CGSMS: 3 +COPS: 0[,<format>,<operator>,<rat>] OK

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

AT&W stores the current AT command settings to a user defined profile in non-volatile memory of PLS8-US-R4. The AT command settings will automatically be restored from the user defined profile during power-up or if ATZ is used. AT&F restores AT command factory default settings. Hence, until first use of AT&W, ATZ works as AT&F. A list of parameters stored to the user profile can be found at Section 21.4, AT Command Settings storable with AT&W.

Syntax

Exec Command
AT&W[<value>]
Response(s)
OK ERROR +CME ERROR: <err>

PIN	MDM	APP	✈	Last
-	+	+	+	-

Reference(s)
V.250

Parameter Description

<value>(num)	
[0]	User Profile Number

2.4 ATQ Result Code Presentation Mode

ATQ controls if the PLS8-US-R4 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	MDM	APP	✈	Last
-	+	+	+	-

Reference(s)
V.250

Parameter Description

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

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

[0](&F)(D)	UE transmits result code.
1	Result codes are suppressed and not transmitted.

2.5 ATV Result code format mode

This command determines the contents of header and trailer transmitted with AT command result codes and information responses. Possible responses are described in Section 2.5.1, Verbose and numeric result codes.

Syntax

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

PIN	MDM	APP	✈	Last
-	+	+	+	-

Reference(s)
ITU-T V.250 [17]

Parameter Description

<value>(num)(&V)(&W)	
[0]	Information response: <text><CR><LF> Short result code format: <numeric code><CR>
1(&F)(D)	Information response: <CR><LF><text><CR><LF> Long result code format: <CR><LF><verbose code><CR><LF>

2.5.1 Verbose and numeric result codes

Verbose format	Numeric format	Meaning
OK	0	command executed, no errors
RING	2	ring detected
NO CARRIER	3	link not established or disconnected
ERROR	4	invalid command or command line too long
NO DIALTONE	6	no dial tone, dialling impossible, wrong mode
BUSY	7	remote station busy
NO ANSWER	8	no answer

2.6 ATX Result Code Selection

ATX determines whether or not the PLS8-US-R4 transmits particular result codes to the TE.
ATX also controls whether or not the UE verifies the presence of a dial tone when it begins dialing, and if engaged tone (busy signal) detection is enabled.

Syntax

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

PIN	MDM	APP	✈	Last
+	+	+	+	-

Reference(s)
ITU-T V.250 [17]

Parameter Description

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

2.7 ATZ Restore AT Command Settings from User Defined Profile

First ATZ resets the AT command settings to their factory default values, similar to AT&F. Afterwards the AT command settings are restored from a user defined profile in non-volatile memory of PLS8-US-R4, if one was stored with AT&W before. Any additional AT command on the same command line may be ignored. A delay of 300 ms is required before next AT command is sent.
However, ATZ does not change the current bit rate of PLS8-US-R4's asynchronous serial interface (UART).
ATZ does not change the PDP context profiles.

Syntax

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

PIN	MDM	APP	✈	Last
+	+	+	+	-

Reference(s)
V.250

Parameter Description

<value>(num)	
[0]	User Profile Number

2.8 AT+CMEE Error Message Format

AT+CMEE controls the format of error result codes that indicates errors related to PLS8-US-R4 functionality. Format can be selected between plain "ERROR" output, error numbers or verbose "+CME ERROR: <err>" and "+CMS ERROR: <err>" messages.
Possible error result codes are listed in Table 2.2, General "CME ERROR" Codes (3GPP TS 27.007), Table 2.3, GPRS related "CME ERROR" Codes (3GPP TS 27.007) and Table 2.5, SMS related "CMS ERROR" Codes (3GPP TS 27.005).
The AT+CMEE exec command performs a write command with factory default parameter setting.

Syntax

Test Command

```
AT+CMEE=?
```

Response(s)

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

Read Command

```
AT+CMEE?
```

Response(s)

```
+CMEE: <errMode>
OK
```

Exec Command

```
AT+CMEE
```

Response(s)

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

Write Command

```
AT+CMEE=<errMode>
```

Response(s)

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

PIN	MDM	APP	✈	Last
-	+	+	+	-

Reference(s)

3GPP TS 27.007 [49], 3GPP TS 27.005 [48]

Parameter Description

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

2.8.1 CME/CMS Error Code Overview

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

<err> Code	Text (if AT+CMEE=2)
0	phone failure
1	no connection to phone
2	phone adapter link reserved
3	operation not allowed
4	operation not supported
5	PH-SIM PIN required
6	PH-FSIM PIN required
7	PH-FSIM PUK required
10	SIM not inserted
11	SIM PIN required
12	SIM PUK required
13	SIM failure
14	SIM busy
15	SIM wrong
16	incorrect password
17	SIM PIN2 required
18	SIM PUK2 required
20	memory full
21	invalid index
22	not found
23	memory failure
24	text string too long
25	invalid characters in text string
26	dial string too long
27	invalid characters in dial string
30	no network service
31	network timeout
32	network not allowed - emergency calls only
40	network personalization PIN required
41	network personalization PUK required
42	network subset personalization PIN required
43	network subset personalization PUK required
44	service provider personalization PIN required
45	service provider personalization PUK required
46	corporate personalization PIN required
47	corporate personalization PUK required
100	unknown

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

<err> Code	Text (if AT+CMEE=2)
103	illegal MS
106	illegal ME
107	GPRS services not allowed
111	PLMN not allowed
112	location area not allowed
113	roaming not allowed in this location area
127	missing or unknown APN
132	service option not supported
133	requested service option not subscribed
134	service option temporary out of order
148	unspecified GPRS error
149	PDP authentication failure
150	invalid mobile class
273	minimum TFTs per PDP address violated
274	TFT precedence index not unique
275	invalid parameter combination

Table 2.4: Enhanced "CME ERROR" Codes

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

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

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

<err> Code	Text (if AT+CMEE=2)
0	none
300	ME failure
301	SMS service of ME reserved
302	operation not allowed
303	operation not supported
304	invalid PDU mode parameter
305	invalid text mode parameter
310	SIM not inserted
311	SIM PIN required
312	PH-SIM PIN required
313	SIM failure
314	SIM busy
315	SIM wrong
316	SIM PUK required
317	SIM PIN2 required
318	SIM PUK2 required
321	invalid memory index
322	memory full
330	SMSC address unknown
331	no network service
332	network timeout
340	no +CNMA acknowledgement expected

<err> Code	Text (if AT+CMEE=2)
500	unknown error
512	user abort

2.9 AT+CSCS Character Set

AT+CSCS write command informs the PLS8-US-R4 which character set is used by the TE. This enables the UE to convert character strings correctly between TE and UE character sets. Please also refer to Section 1.7, Supported character sets.

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	MDM	APP	✈	Last
-	+	+	+	-

Reference(s)

3GPP TS 27.007 [49]

Parameter Description

<charSet>(str)	
"GSM"(&F)(P)	GSM default alphabet (3GPP TS 23.038 [37], 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"	International reference alphabet (ITU T T.50).

2.10 AT+CFUN PLS8-US-R4 Functionality Level

AT+CFUN controls PLS8-US-R4 functionality levels "Normal Functionality Mode" and "Airplane Mode".
AT+CFUN can also be used to reset the UE.

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

Syntax

Test Command

```
AT+CFUN=?
```

Response(s)

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

Read Command

```
AT+CFUN?
```

Response(s)

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

Write Command

```
AT+CFUN=<fun>[, <rst>]
```

Response(s)

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

PIN	MDM	APP	✈	Last
-	+	+	+	-

Reference(s)

3GPP TS 27.007 [49]

Unsolicited Result Codes

URC 1

^SYSSTART

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

URC 2

^SYSSTART AIRPLANE MODE

URC indicates that the UE is running in Airplane Mode.

Parameter Description

<fun>(num)

This parameter determines the functionality level of the UE.
It is possible to enable the UE to store the setting of this parameter persistently via AT^SCFG="MEopMode/CFUN", <volaCFUN>.

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

<rst>(num)

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

2.11 AT+GCAP Capabilities List

AT+GCAP displays a list of basic capabilities supported by the PLS8-US-R4. 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: <name>
OK

PIN	MDM	APP	✈	Last
+	+	+	+	-

Reference(s)

ITU-T V.250 [17]

Parameter Description

<name>(str)

e.g. +GCAP: +CGSM

2.12 AT^SMSO Switch Off PLS8-US-R4

AT^SMSO initiates PLS8-US-R4'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	MDM	APP	✈	Last
-	+	+	+	+

2.13 AT^SCFG Extended Configuration Settings

AT^SCFG can be used to query and configure various settings of the PLS8-US-R4.
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: "Audio/Ecfg", (list of supported <ecfg>s)
^SCFG: "Audio/Loop", (list of supported <al>s)
^SCFG: "Audio/SvTone", (list of supported <toneoff>s)
^SCFG: "Call/ECC", (list of supported <ecc>s)
^SCFG: "Call/Speech/Codec", (list of supported <scc>s)
^SCFG: "Call/VoLTE/Codec", (list of supported <vscc>s)
^SCFG: "GPIO/Mode/Antenna", (list of supported <ant>s)
^SCFG: "GPRS/Auth", (list of supported <gauth>s)
^SCFG: "GPRS/AutoAttach", (list of supported <gaa>s)
^SCFG: "MEopMode/CFUN", (list of supported <volaCFUN>s)
^SCFG: "MEopMode/DTM/Mode", (list of supported <dtm>s)
^SCFG: "MEopMode/ExpectDTR", (list of supported <expDtrSet>s), (list of supported <expDtrPort>s)
^SCFG: "MEopMode/IMS", (list of supported <ims>s), (list of supported <imsService>s)
^SCFG: "MEopMode/NonBlock/Cops", (list of supported <com>s)
^SCFG: "MEopMode/PingRsp", (list of supported <pingv>s)
^SCFG: "MEopMode/PowerMgmt/LCI", (list of supported <lci>s), (list of supported <gpio>s)
^SCFG: "MEopMode/Prov/AutoSelect", (list of supported <provAutoSelect>s)
^SCFG: "MEopMode/Prov/Cfg", (list of supported <provCfg>s)
^SCFG: "MEopMode/PwrSave", (list of supported <PwrSaveMode>s), (list of supported <PwrSavePeriod>s), (list of supported <PwrSaveWakeup>s)
^SCFG: "MEShutdown/OnIgnition", (list of supported <msi>s)
^SCFG: "MEShutdown/Timer", (range of supported <shutdownRemainingTime>values)
^SCFG: "Misc/CId", (max. string length of <CId>)
^SCFG: "Radio/Band", (list of supported <rba>s), (list of supported <rbe>s)
^SCFG: "Radio/CNS", (list of supported <cns>s)
^SCFG: "Radio/Mtpl", (list of supported <PL_mode>s), (list of supported <PL_profile>s), (list of supported <PL_band>s), (list of supported <PL_limit>s), (list of supported <PL_limit_psk>s)
^SCFG: "Radio/OutputPowerReduction", (list of supported <ropr>s)
^SCFG: "RemoteWakeUp/Event/ASC", (list of supported <RemWakeLine>s)
^SCFG: "RemoteWakeUp/Event/URC", (list of supported <RemWakeLine>s)
^SCFG: "RemoteWakeUp/Event/USB", (list of supported <RemWakeLine>s)
^SCFG: "RemoteWakeUp/Ports", (list of supported <RemWakePortSet>s), (list of supported <RemWakePort>s)
^SCFG: "RemoteWakeUp/Pulse", (range of supported <RemWakePulse>s)
^SCFG: "SIM/CS" , (list of supported <CS>s)
^SCFG: "SIM/Retry" , (list of supported <SimReadRetry>s)
^SCFG: "SMS/4GPref", (list of supported <SmsDomain>s)
^SCFG: "SMS/AutoAck", (list of supported <SmsAcknl>s)
^SCFG: "SMS/Retrm", (list of supported <SmsRetrmTimeout>s)
^SCFG: "Tcp/IPv6Priv", (list of supported <v6privacyv>s)
^SCFG: "Tcp/MR", (list of supported <tcpMr>)
^SCFG: "Tcp/OT", (list of supported <tcpOt>)
^SCFG: "Tcp/UnreachRsp", (list of supported <unreachv>s)
^SCFG: "Tcp/WithURCs", (list of supported <tcpWithUrc>)
^SCFG: "Tcp/Loop", (list of supported <loopback>s)

Test Command (Continued)

AT^SCFG=?

Response(s)

^SCFG: "Tcp/TLS/Version", (list of supported <TLS_min_version>s), (list of supported <TLS_max_version>s)
^SCFG: "URC/DstIfc", (list of supported <urcDestIfc>s)
^SCFG: "URC/Ringline", (list of supported <urcRinglineCfg>s)
^SCFG: "URC/Ringline/ActiveTime", (list of supported <urcRinglineDuration>s)
^SCFG: "URC/Ringline/SelWUrc", (list of supported <urcRinglineFilter>s)
OK

Read Command

AT^SCFG?

Response(s)

^SCFG: "Audio/Ecfg", <ecfg>
^SCFG: "Audio/Loop", <al>
^SCFG: "Audio/SvTone", <toneoff>
^SCFG: "Call/ECC", <ecc>
^SCFG: "Call/Speech/Codec", <scc>
^SCFG: "Call/VoLTE/Codec", <vscc>
^SCFG: "GPIO/Mode/Antenna", <ant>
^SCFG: "GPRS/Auth", <gauth>
^SCFG: "GPRS/AutoAttach", <gaa>
^SCFG: "MEopMode/CFUN", <volaCFUN>, <storedCFUN>
^SCFG: "MEopMode/DTM/Mode", <dtm>
^SCFG: "MEopMode/ExpectDTR", "current"[, <expDtrPort>$_1$[, <expDtrPort>$_2$[, ...]]]
^SCFG: "MEopMode/ExpectDTR", "powerup"[, <expDtrPort>$_1$[, <expDtrPort>$_2$[, ...]]]
^SCFG: "MEopMode/IMS", <ims>[, <imsService>$_1$[, <imsService>$_2$[, ...]]]
^SCFG: "MEopMode/NonBlock/Cops", <com>
^SCFG: "MEopMode/PingRsp", <pingv>
^SCFG: "MEopMode/PowerMgmt/LCI", <lci>[, <gpio>]
^SCFG: "MEopMode/Prov/AutoSelect", <provAutoSelect>
^SCFG: "MEopMode/Prov/Cfg", <provCfg>
^SCFG: "MEopMode/PwrSave", <PwrSaveMode>, <PwrSavePeriod>, <PwrSaveWakeup>
^SCFG: "MEShutdown/OnIgnition", <msi>
^SCFG: "MEShutdown/Timer", <shutdownRemainingTime>
^SCFG: "Misc/CId", <CId>
^SCFG: "Radio/Band", <rba>
^SCFG: "Radio/CNS", <cns>
^SCFG: "Radio/Mtpl", <PL_mode>[, <PL_profile>]
^SCFG: "Radio/OutputPowerReduction", <ropr>
^SCFG: "RemoteWakeUp/Event/ASC", <RemWakeLine>
^SCFG: "RemoteWakeUp/Event/URC", <RemWakeLine>
^SCFG: "RemoteWakeUp/Event/USB", <RemWakeLine>
^SCFG: "RemoteWakeUp/Ports", "current"[, <RemWakePort>$_1$[, <RemWakePort>$_2$[, ...]]]
^SCFG: "RemoteWakeUp/Ports", "powerup"[, <RemWakePort>$_1$[, <RemWakePort>$_2$[, ...]]]
^SCFG: "RemoteWakeUp/Pulse", <RemWakePulse>
^SCFG: "SIM/CS" , <CS>
^SCFG: "SIM/Retry" , <SimReadRetry>
^SCFG: "SMS/4GPref", <SmsDomain>
^SCFG: "SMS/AutoAck", <SmsAcknl>
^SCFG: "SMS/Retrm", <SmsRetrmTimeout>
^SCFG: "Tcp/IPv6Priv", <v6privacyv>
^SCFG: "Tcp/MR", <tcpMr>
^SCFG: "Tcp/OT", <tcpOt>
^SCFG: "Tcp/UnreachRsp", <unreachv>

Read Command (Continued)

AT^SCFG?

Response(s)

^SCFG: "Tcp/WithURCs", <tcpWithUrc>
^SCFG: "Tcp/Loop", <loopback>
^SCFG: "Tcp/TLS/Version", <TLS_min_version>, <TLS_max_version>
^SCFG: "URC/DstIfc", <urcDestIfc>
^SCFG: "URC/Ringline", <urcRinglineCfg>
^SCFG: "URC/Ringline/ActiveTime", <urcRinglineDuration>
^SCFG: "URC/Ringline/SelWUrc", <urcRinglineFilter>
OK

Write Command

Configure Enhanced Audio Configuration.

AT^SCFG="Audio/Ecfg"[, <ecfg>]

Response(s)

^SCFG: "Audio/Ecfg", <ecfg>
OK
ERROR
+CME ERROR: <err>

Write Command

Configure Audio Loop.

AT^SCFG="Audio/Loop"[, <al>]

Response(s)

^SCFG: "Audio/Loop", <al>
OK
ERROR
+CME ERROR: <err>

Write Command

Deactivation of supervisory tones.

AT^SCFG="Audio/SvTone"[, <toneoff>]

Response(s)

^SCFG: "Audio/SvTone", <toneoff>
OK
ERROR
+CME ERROR: <err>

Write Command

Query/Configure Emergency numbers for USIM without or empty ECC field.

AT^SCFG="Call/ECC"[, <ecc>]

Response(s)

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

Write Command

Speech Codec Configuration for CS voice calls.

AT^SCFG="Call/Speech/Codec"[, <scc>]

Response(s)

^SCFG: "Call/Speech/Codec", <scc>
OK

Write Command (Continued)

Speech Codec Configuration for CS voice calls.

AT^SCFG="Call/Speech/Codec"[, <scc>]

Response(s)

ERROR
+CME ERROR: <err>

Write Command

Speech Codec Configuration for VoLTE calls.

AT^SCFG="Call/VoLTE/Codec"[, <vscc>]

Response(s)

^SCFG: "Call/VoLTE/Codec", <vscc>
OK
ERROR
+CME ERROR: <err>

Write Command

External Antenna Control Switch for 700 MHz.

AT^SCFG="GPIO/Mode/Antenna"[, <ant>]

Response(s)

^SCFG: "GPIO/Mode/Antenna", <ant>
OK
ERROR
+CME ERROR: <err>

Write Command

Configure PPP authentication.

AT^SCFG="GPRS/Auth"[, <gauth>]

Response(s)

^SCFG: "GPRS/Auth", <gauth>
OK
ERROR
+CME ERROR: <err>

Write Command

PS Domain auto attach.

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

Response(s)

^SCFG: "GPRS/AutoAttach", <gaa>
OK
ERROR
+CME ERROR: <err>

Write Command

Control persistence of AT+CFUN parameter <fun>.

AT^SCFG="MEopMode/CFUN"[, <volaCFUN>]

Response(s)

^SCFG: "MEopMode/CFUN", <volaCFUN>, <storedCFUN>
OK
ERROR
+CME ERROR: <err>

Write Command

AT^SCFG="MEopMode/DTM/Mode"[, <dtm>]

Response(s)

^SCFG: "MEopMode/DTM/Mode", <dtm>
OK
ERROR
+CME ERROR: <err>

Write Command

AT^SCFG="MEopMode/ExpectDTR"[, <expDtrSet>[, <expDtrPort>$_1$[, <expDtrPort>$_2$[, ...]]]]

Response(s)

^SCFG: "MEopMode/ExpectDTR", "current"[, <expDtrPort>$_1$[, <expDtrPort>$_2$[, ...]]]
^SCFG: "MEopMode/ExpectDTR", "powerup"[, <expDtrPort>$_1$[, <expDtrPort>$_2$[, ...]]]
OK
ERROR
+CME ERROR: <err>

Write Command

IMS mode.

AT^SCFG="MEopMode/IMS"[, <ims>[, <imsService>>$_1$[, <imsService>$_2$[, ...]]]]

Response(s)

^SCFG: "MEopMode/IMS", <ims>[, <imsService>>$_1$[, <imsService>$_2$[, ...]]]
OK
ERROR
+CME ERROR: <err>

Write Command

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

Response(s)

^SCFG: "MEopMode/NonBlock/Cops", <com>
OK
ERROR
+CME ERROR: <err>

Write Command

Allow/block response on PING

AT^SCFG="MEopMode/PingRsp"[, <pingv>]

Response(s)

^SCFG: "MEopMode/PingRsp", <pingv>
OK
ERROR
+CME ERROR: <err>

Write Command

Power Management control by Low Current Indicator (LC_IND line).

AT^SCFG="MEopMode/PowerMgmt/LCI"[, <lci>[, <gpio>]]

Response(s)

^SCFG: "MEopMode/PowerMgmt/LCI", <lci>[, <gpio>]
OK
ERROR
+CME ERROR: <err>

Write Command

Auto select provider profile.

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

Response(s)

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

Write Command

Provider profile configuration.

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

Response(s)

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

Write Command

Extended power saving control.

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

Response(s)

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

Write Command

Enable/disable shutdown by ignition line.

AT^SCFG="MEShutdown/OnIgnition"[, <msi>]

Response(s)

```
^SCFG: "MEShutdown/OnIgnition", <msi>
OK
ERROR
+CME ERROR: <err>
```

Write Command

Query/Configure the timer controlled shutdown.

AT^SCFG="MEShutdown/Timer"[, <shutdownRemainingTime>]

Response(s)

```
^SCFG: "MEShutdown/Timer", <shutdownRemainingTime>
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>

Write Command

Enable/Disable Continuous Network Search

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

Response(s)

^SCFG: "Radio/CNS", <cns>
OK
ERROR
+CME ERROR: <err>

Write Command

Disable / enable / query / configure output power limitation for SAR (Specific Absorption Rate)

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

Response(s)

^SCFG: "Radio/Mtpl", <PL_mode>[, <PL_profile>, <PL_band>, <PL_limit>[, <PL_limit_psk>]]

In case of <PL_mode>=0
^SCFG: "Radio/Mtpl", <PL_mode>

In case of <PL_mode>=1 and <PL_profile>
^SCFG: "Radio/Mtpl", <PL_mode>, <PL_profile>

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

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

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

Write Command

Radio output power reduction.

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

Response(s)

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

Write Command

Configure line that shall be toggled when UE has data to be transferred to the TE while RTS is inactive.

AT^SCFG="RemoteWakeUp/Event/ASC"[, <RemWakeLine>]

Response(s)

^SCFG: "RemoteWakeUp/Event/ASC", <RemWakeLine>
OK
ERROR
+CME ERROR: <err>

Write Command

Configure line that shall be toggled when a URC is issued.

AT^SCFG="RemoteWakeUp/Event/URC"[, <RemWakeLine>]

Response(s)

^SCFG: "RemoteWakeUp/Event/URC", <RemWakeLine>
OK
ERROR
+CME ERROR: <err>

Write Command

Configure line that shall be toggled to wake up the TE when a Remote Wakeup Event occurs on USB.

AT^SCFG="RemoteWakeUp/Event/USB"[, <RemWakeLine>]

Response(s)

^SCFG: "RemoteWakeUp/Event/USB", <RemWakeLine>
OK
ERROR
+CME ERROR: <err>

Write Command

Select ports for waking up the TE

AT^SCFG="RemoteWakeUp/Ports"[, <RemWakePortSet>[, <RemWakePort>$_1$[, <RemWakePort>$_2$[, ...]]]]

Response(s)

^SCFG: "RemoteWakeUp/Ports", "current"[, <RemWakePort>$_1$[, <RemWakePort>$_2$[, ...]]]
^SCFG: "RemoteWakeUp/Ports", "powerup"[, <RemWakePort>$_1$[, <RemWakePort>$_2$[, ...]]]
OK
ERROR
+CME ERROR: <err>

Write Command

Configure duration of Wakeup Event pulse.

AT^SCFG="RemoteWakeUp/Pulse"[, <RemWakePulse>]

Response(s)

^SCFG: "RemoteWakeUp/Pulse", <RemWakePulse>
OK
ERROR
+CME ERROR: <err>

Write Command

Select the USIM to be used.

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

Response(s)

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

Write Command

Configure mode of reading unreadable or missing Elementary Files on (U)SIM

AT^SCFG="SIM/Retry" [, <SimReadRetry>]

Response(s)

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

Write Command

Select SMS domain preference (CS or IMS).

AT^SCFG="SMS/4GPref"[, <SmsDomain>]

Response(s)

```
^SCFG: "SMS/4GPref", <SmsDomain>
OK
ERROR
+CME ERROR: <err>
```

Write Command

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

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

Response(s)

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

Write Command

Configure SMS retransmission timeout.

AT^SCFG="SMS/Retrm", <SmsRetrmTimeout>

Response(s)

```
^SCFG: "SMS/Retrm", <SmsRetrmTimeout>
OK
ERROR
+CME ERROR: <err>
```

Write Command

Enable/disable IPv6 privacy extensions for the IP stack

AT^SCFG="Tcp/IPv6Priv"[, <v6privacyv>]

Response(s)

```
^SCFG: "Tcp/IPv6Priv", <v6privacyv>
OK
ERROR
+CME ERROR: <err>
```

Write Command

Configuration of TCP parameter 'MaxRetransmissions'.

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

Response(s)

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

Write Command

Configuration of TCP parameter 'OverallTimeout'.

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

Response(s)

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

Write Command

Enable/disable "destination unreachable response" for connect requests on non-opened TCP sockets (sockets with no listener running)

AT^SCFG="Tcp/UnreachRsp"[, <unreachv>]

Response(s)

^SCFG: "Tcp/UnreachRsp", <unreachv>
OK
ERROR
+CME ERROR: <err>

Write Command

Configuration of Internet Service URCs:

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

Response(s)

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

Write Command

Enables/disables loopback device for the IPoverAT services.

AT^SCFG="Tcp/Loop", <loopback>

Response(s)

^SCFG: "Tcp/Loop", <loopback>
OK
ERROR
+CME ERROR: <err>

Write Command

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

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

Response(s)

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

Write Command

Subcommand controls which interface will be used for URC presentation.

AT^SCFG="URC/DstIfc"[, <urcDestIfc>]

Response(s)

^SCFG: "URC/DstIfc", <urcDestIfc>
OK
ERROR
+CME ERROR: <err>

Write Command

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

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

Response(s)

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

Write Command

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

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

Response(s)

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

Write Command

Subcommand specifies a filter for URC types allowed to toggle the Ring line

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

Response(s)

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

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<ecfg>(str)

Enhanced Audio Configuration

This parameter can be used to enable or disable the enhanced audio configuration for AT^SNFI.

"0"(P)	Disable enhanced audio configuration.
"1"	Enable enhanced audio configuration.

<al>(str)

Audio Loop Setting

This parameter can be used to start and stop an audio loop. The feature is intended for testing the audio path without SIM card inserted and without mobile network environment. It is not intended for normal operation. Before starting the audio loop, it is recommended to set the audio related AT commands for the audio functions to be tested.

"0"(P)	No audio loop active
"1"	Audio loop active

<toneoff>(str)(NV)

Supervisory tone and other locally generated tones off

This parameter can be used to deactivate a supervisory and locally generated tone.
The value range is "0"..."2047". To deselect certain tones calculate the sum of the values of all deactivated tones. For example, for RINGING "2" and CONGESTION "8" please enter the value "10".

“ 0“(D)	No tone is deactivated.
“ 1“	DIAL TONE deactivated.
“ 2“	RINGING deactivated.
“ 4“	BUSY deactivated.
“ 8“	CONGESTION deactivated.
“ 16“	DROPPED deactivated.
“ 32“	WAITING deactivated.
“ 64“	RADIO_ACK deactivated.
“ 128“	AUTHENTICATION deactivated.
“ 256“	UNOBTAINABLE deactivated.
“ 512“	ATTENTION deactivated.
“1024“	all other locally generated tones deactivated.
“2047“	all supervisory tones and other locally generated tones are deactivated.

<ecc>(str)(NV)

Emergency call numbers on non-ECC USIM

Setting specifies emergency call numbers on a USIM without or empty ECC field. It has no influence on the commonly used emergency numbers 112 and 911 which are always supported.
Also refer to Section 7.2, ATD where you can find a list of emergency call numbers supported if no USIM is inserted.
The value range of <ecc> is "0"..."255". To select or deselect an emergency number calculate the sum of the values of all desired numbers and use the resulting value. For example, for "08" (2) and "118" (8) please enter the value (10).
Setting takes effect after next UE restart or USIM insertion.

0(D)...255	Bitmask setting:
“ 0“	No additional emergency numbers
“ 1“	000
“ 2“	08
“ 4“	110
“ 8“	118
“16“	119
“32“	999
“64“	Reserved
“128“	Reserved
“255“	All additional emergency call numbers are supported.

<scc>(str)(NV)

Speech Codec Configuration for voice calls

This parameter can be used to configure the speech version indications in the bearer capabilities in case of voice calls (see 3GPP TS 24.008).
If you change this parameter the command returns "OK", but a new setting takes effect the next time the UE is restarted (after power-cycle).

“0“	All supported speech codecs are enabled for voice calls.
“2“(D)	The speech codecs AMR WB are disabled for voice calls.

<vscc>(str)(NV)

Speech Codec Configuration for VoLTE calls

Speech Codec Configuration for VoLTE calls according to 3GPP TS 24.930.
If you change this parameter the command returns "OK", but a new setting takes effect the next time the UE is restarted (after power-cycle).

“0“(D)	All supported speech codecs are enabled for VoLTE.
“2“	AMR-WB speech codecs are disabled for VoLTE, all others enabled.

<ant>(str)(NV)

External Antenna Control Switch for 700 MHz

Setting can be used to enable or disable an external 700 MHz antenna using a fixed GPIO2 line. For details refer to "PLS8-US-R4 Hardware Interface Description, Version 04.001".
If the external antenna is enabled, GPIO2 is instantly locked for other functions, such as GPIO handler (seeAT^SCPIN) or AT^SCFG="MEopMode/PowerMgmt/LCI" or Remote Wakeup line (see <RemWakeLine>). Vice versa, if for example GPIO2 is opened by AT^SCPIN, then it cannot be configured as external antenna.
Changing the <ant> parameter requires the UE to be restarted. Nevertheless, the new setting is immediately reserved already before UE restart, thus disabling all other alternative functions of this GPIO. Trying to execute the corresponding AT commands will be denied with ERROR.

“off“(D)	External antenna is disabled.
“on“	External antenna is enabled.

<gauth>(str)

PPP authentication mechanism

Setting can be used to configure which authentication algorithm the AT+CGDATA or ATD*99# commands will apply, during the PPP startup phase, for PDP contexts not yet activated.
For contexts activated with AT+CGACT please use the AT command AT^SGAUTH to configure the authentication method.

“0“	CHAP only
“1“	PAP only
“2“(P)	Try CHAP first, then PAP

<gaa>(str)(NV)

PS Domain auto attach

Setting can be used to control whether or not the UE will perform a PS Domain attach immediately after power-up and registering to the network. If the setting is changed to "enabled" and the UE is not attached yet, it will not initiate an attach immediately but after the next restart and registration to the network. For LTE please see more information in Section 13.1.1, Attaching to LTE Networks and Registering to IMS.

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

<volaCFUN>(str)(NV)

Volatile +CFUN Mode

Parameter determines whether AT+CFUN parameter <fun> is stored persistently.

"0"	Setting of AT+CFUN parameter <fun> is stored persistently.
"1"(D)	Setting of AT+CFUN parameter <fun> is volatile, i.e. changes are not reestablished after next UE restart.

<storedCFUN>(str)(NV)

Stored +CFUN Mode

Indicates setting of AT+CFUN parameter <fun> which will be used for next UE restart.

<dtm>(str)(NV)

DTM Mode

This parameter controls the Dual Transfer Mode.

"0"	DTM and EDTM are disabled.
"1"(D)	DTM is enabled and EDTM is disabled.
"2"	DTM and EDTM are enabled.

<expDtrSet>(str)

The <expDtrSet> parameter specifies whether the "MEopMode/ExpectDTR" configuration set with <expDtrPort> is non-volatile or volatile.

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

<expDtrPort>(str)

The AT^SCFG "MEopMode/ExpectDTR" subcommand is designed to ensure an efficient power saving scheme. This is necessary because power saving takes effect only if there is no data pending on any port.

The <expDtrPort> parameter specifies ports where the host application (TE or DTE) can indicate its readiness to receive data from the module (DCE or UE). The supported ports are reported by the AT^SCFG test command in the line for "MEopMode/ExpectDTR". By delivery default the "MEopMode/ExpectDTR" feature is activated for all ports.
On each configured port, the module transmits data and notifications only after the connected host has activated DTR, or has sent a "SetControlLineState(DTE present)" request to a USB CDC ACM port, or a "SetInterface(AltSet)" request to a USB CDC ECM port (WWAN or RmNet adapter). Transmission data becoming pending on such a port before the host has notified its readiness will be discarded, thus allowing for power saving even though the port was never opened.
Ports not configured with AT^SCFG "MEopMode/ExpectDTR" are handled dependent on port-specific flow control. They must be opened and read until no more data is available. Otherwise, data buffered on an unattended port (e.g. a ^SYSSTART URC) would prevent the module from power saving.

"acm1"(D)	Refers to USB0 set with AT^SSRVSET, parameter <Device>
"acm2"(D)	Refers to USB1 set with AT^SSRVSET, parameter <Device>
"acm3"(D)	Refers to USB2 set with AT^SSRVSET, parameter <Device>
"acm4"(D)	Refers to USB3 set with AT^SSRVSET, parameter <Device>. USB3 is not set within preconfigured AT^SSRVSET Service Sets. But it may be set within a customized AT^SSRVSET Service Set <SetNum> ≥ 10. For preconfigured AT^SSRVSET Service Sets, "acm4" must be left enabled.
"rmnet0"(D)	WWAN adapter

“rmnet1“(D)	WWAN adapter
“asc0“(D)	Refers to ASC0 set with AT^SSRVSET, parameter <Device>

<com>(str)(NV)

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.

“0“(D)	Normal mode The standard mode of AT+COPS write command.
“1“	Non-blocking mode AT+COPS write command immediately returns OK.

<ims>(str)(NV)

IMS Mode

The parameter <ims> of AT^SCFG "MEopMode/IMS" can be used to enable or disable the IMS registration attempt after LTE attach. If value is not supported a "NOT IN USE" will be given.
Depending on provider requirements, the delivery value is part of the provider profiles preconfigured in the UE, thus eliminating the need to change it. If nevertheless the setting may need to be changed consider that the new setting takes effect after restart.

“0“	Disable IMS registration attempt after LTE attach. This configuration disables all IMS services.
“1“	Enable IMS registration attempt after LTE attach. If <ims>="1" certain IMS services can be enabled/disabled separately. This can be done by specifying the additional <imsService> parameter of AT^SCFG "MEopMode/IMS", or by using the deprecated AT^SCFG "SMS/4GPref" subcommand (see <SmsDomain>) still supported for compatibilty with earlier releases. If <ims>= "1" is given while <imsService> is omitted in the AT^SCFG "MEopMode/IMS" write command all supported IMS services will be assumed by default.

<imsService>(str)(NV)

IMS Service

Parameter(s) $<imsService>_1$ to $<imsService>_n$ specify the IMS service(s) to be registered to after LTE attach.
Value(s) can be given only if <ims>= "1", otherwise the write command is denied with ERROR result code. Changed value(s) will take effect after restart. Setting specific IMS service(s) deselects all others, i.e. in this case the UE will register only to the given IMS services.
If <ims>= "1" is given while <imsService> is omitted in the AT^SCFG "MEopMode/IMS" write command all supported IMS services will be assumed by default.
The configuration depends also on the provider profiles preconfigured in the UE. Therefore, keep in mind that it may change after inserting another USIM. Of course, the preconfigured configuration can be adapted according to your preferences any time.
Supported IMS services:

“mmtel“	Multimedia Telephony (VoLTE)
“smsip“	SMS over IP

<pingv>(str)(NV)

Enable ping response

Enable or disable response on PING. If module is connected to Internet and has valid IP address it will or will not respond to ICMP PING depending on this setting.

“0“	Disable response on PING
“1“(D)	Enable

<lci>(str)

Low Current Indicator

Setting can be used to enable or disable the Low Current Indicator using the line specified with parameter <gpio>. For details refer to "PLS8-US-R4 Hardware Interface Description, Version 04.001".

“disabled“(P)	Low Current Indicator is disabled.
“enabled“	Low Current Indicator is enabled.

<gpio>(str)

Low Current Indicator GPIO

Parameter specifies the GPIO used as Low Current Indicator.
If Low Current Indicator is enabled with parameter <lci>, the used GPIO cannot be assigned to other functions such as GPIO handler (see AT^SCPIN) or AT^SCFG="GPIO/Mode/Antenna" or Remote Wakeup line (see <RemWakeLine>) or GPIO1 configured as DR_SYNC line (see AT^SGPSC, <DRSyncVal>). Vice versa, if assigned to another function a GPIO cannot be configured as Low Current Indicator.

GPIO1...[GPIO6]...GPIO10

<provAutoSelect>(str)(NV)

Autoselect provider profile

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

The UE comes with two types of preconfigured provider profiles:

- *Dedicated provider profiles distinguished by the IIN field (Issuer Identification Number) of the ICCIDs in the SIM:*
  Each provider profile loads a set of non-volatile provider specific settings, such as PDP contexts defined with AT+CGDCONT, as well as IMS and VoLTE settings if applicable for the specific provider.
- *One Fallback profile intended for all other providers:*
  The fallback profile comes with default PDP contexts. It depends on the provider whether default PDP con-

texts will do. In most cases, the TE will be required to define provider specific PDP contexts.

All preconfigured provider profiles are listed by the AT^SCFG=? test command and by ATI61. The currently selected provider profile is indicated by the <provCfg> parameter of the AT^SCFG "MEopMode/Prov/Cfg" read command response, by ATI61 and by the <provCur> parameter of the AT^SIND "prov" indicator. For profile settings refer to: AT+CAVIMS, AT+CVMOD, AT+CGDCONT, <ims> of AT^SCFG "MEopMode/IMS", <SmsDomain> of AT^SCFG "SMS/4GPref".
It is the responsibility of the Customer Application manufacturer to use a desired profile.

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

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

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

<provCfg>(str)(NV)

Provider configuration

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

“fallb*“(D)	This value represents the fallback provider profile. Can be used if the inserted SIM card does not match the provider profiles preconfigured in the UE. The "*" is only a sign. Do not use this "*" in the provider profile name when setting the fallback provider profile.
“tmode“	*EXAMPLE !* Provider T-Mobile
“vdfde“	*EXAMPLE !* Provider Vodafone
“vzwdcus“	*EXAMPLE !* Provider Verizon
“...“	Next possible provider ...
“...“	Next possible provider ...

<PwrSaveMode>(str)(NV)

Power Save Mode

AT^SCFG "MeOpMode/PwrSave" settings allow to control the PLS8-US-R4's power saving behavior.
See also "PLS8-US-R4 Hardware Interface Description, Version 04.001" for additional advice on power saving requirements for USB.
The first parameter <PwrSaveMode> enables or disables power save mode.

“disabled“(D)	Power save mode is disabled. Under no circumstances the UE will enter its power save (SLEEP) state. <PwrSavePeriod> value is reset to zero.

“enabled“	Power save mode is enabled. This mode enables the UE to enter power save (SLEEP) state when no activity occurs on any port. For ASC0, also set the parameters <PwrSavePeriod> and <PwrSaveWakeup>. Power saving will take effect only if there is no data pending on any port. You have two options to prevent that data remains pending: • On each port, the connected TE must retrieve all data sent from the UE to the TE. • If a TE is not able to receive data you can use the AT^SCFG "MEopMode/ExpectDTR" subcommand. If enabled the subcommand ensures to discard data pending on a port before the connected TE has signalled its readiness to receive data. By default this behavior is enabled for all ports. <PwrSavePeriod> and <PwrSaveWakeup> settings are non-volatile. However, each time when <PwrSaveMode> is enabled without giving <PwrSavePeriod> and <PwrSaveWakeup> delivery defaults are assumed: ^SCFG: "MEopMode/PwrSave","enabled","52","50". To enable different values <PwrSavePeriod> and <PwrSaveWakeup> shall be set as well.

<PwrSavePeriod>(str)(NV)

Maximum Power Save Period

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

0...52(D)...600	Maximum power save period in 1/10 seconds. Tolerance = -0/+2 seconds. In SLEEP state, the CTS0 line stays inactive, i.e. the AT commmand interface is not accessible. The UART wakes up from SLEEP state after one of the following events: - cyclically after expiry of the specified <PwrSavePeriod>, - sending a URC (incl. for incoming calls), - toggling the RTS0 line (falling edge only), - toggling the DTR0 line (both edges). After a wakeup event, the UART stays awake (CTS0 line becomes active), at least for the time defined by the parameter <PwrSaveWakeup> (5 seconds by default). Notes on DTR toggling: - Do not use DTR0 toggling for wakeup in context of data call if AT&D2 is enabled. - Be careful using DTR0 toggling while the AT^SCFG "MEopMode/ExpectDTR" subcommand is enabled for ASC0. It is sometimes possible (when RTS0 and DTR0 are inactive) that some data intended to be sent from the TE to the UE (e.g. a URC) is discarded. <PwrSavePeriod> value "0" means that the UE is allowed to stay in power save (SLEEP) state for an unlimited duration, without cyclic wakeup if once fallen asleep. In this case, the UE wakes up only by sending a URC, or toggling either RTS0 or DTR0. Especially for large <PwrSavePeriod> values, toggling RTS0 or DTR0 is an option to wake up the UE any time before the <PwrSavePeriod> expires. Values between 21 and 600 are recommended when the TE is not designed to toggle RTS0 or DTR0. A recommended value is retaining the delivery default 52, i.e. 5.2 seconds. However, depending on the requirements of the Customer Application other values may be more suitable. If Multiplex mode is used on ASC0, the <PwrSavePeriod> value depends on whether or not the Multipex driver allows for toggling RTS0 and/or DTR0. If not, then the <PwrSavePeriod> must be set to a value smaller than internal timeouts implemented in your own Multiplexer to wait for "Tx data transmission

completed". The WinMux demo driver supplied by GEMALTO M2M does not support RTS0 or DTR0 toggling. Instead, due to internal timeouts implemented in the WinMux driver, <PwrSavePeriod> shall be set to max. 52 (= delivery default).

<PwrSaveWakeup>(str)(NV)

Minimum awake time

This parameter is only effective for the UART, i.e. for the serial interface ASC0.
The <PwrSaveWakeup> value determines the minimum period the UART remains awake after the last activity occurred on the UART (e.g. the first character sent or received caused UART wakeup), or wakeup by RTS0 or DTR0 toggling.

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

<msi>(str)(NV)

Parameter determines the switching mode of the ignition line (IGT): The line may either be used only to switch on the UE, or to toggle it on and off. For details refer to "PLS8-US-R4 Hardware Interface Description, Version 04.001".

“on“	Ignition line (IGT) can be used to switch on and off the UE.
“off“(D)	Ignition line (IGT) can be used to switch on the UE.

<shutdownRemainingTime>(str)

Remaining time for timer controlled shutdown

Remaining time in minutes until PLS8-US-R4 is powered down automatically. The timer is based on the real time clock of the PLS8-US-R4 (see AT+CCLK).
Please note, that changing the real time clock using AT+CCLK influences the remaining time for an activated automatic shutdown timer. Setting the time into the past will increase the remaining time, setting the time into the future will decrease the remaining time. If the real time clock is set to a time later than the expiration time of the active automatic shutdown timer, then the automatic shutdown is disabled.

“off“(P)	Automatic shutdown is disabled
“0“	Automatic shutdown within the next minute
1...525600	Automatic shutdown after specified number of minutes

<CId>(str)(+CSCS)(NV)

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 or IRA depending on the setting of AT+CSCS). The delivery value is an empty string.

<rba>(str)(NV)

Parameter determines frequency band usage of the UE.
Please note that the band selection implementation of PLS8-US-R4 is based on a single band group that includes all frequency bands it is capable to use. This enables the UE to easily find a suitable network in any country around the world, no matter which frequency bands or band combinations and access technologies are present in a particular area.
Factory default of <rba> is 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-US-R4 will be enabled after power-up.

“1“	GSM 900
“2“	GSM 1800
“4“	GSM 850
“8“	GSM 1900
“32“	WCDMA 1900 (BC2)
“64“	WCDMA 850 (BC5)
“512“	WCDMA 1700 AWS (BC4)
“16384“	LTE 1900 (B2)
“65536“	LTE 1700 (B4)
“131072“	LTE 850 (B5)
“1048576“	LTE 700 (B17)

<rbe>(str)

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.

<cns>(str)

Continuous Network Search Mode

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

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

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

<PL_mode>(str)

Power Limitation Mode

AT^SCFG subcommand "Radio/Mtpl" can be used to instantly adapt the module's Specific Absorption Rate (SAR) by reducing its output power for specific or all bands in any operating mode.
8 profiles for instant RF output power limitation can be defined and stored to the NV memory. A profile contains all supported bands (<PL_band>) and, for each single band, a parameter limiting the maximum RF output power (<PL_limit>). For GSM, a second parameter, <PL_limit_psk>, is required to set the RF output power limit for GSM 8 PSK. The RF output power limit for a GSM band is related to one transmit timeslot. If two/three/four timeslots are used for transmission the specified power limit is reduced by another 3 / 4.8 / 6 dB.

Changing limit values of a profile with <PL_mode> 3 takes effect after UE restart only. Activating and deactivating power limitation with <PL_mode> 1 or 0, takes effect instantly. The <PL_mode> is volatile, therefore output power limitaton is deactivated after UE restart.
For an example on how to configure and trigger instant power limitation see below *Example* section.

"0"(P)	Power limitation deactivated (no further parameters are possible).
"1"	Power limitation activated. <PL_profile> parameter is mandatory for activation.
"2"	Query profile settings. The response shows the currently used limit values if instant power limitation is active, i.e. if <PL_mode>= 1. Therefore, bear in mind that modified profile values will be visible only if you restart the UE and run a query before activating instant power limitation. You can read either all profiles, or a specific profile by adding a <PL_profile> number.
"3"	Configure profile. All parameters are mandatory. Remember to restart the UE after changing the output power limits of a profile.

<PL_profile>(str)

Power Limitation Profile

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

1...8	Number of profile.

<PL_band>(str)

Radio Band

"1"	GSM 900
"2"	GSM 1800
"4"	GSM 850
"8"	GSM 1900
"32"	WCDMA 1900 (BC2)
"64"	WCDMA 850 (BC5)
"512"	WCDMA 1700 AWS (BC4)
"16384"	LTE 1900 (B2)
"65536"	LTE 1700 (B4)
"131072"	LTE 850 (B5)
"1048576"	LTE 700 (B17)

<PL_limit>(str)(NV)

Power Limitation

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

18...33	Power limit value in dBm for GSM low bands.
18...30	Power limit value in dBm for GSM high bands.
18...24	Power limit value in dBm for WCDMA bands.
18...24	Power limit value in dBm for LTE bands.

<PL_limit_psk>(str)(NV)

Power Limitation 8 PSK (only for GSM)

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

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

<ropr>(str)(NV)

Radio Output Power Reduction

According to 3GPP TS 45.005, it is permissible to reduce the the maximum (E)GPRS output power. The amount of the maximum (E)GPRS power reduction is configurable for the case of 4TX.
Setting takes effect after next restart.

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

<RemWakeLine>(str)(NV)

Remote Wakeup line

This parameter is part of the AT^SCFG subcommands "RemoteWakeUp/Event/ASC", "RemoteWakeUp/Event/URC" and "RemoteWakeUp/Event/USB" specifiying the lines that may be used for Remote Wakeup, also referred to as host wakeup.
If no call, data or message transfer is in progress, the external host application (the TE) may shut down its own module interfaces or other components in order to save power. If a call, data, or other request (URC) arrives, the TE can be notified of this event and be woken up by a state transition of a configurable remote wakeup line. Available as Remote Wakeup lines are all GPIO signals as well as the RING0 line.
When configuring a GPIO as Remote Wakeup line keep in mind that it is locked for other functions, such as GPIO handler (see AT^SCPIN) or Low Current Indicator (see AT^SCFG "MEopMode/PowerMgmt/LCI" parameter <lci>) or GPIO1 configured as DR_SYNC line (see AT^SGPSC, <DRSyncVal>) or GPIO2 enabling 700 MHz antenna (see AT^SCFG "GPIO/Mode/Antenna" <ant>).

Types of event:

- "RemoteWakeUp/Event/ASC": UE has any kind of data (incl. URCs) on the ASC0 interface to be transferred to the TE while RTS0 is inactive (e.g. due to Sleep state or Flow Control).
- "RemoteWakeUp/Event/URC": The selected hardware line is toggled each time when a URC is generated, no matter whether or not the TE is in power saving state.
- "RemoteWakeUp/Event/USB": UE has any kind of data (incl. URCs) on a USB port to be transferred to the TE while USB is in SUSPEND state or DETACHED as specified in the "USB Specification Revision 2.0/3.0". The USB port has to be specified via <RemWakePort>.
  Note: If no hardware line is configured for this event type a remote wakeup as specified in the "USB Specification Revision 2.0/3.0" is executed. Both mechanisms are mutually exclusive.

The <RemWakeLine> parameter determines the line(s) that shall be toggled. For each Remote Wakeup event type you have the choice to specify the same line or different lines for all event types. The pulse duration of the Remote Wakeup signal is configurable via <RemWakePulse>.

“none“(D)	No hardware line is configured as Remote Wakeup signal.
GPIO1...GPIO10	GPIO toggles when the assigned event occurs. The GPIO is active high.

“RING0“	RING0 line toggles when the assigned event occurs. The RING0 line is active low. When using the RING0 line keep in mind that the options AT^SCFG "RemoteWakeUp/Event/..." and AT^SCFG "URC/Ringline" <urcRingLineCfg>="ASC0" are mutually exclusive (as both refer to the module's physical RING0 line).

<RemWakePortSet>(str)(NV)

Set of ports signaling Remote Wakeup Events

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

“current“	The currently used configuration (volatile).
“powerup“	The configuration used after powerup or restart (non-volatile).

<RemWakePort>(str)

Port

Only ports listed with <RemWakePort> try to wake up the TE when an event configured with AT^SCFG subcommands "RemoteWakeUp/Event/ASC" or "RemoteWakeUp/Event/USB" occurs. The supported ports are reported by the AT^SCFG test command in the line for "RemoteWakeUp/Ports". The setting is only for data, therefore the parameter is not relevant for the event type "RemoteWakeUp/Event/URC".

“acm1“(D)	Refers to USB0 set with AT^SSRVSET, parameter <Device>
“acm2“(D)	Refers to USB1 set with AT^SSRVSET, parameter <Device>
“acm3“(D)	Refers to USB2 set with AT^SSRVSET, parameter <Device>
“acm4“(D)	Refers to USB3 set with AT^SSRVSET, parameter <Device>
“rmnet0“(D)	WWAN adapter
“rmnet1“(D)	WWAN adapter
“asc0“(D)	Refers to ASC0 set with AT^SSRVSET, parameter <Device>

<RemWakePulse>(str)(NV)

Remote Wakeup Pulse Duration

Parameter specifies the pulse duration for a Remote Wakeup Event in 10ms steps.

1...10(D)...100

<CS>(str)(NV)

Card slot / USIM

The AT^SCFG subcommand "SIM/CS" specifies the (U)SIM interface currently used. Usage of this command depends on whether the host application is designed to include an additional second (U)SIM interface. Only one of the supported (U)SIM interfaces can be used at a time. For details on how to connect the first and the second (U)SIM interface please refer to "PLS8-US-R4 Hardware Interface Description, Version 04.001".

“NO_SIM“	No USIM is used, no matter whether a USIM is present in one of the slots.

“SIM_1“(D)	First (U)SIM slot is enabled regardless of whether a (U)SIM card is inserted. Access to another (U)SIM inserted in slot 2 is deactivated.
“SIM_2“	Second (U)SIM slot is enabled regardless of whether a (U)SIM card is inserted. Access to another (U)SIM inserted in slot 1 is deactivated.

To check the status of the (U)SIM and the (U)SIM interface you can take advantage of several URCs, such as AT^SIND "simstatus", AT^SCKS, AT^SSET.
When the configuration changes the UE tries to start the selected (U)SIM interface no matter whether a CCIN line is populated. Therefore, please note that the AT^SIND "simstatus" indicator and the AT^SCKS URCs will show up 3 times when the selected (U)SIM slot is empty. Both URCs will show a sequence of values 0, 1, 0 (e.g. "^SCKS: 0", "^SCKS: 1", "^SCKS: 0" and "+CIEV: simstatus,0", "+CIEV: simstatus,1", "+CIEV: simstatus,0"). If a (U)SIM is inserted both URCs will show value 1.

<SimReadRetry>(str)(+CSCS)

The AT^SCFG subcommand "SIM/Retry" is designed for reading Elementary Files (EF) on the (U)SIM which cannot be read or found for some reason, e.g. if a certain EF on a (U)SIM is corrupt, wrongly configured, or missing at all. In this case, the <SimReadRetry> parameter determines the number of attempts the UE will make to read such an EF on the (U)SIM.

“off“	For each unreadable or missing EF, the UE makes one attempt to read this EF on the (U)SIM.
“on“(P)	For each unreadable or missing EF, the UE makes up to 3 attempts to read this EF on the (U)SIM.

<SmsDomain>(str)(NV)

The AT^SCFG "SMS/4GPref" subcommand is deprecated and supported for compatibility with earler releases. It specifies which technology to use for SMS transmission in LTE networks. The same function is now integrated in the AT^SCFG "MEopMode/IMS" subcommand (see AT^SCFG <ims> and <imsService> parameters). Both commands are synchronized when one of them was changed.
Depending on provider requirements, the delivery value is part of the provider profiles preconfigured in the UE, thus eliminating the need to change it. If nevertheless the setting may need to be changed consider that the new setting takes effect after restart.

“IMS“(D)	SMS over IMS.
“CSPS“	SMS over Circuit Switched domain. Disables IMS for SMS, i.e. no IMS registration will be performed for SMS.

<SmsAcknl>(str)

SMS auto acknowledge

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

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

<SmsRetrmTimeout>(num)(NV)

SMS retransmission timeout in seconds
If the UE fails to send an MO short message, a new attempt of re-transmitting it will be done after <SmsRetrmTimeout>. The total period during which the UE tries to send a short message is 180 seconds - after this time an attempt to send the message is dropped.

1...45(D)

<v6privacyv>(str)(NV)

Enable IPv6 privacy

Enable or disable IPv6 privacy extensions (RFC 4941) for the IP stack

“0“	Disable IPv6 privacy extensions
“1“(D)	Enable

<tcpMr>(str)(NV)

Maximum Number of Retransmissions (MR)

1...10(D)...30	Setting determines the maximum number of times to retransmit TCP packets. The mechanism takes effect only if AT^SCFG "Tcp/OT" is disabled with value "0". The value set with <tcpMr> will be assumed as default for the <srvParmTag> "tcpMR" when a new service profile is created with AT^SISS. In each service profile, you can set another "tcpMR" value which has precedence over the global value set with AT^SCFG. Existing service profiles are not affected when you change the global value via AT^SCFG. Use of default value is recommended.

<tcpOt>(str)(NV)

Overall TCP Timer for outstanding connections (tcpOT)

0...6000(D)	Setting specifies the number of seconds to wait before closing a connection if TCP/IP packets are not acknowledged. Setting the maximum value is practically equivalent to deactivating the tcpOT mechanism because the maximum time would never be reached by the TCP/IP stack. The value set with <tcpOt> will be assumed as default for the <srvParmTag> "tcpOT" when a new service profile is created with AT^SISS. However, in each service profile, you can set another "tcpOT" value which has precedence over the global value set with AT^SCFG. Existing service profiles are not affected when you change the global value via AT^SCFG. Use of default value is recommended.

<unreachv>(str)(NV)

Enable unreach response

Enable or disable response for open (SYN) requests on non-opened TCP sockets (no service is running on this socket). Normally, a SYN request on such a port is answered with a TCP packet, having set the RST bit in its header. Depending on this setting, the responding TCP packet is sent or not.

“0“	Disable response on non-opened sockets
“1“(D)	Enable

<tcpWithUrc>(str)(NV)

URC mode or polling mode for Internet service commands

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

“on“(D)	Enable URCs related to Internet service commands. Throughout the Chapter "Internet Service AT Commands" the mode is also referred to as URC mode.

“off“	Disable URCs related to Internet service commands. This requires the TE to employ polling techniques when using the Internet service AT commands: The TE is responsible to retrieve all status information needed to control an Internet session. The method is referred to as polling mode.

`<loopback>`(str)

IPoverAT loopback device

This parameter controls whether loopback device is enabled/disabled for IPoverAT services.

“disabled“(P)	Loopback device is disabled
“enabled“	Loopback device is enabled

`<TLS_min_version>`(str)(NV)

Minimum TLS Version allowed

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

“MIN“(D)	Automatic minimum
“0.9“	TLSv0.9 (SSLv3)
“1.0“	TLSv1
“1.1“	TLSv1.1
“1.2“	TLSv1.2
“MAX“	Automatic maximum

`<TLS_max_version>`(str)(NV)

Maximum TLS version allowed

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

“1.0“	TLSv1
“1.1“	TLSv1.1
“1.2“	TLSv1.2
“MAX“(D)	Automatic maximum

`<urcDestIfc>`(str)(NV)

Parameter determines which interface will be used for URC presentation. Note that the recommended approach for a typical PLS8-US-R4 application is using the default configuration. If changing the configuration please carefully read Section 1.4, AT Command Interpreter and Section 1.8, Unsolicited Result Code Presentation.
If the application port is not available, then it is not possible to select it.
If Multiplex mode is started with `AT+CMUX`, then automatically the value "app" will be selected.
If the modem interface is used, keep in mind, that if the interface is blocked by an active data connection, this connection should be periodically suspended to check for pending URCs.

“mdm“	Use modem interface to output URCs.
“app“(D)	Use application interface to output URCs.

<urcRinglineCfg>(str)(NV)

Parameter specifies the ring line to be used for signaling URCs both for idle interface and while interface is reserved, i.e. while busy on AT command execution or data transmission.
For details about URC presentation and related hardware signalization refer to Section 1.8, Unsolicited Result Code Presentation. line to wake up the TE refer to "PLS8-US-R4 Hardware Interface Description, Version 04.001".
Note: Setting is local for every AT command instance, i.e. for Modem (MDM) and Application (APP) services; for details refer to Section 1.4, AT Command Interpreter.

“off“	URCs do not activate a ring line.
“local“(D)	Ring line will be activated on the same device where the URC appears: This is the RING0 line (active low) if the URC appears on ASC0 device and a virtual ring line if the URC appears on a USB related device.
“asc0“	RING0 line will be activated as Host Wakeup (low active). This option can be set only if the RING0 line is not configured with parameter <RemWakeLine>.

<urcRinglineDuration>(str)(NV)

Parameter determines how long the ring line shall be activated for URC signalization. The type of ring line depends on parameter <urcRinglineCfg>.
For details about URC presentation and related hardware signalization refer to Section 1.8, Unsolicited Result Code Presentation.

“2“(D)	Ring line will be activated for about 1s.
“on“	Ring line is always activated.
“off“	Ring line is always deactived.

<urcRinglineFilter>(str)(NV)

Parameter determines the types of URCs allowed to toggle ring line in the way specified with parameter <urcRinglineCfg> of the AT^SCFG subcommand "URC/Ringline".

“all“(D)	All types of URCs are allowed to toggle the Ring line.
“RING“	Only call related URCs are allowed to toggle the Ring line.
“+CMT“	Only SMS related URCs are allowed to toggle the Ring line.

Example

The example shows how to read, configure, activate and deactivate output power limitation using the AT^SCFG "Radio/Mtpl" subcommand. See parameters <PL_mode>, <PL_profile>, <PL_band>, <PL_limit>, <PL_limit_psk>.

```
^SYSSTART
AT^SCFG="Radio/Mtpl"                          Read "Radio/Mtpl" mode.
^SCFG: "Radio/Mtpl","0"                       Instant power limitation is still disabled.
OK
AT^SCFG="Radio/Mtpl",2,1                      Read profile 1 settings. Delivery default settings are
                                              shown:
^SCFG: "Radio/Mtpl","2","1","1","33","27"
^SCFG: "Radio/Mtpl","2","1","2","30","26"
^SCFG: "Radio/Mtpl","2","1","4","33","27"
^SCFG: "Radio/Mtpl","2","1","8","30","26"
^SCFG: "Radio/Mtpl","2","1","32","24"
^SCFG: "Radio/Mtpl","2","1","64","24"
^SCFG: "Radio/Mtpl","2","1","512","24"
^SCFG: "Radio/Mtpl","2","1","16384","24"
^SCFG: "Radio/Mtpl","2","1","65536","24"
```

^SCFG: "Radio/Mtpl","2","1","131072","24"	
^SCFG: "Radio/Mtpl","2","1","1048576","24"	
OK	
AT^SCFG="Radio/Mtpl",3,1,32,23	Profile 1: Change max. RF output power limit of WCDMA 1900 (BC2) band to 23dBm.
^SCFG: "Radio/Mtpl","0"	Instant power limitation is still disabled.
OK	
AT^SCFG="Radio/Mtpl",3,1,64,23	Profile 1: Change max. RF output power limit of WCDMA 850 (BC5) band to 23dBm.
^SCFG: "Radio/Mtpl","0"	Instant power limitation is still disabled.
OK	
AT^SCFG="Radio/Mtpl",3,1,512,23	Profile 1: Change max. RF output power limit of WCDMA 1700 AWS (BC4) band to 23dBm.
^SCFG: "Radio/Mtpl","0"	Instant power limitation is still disabled.
OK	
AT^SCFG="Radio/Mtpl",3,1,16384,23	Profile 1: Change max. RF output power limit of LTE 1900 (B2) band to 23dBm.
^SCFG: "Radio/Mtpl","0"	Instant power limitation is still disabled.
OK	
AT^SCFG="Radio/Mtpl",3,1,65536,23	Profile 1: Change max. RF output power limit of LTE 1700 (B4) band to 23dBm.
^SCFG: "Radio/Mtpl","0"	Instant power limitation is still disabled.
OK	
AT^SCFG="Radio/Mtpl",3,1,131072,23	Profile 1: Change max. RF output power limit of LTE 850 (B5) band to 23dBm.
^SCFG: "Radio/Mtpl","0"	Instant power limitation is still disabled.
OK	
AT^SCFG="Radio/Mtpl",3,1,1048576,23	Profile 1: Change max. RF output power limit of LTE 700 (B17) band to 23dBm.
^SCFG: "Radio/Mtpl","0"	Instant power limitation is still disabled.
OK	
AT^SCFG="Radio/Mtpl",2,1	Read profile 1 settings.
.....	The response returns the old values as above (therefore omitted in this example).
AT+CFUN=1,1	Restart UE to enable the profile 1 settings configured above.
OK	
^SYSSTART	
AT^SCFG="Radio/Mtpl"	Read "Radio/Mtpl" mode.
^SCFG: "Radio/Mtpl","0"	Instant power limitation is still disabled.
OK	
AT^SCFG="Radio/Mtpl",2,1	Read profile 1 settings. Changed values are shown now.
^SCFG: "Radio/Mtpl","2","1","1","33","27"	
^SCFG: "Radio/Mtpl","2","1","2","30","26"	
^SCFG: "Radio/Mtpl","2","1","4","33","27"	
^SCFG: "Radio/Mtpl","2","1","8","30","26"	
^SCFG: "Radio/Mtpl","2","1","32","23"	
^SCFG: "Radio/Mtpl","2","1","64","23"	
^SCFG: "Radio/Mtpl","2","1","512","23"	
^SCFG: "Radio/Mtpl","2","1","16384","23"	
^SCFG: "Radio/Mtpl","2","1","65536","23"	
^SCFG: "Radio/Mtpl","2","1","131072","23"	
^SCFG: "Radio/Mtpl","2","1","1048576","23"	
OK	
AT^SCFG="Radio/Mtpl",1,1	Activate Profile 1.
^SCFG: "Radio/Mtpl","1","1"	Instant power limitation is now enabled with profile 1 and new limits as changed above.

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

2.14 AT^SSRVSET Service Interface Configuration

PLS8-US-R4 offers numerous services such as two AT command instances MDM (Modem) and APP (Application) and NMEA streaming (see Chapter 16., GNSS Commands). For AT command instances MDM and APP refer to Section 1.4, AT Command Interpreter and AT^SQPORT.
PLS8-US-R4 also offers numerous devices such as serial interface ASC0, USB related channels and Multiplex mode related channels. USB related channels are part of the UE's USB composition, which can be enabled or disabled.
Hence, AT^SSRVSET serves to configure which service is mapped onto which device. These mappings are stored in Service Sets. A number of fixed (i.e. predefined) Service Sets and some customer configurable Service Sets are available.
Information provided by the active Service Set is evaluated during PLS8-US-R4 restart.

The UE does not support mapping of any available service to every device. Therefore, it is highly recommended to exclusively use the mappings specified in the following table. For every service the table determines the mapping two scenarios: Normal mode after UE switch-on and for Multiplex mode activated via AT+CMUX.

After changing the AT^SSRVSET configuration make sure that all device / interface relevant AT commands and settings match. For example, please check, and if needed, modify AT^SCFG subcommands "URC/DstIfc", "URC/Ringline" and "MEopMode/ExpectDTR".

Table 2.6: Validated and released Service/Device Mappings

Service Set	MDM*)	APP	NMEA
<SetNum> 1 UART & USB	ASC0, MUX0 **)	USB1, MUX1	USB2, MUX2
<SetNum> 2 USB only	USB0, MUX0	USB1, MUX1	USB2, MUX2
<SetNum> 3 UART only	ASC0, MUX0	NONE, MUX1	NONE, MUX2
<SetNum> 4 UART & USB & MBIM	ASC0, MUX0 **)	USB1, MUX1	USB2, MUX2
<SetNum>s ≥ 10 Customer Configurable	ASC0, MUX0	USB1***), MUX1	NONE, MUX2

*) Multiplex mode can be started on Modem interface (MDM) only. For details refer to AT+CMUX.
**) Please note that the AT^SSRVSET command starts off counting the multiplex channels from 0, whereas other AT commands and descriptions start off from 1 (see e.g. AT+CMUX). This means MUX0 refers to multiplex channel 1, MUX1 to multiplex channel 2 etc.
***) Even if APP service is not used while UE is not in Multiplex mode, it is recommended to enable USB1 as a fallback solution to regain access to AT commands.

Syntax

Test Command

AT^SSRVSET=?

Response(s)

OK

Read Command

AT^SSRVSET?

Response(s)

^SSRVSET:<SetNum>, "usbcomp", <comp>, <usbLangId>, <usbVendorId>, <usbProductId>, <usbManufacturer>, <usbProduct>, <usbSerialNo>
^SSRVSET:<SetNum>, "srvmap", <Service>, <Device>, <Mux-Device>
^SSRVSET:...
OK

Read Command (Continued)

AT^SSRVSET?

Response(s)

ERROR
+CME ERROR: <err>

Write Command

Determine or query the Service Set used during next UE restart. Only a valid Service Set can be activated, i.e. at least one AT command service (i.e. MDM or APP) mapping needs to be provided. Otherwise "actSrvSet" subcommand will return an <SrvSetError> code.

AT^SSRVSET="actSrvSet"[, <SetNum>]

Response(s)

In case of an error:
[^SSRVSET:"ERROR", <SrvSetError>]

OK

Write Command

Generate list of all devices available as part of a certain Service Set.

AT^SSRVSET="listSrvSetDev", <SetNum>

Response(s)

^SSRVSET:"fixDev" , <SetNum>, <Device>[, <Device>, ...]
^SSRVSET:"usbDev" , <SetNum>, <Device>[, <Device>, ...]
^SSRVSET:"muxDev" , <SetNum>, <Mux-Device>[, <Mux-Device>, ...]
Or in case of an error:
[^SSRVSET:"ERROR", <SrvSetError>]

OK

Write Command

Query details of service interface configuration currently used by the UE. The configuration data was initially taken from the Service Set database and cannot be changed without UE restart.

AT^SSRVSET="current"

Response(s)

^SSRVSET:"usbcomp", <comp>, <usbLangId>, <usbVendorId>, <usbProductId>, <usbManufacturer>, <usbProduct>, <usbSerialNo>
^SSRVSET:"srvmap", <Service>, <Device>, <Mux-Device>
^SSRVSET:...
Or in case of an error:
[^SSRVSET:"ERROR", <SrvSetError>]

OK

Write Command

Determine USB composition for a given customer configurable Service Set. This way a USB composition is to be used if the given Service Set is activated for next UE restart.
If parameter <comp> is set to "NONE", the service set does not use a USB composition. Hence, no USB related devices can be mapped to a service. If a device provided as part of a USB composition is used in any mapping of the given Service Set the "usbcomp" subcommand will return an <SrvSetError> code.
If no further parameters are provided this subcommand queries the USB composition used by the UE.

AT^SSRVSET="usbcomp"[, <SetNum>, <comp>]

Response(s)

In case of query of available USB composition:
[^SSRVSET:"usbcomp", <comp>, <usbLangId>, <usbVendorId>, <usbProductId>, <usbManufacturer>, <usbProduct>, <usbSerialNo>]

Write Command (Continued)

Determine USB composition for a given customer configurable Service Set. This way a USB composition is to be used if the given Service Set is activated for next UE restart.
If parameter <comp> is set to "NONE", the service set does not use a USB composition. Hence, no USB related devices can be mapped to a service. If a device provided as part of a USB composition is used in any mapping of the given Service Set the "usbcomp" subcommand will return an <SrvSetError> code.
If no further parameters are provided this subcommand queries the USB composition used by the UE.

AT^SSRVSET="usbcomp"[, <SetNum>, <comp>]

Response(s)

In case of an error:
[^SSRVSET:"ERROR", <SrvSetError>]

OK

Write Command

Determine a service - device mapping for a given customer configurable Service Set. This way connects a service to a device and a Multiplex mode related device if the given Service Set is used during UE restart. If last parameter <Mux-Device> is omitted "NONE" is used as default value, i.e. the service will remain usable on the given device during Multiplex mode.
If no devices are provided (i.e. parameters <Device> and <Mux-Device> are set to "NONE"), a mapping of the service is deleted if one exists, if not the "srvmap" subcommand will return with <SrvSetError>=3.
It is not possible to map a <Device> or Multiplex mode related <Mux-Device> to more than one service. "srvmap" subcommand will return an <SrvSetError> code.
Take special care when changing the mapping of the currently active Service Set for use after next UE restart. It is not allowed to invalidate the active Service Set by deleting the last AT command service (i.e. MDM or APP) mapping. "srvmap" subcommand will return an <SrvSetError> code in this case.

AT^SSRVSET="srvmap", <SetNum>, <Service>, <Device>[, <Mux-Device>]

Response(s)

In case of an error:
[^SSRVSET:"ERROR", <SrvSetError>]

OK

Write Command

Dismiss all service - device mappings for a given customer configurable Service Set. If no further parameter is provided this subcommand clears all customer configurable Service Sets. However, it is not allowed to clear the mappings of the currently active Service Set, i.e. which will be used during next UE restart. "clear" subcommand will return an <SrvSetError> code in this case.

AT^SSRVSET="clear"[, <SetNum>]

Response(s)

In case of an error:
[^SSRVSET:"ERROR", <SrvSetError>]

OK

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<SetNum>(num)(NV)

Service Set Number

The Service Set number can be seen as an index into the Service Set database.

1(D)	Service Set with fixed configuration for USB and UART access. Same interface configuration as <SetNum> 1, but with USB composition identifier "0061" (with additional USB CDC ECM enabled). See <comp> for details.
2	Service Set with fixed configuration for accessing USB only.
3	Service Set with fixed configuration for accessing UART only.
4	Service Set with fixed configuration for USB and UART access. Same interface configuration as <SetNum> 1, but with USB composition identifier "0062" (with additional USB CDC MBIM enabled). See <comp> for details.
10...12	Customer configurable Service Sets.

<comp>(str)(NV)

USB Composition Identification

Identification of USB composition.

“NONE“	No USB composition dedicated to a Service Set. Hence, no USB related devices are available to be mapped to a service.
“0061“	USB composition Identifier. This composition enumerates the following devices: 4*CDC-ACM (USB0..3), 1*CDC-ACM (USB4 only reserved) and 2*CDC-ECM (WWAN adapters). Usage of CDC-ECM and CDC MBIM, and therefore enumerations 0061 and 0062, are mutually exclusive. For details on the CDC-ECM adapters see AT^SWWAN.
“0062“	USB composition Identifier. This composition enumerates the following devices: 4*CDC-ACM (USB0..3), 1*CDC-ACM (USB4 only reserved) and 1*CDC-MBIM adapter. Usage of CDC-ECM and CDC MBIM, and therefore enumerations 0061 and 0062, are mutually exclusive.

<usbLangId>(str)(NV)

Language ID

Please refer to "USB Language Identifiers (LANGIDs) [.PDF!]." to find the language IDs currently defined for USB devices. If parameter <usbLangId> is not specified, the default value of the UE's standard USB Device Descriptor configuration applies (US English).
Parameter shall be given in HEX format, maximum 4 characters.

<usbVendorId>(str)(NV)

Vendor ID

This parameter represents the Vendor ID obtained from the USB Implementers Forum. The Vendor ID will, together with the Product ID, be transmitted to the host during USB enumeration. If the parameter <usbVendorId> is not specified, the default value of the UE's standard USB Device Descriptor configuration applies.
Parameter shall be given in HEX format, maximum 4 characters.

<usbProductId>(str)(NV)

Product ID

Product ID (PID) defined by the Customer Application manufacturer to identify the USB device.
The Product ID will, together with the Vendor ID, be transmitted to the host during USB enumeration. If parameter <usbProductId> is not specified, the default value of UE's standard USB Device Descriptor applies.
Parameter shall be given in HEX format, maximum 4 characters.

<usbManufacturer>(str)(NV)

Manufacturer name

Optional manufacturer string defined by the Customer Application manufacturer. If parameter <usbManufacturer> is not specified, the default value of the UE's standard USB Device Descriptor configuration applies.
Parameter length: maximum 63 characters.

<usbProduct>(str)(NV)

Product string

Optional product name defined by the Customer Application manufacturer. If parameter <usbProduct> is not specified, the default value of the UE's standard USB Device Descriptor configuration applies.
Parameter length: maximum 63 characters.

<usbSerialNo>(str)(NV)

Device serial number

Optional serial number. Empty string if not used, like in the case of the UE's standard USB Device Descriptor configuration.
A serial number enables the host to assign the same virtual COM port to the USB device even though the device is connected to another USB port. This eliminates the need for the host to load the driver again.
Parameter length: maximum 4 characters.

<Service>(str)(NV)

List of possible services provided by the UE.

“APP“	Application instance referred to as "Application" if queried with AT^SQPORT. In the quick reference tables it is named APP.
“MDM“	Modem instance referred to as "Modem" if queried with AT^SQPORT. In the quick reference tables it is named MDM.
“NMEA“	Interface dedicated for output of NMEA data.

<Device>(str)(NV)

List of devices provided by the UE.

“NONE“	Special value which is used to indicate that there is no device mapping.
“ASC0“	
“USB0“	
“USB1“	
“USB2“	
“USB3“	Not used in preconfigured Service Sets <SetNum>, but can be selected in a customized Service Set (with <SetNum> ≥ 10). If not used, take care that AT^SCFG "MEopMode/ExpectDTR" feature remains activated for USB3. For details see parameter <expDtrPort>.

<Mux-Device>(str)(NV)

Devices related to Multiplex mode. For details refer to AT+CMUX

[“NONE“]	No mapping to a <Mux-Device> during Multiplex mode, however, there may be a mapping to a <Device> at this time.
“MUX0“	Multiplex channel 1
“MUX1“	Multiplex channel 2

“MUX2“	Multiplex channel 3
“MUX3“	Multiplex channel 4. Not used in preconfigured Service Sets <SetNum>, but can be selected in a customized Service Set <SetNum> ≥ 10.

<SrvSetError>(num)

Service Set Error

Error result codes.

1	Error cause unknown
2	Parameter out of range
3	Operation not supported
4	No AT command service would be accessible after UE restart
5	Invalid service name
6	Invalid device name
7	Invalid Multiplex mode related device name
8	Storage failure

Examples

EXAMPLE 1

Query details of service interface configuration currently used by the UE.

```
AT^SSRVSET="current"          For example, if Service Set 2 was active during last start-up of the UE
                              the following information will be provided.
^SSRVSET: "usbcomp","0061","","1E2D","0061","Cinterion","LTE Modem",""
^SSRVSET: "srvmap","MDM","USB0","MUX0"
^SSRVSET: "srvmap","APP","USB1","MUX1"
^SSRVSET: "srvmap","NMEA","USB2","MUX2"
OK
```

EXAMPLE 2

Configure the customer settings in last row of Table 2.6, Validated and released Service/Device Mappings into Service Set 10.

```
^SYSSTART                     After UE restart ...
AT^SSRVSET="actSrvSet"        ... assure to run a Service Set other than the one to configure
^SSRVSET: 10                  If not running the right Service Set ...
OK

AT^SSRVSET="actSrvSet",2      ... switch to Service Set 2.
OK                            However, the new setting is activated after next UE restart only, ...

AT+CFUN=1,1                   ... therefore, force UE restart.
OK
^SYSSTART                     The newly selected Service Set is now active.

AT^SSRVSET="usb-              Determine the USB composition "0061" to be used by Service Set 10.
comp",10,"0061"
OK

AT^SSRVSET="srv-              MDM service is accessible via ASC0 device. After Multiplex mode is
map",10,"MDM" ,"ASC0"         started MDM service is accessible on MUX0 channel.
,"MUX0"
OK

AT^SSRVSET="srv-              APP service is accessible via USB1 device. After Multiplex mode is
map",10,"APP" ,"USB1"         started APP service is accessible on MUX1 channel.
,"MUX1"
OK

AT^SSRVSET="srv-              NMEA (i.e. GPS location data) service is only accessible during Multi-
map",10,"NMEA","NONE"         plex mode. After Multiplex mode is started NMEA service is accessible
,"MUX2"                       on MUX2 channel.
OK

AT^SSRVSET= "actSrvSet",10    Activate the configured Service Set 10.
OK                            Consequently, it will be used after next UE restart.
```

3. Status Control Commands

The AT Commands described in this chapter allow the external application to obtain various status information from the PLS8-US-R4.

3.1 AT+CEER Extended Error Report

AT+CEER returns an extended error report regarding the reason of the last

- call release
- failure to set up a call (both mobile originated or terminated)
- failure to modify a call by using Supplementary Services
- failed attempt to activate, register, query, deactivate or deregister a Supplementary Service
- unsuccessful PS attach or unsuccessful PDP context activation
- PS detach or PDP context deactivation

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

Syntax

Test Command

```
AT+CEER=?
```

Response(s)

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

Exec Command

```
AT+CEER
```

Response(s)

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

Write Command

```
AT+CEER=<reset>
```

Response(s)

```
OK
ERROR
+CME ERROR
```

PIN	MDM	APP	✈	Last
+	+	+	+	-

Reference(s)

3GPP TS 27.007 [49]
3GPP TS 24.008 [42]

Parameter Description

<report>(str)

release cause report

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

<reset>(num)	
0	Reset the extended error report to initial value.

3.1.1 List of status codes for extended error report

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

CS network cause
Unassigned/unallocated number
No route to destination
Channel unacceptable
Operator determined barring
Normal call clearing
User busy
No user responding
User alerting, no answer
Call rejected
Number changed
Non selected user clearing
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

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

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

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

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

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

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

Other release cause
Call barred

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

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

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

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

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

PS LTE SIP cause
SIP End bad req wait invite
SIP End bad req wait reinvite
SIP End invalid remote URII
SIP End remote unsupp media type
SIP End peer not reachable
SIP End network no resp time out
SIP End network no resp hold fail
SIP End data connecxtion lost

PS LTE SIP cause
SIP End upgrade downgrade rej
SIP End 403 forbidden
SIP End LTE hard fail
SIP End no network response
SIP End upgrade downgrade cancelled
SIP End upgrade downgrade failed
SIP End CC reject
SIP End 486 busy here
SIP End IRAT pending call
SIP End emergency only
SIP End BSR in progress
SIP End BSR complete GSM
SIP End BSR complete WCDMA
SIP End 200 answered elsewhere
SIP End 300 multiple choices
SIP End 301 moved permanently
SIP End 302 moved temporarily
SIP End 305 use proxy
SIP End 380 alternate service
SIP End 380 alternate service
SIP End 401 unauthorized
SIP End 402 payment required
SIP End 405 method not allowed
SIP End 406 not acceptable
SIP End 407 proxy authentication required
SIP End 410 gone
SIP End 413 entity too large
SIP End 414 request URI too large
SIP End 416 unsupported URI scheme
SIP End 420 bad extension
SIP End 421 extension required
SIP End 422 interval too brief
SIP End 481 call or transaction does not exist
SIP End 482 loop detected
SIP End 483 too many hops
SIP End 484 address incomplete
SIP End 485 ambiguous
SIP End 487 request terminated
SIP End 488 not acceptable here
SIP End 491request pending
SIP End 493 undecipherable
SIP End 501 not implemented

PS LTE SIP cause
SIP End 502 bad gateway
SIP End 503 no response timeoutt
SIP End 504 server timeout
SIP End 505 version not supported
SIP End 513 message too large
SIP End 505 version not supported
SIP End 600 busy everywhere
SIP End 603 decline
SIP End 604 does not exist anywhere
SIP End 605 session description not acceptable
SIP End 606 SRVCC handover to WCDMA
SIP End 607 SRVCC end call

SIP Release Causes
no reason
100 Trying
180 Ringing
181 Call Is Being Forwarded
182 Queued
183 Session Progress
182 Queued
183 Session Progress
200 OK
180 Ringing
300 Multiple Choices
301 Moved Permanently
302 Moved Temporarily
305 Use Proxy
380 Alternative Service
400 Bad Request
401 Unauthorized
402 Payment Required
403 Forbidden
404 Not Found
406 Not Acceptable
408 Request Timeout
410 Gone
413 Request Entity Too Large
414 Request-URI Too Large
415 Unsupported Media Type
416 Unsupported URI Scheme
420 Bad Extension

SIP Release Causes
421 Extension Required
423 Interval Too Brief
480 Temporarily not available
481 Call Leg/Transaction Does Not Exist
482 Loop Detected
483 Too Many Hops
484 Address Incomplete
485 Ambiguous
486 Busy Here
487 Request Terminated
488 Not Acceptable Here
491 Request Pending
493 Undecipherable
500 Internal Server Error
501 Not Implemented
502 Bad Gateway
503 Service Unavailable
504 Server Time-out
505 SIP Version not supported
513 Message Too Large
600 Busy Everywhere
603 Decline
604 Does not exist anywhere
606 Not Acceptable

ITU Q.850 Release Cause
1 Unallocated number
2 No route to specified transit network
3 No route to destination
4 Send special information tone
5 Misdialled trunk prefix
6 Channel unacceptable
7 Call awarded and being delivered in an established channel
8 Preemption
9 Preemption - circuit reserved for reuse
14 QoR: ported number
16 Normal call clearing
17 User busy
18 No user responding
19 No answer from user
20 Subscriber absent
21 Call rejected

ITU Q.850 Release Cause
22 Number changed
23 Redirection to new destination
24 Call rejected due to feature at the destination
25 Exchange routing error
26 Non-selected user clearing
27 Destination out of order
28 Invalid number format
29 Facility rejected
30 Response to STATUS ENQUIRY
31 Normal, unspecified
34 No circuit/channel available
38 Network out of order
40 Permanent frame mode connection operational
41 Temporary failure
42 Switching equipment congestion
43 Access information discarded
44 Requested circuit or channel not available
46 Precedence call blocked
47 Resource unavailable, unspecified
49 Quality of service not available
50 Requested facility not subscribed
53 Outgoing calls barred within CUG
54 Incoming calls barred within CUG
55 Bearer capability not authorized
58 Inconsistency in designated outgoing access information and subscriber class
62 Service or option not available, unspecified
63 Bearer capability not implemented
65 Channel type not implemented
69 Requested facility not implemented
70 Only restricted digital information bearer capability is available
79 Service or option not implemented, unspecified
81 Invalid call reference value
82 Identified channel does not exist
83 A suspended call exists, but this call identity does not
84 Call identity in use
85 No call suspended
86 Call having the requested call identity has been cleared
87 User not member of CUG
88 Incompatible destination
90 Non-existent CUG
91 Invalid transit network selection
95 Invalid message, unspecified

ITU Q.850 Release Cause
96 Mandatory information element is missing
97 Message type non-existent or not implemented
98 Message not compatible with call state or message type non-existent or not implemented
99 Information element /parameter non existent or not implemented
100 Invalid information element contents
101 Message not compatible with call state
102 Recovery on timer expiry
103 Parameter non-existent or not implemented, passed on
110 Message with unrecognized parameter, discarded
111 Protocol error, unspecified
127 Interworking, unspecified

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-US-R4 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>="sendsms"
^SIND: sendsms, <mode>, <indValue>, <SmsMr>

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

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

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

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

In case of <indDescr>="ceer"
^SIND: ceer, <mode>, <ceerRelCauseGroup>[, <ceerRelCauseGroupList>]

In case of <indDescr>="simlocal"
^SIND: simlocal, <mode>, <indValue>$_{slot\_1}$, <indValue>$_{slot\_2}$

In case of <indDescr>="dtmf"
^SIND: dtmf, <mode>, <dtmfSrc>, <dtmfSilenceTime>, <dtmfBufferTimeout>, <dtmfMinToneTime>

In case of <indDescr>="simread"
^SIND: simread, <mode>, <simreadCfgEfBitMask>, <simreadEfBitMask>

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

In case of <indDescr>="omadm"
^SIND: omadm, <mode>, <OmaDmAction>[, <OmaDmStatus>]

Read Command (Continued)

AT^SIND?

Response(s)

In case of <indDescr>="orpco"
^SIND: orpco, <mode>[, <containerid>, <mccmnc>, <clength>, <container>]

In case of <indDescr>="ltebot"
^SIND: ltebot, <mode>, <ltebotTimerstat>, <ltebotReason>, <APN>[, <ltebotReasonTxt>]

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

OK
ERROR
+CME ERROR: <err>

Write Command

AT^SIND=<indDescr>, <mode>

Response(s)

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

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

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

In case of: <indDescr>="orpco" and <mode>=2
^SIND: orpco, <mode>, <containerid>, <mccmnc>, <clength>, <container>

In case of: <indDescr>="ltebot" and <mode>=2
^SIND: ltebot, <mode>, <ltebotTimerstat>, <ltebotReason>, <APN>[, <ltebotReasonTxt>]

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

Write Command

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

Response(s)

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

Write Command

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

Response(s)

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

Write Command

AT^SIND="simread", <mode>[, <simreadCfgEfBitMask>]

Response(s)

^SIND: simread, <mode>, <simreadCfgEfBitMask>, <simreadEfBitMask>
OK
ERROR
+CME ERROR: <err>

Write Command

AT^SIND="sendsms", <mode>

Response(s)

^SIND: sendsms, <mode>, <indValue>, <SmsMr>
OK
ERROR
+CME ERROR: <err>

Write Command

AT^SIND="omadm", <mode>

Response(s)

^SIND: omadm, <mode>, <OmaDmAction>[, <OmaDmStatus>]
OK
ERROR
+CME ERROR: <err>

Write Command

AT^SIND="prov", <mode>

Response(s)

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

Write Command

AT^SIND="dtmf", <mode>[, <dtmfSrc>, <dtmfSilenceTime>, <dtmfBufferTimeout>, <dtmfMinToneTime>]

Response(s)

^SIND: "dtmf", <mode>, <dtmfSrc>, <dtmfSilenceTime>, <dtmfBufferTimeout>, <dtmfMinToneTime>
ERROR
+CME ERROR: <err>

PIN	MDM	APP	✈	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 "sendsms" indicator:

+CIEV: <indDescr>, <indValue>, <SmsMr>

The URC indicates that the UE has finished executing the AT commands for sending a short message.

URC 3

Format of the "simdata" indicator follows the AT^SSTGI response:

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

This URC is issued when the UE receives a USAT Proactive Command (PAC) from the (U)SIM Application, e.g. indicating that the content of one or more Elementary Files has been changed.
Additionally, independent of Remote-USAT modes, a "+CIEV: "simdata"" URC is issued if REFRESH command processing fails. The reason may derived from <status> and <statAddInfo> values.
The UE holds a limited storage available to keep numerous "simdata" events received while AT^SIND setting was not enabled or UE-TE link was reserved, e.g. in online data mode. In case of storage overflow a special URC "+CIEV: simdata,1,254" will be issued.

URC 4

Format of the "eons" indicator:

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

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

URC 5

Format of the "nitz" indicator:

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

URC 6

Format of the "steerroam" indicator:

+CIEV: <indDescr>

URC 7

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

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

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

URC 8

In case <indValue> equals "1".

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

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

URC 9

Format of the "ceer" indicator:

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

URC 10

Format of the "simlocal" indicator:

+CIEV: <indDescr>, <indValue>$_{slot\_1}$, <indValue>$_{slot\_2}$

URC 11

Format of the "dtmf" indicator:

```
+CIEV: <indDescr>, <dtmfChar>, <dtmfSrc>, <dtmfToneDuration>[,
<dtmfToneDuration>...]
```

DTMF characters are enclosed in quotation marks "...", for each detected character measured tone duration is provided. The URC is sent when the DTMF buffer is emptied. This is the case either when the buffer is full (max. 15 DTMF characters) or when the timeout specified with <dtmfBufferTimeout> expires. Refer to <indDescr>, "dtmf".

URC 12

Format of the "is_cert" indicator:

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

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

URC 13

Format of the "omadm" indicator:

```
+CIEV: <indDescr>, <OmaDmAction>[, <OmaDmStatus>]
```

URC 14

Format of the "orpco" indicator:

```
+CIEV: <indDescr>, <containerid>, <mccmnc>, <clength>, <container>
```

URC 15

Format of the "simread" indicator:

```
+CIEV: <indDescr>, <simreadEf>
```

The URC indicates that the UE has finished reading one of the Elementary Files on the (U)SIM specified with <simreadCfgEfBitMask> in the AT^SIND write command. For each Elementary File type one single URC will be issued.

URC 16

Format of the "ltebot" indicator:

```
+CIEV: <indDescr>, <ltebotTimerstat>, <ltebotReason>, <APN>[,
<ltebotReasonTxt>]
```

URC 17

Format of the "prov" indicator:

```
+CIEV: <indDescr>, <provMm>, <provCur>
```

Parameter Description

<indDescr>(str)

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

“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.
“sounder“	Sounder activity:

Reports every event that causes the UE to generate a tone.
0 Tone generator not active.
1 Tone generator active.
Value 1 means for example:
Incoming call - UE is ringing. Note that in this case the URC "+CIEV: sounder" will be output only if ringing tones are enabled with AT^SRTC.
Waiting call - UE generates waiting call tone if call waiting is enabled.
Outgoing call - UE generates BUSY tone.
Playback of ringing tones when tested with AT^SRTC.

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

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

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

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

“sendsms“
Short message sending status:
0 No error, short message successfully sent.
1 Short message not sent.

If enabled the "+CIEV: sendsms" URC indicates that the UE has finished executing the AT commands for sending a short message.

“audio“
Activity of the built-in audio unit:
0 Audio unit not active.
1 Audio unit is active.

“simdata“
If the UE has Remote-USAT set to Automatic Response mode the (U)SIM Application activity is handled internally; for details refer to AT^SSTA, parameter <mode>. However, it is necessary for the Customer Application (TE) to be informed about some types of ongoing Proactive Commands (PAC) with their content and status.
Therefore, AT^SIND="simdata" provides URC notification for PAC type REFRESH:

- PAC REFRESH is sent by the (U)SIM Application to notify the UE of changes to Elementary File(s) data on the (U)SIM. All data provided by the USIM is stored in one of many of its so-called Elementary Files. This data can be queried by the TE directly via AT+CRSM or implicitly via many AT commands presented by this document. For instance the (U)SIM's International Mobile Subscriber Identity (IMSI) can be queried via AT+CIMI, but actually is stored in EF_{IMSI}, as defined in 3GPP TS 11.11 [18], 3GPP TS 31.101 [19], 3GPP TS 31.102 [20].
  However, be aware that the content of any Elementary File can be changed at any time by the network provider or the (U)SIM Application. For details refer to USAT feature "Data Download to USIM" in 3GPP TS 11.14 [22], 3GPP TS 31.111 [23], ETSI TS 102 223 [24]. If this happens the TE urgently needs to refresh its own copy of the changed data to ensure its safe and consistent use!
  Therefore, "+CIEV: "simdata"" URCs can be enabled in both Remote-USAT modes (Autoresponse mode and Explicit Response mode) indicating that

the content of one or more Elementary Files has been changed.

One "+CIEV: "simdata"" URC is generated, containing PAC data and Terminal Response.
The UE provides a limited storage to keep numerous "simdata" events received while AT^SIND setting was not enabled or UE-TE link was reserved, e.g. in online data mode. In case of storage overflow a special URC "+CIEV: "simdata",1,254" will be issued.

"eons" Enhanced Operator Name String (EONS):
The Enhanced Operator Name String indicator feature allows the PLS8-US-R4 to output various operator names for different PLMN identities. It also allows the output of a different operator name based on a subset of the registered network by using a range of Location Area Codes (LACs) or a single LAC. See also 3GPP TS 22.101 [51].
The EONS tables are stored in the USIM and will be read after SIM PIN authentication.
Following USIM Elementary Files are affected by the EONS feature:
EF_{SST} (USIM Service Table) - describes which features are active.
EF_{OPL} (Operator PLMN List) - contains the PLMN identification and location ID together with the index of the corresponding PNN record
EF_{PNN} (PLMN Network Name) - contains the full and short form version of the network name for the registered PLMN

The name displayed by the <eonsOperator> parameter depends on various sources of information prioritized in the list below. The highest priority has option 1. If an option is not available the next lower option from the list determines the displayed name. The priority is indicated by the <indValue> parameter.
Prioritized sources determining the name displayed by <eonsOperator>:

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

"nitz" Network Identity and Time Zone:
This indicator shows the time relevant information elements of an MM Information (MMI) or GMM Information (GMMI) message received from the network (see 3GPP TS 24.008 [42], ch. 9.2.15a and 9.4.19).
The network usually sends a NITZ indicator when the mobile attaches to the network, when it enters a location area with different time zone or when a daylight change occurs.
A NITZ indicator may consist of the following parameters: Universal Time (UT), local Time Zone (TZ), Daylight Saving Time (DST). All information elements of MMI/GMMI are optional and therefore, the presentation of the parameters <nitzUT>, <nitzTZ>, <nitzDST> varies with the network. For example, the network may send all three parameters UT, TZ, DST, or only UT and TZ or only TZ.

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

TZ is given as a positive (east) or negative (west) offset from UT in units of 15 minutes.
DST shows the number of hours added to the local TZ because of daylight saving time (summertime) adjustment. Usually DST is 1 hour but it can be also 2 hours in certain locations.

Example for time and time zone with DST:
+CIEV: nitz,"04/07/23,13:39:20",-28,1
In this example TZ is -28, showing a time offset of -7 hours (west) to Universal Time/GMT (which never changes for DST). DST is 1 which indicates that one hour was added to TZ because of Daylight Saving Time. If a network does not send the DST parameter the TZ value would be -32 (8 hours west) as would be done in winter:
+CIEV: nitz,"04/11/23,13:39:20",-32

Please be aware that although the last NITZ value can be looked up again via "AT^SIND=nitz,2" the returned values may be out of date. Especially the UT value is obsolete because there is no internal NITZ clock and therefore no continuation of UT.
NITZ values are lost when the UE detaches from network. Also when a manual network selection fails and the UE automatically falls back to the previous network the NITZ values cannot be recalled. Nevertheless an indicated time zone is valid until a new MMI/GMMI will trigger another NITZ indication.

“simstatus“

USIM status:
0 USIM removed.
Note: Another way to verify the USIM connection is the "^SCKS" URC enabled with AT^SCKS.
1 USIM inserted.
3 USIM PIN required - USIM locked. USIM PIN must be entered to enable PLS8-US-R4 to register to the network.
4 Personalization info ready - CHV (Card Holder Verification) data have been verified (if required).
5 USIM initialization completed - UE has finished reading USIM data.

“simlocal“

Availability of the physically connected USIM:
0 USIM removed.
1 USIM inserted.
The availability of the (U)SIM is shown for the (U)SIM interfaces configurable with AT^SCFG="SIM/CS" parameter <CS>.

“psinfo“

Packet Switched status:
"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

“lsta“

Link Stability indication (for GSM only):
The Link Stability indicator feature allows the PLS8-US-R4 to output radio link

errors and statistic parameters of signal strength distribution across the band via URC.
0 Radio link error.
1 Radio link signal strength distribution.
2 Radio link error during voice call.
The presentation of the "lsta" indicator is determined by the radio link spectrum shape. For example, each time a radio link error appears the URC indicates an Error Downcounter value and the RSSI of the serving cell to provide some kind of warning. Every consecutive error decrements the Error Downcounter value and successful downlink signal reception resets it to start value of 11. The Error Downcounter value is only available in IDLE mode or during voice calls. It will not be presented during PS connections.
The factor on which Error Downcounter is decremented depends on network settings.
Error Downcounter value 0 means that the UE has lost the cell and will start the cell reselection process. In this case the URC is enhanced and includes the following statistic parameters of signal strength distribution across the band.
These are:
- Number of reported channels,
- Maximal signal strength value,
- Minimal signal strength value,
- Mean value of signal strength across frequency band and
- Variance of signal strength across frequency band.

To avoid that radio link error URCs are output too often, when radio conditions are bad, you can select a lower warning level with `<lstaLevel>`.

“ratmode“

Radio Access Technology mode indication:
"ratmode" indicates the value of the AT&T specific USIM Elementary File $EF_{RATmode}$.
0 RAT mode dual (GSM/WCDMA)
1 RAT mode GSM only
2 RAT mode WCDMA only
3 RAT mode triple (GSM/WCDMA/LTE)
4 RAT mode LTE only
99 RAT mode not known or USIM Elementary File $EF_{RATmode}$ not accessible
The contents of the USIM Elementary File $EF_{RATmode}$ may be changed by the network in the background at any time via USIM Application Toolkit (USAT) procedure "Data download to USIM". For a detailed description please refer to 3GPP TS 11.14 [22], 3GPP TS 31.111 [23], ETSI TS 102 223 [24].

“pacsp“

PLMN mode bit status::
"pacsp" indicates the parsed PLMN mode bit value of the USIM Elementary File EF_{CSP} (Customer Service Profile) according to Common PCN Handset Specification (CPHS) [52].
0 CSP PLMN mode bit off
1 CSP PLMN mode bit on
99 CSP PLMN mode bit not defined or USIM Elementary File EF_{CSP} not accessible
The contents of the USIM Elementary File EF_{CSP} may be changed by the network in the background at any time via USIM Application Toolkit (USAT) procedure "Data download to USIM". For a detailed description please refer to 3GPP TS 11.14 [22], 3GPP TS 31.111 [23], ETSI TS 102 223 [24].
Please note that URC presentation `<mode>` for this indicator is stored to non-volatile memory with `AT&W`, restored with `ATZ` and reset to '0' (disabled) by `AT&F`.

“steerroam“

Steering-of-roaming:
The "steerroam" indicator 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 [42] 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 +CIEV: "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.

“iccid“

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

“euiccid“

USIM embedded identification number:
"euiccid" indicator shows the USIM embedded identification number stored in the USIM Elementary File $EF_{EUICCID}$.
The AT^SIND test command indicates the maximum length of the "euiccid" <indValue>.

“imsi“

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

“pagingcoor“

Paging coordination:
Paging coordination is a network feature which allows the network to page (alert) the UE about incoming CS calls while the UE is receiving PS data transmissions
The indicator notifies the UE of the capabilities currently present in the network, i.e. it can show one of the single values listed below or the sum of some of them.

0	No coordination
1	WCDMA
2	NMO 1
4	DTM support
8	BSS PAGING COORD
16	LTE
99	Undefined e.g. transitional state or PS data not supported by the 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: ceer,<ceerRelCauseGroup>,<ceerReport>" shows the

	same information as the standard command AT+CEER. If enabled the indicator will show up each time when a release cause is detected, wherease 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.
“dtmf“	DTMF character indication: Recognition of DTMF signals from local source is supported even in absence of a voice call. The detected DTMF characters are buffered. If enabled with parameter <mode>=1 the buffered DTMF characters are shown as "dtmf" URC when the DTMF buffer is emptied. The DTMF buffer is emptied either when full (max. 15 DTMF characters) or when the timeout specified with <dtmfBufferTimeout> expires. Parameter <dtmfSrc> specifies whether to detect DTMF tones sent from a local source, via the network or from both. Parameter <dtmfSilenceTime> specifies the minimum silence time after which the UE is ready to detect the next valid DTMF character. The benefit of this parameter is to optimize the robustness of DTMF decoding versus data throughput. Parameter <dtmfMinToneTime> specifies the minimum duration of a tone that can be detected as a DTMF character. All tones shorter than the value specified by this parameter will be ignored. Please note that URC presentation <mode> for this indicator is stored to non-volatile memory with AT&W restored with ATZ and reset to '0' (disabled) by AT&F. Additionally when DTMF source is network, it is strongly recommended to activate audio mode: <audMode>=6 set with AT^SNFS Example for a DTMF character train with 4 characters: +CIEV: dtmf,"1*2#",1,60,60,60,60 Example for a DTMF character train with the maximum of 15 characters: +CIEV: dtmf,"004930311021a2b",0,60,60,60,60,60,60,60,60,60,60,60,60,60,60 Example for a DTMF character train with a single character: +CIEV: dtmf,"9",0,75
“is_cert“	Report details of the server certificate used for a secure Internet connection opened with AT^SISO. The following certificate details are listed: <srvProfileId>, <issuer>, <serialNumber>, <subject>, <signatureAlgorithm>, <thumbprintAlgorithm>, <thumbprint> Detailed guidelines for managing the required certificates can be found in [8]. See also AT commands AT^SISS, AT^SBNR and AT^SBNW.
“omadm“	Indication of OMA-DM session progress or errors: +CIEV: omadm,"START" - indicates start of the execution of the OMA-DM process. +CIEV: omadm,"PROGRESS", <OmaDmStatus> - describes a progress and current a state of the process. +CIEV: omadm,"FINISHED", <OmaDmStatus> - describes a final result after an execution of the process. +CIEV: omadm,"ERROR", <OmaDmStatus> - in case of an error indicates the result with extended error code.
“orpco“	Indication of new Operator Reserved Protocol Configuration Options: "orpco" delivers the indication of a new "Operator Reserved PCO" received from the network.
“simread“	Notification of end of reading Elementary Files on the (U)SIM: If enabled the URC "CIEV: simread, <simreadEf>" indicates that the UE has completed reading and verifying the accessibility of a specific Elementary File (EF) on the (U)SIM. The purpose of this URC is that the access to selected Elementary Files will be

reported earlier than the access to the entire (U)SIM as indicated by the "^SSIM READY" URC (see AT^SSET). The resulting time advantage can be used, for example, to cut the time until the UE is able to set up an emergency call.
See also parameters <simreadEfBitMask> and <simreadCfgEfBitMask>.

"ltebot" Status of LTE back-off timer:
The "ltebot" indicator shows up each time when the T3402 timer starts (<ltebotTimerstat> 1) and expires (<ltebotTimerstat> 0). It notifies the user whether the UE is backing off from LTE. For details on the T3402 timer please refer to see 3GPP TS 24.301 [44], table 10.2.
The duration of the timer is 12 minutes. During this period the UE will not try to attach to LTE unless a manual AT+CGATT=0 and AT+CGATT=1 is performed. Yet, before the timer expires, it is possible that the UE registers with UMTS or GSM UMTS instead of LTE.
The "ltebot" indicator is almost exclusively triggered by a wrong APN (in case of no LTE rights on the subscription or no LTE coverage, it is not started).
The indicator includes the following parameters: <ltebotTimerstat>, <ltebotReason>, <APN>, <ltebotReasonTxt>. The values of <ltebotReason> and the content of <ltebotReasonTxt> are operator dependent.
Examples for wrong APN given with AT+CGDCONT:
+CIEV: ltebot,1,33,"invalid name","Requested service option not subscribed"
+CIEV: ltebot,1,27,"invalid name","Unknown or missing APN"

In addition to the "ltebot" indicator, you can activate the "ceer" indicator that also shows the reason when the the UE fails to attach to the LTE.
Example for wrong APN given with AT+CGDCONT:
+CIEV: ceer,7,"Unknown or missing APN"

"prov" Provider configuration mismatch:
The "prov" indicator delivers the provider configuration mismatch status via URC.
+CIEV: prov,<provMm>,<provCur>
The AT^SIND test command indicates the maximum length of the "prov" <indValue>.
For provider configuration details see ATI61.
Changing the provider configuration is done by AT^SCFG parameter "MEopMode/Prov/Cfg" (see <provCfg>).
Please note that URC presentation <mode>=1 for this indicator is enabled by powerup default.

<indValue>(num)

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

<mode>(num)

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

0(P) Disables the presentation of a specific URC.

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

`<SmsMr>`(num)

Reference of short message most recently sent. See parameter `<mr>` of `AT+CMSS`.

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

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

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

Service Provider Name according to the status settings (USIM Service No. 17) in the USIM Service Table (SST) of the USIM.
Service Provider Name (SPN) will be read from EF_{SPN}. Service Provider Display Information (SPDI) will be read from EF_{SPDI} list.

`<servProviderType>`(num)

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

0	Service Provider Name will not be displayed (EF_{SPN} is empty or not available).
1	Service Provider Name will be displayed. RPLMN is the HPLMN.
2	Service Provider Name will be displayed. One entry of SPDI list is equal to the RPLMN.

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

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

`<nitzTZ>`(num)

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

`<nitzDST>`(num)

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

`<lstaLevel>`(num)

Warning Level

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

Refer to `<indDescr>`.

`<lstaEdvs>`(num)

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

<lstaRssi>(num)

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

<lstaNo>(num)

Number of reported channels. Refer to <indDescr>.

<lstaMin>(num)

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

<lstaMax>(num)

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

<lstaMean>(num)

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

<lstaVar>(num)

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

<ceerRelCauseGroup>(num)

Release Cause Group.
To enable the URC "CIEV: ceer,<ceerRelCauseGroup>,<ceerReport>" activate <mode> "1", and either select single <ceerRelCauseGroup> values, or choose value "99" for all release causes. For each single <ceerRelCauseGroup> value the AT^SIND write command needs to be executed, but the AT^SIND read command response lists all activated values (see <ceerRelCauseGroupList>). <ceerRelCauseGroup> value "0" can be used to clear all activated values. Setting <mode> "0" also clears all values and restores default <ceerRelCauseGroup> "0".

0(P)	Clear activated <ceerRelCauseGroup> values.
1	CS Internal Cause.
2	CS Network Cause.
3	CS Network Reject.
4	PS Internal Cause.
5	PS Network Cause.
6	Other Release Cause.
7	PS LTE Cause.
8	PS LTE Local Cause.
40	ITU Q.850 Release Cause.
41	SIP Release Cause.
99	All Release Causes. Note that if value "99" is set selecting a single release causes will have no effect. Before activating single release cause values first set <ceerRelCauseGroup> "0".

<ceerRelCauseGroupList>(num)

In the AT^SIND read command response: List of <ceerRelCauseGroup>s currently activated, each separated by comma.
The <ceerRelCauseGroupList> is only displayed if several single <ceerRelCauseGroup>s were activated before. If only one <ceerRelCauseGroup> or value 99 was activated, the read command response contains just this one value, and no <ceerRelCauseGroupList>.
Example: after activating <ceerRelCauseGroup>s 1, 4, 5 and 6 the read command returns:
^SIND: ceer,1,1,4,5,6

<ceerReport>(str)

Release cause information given by the network in textual format.

<dtmfChar>(str)

DTMF character string of the "dtmf" URC.

<dtmfSrc>(num)(&W)

Source of the DTMF signal. Refer to <indDescr>, "dtmf".

0(&F)(D)	DTMF source is local
1	DTMF source is network
2	DTMF detection on both local and network source

<dtmfSilenceTime>(num)(&W)

25...50(&F)(D)...65525	Minimum silence time in milliseconds after which the UE is ready to detect the next valid DTMF tone. Depends on <dtmfSrc> and DTMF scenario. Value needs to be divisible by 25 without remainder. Refer to <indDescr>, "dtmf".

<dtmfBufferTimeout>(num)(&W)

0(&F)(D)...65535	Timeout in milliseconds for emptying the DTMF buffer. If the timeout is disabled with <dtmfBufferTimeout>=0, the "dtmf" URC will be sent for each single DTMF character. Refer to <indDescr>, "dtmf".

<dtmfMinToneTime>(num)(&W)

0(&F)(D)	DTMF tones are detected, regardless of their duration.
40...100	Minimum duration of a DTMF character that can be detected in milliseconds and in steps of 10 milliseconds. Refer to <indDescr>, "dtmf".

<dtmfToneDuration>(num)

30...65535	Measured tone duration of DTMF character indicated in "dtmf" URC.

<srvProfileId>(num)

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

<issuer>(str)

Certificate's issuer. Refer to <indDescr>.

<serialNumber>(str)

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

<subject>(str)

Certificate's subject. Refer to <indDescr>.

<signatureAlgorithm>(str)

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

<thumbprintAlgorithm>(str)

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

<thumbprint>(str)

Certificate's thumbprint. Refer to <indDescr>.

<OmaDmAction>(str)

OMA-DM action current state delivered as part of "omadm" indicator. Refer to <indDescr>.

“IDLE“

“START“

“PROGRESS“

“FINISHED“

“ERROR“

<OmaDmStatus>(num)

OMA-DM action status delivered as part of "omadm" indicator. Refer to <indDescr>.

0	No error
1	Bearer error
2	Error in WAP Push message
3	Error in OMA-DM session
101	WAP Push message received
103	Bearer connected
104	Bearer disconnected
105	Session established
106	Session closed
107	IPV6 failed, fallback to IPV4
108	OTA boostrap
109	Retry requested

<containerid>(num)

Container Id of Operator Reserved Protocol Configuration Options.

65280...65535	Container ID of received orpco

<mccmnc>(str)

Mobile country and network code

<clength>(num)

Length of received orpco

<container>(str)

Provider specific Hex output of the received orpco

<simreadCfgEfBitMask>(num)

As part of AT^SIND write command, this parameter determines the type(s) of EF to be read when the UE is reading data from the (U)SIM. You may set the value of a specific EF type, or sum up the values of the EF types you may want to be reported. With <mode>= 0 the parameter <simreadCfgEfBitMask> will be set to "0". Parameter <simreadCfgEfBitMask> can only be set if <mode>= 1.

0(P)	No USIM Elementary File.
1	USIM Elementary File EF_{SMS}.
2	USIM Elementary File EF_{FDN}.
4	USIM Elementary File EF_{SDN}.
8	USIM Elementary File EF_{UST}.
255	All USIM Elementary Files listed above. This value can be set only in the write command, it will not be reported in the URC "CIEV: simread, <simreadEf>".

<simreadEfBitMask>(num)

As part of AT^SIND read or write command, this parameter indicates the Elementary Files (EF) already read from the (U)SIM. The value is either a single EF type, or the sum of the EF types already read, or 0.

0	No USIM Elementary File read.
1	USIM Elementary File EF_{SMS}.
2	USIM Elementary File EF_{FDN}.
4	USIM Elementary File EF_{SDN}.
8	USIM Elementary File EF_{UST}.

<simreadEf>(num)

As part of the URC CIEV: simread, the <simreadEf> parameter reports a specific EF type that the UE has just read. For each Elementary File type one single URC will be issued.

1	USIM Elementary File EF_{SMS}.
2	USIM Elementary File EF_{FDN}.
4	USIM Elementary File EF_{SDN}.
8	USIM Elementary File EF_{UST}.

<ltebotTimerstat>(num)

Status of LTE back-off timer.

0	LTE back-off timer is not running, UE is using LTE (if available).
1	LTE back-off timer (12 minute T3402 timer) is running. The UE will not try to attach to LTE until it expires.

<ltebotReason>(num)

Rejection cause value given from the network that caused the module to back-off from LTE. Value is dependent on the operator. Value is 0 if attached to LTE.

<APN>(str)

Last APN attempted for LTE attachment, successful or otherwise.

<ltebotReasonTxt>(str)

Rejection cause value <ltebotReason> in text form. Displayed only if text form is available. Text is dependent on operator.

<provMm>(num)

Provider configuration mismatch.

0	No provider mismatch.
1	Provider mismatch.

<provCur>(str)

Current provider. The fallback configuration is indicated by a "*".

“fallback“	Modem software configuration.
“tmode“	*EXAMPLE !* Provider T-Mobile.
“vdfde“	*EXAMPLE !* Provider Vodafone.
“...“	Next possible provider ...
“...“	Next possible provider ...

Notes

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

3.3 AT+CPAS Activity Status

AT+CPAS execute command queries PLS8-US-R4's activity status.

Syntax

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

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

PIN	MDM	APP	✈	Last
-	+	+	+	-

Reference(s)
3GPP TS 27.007 [49]

Parameter Description

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

3.4 AT+WS46 Select wireless network

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

Syntax

Test Command

AT+WS46=?

Response(s)

+WS46: (list of supported<n>s)
OK

Read Command

AT+WS46?

Response(s)

+WS46:<n>
OK

Write Command

AT+WS46=<n>

Response(s)

OK
ERROR
+CME ERROR: <err>

PIN	MDM	APP	✈	Last
-	+	+	+	-

Reference(s)

3GPP TS 27.007 [49]

Parameter Description

<n>(num)	
12	GSM digital cellular (GERAN only)
22	UTRAN only
25	3GPP Systems (GERAN, UTRAN and E-UTRAN)
28	E-UTRAN only
29	GERAN and UTRAN

4. Serial Interface Control Commands

The AT Commands described in this chapter allow the external application to determine various settings related to the PLS8-US-R4's serial interface.

4.1 AT\Q Flow Control

AT\Q allows to configure flow control on the PLS8-US-R4's asynchronous serial interface ASC0 (UART).

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

Syntax

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

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<n>(num)(&V)(&W)	
3(&F)(D)	RTS/CTS hardware flow control

Note

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

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

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

Syntax

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

PIN	MDM	APP	✈	Last
+	+	+	+	-

Parameter Description

<value>(num)(&V)(&W)	
[0]	DCD line shall always be on.
1(&F)(D)	DCD line shall be on only when data carrier signal is present.
2	DCD line shall be on when Internet service profiles are in an active state as described below. For details on the various service states refer to AT^SISI, parameter <srvState> or AT^SISO, parameter <srvState>. • Transparent TCP or Transparent UDP client, SOCKET, HTTP, SMTP: DCD shall be on when <srvState>="Connnecting" or "Up". • Transparent TCP Listener: DCD shall be on when <srvState>="Up", "Alerting", "Connected" and "Released". • FTP: DCD shall be on when data channel is connected, i.e. <srvState>="Up".

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

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

Syntax

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

PIN	MDM	APP	✈	Last
+	+	-	+	-

Parameter Description

<value>(num)(&V)(&W)	
[0]	ME ignores status of DTR line.
2(&F)(D)	ON->OFF on DTR: Disconnect data call or PPP and change to command mode. During OFF state of the DTR line the auto-answer function (see ATS0) is disabled. In Transparent Access Mode set up with AT^SIST DTR ON-OFF transition changes to command mode. For more details see AT^SISS and AT^SIST.

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

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

Syntax

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

PIN	MDM	APP	✈	Last
-	+	-	+	-

Reference(s)
V.250

Parameter Description

<value>(num)(&V)(&W)	
[0](&F)(D)	DSR line is always ON
1	ME in command mode: DSR is OFF. ME in data mode: DSR is ON.

4.5 ATE AT Command Echo

ATE controls if the PLS8-US-R4 echoes characters received from TE during AT command state.

Syntax

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

PIN	MDM	APP	✈	Last
-	+	+	+	-

Reference(s)
V.250

Parameter Description

<value>(num)(&V)(&W)	
0	Echo mode off
[1](&F)(D)	Echo mode on

4.6 AT+IPR Bit Rate

AT+IPR allows to query and set the bit rate of the PLS8-US-R4's asynchronous serial interface (UART).
The test command returns the values of supported fixed bit rates.
The read command returns the currently set <rate> value.
The write command determines the bit rate to be used for the interface.

A selected fixed bit rate takes effect after the write command returns "OK" and is stored in the non-volatile memory.
When using AT+IPR on a USB channel or on a Multiplex mode related channel(AT+CMUX) the AT+IPR write command responds with "OK", but will not have any effect. However, the AT+IPR read command always returns the current setting dedicated to the UART channel.
It is highly recommended to use AT+IPR as a standalone AT command, i.e. better do not combine with other commands on the same AT command line.
The current setting of AT+IPR will be preserved after firmware download (i.e. a firmware update does not restore the factory setting) or in the event of power failure.

Syntax

Test Command

```
AT+IPR=?
```

Response(s)

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

Read Command

```
AT+IPR?
```

Response(s)

```
+IPR: <rate>
OK
```

Write Command

```
AT+IPR=<rate>
```

Response(s)

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

PIN	MDM	APP	✈	Last
-	+	+	+	-

Reference(s)

V.250

Parameter Description

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

Bit rate per second (bps)

115200(D)

230400

460800

921600

4.7 AT+CMUX Multiplex mode

Multiplex mode according to 3GPP TS 27.010 [11] enables a serial interface to be partitioned into virtual channels. It can be used either on PLS8-US-R4's USB interface or its asynchronous serial interface ASC0.

Multiplex mode can be started only on the Modem interface. This may be either the virtual modem port of the USB composite device or the ASC0 interface. In either case the Modem interface will be mapped to the first multiplex channel, and the Application interface will be mapped to the second multiplex channel. As a result, the functions of the first and second multiplex channels are the same as described in Section 1.4, AT Command Interpreter for the Modem and Application interfaces. The third multiplex channel is dedicated to GPS and will be used if NMEA output is switched on with AT^SGPSC while Multiplex mode is active. Multiplex channels 5 and 6 are dedicated for the Transparent TCP/IP service and can be used for data exchange with AT^SIST. For more details on number and usage of multiplex channels refer to "Multiplexer User's Guide".

PLS8-US-R4 offers an internal multiplexer and thus integrates all functionality needed to implement full-featured multiplex solutions. For the application on top, customers have the flexibility to create their own multiplex programs conforming to the multiplexer protocol. To help system integrators save the time and expense of designing multiplexer applications, Gemalto M2M GmbH offers WinMux, a ready-to-use multiplex driver for Windows XP, Windows Vista, Windows 7. Another approach is to develop customized solutions based on the sources of the WinMux driver.

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

AT+CMUX write command is used to enter Multiplex mode. Setup of the logical channels is initiated by the TE, i.e. the TE acts as initiator. This means that the TE shall ensure that logical channels are established before any further actions on the channels can be started. There is a timeout of five seconds, if the multiplexer protocol is enabled but no multiplexer control channel is established. Afterwards PLS8-US-R4 returns to AT command mode.
The parameter maximum frame size (N1) according to 3GPP TS 27.010 [11] is implemented as 98 bytes by default. All other parameters are not available. Refer to "Multiplexer User's Guide" for further details regarding frame size.

Syntax

Test Command

```
AT+CMUX=?
```

Response(s)

```
+CMUX: (list of supported<mode>s)
OK
```

Read Command

```
AT+CMUX?
```

Response(s)

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

Write Command

```
AT+CMUX=<mode>
```

Response(s)

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

PIN	MDM	APP	✈	Last
-	+	-	+	+

Reference(s)

3GPP TS 27.007 [49]
3GPP TS 27.010 [11]

Parameter Description

<mode>(num)	
Enable Multiplex mode.	
0	Basic option

4.7.1 Restrictions while using Multiplex mode

If Multiplex mode is used on ASC0 interface:

1. Using AT+IPR write command on a Multiplex mode related channel command has no effect but always responds with "OK".
2. It is recommended to set hardware flow control (AT\Q3) before starting Multiplex mode.

4.8 AT^SQPORT Query Port Type

AT^SQPORT enables the Customer Application to query the type of AT command instance it is connected to. Further details on AT command instances and the different types of PLS8-US-R4 devices can be found in Section 1.4, AT Command Interpreter and AT^SSRVSET.

Syntax

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

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

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

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<type>(str)	
"Modem"	Main AT command instance, mainly intended for data transmission.
"Application"	Auxiliary AT command instance. It is recommended that this instance be used for controlling the PLS8-US-R4, e.g. for entering AT commands, receiving URCs, or sending and receiving short messages. For further details on URCs please refer to Section 1.8, Unsolicited Result Code Presentation.

5. Security Commands

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

5.1 AT+CPIN PIN Authentication

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

The write AT+CPIN command allows the PLS8-US-R4 to store the entered password. This may be for example the SIM PIN1 to register to a GSM/UMTS/LTE network, or the SIM PUK1 to replace a disabled SIM PIN1 with a new one, or the PH-SIM PIN if the client has taken precautions for preventing damage in the event of loss or theft etc.

If SIM PIN1 authentication was successful and no SIM PIN1 request is pending the AT+CPIN? read command returns "READY", but the next AT+CPIN=<pin> write command request refers to SIM PIN2. As a result, whilst SIM PIN2 has not been given, each attempt to enter SIM PIN1 again leads to "+CME ERROR: incorrect password", thus decreasing the SIM PIN2 counter. Therefore, you are advised to check which password is requested by using the read command AT^SPIC? and the execute command AT^SPIC.

Syntax

Test Command

```
AT+CPIN=?
```

Response(s)

```
OK
```

Read Command

```
AT+CPIN?
```

Response(s)

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

Write Command

```
AT+CPIN=<pin>[, <new pin>]
```

Response(s)

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

PIN	MDM	APP	✈	Last
-	+	+	+	-

Reference(s)

3GPP TS 27.007 [49]

Parameter Description

<pin>(str)

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

<new pin>(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 corprorate personalisation un-blocking password

Notes

- Successful PIN authentication only confirms that the entered PIN was recognized and correct. The output of the result code OK does not necessarily imply that the mobile is registered to the desired network.
  Typical example: PIN was entered and accepted with OK, but the UE fails to register to the network. This may be due to missing network coverage, denied network access with currently used USIM card, no valid roaming agreement between home network and currently available operators etc.
  PLS8-US-R4 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

Test Command

AT+CLCK=?

Response(s)

+CLCK: list of supported <facility>s
OK

Write Command

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

Response(s)

If <mode> is 0 or 1 and command successful:
OK
If <mode>= 2 and command successful:
+CLCK: <status>[, <class>]
[+CLCK: <status>[, <class>]]
[+CLCK: ...]
OK
If <mode>= 3 and no Customer Lock has been programmed yet:
+CLCK: <password>
If <mode>= 3 and Customer Lock is set:
+CLCK: ERROR
If <mode>= 4 and no Network Lock is set:
+CLCK: ""
If <mode>= 4 and Network Lock is effective:
+CLCK: <data>[: <data>: <data>: ...]
OK
ERROR
+CME ERROR: <err>

PIN	MDM	APP	✈	Last
+	+	+	±	-

Reference(s)

3GPP TS 27.007 [49],
3GPP TS 22.004 [27],
3GPP TS 22.088 [35],
3GPP TS 23.088,
3GPP TS 24.088

Parameter Description

<facility>(str)

Phone security locks set by client or factory:

Primarily intended for the client to take safety precautions, "SC" can be configured individually.
Parameter <class> is not applicable to security locks.
See examples below for further details.

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

“PS“	PH SIM (lock PHone to SIM/UICC card). UE asks for <password> when other than current SIM/UICC card is inserted. <password>: PH-SIM PIN. This 8-digit code is unique for each device. The PH-SIM PIN is necessary to lock the UE to a SIM/UICC. To find out the PH-SIM PIN it is necessary to execute the AT+CLCK write command with <facility>="PS", <mode>=3. Keep in mind that if a lock is set, reading the <password> with <mode>=3 is no longer possible. Parameter <class> is not applicable. To allow for any later changes, it is the responsibility of the manufacturer to hold a database with the module specific passwords. To avoid unauthorized use, the PH-SIM PIN should not be provisioned to end users.
“FD“	SIM Fixed Dialing Phonebook lock. 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#". The capacity of the "FD" phonebook is depending on the SIM card. <password>: SIM PIN2 is mandatory for <mode>=0 (unlock) or <mode>=1 (lock). 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: "+CME ERROR: call barred" for voice calls, packet switched connections and *# codes for Supplementary Services and USSD. "+CMS ERROR: operation not allowed" for SMS. If "FD" lock is enabled the following applies: • Handling of AT+CCFC: The "FD" lock is effective only for AT+CCFC <mode> 3 (registering the CF destination number). All other functions provided by AT+CCFC are not restricted by the "FD" lock. • 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" phonebook. The USSD command AT+CUSD, however, is not barred by an "FD" lock.
“PN“	Network Personalization. This feature allows application manufacturers to lock a mobile to specific operators by activating a Network Personalization ("PN"). If the lock is enabled the mobile will accept only SIM/UICC cards from the given operators. The lock is activated by specifying the mobile country codes and mobile networks codes on command line. The Customer SIM Lock feature is protected by depersonalization key. UE asks for <password> when other than specified operator SIM/UICC card is inserted. <password>: PH-NET PIN. This 8-digit code is unique for each device. To allow for any later changes, it is the responsibility of the manufacturer to hold a database with the module specific passwords. To avoid unauthorized use, the PH-NET PIN should not be provisioned to end users. Parameter <class> is not applicable.

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 <mode>=0)
“AG“	All outGoing barring services (applicable only for <mode>=0)
“AC“	All inComing barring services (applicable only for <mode>=0)

<mode>(num)

0	Unlock (parameter <password> is mandatory).
1	Lock (parameter <password> is mandatory).
2	Query status.
3	Request the PH-SIM PIN, allowed if phone lock to SIM card <facility> "PS" has not already been programmed. Otherwise returns "+CLCK: ERROR". Required parameters: <facility>="PS",<mode>=3.
3	Request the PH-NET PIN, allowed if phone lock to Network <facility> "PN" has not already been programmed. Otherwise returns "+CLCK: ERROR". Required parameters: <facility>="PN",<mode>=3.
4	Request Customer Network lock status. Required parameters: <facility>="PN",<mode>=4.
5	Set Customer Network lock into prepared state (Autolock). In this case, the Network lock data will be read from the first inserted SIM card and stored. Required parameters: <facility>="PN",<mode>=5,<password>.

<status>(num)

0	Lock is inactive
1	Lock is active

<password>(str)

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

<class>(num)

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 [27]. Values related to data connectivity are listed for compatibility reasons, but are not supported by PLS8-US-R4.

1	Voice

2	Class 2 ("Data") comprises all those individual data classes between 16 and 128, that are supported both by the network and the MS. This means, a setting made for class 2 applies to all individual data classes (if supported). In addition, you can assign a different setting to a specific class. For example, you can activate Call Forwarding for all data classes, but deactivate it for data class 64, "dedicated packet access".
4	Fax (only for compatibility reasons, not supported by PLS8-US-R4)
8	SMS
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 compatibilty reasons) . The value 255 covers all classes. If parameter "class" is omitted, the default value 7 is used.

`<data>`(str)

Data of the allowed network operators. Parameter is mandatory for Network Personalization ("PN").
Each operator code consists of the "Mobile Country Code" MCC and the "Mobile Network Code" MNC, both separated by a dot, e.g. MCC1.MNC1 . If more than one operator is entered on the same line, then a colon must be set between each operator code, e.g. MCC1.MNC1:MCC2.MNC2:MCC3.MNC3 . For example, for the three operators T-Mobile D1, Vodafone D2 and E-Plus you would enter the following data: 262.01:262.02:262.03
New operator entries will not be added to an existing list. If you need to add new operator entries please unlock the old one and send the complete list once again.

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 [49]. 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 [27].
- 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 the user tries to set a lock although it is already active or, the other way round, tries to unlock an inactive lock, the response will be OK, but the <password> will not be checked or verified.
- In the airplane mode the write command version for the network related <facility> (AO, OI, OX, AI, IR, AB, AG and AC) is not supported. For remaining facilities the command is fully functional then.
- As stated above <class> 2 is intended only to send the data classes 16/32/64/128 to the network. However, the responses returned when the subscriber sets or queries the lock refer only to the status of the data classes received from the network. This means that the responses will display only those data classes between 16 and 128 which are supported by the network and currently activated. There will be no output for class 2, nor for classes which are not supported or not set.
- The parameter <class> will not be sent to the network if <mode>=2. Therefore it may happen that the response of the query command contains information about classes which were not requested, or it shows only the inactive status of the class 1 or 255. This means that the status is valid for all classes.
- 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.

Examples

EXAMPLE 1

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

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

AT+CLCK="SC",0,"9999"	Unlocks SIM card.
OK	When powered up, UE registers to the network without requesting SIM PIN1. Note: Depending on the services offered by the provider, this feature is not supported by all SIM card types. If so, the command returns "ERROR" when you attempt to unlock the card.

To query the status of the SIM card lock:

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

EXAMPLE 2

Phone locked to SIM card (<facility>="PS"):

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

To lock the UE to the currently inserted SIM card, first read the password for <facility> "PS":

AT+CLCK="PS",3	Read the <facility> "PS" password.
+CLCK: 55555555	
OK	

Then, activate the phone locked to SIM card:

AT+CLCK="PS",1,"55555555"	Locks the UE to the current SIM card.
OK	

Optionally, query the status of the phone locked to SIM card:

```
AT+CLCK="PS",2
+CLCK: 1
OK
```

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

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

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

AT+CPIN?	
+CPIN: SIM PIN	
OK	
AT+CPIN="1111"	
OK	PIN authentication accepted.
AT+CPIN?	

```
+CPIN: PH-SIM PIN              "PS" phone lock password is required.
OK
AT+CPIN="55555555"
OK                             "PS" phone lock password has been accepted. UE is fully operational now.
```

To deactivate the phone locked to SIM card:

```
AT+CLCK="PS",0,"55555555"      "PS" phone lock password has to be provided again.
OK                             Now the UE can be used with any SIM card, without the need of the phone lock password.
```

EXAMPLE 3

Phone locked to Network (<facility>="PN"):

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

To lock the UE to Network, first read the password for <facility> "PN":

```
AT+CLCK="PN",3                 Read the <facility> "PN" password.
+CLCK: 66666666
OK
```

Then, activate the phone locked to Network:

```
AT+CLCK="PN",1,"66666666",     Locks the UE to Network "262.01".
,"262.01"
OK
```

Optionally, query the status of the phone locked to Network:

```
AT+CLCK="PN",2
+CLCK: 1
OK
```

Optionally, query the status of the locked Network (string is empty when no Network locked):

```
AT+CLCK="PN",4
+CLCK: "262.01"
OK
```

Optionally, activate the phone locked to Network using Autolock:

```
AT+CLCK="PN",5,"66666666"      Locks the UE to current Network.
OK
```

To operate the UE with the Network for which "PN" lock was activated:

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

To operate the UE with other Network than the one used for the "PN" lock:
Enter PH-NET PIN of present card, followed by "PN" lock password.

```
AT+CPIN?
+CPIN: NET PIN
OK
AT+CPIN="1111"
OK                             PIN authentication accepted.
AT+CPIN?
+CPIN: PH-NET PIN              "PN" phone lock password is required.
OK
```

`AT+CPIN="66666666"`	
`OK`	"PN" phone lock password has been accepted. UE is fully operational now.

To deactivate the phone locked to Network:

`AT+CLCK="PN",0,"66666666"`	"PN" phone lock password has to be provided again.
`OK`	Now the UE can be used with any SIM card, without the need of the phone lock password.

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 (<facility>, <password length>)
OK

Write Command

AT+CPWD=<facility>, <old password>, <new password>

Response(s)

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

PIN	MDM	APP	✈	Last
+	+	+	±	-

Reference(s)

3GPP TS 27.007 [49]

Parameter Description

<facility>(str)

Phone security locks set by client or factory:

Primarily intended for the client to take safety precautions, passwords "SC" (SIM PIN) and "P2" (SIM PIN2) are usually predefined, but can be configured individually.

“SC“	SIM PIN. SIM requests password upon ME power-up and when this lock command is issued. If incorrectly entered three times, the SIM PUK is required to perform authentication. Input of the SIM PUK password is possible only with AT command AT+CPIN or ATD. <password length>: 4 to 8 digits.
“P2“	SIM PIN 2, e.g. required for authentication with facility lock "FD" (cf. AT+CLCK). If incorrectly entered three times, the SIM PUK 2 is required to perform authentication. Input of the SIM PUK 2 password is possible only with AT command AT+CPIN or ATD. <password length>: 4 to 8 digits.

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>(num)

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

<old password>(str)

Password specified for the facility.
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>(str)

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

Notes

- In the airplane mode the write command version for the network related <facility> (AO, OI, OX, AI, IR, AB, AG and AC) is not supported. For remaining facilities the command is fully functional then.
- As stated above there is usually a one 4-digit password for all call barring facilities. To change the password please use only the "AB" <facility> (All Barring services).

Examples

EXAMPLE 1

To change PIN2

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

EXAMPLE 2

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

`AT+CPWD="AB","0000","3333"`	Requests the network to change the password for the call barring supplementary service.
`OK`	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 AT^SPIC read and execute commands return only OK.
If no USIM card is inserted the AT^SPIC read, execute and write commands return "+CME ERROR: SIM not inserted".

Syntax

Test Command

```
AT^SPIC=?
```

Response(s)

```
OK
```

Read Command

```
AT^SPIC?
```

Response(s)

```
^SPIC: <code>
OK
```

Exec Command

```
AT^SPIC
```

Response(s)

```
[^SPIC: <counter>]
OK
```

Write Command

```
AT^SPIC=<facility>[, <pin_puk>]
```

Response(s)

```
^SPIC: <counter>
OK
ERROR
+CME ERROR: <err>
```

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<counter>(num)

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

<facility>(str)	
Password for which the corresponding PIN counter is to be displayed.	
“SC“	SIM PIN if parameter <pin_puk> is omitted or set to 0. SIM PUK if parameter <pin_puk> is set to 1.
“PS“	PH-SIM PIN if parameter <pin_puk> is omitted or set to 0. PH-SIM PUK if parameter <pin_puk> is set to 1. For details see AT command AT+CLCK.
“P2“	SIM PIN2 if parameter <pin_puk> is omitted or set to 0. SIM PUK2 if parameter <pin_puk> is set to 1.
“PN“	Network Personalisation. PH-NET PIN if parameter <pin_puk> is omitted or set to 0. PH-NET PUK if parameter <pin_puk> is set to 1.

<pin_puk>(num)	
[0]	Show PIN counter for given <facility>.
1	Show PUK counter for given <facility>.

<code>(text)	
Identification of the currently required password.	
SIM PIN	ME is waiting for SIM PIN1.
SIM PUK	ME is waiting for SIM PUK1 if PIN1 was disabled after three failed attempts to enter PIN1.
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 AT+CPBS="FD","PIN2").
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 AT+CLCK="PS".
PH-SIM PUK	ME is waiting for 8-digit code to unblock the UE, if the "PS" lock password was incorrectly entered 10 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                                  Currently required password is PIN1.
at^spic?
```

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

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 pass-
                                        word.
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                             The mobile ist properly registered to the network.
at+cpin?
+CPIN: READY                         The AT+CPIN? read command confirms that SIM
                                     PIN1 authentication was successful.
at^spic
^SPIC: 3                             As SIM PIN1 authentication was successful, the
                                     counter relates to SIM PIN2 and correctly indicates
                                     that the user has 3 attempts to enter SIM PIN2.
OK
AT^SPIC?                             Likewise, the read command notifies that the ME is
                                     waiting for SIM PIN2.
^SPIC: SIM PIN2
OK
at+clck="SC",0,"456789"              First attempt to enter a wrong SIM PIN1.
+CME ERROR: incorrect password
at^spic
^SPIC: 3                             SIM PIN1 authentication is still valid, and the counter
                                     relates to SIM PIN2.
at+clck="SC",0,"456789"              Second attempt to enter a wrong SIM PIN1.
+CME ERROR: incorrect password
at^spic
^SPIC: 3                             SIM PIN1 authentication is still valid, and the counter
                                     relates to SIM PIN2.
at+clck="SC",0,"456789"              Third attempt to enter a wrong SIM PIN1.
+CME ERROR: incorrect password

+CREG: 0                             SIM PIN1 authentication is no longer valid.
```

at^spic ^SPIC: 10	This time, after the SIM PIN1 code has been disabled, the counter indicates the status of SIM PIN1 and notifies that 10 attempts are left to enter the SIM PUK.

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

6. Identification Commands

The AT Commands described in this chapter allow the external application to obtain various identification information related to the PLS8-US-R4 and linked entities.

6.1 ATI Display product identification information

The ATI execute command delivers a product information text.

Syntax

Exec Command

ATI

Response(s)

Cinterion
PLS8-US-R4
REVISION xx.yyy
OK

Exec Command

ATI1

Response(s)

Cinterion
PLS8-US-R4
REVISION xx.yyy
A-REVISION xx.zzz.cc
OK

Exec Command

ATI2

Response(s)

UICC Application Identification <applId>
OK
ERROR
+CME ERROR: <err>

Exec Command

ATI3

Response(s)

L-REVISION xx.zzz.cc
OK

Exec Command

ATI61

Response(s)

[<provCfg> <mdmSwVer>]
[<provCfg> <mdmSwVer>]
[...]
xxx.<cProvCfg>
MIMG <mdmImage>
OK

Exec Command

```
ATI176
```

Response(s)

```
<imeisv_number>
OK
```

PIN	MDM	APP	✈	Last
±	+	+	+	-

Reference(s)

ITU-T V.250 [17]

Parameter Description

<applId>(num)

UICC application types. A single value or a combination of the following values is possible.
For example, the response value 0x03 represents the sum of the integers 0x01 and 0x02 (GSM application and USIM application).

0x01	GSM application
0x02	USIM application
0x04	ISIM application
0x08	CSIM application

<provCfg>(text)

Possible provider configuration.
The change of provider configuration is done by AT^SCFG parameter "MEopMode/Prov/Cfg" (see <provCfg>).
The fallback configuration is indicated by a "*".

<mdmSwVer>(text)

Modem software version number.

<cProvCfg>(text)

Current provider configuration.

<mdmImage>(text)

Modem image.

<imeisv_number>(num)

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

Notes

- The "Revision" information consists of the following parts: Version xx and variant yyy of software release.
- "A-REVISION xx.zzz.cc" information consists of the following parts:
  Application Revision Number 'xx' as an assignment to customer application. '01' indicates no customer application.
  Application Revision Version 'zzz' as an assignment to changes in customer application.
  'cc' as an additional number, e.g. defined by customer.

6.2 AT+CGMI Request manufacturer identification

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

Syntax

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

Exec Command
AT+CGMI
Response(s)
Cinterion OK

PIN	MDM	APP	✈	Last
-	+	+	+	-

Reference(s)
3GPP TS 27.007 [49]

6.3 AT+GMI Request manufacturer identification

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

Syntax

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

Exec Command
AT+GMI
Response(s)
Cinterion OK

PIN	MDM	APP	✈	Last
-	+	+	+	-

Reference(s)
ITU-T V.250 [17]

6.4 AT+CGMM Request model identification

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

Syntax

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

Exec Command
AT+CGMM
Response(s)
PLS8-US-R4 OK

PIN	MDM	APP	✈	Last
-	+	+	+	-

Reference(s)
3GPP TS 27.007 [49]

6.5 AT+GMM Request model identification

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

Syntax

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

Exec Command
AT+GMM
Response(s)
PLS8-US-R4 OK

PIN	MDM	APP	✈	Last
-	+	+	+	-

Reference(s)
ITU-T V.250 [17]

6.6 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	MDM	APP	✈	Last
-	+	+	+	-

Reference(s)
3GPP TS 27.007 [49]

Parameter Description

<xx.yyy>(text)

Version xx and variant yyy of software release.

6.7 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	MDM	APP	✈	Last
-	+	+	+	-

Reference(s)
ITU-T V.250 [17]

Parameter Description

<xx.yyy>(text)

Version xx and variant yyy of software release.

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

AT+CGSN returns the International Mobile Equipment Identity (IMEI). Command is identical with AT+GSN.

Syntax

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

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

PIN	MDM	APP	✈	Last
-	+	+	+	-

Reference(s)
3GPP TS 27.007 [49]

Parameter Description

<sn>(text)

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

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

AT+GSN returns the International Mobile Equipment Identity (IMEI). Command is identical with AT+CGSN.

Syntax

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

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

PIN	MDM	APP	✈	Last
-	+	+	+	-

Reference(s)
ITU-T V.250 [17]

Parameter Description

<sn>(text)

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

6.10 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	MDM	APP	✈	Last
+	+	+	+	-

Reference(s)

3GPP TS 27.007 [49]

Parameter Description

<imsi>(text)

International Mobile Subscriber Identity

6.11 AT^SINFO Information Output

The AT^SINFO command delivers general product information text.

Syntax

Test Command

AT^SINFO=?

Response(s)

OK

Read Command

AT^SINFO?

Response(s)

^SINFO: "ProvCfg/Ident", <ProvCfgIdent>
^SINFO: "RPM", <RpmFlag>, <RpmN1>, <RpmT1>, <RpmF1>, <RpmF2>, <RpmF3>, <RpmF4>, <RpmLR-1>, <RpmLR-2>, <RpmLR-3>, <RpmC-BR-1>, <RpmC-PDP-1>, <RpmC-PDP-2>, <RpmC-PDP-3>, <RpmC-PDP-4>, <RpmVer>, <RpmOrigin>
OK
ERROR
+CME ERROR: <err>

Write Command

Display Provider Configuration

AT^SINFO="ProvCfg/Ident"

Response(s)

^SINFO: "ProvCfg/Ident", <ProvCfgIdent>
OK
ERROR
+CME ERROR: <err>

Write Command

Display loaded RPM (Radio Policy Manager) parameters

AT^SINFO="RPM"

Response(s)

^SINFO: "RPM", <RpmFlag>, <RpmN1>, <RpmT1>, <RpmF1>, <RpmF2>, <RpmF3>, <RpmF4>, <RpmLR-1>, <RpmLR-2>, <RpmLR-3>, <RpmC-BR-1>, <RpmC-PDP-1>, <RpmC-PDP-2>, <RpmC-PDP-3>, <RpmC-PDP-4>, <RpmVer>, <RpmOrigin>
OK
ERROR
+CME ERROR: <err>

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<ProvCfgIdent>(str)

Provider Configuration Identification.

<RpmFlag>(str)

The AT^SINFO "PRM" command returns the loaded RPM (Radio Policy Manager) parameters specified in the GSMA "TSG.34/TS.34 - IoT Device Connection Efficiency Guidelines", as of Version 1.x, chapter 8. For further information see also the GSMA "TSG.35/TS.35 - IoT Device Connection Efficiency Test Book".

“Enabled“	RPM enabled
“Disabled“	RPM disabled

<RpmN1>(str)

Max number of SW resets per hour allowed by RPM following "permanent" MM/GMM/EMM reject.

“0“	Requirement disabled.
1...255	Number of resets per hour.

<RpmT1>(str)

T1. Average time before RPM resets modem following permanent MM/GMM/EMM reject.

“0“	Requirement disabled.
1...255	Defines in 6 min increments the time to reset after receiving a permanent MM/GMM/EMM reject, i.e. MM#2.

<RpmF1>(str)

F1. Max. number of PDP Activation Requests per Hour allowed by RPM following a PDP Activation Ignore Scenario.

“0“	Requirement disabled.
1...255	Defines in 6 min increments the time to reset after receiving a permanent MM/GMM/EMM reject, i.e. MM#2.

<RpmF2>(str)

F2. Max number of PDP Activation Requests per Hour allowed by RPM following a "Permanent" PDP Activation Reject.

“0“	Requirement disabled.
1...255	Max. attempts allowed.

<RpmF3>(str)

F3. Max number of PDP Activation Requests per Hour allowed by RPM following a "Temporary" PDP Activation Reject.

“0“	Requirement disabled.
1...255	Max. attempts allowed.

<RpmF4>(str)

F4. Max number of PDP Activation/Deactivation Requests per Hour allowed by RPM.

“0“	Requirement disabled.
1...255	Max. attempts allowed.

<RpmLR-1>(str)

LR-1. Leak rate for C-BR-1.

“0“	C-BR-1 shall not be decremented.
1...255	Defines number of hours before C-BR-1 is decremented by 1.

<RpmLR-2>(str)

LR-2. Leak rate for C-R-1.

“0“	C-R-1 shall not be decremented.
1...255	Defines number of hours before C-R-1 is decremented by 1.

<RpmLR-3>(str)

LR-3. Leak rate for C-R-3.

“0“	C-PDP-1 TO C-PDP-4 shall not be decremented.
1...255	Defines number of hours before C-PDP-1 TO C-PDP-4 is decremented by 1.

<RpmC-BR-1>(str)

C-BR-1. Counter related to N1.

1...255	Indicate number of control actions triggered by N1.

<RpmC-R-1>(str)

C-R-1. Counter related to T1.

1...255	Indicate number of control actions triggered by T1.

<RpmC-PDP-1>(str)

C-PDP-1. Counter related to F1.

1...255	Indicate number of control actions triggered by F1.

<RpmC-PDP-2>(str)

C-PDP-2. Counter related to F2.

1...255	Indicate number of control actions triggered by F2.

<RpmC-PDP-3>(str)

C-PDP-3. Counter related to F3.

1...255	Indicate number of control actions triggered by F3.

<RpmC-PDP-4>(str)

C-PDP-4. Counter related to F4.

1...255	Indicate number of control actions triggered by F4.

<RpmVer>(str)

RPM version implemented on the device

<RpmOrigin>(str)

Origination of RPM parameters

“0“	UE's memory
“1“	USIM

7. Call related Commands

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

7.1 ATA Connect to Incoming Call

ATA connects the PLS8-US-R4 to an incoming voice call indicated by a "RING" URC. AT+CRC allows to customize the format of the incoming call URC.

Additional AT commands on the same command line are ignored.

The command may be aborted by any character sent from the TE to the UE during execution. It cannot be aborted in some connection setup states, such as handshaking.

Syntax

Exec Command

ATA

Response(s)

In case of voice call, if successfully connected:
OK
If incoming call is not available, i.e. already disconnected or hung up:
NO CARRIER

PIN	MDM	APP	✈	Last
+	+	+	-	+

Reference(s)

ITU-T V.250 [17]

Parameter Description

<text>(str)

Connection speed

Presented only if ATX parameter setting is greater 0. See also ATV.

7.2 ATD Mobile originated call to specified number

ATD can be used to set up outgoing voice calls. The termination character ";" is mandatory. The command may be aborted by any character sent from the TE to the UE during execution. It cannot be aborted in some connection setup states, such as handshaking.

Syntax

Exec Command

ATD<n>[<mgsm>];

Response(s)

If voice call successful or not:
OK
When sending *# sequences response is specific to *# sequence. For details see Section 21.1, Star-Hash (*#) Network Commands
If no dialtone (parameter setting ATX2 or ATX4):
NO DIALTONE
If busy (parameter setting ATX3 or ATX4):
BUSY
If a connection cannot be set up:
NO DIALTONE
BUSY
NO CARRIER
NO ANSWER
ERROR
+CME ERROR: <err>

PIN	MDM	APP	✈	Last
±	+	±	-	-

Reference(s)

ITU-T V.250 [17]

Parameter Description

<n>(text)

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

DTMF transmission: If the dial string <n> contains the call modifier "P" the digits after this call modifier till the end are handled as DTMF tones, which are transmitted at connect state for voice calls. The command returns OK after the transmission of DTMF tones has been completed, even if the call is already connected. When encountering the DTMF separator subsequently, the module will insert a pause.

<mgsm>(text)

Modifier characters:

I	Activates CLIR (disables presentation of own phone number to called party, *#31#-code will be ignored)
i	Deactivates CLIR (enables presentation of own phone number to called party, *#31#-code will be ignored)
G	Activate Closed User Group explicit invocation for this call only.
g	Deactivate Closed User Group explicit invocation for this call only.

Notes

- The UE is equipped with a "Blacklist" function according to GSM02.07 Annex A:
  After a predefined number of failed call attempts, the dialed number is entered into a read-only phonebook called "blacklist" (phonebook "BL"). Call attempts to numbers contained in the blacklist will be barred by UE and not signalled to the network.
  An attempt to start a voice call to a barred phone number will be stopped with a "+CME ERROR: call barred".
  The barred numbers are automatically removed from the blacklist according to the timing conditions specified in GSM02.07 Annex A.
- Emergency calls:
  If no SIM is inserted, call numbers 000, 08, 110, 112, 118,119, 911 and 999 cause an emergency call setup.
  If a SIM with ECC file is inserted, 112 and 911 and all additional call numbers stored in the ECC file cause an emergency call setup.
  If a SIM without or empty ECC file is inserted, call numbers 112 and 911 and in addition all call numbers enabled with AT^SCFG, "Call/ECC", parameter <ecc> will cause an emergency call setup.

7.3 ATD><mem><index> Mobile originated call using specific memory and index number

This ATD command variant can be used to dial a number by specifying the phonebook and an index stored in this phonebook. The termination character ";" is mandatory to set up voice calls or to send *# codes for Supplementary Services.

The command may be aborted by any character sent from the TE to the UE during execution. Abortion is not possible during some states of connection setup such as handshaking.

See ATX for setting result code and call monitoring parameters.

Syntax

Exec Command

ATD>"<mem><index>" ;

Response(s)

If voice call successful or not:
OK
When sending *# sequences:
Response specific to *# sequence. For details see Section 21.1, Star-Hash (*#) Network Commands.
If no dialtone (parameter setting ATX2 or ATX4):
NO DIALTONE
If busy (parameter setting ATX3 or ATX4):
BUSY
If connection cannot be set up:
NO DIALTONE
BUSY
NO CARRIER
NO ANSWER
ERROR
+CME ERROR: <err>

PIN	MDM	APP	✈	Last
+	+	+	-	-

Reference(s)

ITU-T V.250 [17]

Parameter Description

<mem>(text)

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

FD	Fixed dialing phonebook
SM	SIM phonebook
ON	MSISDN list
ME	Mobile equipment phonebook
LD	Last number dialed phonebook
MC	Missed (unanswered received) calls list
RC	Received calls list
EN	Emergency numbers
DC	Dialed calls list
VM	CPHS voice mailbox phonebook

<index>(num)

Integer type memory location in the range of locations available in the selected memory, i.e. the index number returned by AT+CPBR.
DTMF transmission: If the dial string stored in the memory contains the call modifier "P" the digits after this call modifier till the end are handled as DTMF tones, which are transmitted at connect state for voice calls. The command returns OK after the transmission of DTMF tones has been completed, even if the call is already connected.

Examples

EXAMPLE 1

To query the location number of a phonebook entry:

```
AT+CPBR=1,15
+CPBR: 1,"+999999",145,"Charlie"
+CPBR: 2,"+777777",145,"Bill"
...
+CPBR: 15,"+888888",145,"Arthur"
```

UE returns the entries stored in the active phonebook.

EXAMPLE 2

To dial a number from the SIM phonebook, for example the number stored to location 15:

```
ATD>"SM15";
OK
```

EXAMPLE 3

To dial a phone number stored in the last dial memory on the SIM card:

```
ATD>"LD9";
OK
```

EXAMPLE 4

To dial a number from the ME phonebook, for example the number stored to location 15:

```
ATD>"ME15";
OK
```

7.4 ATD><index> Mobile originated call from active memory using index number

This ATD command variant can be used to dial a number by selecting an index from the active phonebook. The termination character ";" is mandatory to set up voice calls or to send *# codes for Supplementary Services.

The command may be aborted by any character sent from the TE to the UE during execution. Abortion is not possible during some states of connection setup such as handshaking.

See ATX for setting result code and call monitoring parameters.

Syntax

Exec Command

```
ATD><index>;
```

Response(s)

If voice call successful or not:
OK
When sending *# sequences:
Response specific to *# sequence. For details see Section 21.1, Star-Hash (*#) Network Commands.
If no dialtone (parameter setting ATX2 or ATX4):
NO DIALTONE
If busy (parameter setting ATX3 or ATX4):
BUSY
If connection cannot be set up:
NO DIALTONE
BUSY
NO CARRIER
NO ANSWER
ERROR
+CME ERROR: <err>

PIN	MDM	APP	✈	Last
+	+	+	-	-

Reference(s)

ITU-T V.250 [17]

Parameter Description

<index>(num)

Integer type memory location in the range of locations available in the active memory, i.e. the index number returned by AT+CPBR.
DTMF transmission: If the dial string stored in the memory contains the call modifier "P" the digits after this call modifier till the end are handled as DTMF tones, which are transmitted at connect state for voice calls. The command returns OK after the transmission of DTMF tones has been completed, even if the call is already connected.

7.5 ATD><str> Mobile originated call from memory using corresponding string

This ATD command variant can be used to search all PLS8-US-R4 phonebooks for a given string and dial the found number. The termination character ";" is mandatory to set up voice calls or to send *# codes for Supplementary Services.

The command may be aborted by any character sent from the TE to the UE during execution. Abortion is not possible during some states of connection setup such as handshaking.

See ATX for setting result code and call monitoring parameters.

Syntax

Exec Command

ATD><str>;

Response(s)

If voice call successful or not:
OK
When sending *# sequences:
Response specific to *# sequence. For details see Section 21.1, Star-Hash (*#) Network Commands.
If no dialtone (parameter setting ATX2 or ATX4):
NO DIALTONE
If busy (parameter setting ATX3 or ATX4):
BUSY
If connection cannot be set up:
NO DIALTONE
BUSY
NO CARRIER
NO ANSWER
ERROR
+CME ERROR: <err>

PIN	MDM	APP	✈	Last
+	+	+	-	-

Reference(s)

ITU-T V.250 [17]

Parameter Description

<str>(str)(+CSCS)

String type value ("x"), which should equal to an alphanumeric field in at least one phonebook entry in the searched memories. The string must contain at least one character. Used character set should be the one selected with AT+CSCS. <str> can contain escape sequences as described in chapter "Supported character sets".
If AT+CSCS is set to "UCS2", with respect to the coding of UCS2-characters only phonebook entries that contain an alphanumeric string with a size less than the half of the parameter <tlength> from AT+CPBW can be dialed.

DTMF transmission: If the dial string stored in the memory contains the call modifier "P" the digits after this call modifier till the end are handled as DTMF tones, which are transmitted at connect state for voice calls. The command returns OK after the transmission of DTMF tones has been completed, even if the call is already connected.

7.6 AT+CHUP Hang up call

AT+CHUP cancels all voice calls.

Syntax

Test Command

```
AT+CHUP=?
```

Response(s)

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

Exec Command

```
AT+CHUP
```

Response(s)

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

PIN	MDM	APP	✈	Last
-	+	+	-	-

Reference(s)

3GPP TS 27.007 [49]

7.7 AT^SHUP Hang up call(s) indicating a specific 3GPP TS 24.008 release cause

The AT^SHUP write command terminates calls known to the UE and indicates a specific 3GPP TS 24.008 [42] release cause specified by the user. Calls will be terminated regardless of their current call status, which may be any of the states listed with AT+CLCC.

Syntax

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

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

PIN	MDM	APP	✈	Last
+	+	±	-	-

Parameter Description

<cause>(num)

Release cause

3GPP TS 24.008 [42] release cause to be indicated to the network.
The PLS8-US-R4 will release the selected connection(s) with release cause indication "cause" and location "user" (0) in the "disconnect" protocol message to the network. It depends on the network whether or not the release cause will be forwarded to the remote party.

1	Send 3GPP TS 24.008 [42] release cause "unassigned (unallocated) number"
16	Send 3GPP TS 24.008 [42] release cause "normal call clearing "
17	Send 3GPP TS 24.008 [42] release cause "user busy "
18	Send 3GPP TS 24.008 [42] release cause "no user responding "
21	Send 3GPP TS 24.008 [42] release cause "call rejected"
27	Send 3GPP TS 24.008 [42] release cause "destination out of order "
31	Send 3GPP TS 24.008 [42] release cause "normal, unspecified"
88	Send 3GPP TS 24.008 [42] release cause "incompatible destination"

<cn>(num)

Call number

The "call number" is an optional index used in the list of current calls indicated by AT+CLCC. The AT^SHUP command will terminate the call identified by the given call number. The default call number "0" is not assigned to any call, but signifies "all calls". As "0" is the default value, it may be omitted.

[0]	Terminate all known calls.
1...7	Terminate the specific call number <cn>.

Note

- Multiparty calls within a IMS call cannot be terminated individually by AT^SHUP command, due to limitations of the IMS standard.

7.8 ATS0 Set number of rings before automatically answering a call

ATS0 controls the automatic answering feature. The setting is global for all interfaces. The write command is SIM PIN protected, the read command is not.

Syntax

Read Command
ATS0?
Response(s)
<n> OK ERROR

Write Command
ATS0=<n>
Response(s)
OK ERROR

PIN	MDM	APP	✈	Last
-	+	+	-	-

Reference(s)
ITU-T V.250 [17]

Parameter Description

<n>(num)(&V)(&W)	
000(&F)(D)	Automatic answer mode is disabled.
001-255	Enable automatic answering after specified number of rings.

7.9 AT+CLCC List of current calls

The AT+CLCC execute command lists all current calls. If the command is successful, but no calls are available, no information response is sent to the TE.

Syntax

Test Command

```
AT+CLCC=?
```

Response(s)

```
OK
```

Exec Command

```
AT+CLCC
```

Response(s)

```
[+CLCC: <idx>, <dir>, <stat>, <mode>, <mpty>[, <number>, <type>[, <alpha>]]]
[+CLCC: <idx>, <dir>, <stat>, <mode>, <mpty>[, <number>, <type>[, <alpha>]]]
[+CLCC: ...]
OK
ERROR
+CME ERROR: <err>
```

PIN	MDM	APP	✈	Last
-	+	+	-	-

Reference(s)

3GPP TS 27.007 [49]

Parameter Description

<idx>(num)

Call identification number as described in 3GPP TS 22.030 [28], subclause 6.5.5.1., this number can be used in AT+CHLD command operations.

<dir>(num)

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

<stat>(num)

State of the call

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

<mode>(num)

Bearer/teleservice

0	Voice

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

<number>(str)

Phone number in format specified by <type>

<type>(num)

Type of address octet as defined by 3GPP TS 24.008 [42], subclause 10.5.4.7. For possible values and further details see <type> parameter specified for phonebook related AT commands such as AT+CPBR and AT+CPBW.

128	Number is restricted
161	National <number>. Network support of this type is optional.
145	Dialing string <number> includes international access code character '+'
255	Dialing string <number> contains "*", "#" characters for Supplementary Service codes. Network support of this type is optional.
129	Otherwise

<alpha>(str)(+CSCS)

Alphanumeric representation of <number> corresponding to the entry found in phonebook(see for example AT+CPBW, parameters <text> and <tlength>).
If the same <number> is written to several phonebooks with different names the <alpha> representation prioritizes the name from the "SM" phonebook and next according to the order: "ME", "FD", "ON". This order of priority applies also to dialed numbers no matter which phonebook is used for dialing.

Note

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

7.10 AT^SLCC Extended list of current calls

AT^SLCC covers essentially the same information as the 3GPP TS 27.007 [49] command AT+CLCC, with the following extensions:

- The additional write command allows to activate event reporting for the list of current calls.
- The additional read command returns an indication whether event reporting is active for the current interface.
- The exec command returns, like AT+CLCC, a list of current calls. If the command is successful, but no calls are available, no information response is sent to the TE.

Syntax

Test Command

```
AT^SLCC=?
```

Response(s)

```
^SLCC: (list of supported<n>s)
OK
```

Read Command

```
AT^SLCC?
```

Response(s)

```
^SLCC: <n>
OK
```

Exec Command

```
AT^SLCC
```

Response(s)

```
[^SLCC:<idx>, <dir>, <stat>, <mode>, <mpty>, <Reserved>[, <number>, <type>[, <alpha>]]]
[^SLCC:<idx>, <dir>, <stat>, <mode>, <mpty>, <Reserved>[, <number>, <type>[, <alpha>]]]
[^SLCC:...]
OK
ERROR
+CME ERROR: <err>
```

Write Command

```
AT^SLCC=<n>
```

Response(s)

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

PIN	MDM	APP	✈	Last
-	+	+	-	-

Unsolicited Result Code

Unsolicited Call Status information

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

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

^SLCC:

URC "^SLCC" displays the list of current calls as displayed with the execute command AT^SLCC. The list is displayed in the state it has at the time of display, not in the state it had when the signal was generated. The URC's occurrence indicates call status changes for any of the calls in the list of current calls.
If multiple displays of identical list configurations occur, this happens because of short intermediate states of the list, that have already been overridden by new transitions and states. Thus, it is guaranteed that the configuration displayed is always the current configuration at the time of the last display.
The list of active calls displayed with this URC will always be terminated with an empty line preceded by prefix "^SLCC: ", in order to indicate the end of the list.

Parameter Description

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

0(&F)(D)	Presentation of URC "^SLCC" disabled
1	Presentation of URC "^SLCC" enabled

<idx>(num)

Call identification number as described in subclause 6.5.5.1 of 3GPP TS 22.030 [28]. This number can be used in AT+CHLD command operations.

<dir>(num)

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

<stat>(num)

State of the call

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

<mode>(num)

Bearer/teleservice

0	Voice

<mpty>(num)

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

<Reserved>(num)

0	Reserved

<number>(str)

Phone number in format specified by <type>

<type>(num)

Type of address octet as defined by 3GPP TS 24.008 [42], subclause 10.5.4.7. For possible values and further details see <type> parameter specified for phonebook related AT commands such as AT+CPBR and AT+CPBW.

128	Number is restricted
145	Dialing string <number> includes international access code character '+'
161	National number
255	Dialing string <number> contains "*", "#" characters for Supplementary Service codes. Network support of this type is optional.
129	Otherwise

<alpha>(str)(+CSCS)

Alphanumeric representation of <number> corresponding to the entry found in phonebook (see for example AT+CPBW, parameters <text> and <tlength>).
Due to time constraints on the necessary evaluation of the phonebook, this parameter may show a default value during early call phases (e.g. for <stat>= "dialing", "incoming" or "alerting"), even if a phonebook entry is present for the number concerned.
If the same <number> is written to several phonebooks with different names the <alpha> representation prioritizes the name from the "SM" phonebook and next according to the order: "ME", "FD", "ON". This order of priority applies also to dialed numbers no matter which phonebook is used for dialing.

Notes

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

7.11 AT+CR Service reporting control

AT+CR configures the PLS8-US-R4 whether or not to transmit an intermediate result code +CR: <serv> to the TE when a call is being set up.
<mode>=1 may lead to connection failure, if the application waits for default result code/URC.

Syntax

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

Read Command
AT+CR?
Response(s)
+CR: <mode> OK ERROR

Write Command
AT+CR=<mode>
Response(s)
OK ERROR

PIN	MDM	APP	✈	Last
+	+	+	+	-

Reference(s)
3GPP TS 27.007 [49]

Intermediate Result Code

If enabled, an intermediate result code is transmitted during connect negotiation when the PLS8-US-R4 has determined speed and quality of service to be used, before any error control or data compression reports are transmitted, and before any final result code (e.g. CONNECT) appears.

+CR: <serv>

Parameter Description

<mode>(num)(&V)(&W)	
0(&F)(D)	Disable
1	Enable

<serv>(str)	
“REL ASYNC“	Asynchronous non-transparent
“GPRS“	GPRS
“SYNC“	Fax call (Fax only for compatibility reasons, not supported by PLS8-US-R4)

7.12 AT+CRC Set Cellular Result Codes for incoming call indication

AT+CRC controls whether or not to use the extended format of incoming call indication.
<mode>=1 may lead to connection failure, if the application waits for default result code/URC.

Syntax

Test Command

AT+CRC=?

Response(s)

+CRC: (list of supported<mode>s)
OK
ERROR

Read Command

AT+CRC?

Response(s)

+CRC: <mode>
OK
ERROR

Exec Command

AT+CRC

Response(s)

OK
ERROR

Write Command

AT+CRC=<mode>

Response(s)

OK
ERROR

PIN	MDM	APP	✈	Last
+	+	+	+	-

Reference(s)

3GPP TS 27.007 [49]

Unsolicited Result Codes

URC 1

RING

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

URC 2

+CRING: <type>

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

Parameter Description

<mode>(num)(&V)(&W)	
0(&F)(D)	Disable extended format
1	Enable extended format

<type>(str)	
“REL ASYNC“	Asynchronous non-transparent
“FAX“	Fax call (Fax only for compatibility reasons, not supported by PLS8-US-R4)
“VOICE“	Voice

7.13 AT+CVMOD Voice call mode

The AT+CVMOD selects the voice call mode for making a Mobile Originated voice call from the UE. The voice call mode can be CS_ONLY, VOIP_ONLY, CS_PREFERRED or VOIP_PREFERRED.

Syntax

Test Command

```
AT+CVMOD=?
```

Response(s)

```
+CVMOD: (list of supported<voicemode>s)
OK
```

Read Command

```
AT+CVMOD?
```

Response(s)

```
+CVMOD: <voicemode>
OK
```

Write Command

```
AT+CVMOD=<voicemode>
```

Response(s)

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

PIN	MDM	APP	✈	Last
+	+	+	-	+

Reference(s)

3GPP TS 27.007 [49]

Parameter Description

<voicemode>(num)(NV)

When selecting another mode restart the UE for the change to take effect.

0	CS_ONLY
1	VOIP_ONLY
2	CS_PREFFERED
3(D)	VOIP_PREFFERED

Notes

- If the Call Mode is set to CS_ONLY, then the ATD command will make a call in CS mode.
  If the Call Mode is set to VOIP_ONLY, then the ATD command will make a call in VoIP mode.
  If the Call Mode is set to CS_PREFERRED, then the ATD command gives preference for CS based voice call.
  If the Call Mode is set to VOIP_PREFERRED, then the ATD command gives preference for VoIP based voice call
- The preferences are not applicable for the emergency call.

8. Network Service Commands

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

8.1 AT+COPN Read operator names

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

Syntax

Test Command

```
AT+COPN=?
```

Response(s)

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

Exec Command

```
AT+COPN
```

Response(s)

```
+COPN: <numericn>,<alphan>
[+COPN: ...]
OK
ERROR
+CME ERROR: <err>
```

PIN	MDM	APP	✈	Last
+	+	+	+	-

Reference(s)

3GPP TS 27.007 [49]

Parameter Description

<numericn>(str)

Operator in numeric format

<alphan>(str)(+CSCS)

Operator in long alphanumeric format

8.2 AT+COPS Operator Selection

AT+COPS queries the present status of the PLS8-US-R4'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-US-R4 searches for the home operator automatically. If successful the PLS8-US-R4 registers to the home network. If the home network is not found, PLS8-US-R4 goes on searching. If a permitted operator is found, PLS8-US-R4 registers to this operator.
  If no operator is found the PLS8-US-R4 remains unregistered.
- Manual
  Desired operator can be determined using the AT+COPS write command. If the operator is found, PLS8-US-R4 registers to it immediately. If the selected operator is forbidden, the PLS8-US-R4 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 reponse to the AT+COPS test command is independent of the settings made with <mode> and <rat>. The AT+COPS test command will return a list of operators with the supported <rat>s.
Under certain conditions the UE has not enough resources to perform a network scan in the background. In such case, the AT+COPS test command is denied with error, for example during location update, data traffic in PS connections, voice call etc.

The reponse 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	MDM	APP	✈	Last
+	+	+	-	-

Reference(s)

3GPP TS 27.007 [49]

Parameter Description

<opStatus>(num)

Operator Status

0	Unknown
1	Operator available
2	Current operator
3	Operator forbidden

<opName>(str)(+CSCS)(&V)

Operator Name

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

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

Only Parameter values 0 and 1 are stored in the non-volatile memory of the PLS8-US-R4.

0(D)	Automatic mode; <opName> field is ignored.
1	Manual operator selection The AT+COPS write command requires <opName> in numeric format, i.e. <format> shall be 2. <opName> can be omitted when changing only the <rat> parameter and retaining the network already manually selected. When using this mode keep in mind that only the <mode> parameter is non-volatile, but not the selected <opName>. After restarting the UE the network will be selected according to the priority order specified in 3GPP TS 23.122: "Last Registered PLMN", "Home PLMN", "Preferred PLMN" (related USIM elementary files are EF_LOCI, EF_IMSI, EF_PLMNwAcT). The same priority order applies when swapping the USIM during operation.
2	Manually deregister from network and remain unregistered until <mode>=0 or 1 or 4 is selected. After setting command AT+COPS=2 wait for <regStatus> 0, e.g. indicated by the "+CREG: 0" URC before executing any further network service related AT commands.

3	Set only <format> (for AT+COPS read command).
4	Manual / automatic selection; if manual selection fails, automatic mode (<mode>=0) is entered (<opName> field will be present).

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

Radio Access Technology (RAT)

By delivery default, the <rat> parameter is set to an automatic selection mode which enables the UE to select 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 or GSM only or E-UTRAN only. The selected <rat> value will be stored in the non-volatile memory. If the selected <rat> is not available, the UE cannot register to a network.
The automatic <rat> selection mode can be restored any time by executing the AT+COPS write command without choosing a specific <rat>, i.e. simply by omitting the <rat> value. When you do so, it does not matter, which value(s) you select for other AT+COPS parameters. For example, an easy way is setting AT+COPS=0, which means both PLMN and RAT are automatically selected. Another way is giving the AT+COPS write command with any <mode>, <format>, or <opName>, but <rat> omitted.
Please consider that the AT+COPS? read command does not reflect whether <rat> was omitted or explicitly set. This is because the response to the AT+COPS? read command will always indicate the currently used <rat>. 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>(num)(&V)(&W)

0(D)	Long alphanumeric format of <opName>.
1	Short alphanumeric format of <opName>.
2	Numeric format of <opName>. This is the Location Area Identification (LAI) number, which consists of the 3-digit Mobile Country Code (MCC) plus the 2- or 3-digit Mobile Network Code (MNC).

Note

- AT+COPS=? shows PLMNs as available (<opStatus>=1) as long as a location update was not rejected and the PLMNs are not written to the forbidden PLMN list (SIM EF-FPLMN).

8.3 AT+CPOL Preferred Operator List

AT+CPOL read command queries the list of the preferred operators.
AT+CPOL write command allows to edit the list of the preferred operators.
The response of AT+CPOL read command also depends on the setting of AT+CPLS.
If <index> is given but <operator> is left out, the entry is deleted.

Syntax

Test Command

```
AT+CPOL=?
```

Response(s)

```
+CPOL:(list of supported <index>s), (list of supported <format>s)
OK
ERROR
+CME ERROR: <err>
```

Read Command

```
AT+CPOL?
```

Response(s)

```
+CPOL: <index>, <format>, <operator>[, <gsm>, <gsm_compact>, <utran>, <e-utran>]
+CPOL: ...
OK
ERROR
+CME ERROR: <err>
```

Write Command

```
AT+CPOL=[<index>][, <format>[[, <operator>][, <gsm>, <gsm_compact>, <utran>, <e-utran>]]]
```

Response(s)

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

PIN	MDM	APP	✈	Last
+	+	+	+	-

Reference(s)

3GPP TS 27.007 [49]

Parameter Description

<index>(num)

The order number of the operator in the SIM preferred operator list.

<format>(num)

0	Long alphanumeric format <operator>
1	Short alphanumeric format <operator>
2	Numeric format <operator>

<operator>(str)

The operator in the format specified in <format>.

<gsm>(num)	
0	AcT GSM disabled
1	AcT GSM enabled

<gsm_compact>(num)	
0	AcT GSM Compact disabled

<utran>(num)	
0	AcT UTRAN disabled
1	AcT UTRAN enabled

<e-utran>(num)	
0	AcT E-UTRAN disabled
1	AcT E-UTRAN enabled

Note

- The Access Technology selection parameters <gsm>, <gsm_compact>, <utran>, <e-utran> are required for SIM cards or UICCs containing PLMN selector with Access Technology.

8.4 AT+CPLS Select Preferred Operator List

AT+CPLS is used to select a preferred PLMN list defined in Elementary Files of the SIM card or active application of the USIM. The setting takes effect for the AT+CPOL command.

Syntax

Test Command

AT+CPLS=?

Response(s)

+CPLS:(list of USIM supported <plmn-selector>s)
OK

Read Command

AT+CPLS?

Response(s)

+CPLS: <plmn-selector>
OK
ERROR
+CME ERROR: <err>

Write Command

AT+CPLS=<plmn-selector>

Response(s)

OK
ERROR
+CME ERROR: <err>

PIN	MDM	APP	✈	Last
+	+	+	-	-

Reference(s)

3GPP TS 27.007 [49]

Parameter Description

<plmn-selector>(num)	
0(P)	User controlled PLMN with $EF_{PLMNwAcT}$/$EF_{PLMNsel}$
1	Operator controlled PLMN selector with $EF_{OPLMNwAcT}$
2	HPLMN selector with $EF_{HPLMNwAcT}$

8.5 AT+CREG Network Registration Status

AT+CREG serves to monitor the PLS8-US-R4'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	MDM	APP	✈	Last
-	+	+	+	-

Reference(s)

3GPP TS 27.007 [49]

Unsolicited Result Codes

URC 1

If <urcMode>=1 and there is a change in the UE's network registration status:

+CREG: <regStatus>

URC 2

If <urcMode>=2 and there is a change of the UE's network registration status or at least one of the additional network information elements:

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

Parameter Description

<urcMode>(num)(&V)(&W)	
[0](&F)	Disable +CREG URC.
1	Enable URC +CREG:<regStatus> to report status of network registration.
2	Enable URC +CREG:<regStatus>[,<netLac>,<netCellId>>[, <AcT>]] to report status of network registration including location information. Parameters <netLac>, <netCellId> and <AcT> will only be displayed if available.

<regStatus>(num)(&V)	
0	Not registered, UE is currently not searching for new operator. There is a technical problem. User intervention is required. Yet, emergency calls can be made if any network is available. Probable causes: • no SIM card available • no PIN entered • no valid Home PLMN entry found on the SIM
1	Registered to home network.
2	Not registered, but UE is currently searching for a new operator. UE searches for an available network. Failure to log in until after more than a minute may be due to one of the following reasons: • No network available or insufficient Rx level. • UE has no access rights to the networks available. • Networks from the SIM list of allowed networks are around, but login fails due to one of the following reasons: - #11 ... PLMN not allowed - #12 ... Location area not allowed - #13 ... Roaming not allowed in this location area After this, the search will be resumed (if automatic network search is enabled). • The Home PLMN or an allowed PLMN is available, but login is rejected by the cell (reasons: Access Class or LAC). If at least one network is available, emergency calls can be made.
3	Registration denied • If automatic network search is enabled: Authentication or registration fails after Location Update Reject due to one of the following reasons: - #2 ... IMSI unknown at HLR - #3 ... Illegal MS - #6 ... Illegal UE Either the SIM or the UE are unable to log into any network. User intervention is required. Emergency calls can be made, if any network is available. • Only if manual network search is enabled: Manual registration fails after Location Update Reject due to the following reasons: - #2 ... IMSI unknown at HLR - #3 ... Illegal MS - #6 ... Illegal UE - #11 ... PLMN not allowed - #12 ... Location area not allowed - #13 ... Roaming not allowed in this location area No further attempt is made to search or log into a network. Emergency calls can be made if any network is available.
4	Unknown, e.g. out of GSM/UMTS/LTE coverage.
5	Registered, roaming. UE is registered at a foreign network (national or international network)

<netLac>(str)

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

<netCellId>(str)

Cell ID in hexadecimal format:
- 16 bit for 2G
- 28 bit for 3G or 4G

<AcT>(num)

Radio access technology

0	GSM
2	UTRAN
3	GSM w/EGPRS
4	UTRAN w/HSDPA
6	UTRAN w/HSDPA and 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.

8.6 AT+CESQ Extended Signal Quality

The AT+CESQ command returns received signal quality parameters. If the current serving cell is not a GERAN cell, <rxlev> and <ber> are set to value 99. If the current serving cell is not a UTRA FDD or UTRA TDD cell, <rscp> is set to 255. If the current serving cell is not a UTRA FDD cell, <ecno> is set to 255. If the current serving cell is not an E-UTRA cell, <rsrq> and <rsrp> are set to 255.

Syntax

Test Command

AT+CESQ=?

Response(s)

+CESQ: (list of supported <rxlev>s), (list of supported<ber>s), (list of supported<rscp>s), (list of supported<ecno>s), (list of supported<rsrq>s), (list of supported<rsrp>s)
OK

Exec Command

AT+CESQ

Response(s)

+CESQ: <rxlev>, <ber>, <rscp>, <ecno>, <rsrq>, <rsrp>
OK
ERROR

PIN	MDM	APP	✈	Last
+	+	+	-	-

Reference(s)

3GPP TS 27.007 [49]

Parameter Description

<rxlev>(num)

Received signal strength level (see 3GPP TS 45.008 [53] subclause 8.1.4). For 2G networks only

0	rssi < -110 dBm
1	-110 dBm ≤ rssi < -109 dBm
2	-109 dBm ≤ rssi < -108 dBm
...	
61	-50 dBm ≤ rssi < -49 dBm
62	-49 dBm ≤ rssi < -48 dBm
63	-48 dBm ≤ rssi
99	not known or not detectable

<ber>(num)

Channel bit error rate (in percent). For 2G networks only

0..7	as RXQUAL values in the table in 3GPP TS 45.008 [53] subclause 8.2.4
99	not known or not detectable

<rscp>(num)

Received signal code power (see 3GPP TS 25.133 [45] subclauses 9.1.1.3 and 9.1.1.1.3) For 3G networks only

0	rscp < -120 dBm
1	-120 dBm ≤ rscp < -119 dBm
2	-119 dBm ≤ rscp < -118 dBm

...	
94	-27 dBm ≤ rscp < -26 dBm
95	-26 dBm ≤ rscp < -25 dBm
96	-25 dBm ≤ rscp
255	not known or not detectable

`<ecno>`(num)

Ratio of the received energy per PN chip to the total received power spectral density (see 3GPP TS 25.133 [45] subclause 9.1.2.3) For 3G networks only

0	Ec/Io < -24 dB
1	-24 dB ≤ Ec/Io < -23.5 dB
2	-23.5 dB ≤ Ec/Io < -23 dB
...	
47	-1 dB ≤ Ec/Io < -0.5 dB
48	-0.5 dB ≤ Ec/Io < 0 dB
49	0 dB ≤ Ec/Io
255	not known or not detectable

`<rsrq>`(num)

Reference signal received quality (see 3GPP TS 36.133 [54] subclause 9.1.7). For 4G networks only

0	rsrq < -19.5 dB
1	-19.5 dB ≤ rsrq < -19 dB
2	-19 dB ≤ rsrq < -18.5 dB
...	
32	-4 dB ≤ rsrq < -3.5 dB
33	-3.5 dB ≤ rsrq < -3 dB
34	-3 dB ≤ rsrq
255	not known or not detectable

`<rsrp>`(num)

Reference signal received power (see 3GPP TS 36.133 [54] subclause 9.1.4). For 4G networks only

0	rsrp < -140 dBm
1	-140 dBm ≤ rsrp < -139 dBm
2	-139 dBm ≤ rsrp < -138 dBm
...	
95	-46 dBm ≤ rsrp < -45 dBm
96	-45 dBm ≤ rsrp < -44 dBm
97	-44 dBm ≤ rsrp
255	not known or not detectable

8.7 AT+CSQ Signal Quality

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

Syntax

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

Exec Command
AT+CSQ
Response(s)
+CSQ: <rssi>,<ber> OK

PIN	MDM	APP	✈	Last
+	+	+	-	-

Reference(s)
3GPP TS 27.007 [49]

Parameter Description

<rssi>(num)	
0	-113 dBm or less
1	-111 dBm
2..30	-109... -53 dBm
31	-51 dBm or greater
99	not known or not detectable

According to 3GPP TS 27.007 [49], the <rssi> value is not applicable to 3G and 4G networks. Please use AT+CESQ instead, or AT^SMONI.

Note for 3G only: With a view to employing AT+CSQ also for 3G networks the PLS8-US-R4 has been designed to show a <rssi> value derived from the 3G specific RSCP parameter shown by AT^SMONI. Nevertheless, please consider that connection quality in 3G networks is depending on further factors. For example, despite good <rssi> 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 AT^SMONI which delivers additional information, in particular the values RSCP, EC/n0, SQual and SRxLev RX level.

<ber>(num)	
0..7	as RXQUAL values in the table in 3GPP TS 45.008 [53], section 8.2.4 (for GSM network only).
99	not known or not detectable.

Note

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

8.8 AT+CTZU Automatic Time Zone Update

The AT+CTZU command enables and disables automatic time zone update via NITZ (if supported by the network).

When AT+CTZU is set to 1, the Real Time Clock (RTC) on the UE is updated with the network time every time when the UE receives a NITZ message. Any changes to the RTC using the command AT+CCLK will be wiped out by the network time.

When AT+CTZU is set to 0, AT+CCLK can be used to set the RTC. The newly set time will not be overwritten by the network time.

The AT^SIND command can also be used to get NITZ information, for details see "nitz" indicator. Unlike AT+CTZU, AT^SIND settings have no effect for the RTC.

Syntax

Test Command

```
AT+CTZU=?
```

Response(s)

```
+CTZU:(list of supported <n>s)
OK
```

Read Command

```
AT+CTZU?
```

Response(s)

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

Write Command

```
AT+CTZU=<n>
```

Response(s)

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

PIN	MDM	APP	✈	Last
-	+	+	+	-

Reference(s)

3GPP TS 27.007 [49]

Unsolicited Result Code

Format of the unsolicited result code:

```
+CTZU:<nitzUT>, <nitzTZ>[, <nitzDST>]
```

The URC indicates the RTC update from network time, and contains the time relevant information elements of the NITZ message.

Parameter Description

<n>(num)(NV)	
0(&F)(D)	Disable Automatic Time Zone update via NITZ. Suppress unsolicited result codes.
1	Enable Automatic Time Zone update via NITZ. Output unsolicited result codes.

<nitzUT>(str)

Universal Time delivered as part of the NITZ message.

<nitzTZ>(num)

Time Zone delivered as part of the NITZ message.

<nitzDST>(num)

Adjustment for Daylight Saving Time as part of the NITZ message. Displayed only when received from network.

8.9 AT^SMONI Monitoring Serving Cell

The AT^SMONI command supplies information of the serving cell.

Syntax

Test Command

AT^SMONI=?

Response(s)

OK

Exec Command

AT^SMONI

Response(s)

See: Section 8.9.1, AT^SMONI Responses
OK

Write Command

AT^SMONI=255

Response(s)

See: Section 8.9.2, AT^SMONI Enhanced Responses
OK
ERROR
+CME ERROR: <err>

PIN	MDM	APP	✈	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 the UE is leaving connected mode.
- The value of the TransportCh field is valid only for the moment, and can change frequently.

8.9.1 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,CSGid,TransportCh,
SF,Slot,EC/n0,RSCP,ComMod,HSUPA,HSDPA
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,Phys-
ical 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,CSGid,TransportCh,
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,Phys-
ical Cell ID,Srxlev,RSRP,RSRQ,Conn_state
Example:
^SMONI: 4G,SEARCH
```

- 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,ChM
od
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,CSGid,TransportCh,
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,Phys-
ical 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:

- 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,CSGid,TransportCh,
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,Phys-
ical 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 (level is limited from -110dBm to -47dBm)
MCC	Mobile Country Code (first part of the PLMN code)
MNC	Mobile Network Code (second part of the PLMN code)
LAC	Location Area Code
cell	Cell ID
C1	Coefficient for base station selection
C2	Coefficient for base station selection
NCC	PLMN colour code
BCC	Base station colour code
GPRS	GPRS state

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)

Column	Description
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)
CSGid	Closed Subscriber Group id

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 (3G) Dedicated Channel parameters:
Note: Transport channels in downlink are considered.

Column	Description
TransportCh	Transport Channel Type (DPCH, FDPCH, HSDSCH, EDCH)
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 [47] (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 (a.k.a. HSDSCH 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 [47] (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

Columns for LTE (4G) Serving Channel parameters:

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

8.9.2 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,ChM
od
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:

```
Syntax:
^SMONI: ACT,UARFCN,PSC,EC/n0,RSCP,MCC,MNC,LAC,cell,SQual,SRxLev,CSGid,TransportCh,
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,Phys-
ical 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 cell:
  See Section 8.9.1, AT^SMONI Responses.
- 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,ChM
od
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,CSGid,TransportCh,
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,Phys-
ical 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 has a dedicated channel (for example call in progress):

- GSM (2G) cell:

```
Syntax:
^SMONI:
ACT,ARFCN,BCCH,MCC,MNC,LAC,cell,C1,C2,NCC,BCC,GPRS,PWR,RXLev,ARFCN,TS,timAdv,dBm,Q,ChM
od
Example:
^SMONI: 2G,852,-80,262,03,4E2D,6C2D,28,32,3,5,E,0,-104,816,1,3,-71,0,A_FR
```

- UMTS (3G) cell:

```
Syntax:
^SMONI: ACT,UARFCN,PSC,EC/n0,RSCP,MCC,MNC,LAC,cell,SQual,SRxLev,CSGid,TransportCh,
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,Phys-
ical 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 (level is limited from -110dBm to -47dBm)
MCC	Mobile Country Code (first part of the PLMN code)
MNC	Mobile Network Code (second part of the PLMN code)

Column	Description
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)
CSGid	Closed Subscriber Group id

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 (3G) Dedicated Channel parameters:
Note: Transport channels in downlink are considered.

Column	Description
TransportCh	Transport Channel Type (DPCH, FDPCH, HSDSCH, EDCH)
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 [47] (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 (a.k.a. HSDSCH 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 [47] (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

Columns for LTE (4G) Serving Channel parameters:

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

8.9.3 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 AT+CREG AT+CEREG to query the registration status),
  - authentication failed.

8.10 AT^SMONP Monitoring Neighbour Cells

The AT^SMONP supplies information of active cells and all neighbour cells. The active cell information will be delivered additively because an UE can be situated in Soft Handover or Softer Handover.

Syntax

Test Command

AT^SMONP=?

Response(s)

OK

Exec Command

AT^SMONP

Response(s)

See: Section 8.10.1, AT^SMONP Responses
OK

Write Command

AT^SMONP=255

Response(s)

See: Section 8.10.2, AT^SMONP Enhanced Responses
OK
ERROR
+CME ERROR: <err>

PIN	MDM	APP	✈	Last
-	+	+	-	-

Notes

- Due to the fact that not all necessary information of the neighbour cells can be decoded during a connection, there are several constraints to be considered:
  - Only neighbour cells that have already been visible in IDLE mode will be further updated, as long as they are still included in the list.
  - Though new neighbour cells can be added to the list (e.g. due to handover), their C1 and C2 parameters cannot be displayed until the connection is released. In this case "-" is presented for C1 and C2.
- The neighbour cells have the same PLMN as the serving cell. In case of searching for a network the serving cell can change and the UE shows different sets of neighbour cells depending on the PLMN of the serving cell.
- Parameters for which no values are available are shown as "-".

8.10.1 AT^SMONP Responses

Responses of AT^SMONP execute command:

- In case of a GSM (2G) serving cell:

```
Syntax:
2G:
ARFCN1,rs1,dBm1,MCC1,MNC1,NCC1,BCC1,C11,C21,LAC1,cell1
ARFCN2,rs2,dBm2,MCC2,MNC2,NCC2,BCC2,C12,C22,LAC2,cell2
...
ARFCNn,rsn,dBmn,MCCn,MNCn,NCCn,BCCn,C1n,C2n,LACn,celln
3G:
```

```
UARFCN1,PSC1,EC/n01,RSCP1
UARFCN2,PSC2,EC/n02,RSCP2
...
UARFCNn,PSCn,EC/n0n,RSCPn

4G:
EARFCN1,RSRQ1,RSRP1,PCI1
EARFCN2,RSRQ2,RSRP2,PCI2
...
EARFCNn,RSRQn,RSRPn,PCIn


Example:
2G:
658,50,-61,262,07,7,4,45,45,4EED,08B8
666,48,-63,262,07,7,1,43,43,4EED,A500
1006,39,-72,262,07,7,4,34,34,4EED,----
1021,36,-75,262,07,7,1,31,21,4EED,08B2
702,32,-79,262,07,7,3,27,27,4EED,A4F0
654,30,-81,262,07,7,5,25,25,4EED,1C3A
3G:
-----,---,-----,----
4G:
-----,-----,----,---
OK
```

- In case of a UMTS (3G) serving cell:

```
Syntax:
3G:
UARFCN1,PSC1,EC/n01,RSCP1,SQual1,SRxLev1
UARFCN2,PSC2,EC/n02,RSCP2,SQual2,SRxLev2
...
UARFCNn,PSCn,EC/n0n,RSCPn,SQualn,SRxLevn

2G:
ARFCN1,RSSI1,NCC1,BCC1,SRxLev1
ARFCN2,RSSI2,NCC2,BCC2,SRxLev2
...
ARFCNn,RSSIn,NCCn,BCCn,SRxLevn

4G:
EARFCN1,RSRQ1,RSRP1,Srxlev1,PCI1
EARFCN2,RSRQ2,RSRP2,Srxlev2,PCI2
...
EARFCNn,RSRQn,RSRPn,Srxlevn,PCIn


Example:
3G:
10786,49,-5.5,-78,25,34
10786,161,-24.0,-121,0,0
10786,54,-24.0,-121,0,0
10786,51,-24.0,-121,0,0
10786,62,-24.0,-121,0,0
10786,159,-24.0,-121,0,0
2G:
----,----,-,-,----
```

```
4G:
-----,-----,----,--,---
OK
```

- In case of a LTE (4G) serving cell:

```
Syntax:
4G:
EARFCN1,RSRQ1,RSRP1,Srxlev1,PCI1,RSSI1
EARFCN2,RSRQ2,RSRP2,Srxlev2,PCI2,RSSI2
...
EARFCNn,RSRQn,RSRPn,Srxlevn,PCIn,RSSIn

2G:
ARFCN1,RSSI1,NCC1,BCC1,SRxLev1
ARFCN2,RSSI2,NCC2,BCC2,SRxLev2
...
ARFCNn,RSSIn,NCCn,BCCn,SRxLevn

3G:
UARFCN1,PSC1,EC/n01,RSCP1,SQual1,SRxLev1
UARFCN2,PSC2,EC/n02,RSCP2,SQual2,SRxLev2
...
UARFCNn,PSCn,EC/n0n,RSCPn,SQualn,SRxLevn


Example:
4G:
1830,-11.7,-91,38,368,-61
1830,-11.6,-93,36,262,-72
1830,-11.7,-95,35,329,-74
1830,-14.3,-95,34,261,-72
1830,-18.4,-105,24,248,-74
2G:
----,--,----,-,-,----
3G:
-----,---,-----,----,--
Example 2:
4G:
1830,-11.7,-91,38,368,-61
1830,-11.6,-93,36,262,-72
1830,-11.7,-95,35,329,-74
1830,-14.3,-95,34,261,-72
1830,-18.4,-105,24,248,-74
2G:
----,--,----,-,-,----
3G:
10663,---,-----,----,--
10786,---,-----,----,--
OK
```

Columns for GSM (2G) parameters:

Column	Description
ARFCN	Absolute Radio Frequency Channel Number of the BCCH carrier
rs	RSSI value 0 - 63 (RSSI = Received signal strength indication)

Column	Description
dBm	Receiving level in dBm
MCC	Mobile Country Code (first part of the PLMN code)
MNC	Mobile Network Code (second part of the PLMN code)
NCC	Network colour Code
BCC	Base Station colour code
C1	cell selection criterion
C2	cell reselection criterion
LAC	Location area code
cell	Cell identifier

Columns for UMTS (3G) parameters:

Column	Description
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
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) parameters:

Column	Description
EARFCN	E-UTRA Absolute Radio Frequency Channel Number
RSRQ	Reference Signal Received Quality as measured by L1 in dB (see ETSI TS 136 214 version 10.1.0 Section 5.1.3.)
RSRP	Reference Signal Received Power as measured by L1 in dBm (see ETSI TS 136 214 version 10.1.0 Section 5.1.1.)
Srxlev	RX level value for base station selection in dB (see 3GPP 25.304)
PCI	Physical Cell ID
RSSI	Received Signal Strength Indication as measured by L1 in dBm

8.10.2 AT^SMONP Enhanced Responses

Responses of write command AT^SMONP=255:

- In case of a GSM (2G) serving cell:

```
Syntax:
2G:
ARFCN1,rs1,dBm1,MCC1,MNC1,NCC1,BCC1,C11,C21,LAC1,cell1,C311,C321
ARFCN2,rs2,dBm2,MCC2,MNC2,NCC2,BCC2,C12,C22,LAC2,cell2,C312,C322
...
ARFCNn,rsn,dBmn,MCCn,MNCn,NCCn,BCCn,C1n,C2n,LACn,celln,C31n,C32n
```

```
3G:
UARFCN1,PSC1,EC/n01,RSCP1
UARFCN2,PSC2,EC/n02,RSCP2
...
UARFCNn,PSCn,EC/n0n,RSCPn

4G:
EARFCN1,RSRQ1,RSRP1,PCI1
EARFCN2,RSRQ2,RSRP2,PCI2
...
EARFCNn,RSRQn,RSRPn,PCIn


Example:
2G:
658,51,-60,262,07,7,4,46,46,4EED,08B8,0,0
666,47,-64,262,07,7,1,42,42,4EED,A500,0,0
1006,37,-74,262,07,7,4,32,32,4EED,----,0,0
1021,36,-75,262,07,7,1,31,21,4EED,08B2,0,0
702,33,-78,262,07,7,3,28,28,4EED,A4F0,0,0
654,32,-79,262,07,7,5,27,27,4EED,1C3A,0,0
3G:
-----,---,-----,----
4G:
-----,-----,----,---
OK
```

- In case of a 3G serving cell:

```
Syntax:
3G:
UARFCN1,PSC1,EC/n01,RSCP1,SQual1,SRxLev1,set1,rank1
UARFCN2,PSC2,EC/n02,RSCP2,SQual2,SRxLev2,set2,rank2
...
UARFCNn,PSCn,EC/n0n,RSCPn,,SQualn,SRxLevn,setn,rankn

2G:
ARFCN1,RSSI1,NCC1,BCC1,SRxLev1,rank1
ARFCN2,RSSI2,NCC2,BCC2,SRxLev2,rank2
...
ARFCNn,RSSIn,NCCn,BCCn,SRxLevn,rankn

4G:
EARFCN1,RSRQ1,RSRP1,Srxlev1,PCI1,TDD1
EARFCN2,RSRQ2,RSRP2,Srxlev2,PCI2,TDD2
...
EARFCNn,RSRQn,RSRPn,Srxlevn,PCIn,TDDn


Example:
3G:
10786,49,-7.0,-75,22,37,AS,-9
10786,161,-24.0,-121,0,0,--,0
10786,54,-24.0,-121,0,0,--,0
10786,51,-24.0,-121,0,0,--,0
10786,62,-24.0,-121,0,0,--,0
10786,159,-24.0,-121,0,0,--,0
2G:
```

```
----,----,-,-,----,------
4G:
-----,-----,----,--,---,-
OK
```

- In case of a 4G serving cell:

```
Syntax:
4G:
EARFCN1,RSRQ1,RSRP1,Srxlev1,PCI1,RSSI1,Cell ID1,MCC1,MNC1,TAC1
EARFCN2,RSRQ2,RSRP2,Srxlev2,PCI2,RSSI2,Cell ID2,MCC2,MNC2,TAC2
...
EARFCNn,RSRQn,RSRPn,Srxlevn,PCIn,RSSIn,Cell IDn,MCCn,MNCn,TACn

2G:
ARFCN1,RSSI1,NCC1,BCC1,SRxLev1,rank1
ARFCN2,RSSI2,NCC2,BCC2,SRxLev2,rank2
...
ARFCNn,RSSIn,NCCn,BCCn,SRxLevn,rankn

3G:
UARFCN1,PSC1,EC/n01,RSCP1,SQual1,SRxLev1,set1,rank1
UARFCN2,PSC2,EC/n02,RSCP2,SQual2,SRxLev2,set2,rank2
...
UARFCNn,PSCn,EC/n0n,RSCPn,,SQualn,SRxLevn,setn,rankn


Example:
4G:
1830,-12.6,-91,38,368,-60,368,262,03,C463
1830,-11.7,-93,36,262,-72,368,262,03,C463
1830,-10.9,-93,36,329,-73,368,262,03,C463
1830,-15.1,-96,33,261,-72,368,262,03,C463
2G:
----,--,----,-,-,----,-
3G:
-----,---,-----,----,--
OK

Example 2:
4G:
1830,-12.6,-91,38,368,-60,368,262,03,C463,0
1830,-11.7,-93,36,262,-72,368,262,03,C463,0
1830,-10.9,-93,36,329,-73,368,262,03,C463,0
1830,-15.1,-96,33,261,-72,368,262,03,C463,0
2527,-9.5,-83,--,1,-57,----,---,---,----,1
2G:
----,--,----,-,-,----,-
3G:
10564,---,-----,----,--
10688,---,-----,----,--
OK
```

Columns for GSM (2G) parameters:

Column	Description
ARFCN	Absolute Radio Frequency Channel Number of the BCCH carrier
rs	RSSI value 0 - 63 (RSSI = Received signal strength indication)
dBm	Receiving level in dBm
MCC	Mobile Country Code (first part of the PLMN code)
MNC	Mobile Network Code (second part of the PLMN code)
NCC	Network colour Code
BCC	Base Station colour code
C1	cell selection criterion
C2	cell reselection criterion
LAC	Location area code
cell	Cell identifier
C31	cell reselection criterion
C32	cell reselection criterion
SRxLev	RX level value for base station selection in dB (see 3GPP 25.304)
rank	Rank of this cell as neighbor for inter-RAT cell reselection

Columns for UMTS (3G) parameters:

Column	Description
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
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)
set	3G neighbour cell set (AS: ASET, SN: Sync Nset, AN: Async Nset)
rank	Rank of this cell as neighbor for inter-RAT cell reselection

Columns for LTE (4G) parameters:

Column	Description
EARFCN	E-UTRA Absolute Radio Frequency Channel Number
RSRQ	Reference Signal Received Quality as measured by L1 in dB (see ETSI TS 136 214 version 10.1.0 Section 5.1.3.)
RSRP	Reference Signal Received Power as measured by L1 in dBm (see ETSI TS 136 214 version 10.1.0 Section 5.1.1.)
Srxlev	RX level value for base station selection in dB (see 3GPP 25.304)
PCI	Physical Cell ID
RSSI	Received Signal Strength Indication as measured by L1 in dBm
Cell ID	LTE Serving cell ID
MCC	Mobile Country Code

Column	Description
MNC	Mobile Network Code
TAC	Tracking Area Code (see 3GPP 23.003 Section 19.4.2.3)

8.11 AT^SNMON Network Monitoring

The AT^SNMON command can be used to monitor various network information.

Syntax

Test Command

AT^SNMON=?

Response(s)

^SNMON: "PDM", (list of supported <action>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

Start Packet Data Monitor. <action> shall be 2.

AT^SNMON="PDM", <action>

Response(s)

[^SNMON: "PDM", <reserved>, <ta>, <nom>, <rac>, <dsac_avail>, <dsac_cs>, <dsac_ps>, <tac_avail>, <tac>]
OK
ERROR
+CME ERROR: <err>

PIN	MDM	APP	✈	Last
-	+	+	-	-

Reference(s)

3GPP TS 45.008 [53]

Parameter Description

<action>(num)

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

0	Reset values
2	Query values

<reserved>(num)

0	Value returned in scan output responses. Value has no meaning and can be ignored.

<tac>(num)

Tracking Area Code (see 3GPP 23.003 Section 19.4.2.3)

<ta>(num)

Timing Advance (TA)

-1(P)	Information is not available
0...63	

`<nom>`(num)

Network Operation Mode (NOM)

-1(P)	Information is not available
1	NOM1
2	NOM2
3	NOM3

`<rac>`(num)

Routing Area Code (RAC)

-1	Information is not available

0...255

`<dsac_avail>`(num)

Domain Specific Access Control (DSAC) availibility

0	DSAC not available
1	DSAC available

`<dsac_cs>`(num)

Cell access status for CS domain

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

`<dsac_ps>`(num)

Cell access status for PS domain

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

`<tac_avail>`(num)

Tracking Area Code (TAC) availibility

0	TAC not available
1	TAC available

`<tac>`(num)

Tracking Area Code (TAC)

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

0000

8.12 AT^SNOMADM Configure OMA DM

AT^SNOMADM can be used to manage the configuration of Open Mobile Alliance Device Management (OMA DM).

AT^SNOMADM can be employed in protected or unprotected mode:

- By default, AT^SNOMADM can be handled in unprotected mode without setting the <hash> parameter.
- Optionally, AT^SNOMADM can be protected by a cryptographic hash value in order to prevent unauthorized usage of OMA DM services. The calculation of the hash value must be protected by a private certificate created in DER format. To write this certificate the command AT^SBNW subcommand "is_cert" has to be used. Instead of AT^SBNW you can take advantage of the Certificate Manager "cmd_ipCertMgr.jar". This is a Java command line tool provided by Gemalto M2M on request. The tool handles all necessary AT^SBNW "is_cert" procedures to load, read or delete existing certificates. For the creation of this certificate the "cmd_ipCertMgr.jar" tool shall be run in mode "omdm" (note that default is "is_cert"). For ease of use, Gemalto M2M delivers a ready-to-use script along with "cmd_ipCertMgr.jar".
  To calculate the hash value you can take advantage of the Hash Generator "hash_gen.jar". This is a Java command line tool provided by Gemalto M2M on request. The "hash-gen.jar" tool prints the hash value on the command line or saves it to a file named cmd_output.txt.
  Once the OMA DM service is protected the AT^SNOMADM write command demands the calculated hash value to be given by parameter <hash>.

Other AT commands and tools related to OMA DM:

- Root certificates commonly used for OMA DM services are embedded inside the UE. Whenever these certificates need to be updated you can use the AT^SBNW subcommand "omadm", or the Certificate Manager "cmd_ipCertMgr.jar" mentioned above. This type of certificates has to be created in PEM format. For the creation of these certificates the "cmd_ipCertMgr.jar" tool shall be run in mode "is_cert".
- To notify the user of OMA DM activities it is possible to enable the "+CIEV: omadm" indicator. For details see AT^SIND.

Syntax

Test Command

```
AT^SNOMADM=?
```

Response(s)

```
^SNOMADM:"cfg", max. string length of <node>s[, max. string length of <value>s, range for supported <hash>es]
OK
```

Write Command

```
AT^SNOMADM="cfg" , <node>[, <value>][, <hash>]
```

Response(s)

```
^SNOMADM:  "cfg" , <node>, <value>
OK
ERROR
+CME ERROR: <err>
```

PIN	MDM	APP	✈	Last
-	+	+	-	-

Parameter Description

<node>(str)(NV)

A Node is a single element in a Management Tree. Only Leaf Nodes are supported. Each Node MUST be addressed by a unique full device URI. URIs MUST follow requirements specified in Uniform Resource Identifiers (URI) [RFC2396] with the restrictions as specified in "OMA Device Management Tree and Description" at http://www.openmobilealliance.org. Node addressing is defined in this specification. URIs used in OMA DM MUST use the UTF-8 character set. Only nodes of simple text type (text/plain) are supported.

URIs of ODIS nodes for AT&T only:

“DevDetail/Ext/HostMan“	Host Device Manufacturer
“DevDetail/Ext/HostMod“	Host Device Model
“DevDetail/Ext/HostSwV“	Host Device Software Version
“DevDetail/Ext/HostID“	Host ID

<value>(str)(NV)

The value of the given <node>. The parameter is coded as UTF-8 character set.

<hash>(num)

As explained above the hash value is required only for the protected mode of AT^SNOMADM. In this case, the hash value must be calculated before using the AT^SNOMADM write command. The calculation can be done by using the above mentioned "hash_gen.jar" tool.

8.13 AT^SNCSGLS Operator CSG lists on USIM

The AT^SNCSGLS command supplies the CSG (Closed Subscriber Group) lists from USIM EF_{OCSGL}.

Syntax

Test Command

```
AT^SNCSGLS=?
```

Response(s)

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

Exec Command

```
AT^SNCSGLS
```

Response(s)

```
^SNCSGLS: <mcc>,<mnc>,<csgId>,<cti>
[^SNCSGLS: ...]
OK
ERROR
+CME ERROR: <err>
```

PIN	MDM	APP	✈	Last
+	+	+	+	-

Parameter Description

<mcc>(str)

Mobile Country Code

<mnc>(str)

Mobile Network Code

<csgId>(str)

CSG ID belonging to the Operator CSG lists

<cti>(num)

CSG type indicator

8.14 AT^SNCSGSC Closed Subscriber Group Network Scan

AT^SNCSGSC queries the present status of the PLS8-US-R4's CSG networks registration and allows to register to a specific macro cell as well as query the current used macro cell.

The AT^SNCSGSC test command lists sets of six parameters, each representing a macro cell present in the network.
A set consists of

- numeric format representation of the operator country code
- numeric format representation of the operator network code
- an hexadecimal number indicating the macro cell id.
- an integer indicating the access technology of the operator.
- an integer indicating the access properties of the macro cell.
- an integer indicating the signal strength.

Reponse to AT^SNCSGSC read command depends on the registration status. If the UE is registered the response returns the currently registered status. Any of the parameters may be unavailable and will then be an empty field (-). The <mcc>,<mnc>,<netLac>,<netCellId>,<rat> are vaild if module is registered or camped to network. If <csgId> is not empty (-) it means that current serving cell is a femtocell with CSG support.

The AT^SNCSGSC write command forces an attempt to select and register to a manual selected macro cell. This result does not mean that registration to CSG cell is done with success or not. In order to get information if registration to CSG was done, it is needed to set the command AT+CREG= 2 before CSG registration. After executing the AT^SNCSGSC write command wait for URC with information that ME is registered to new cell. After that, it can be checked if this cell is CSG via AT^SNCSGSC read command. The network name can be checked via AT+COPS command.

Syntax

Test Command

```
AT^SNCSGSC=?
```

Response(s)

```
^SNCSGSC: [list of supported (<mcc>, <mnc>, <csgId>, <rat>, <cat>, <rssi>)]
OK
ERROR
+CME ERROR:<err>
```

Read Command

```
AT^SNCSGSC?
```

Response(s)

```
^SNCSGSC:<mcc>, <mnc>, <csgId>, <rat>, <netLac>, <netCellId>
OK
ERROR
+CME ERROR:<err>
```

Write Command

```
AT^SNCSGSC=<mcc>, <mnc>, <csgId>, <rat>
```

Response(s)

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

PIN	MDM	APP	✈	Last
-	+	+	-	-

Parameter Description

<rat>(num)	
0	GSM
1	UTRAN
2	E-UTRAN

<cat>(num)	
0	Unknown CSG list
1	Allowed CSG list
2	Operator CSG list

8.15 AT+CAVIMS Availability for voice calls with IMS

Read command returns the UEs IMS voice call availability status stored in the MT. Test command returns supported values as a compound value.

Syntax

Test Command

```
AT+CAVIMS=?
```

Response(s)

```
+CAVIMS:(list of supported <mode>s)
OK
+CME ERROR: <err>
ERROR
```

Read Command

```
AT+CAVIMS?
```

Response(s)

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

PIN	MDM	APP	✈	Last
-	+	+	+	-

Reference(s)

3GPP TS 27.007 [49]

Parameter Description

<mode>(num)

The UEs IMS voice call availability status

0	Voice calls with the IMS are not available.
1	IMS registration was successful. Voice calls with the IMS are available.

9. USIM Application Toolkit (USAT) Commands

This chapter describes AT commands and responses related to the PLS8-US-R4's USIM Application Toolkit (USAT) implementation.

USAT is a technology that allows an application running on the USIM to control the GSM/UMTS/LTE Mobile Engine (UE); it is specified in 3GPP TS 11.14 [22], 3GPP TS 31.111 [23], ETSI TS 102 223 [24].
Remote USIM Application Toolkit, or short Remote-USAT, provides a link between an application running on the USIM and the Customer Application (TE). The purpose of Remote-USAT is to allow the TE to send AT commands to the USAT interface and to display dedicated USAT activity on the user interface of the TE. The overall scenario is illustrated in the context diagram below.

Following types of data are exchanged between the PLS8-US-R4 and the application running on the USIM:

- Proactive commands (PACs) are sent from the USIM application to the UE. Some PAC types are executed by the UE itself, comparable with AT commands. Other PAC types are immediately forwarded to the TE, e.g. "DISPLAY TEXT".
- Terminal Response is the UE's answer to the last PAC, sometimes to be provided by the TE.
- Envelope commands are sent from the UE or TE to the USIM Application, such as "MENU SELECTION".

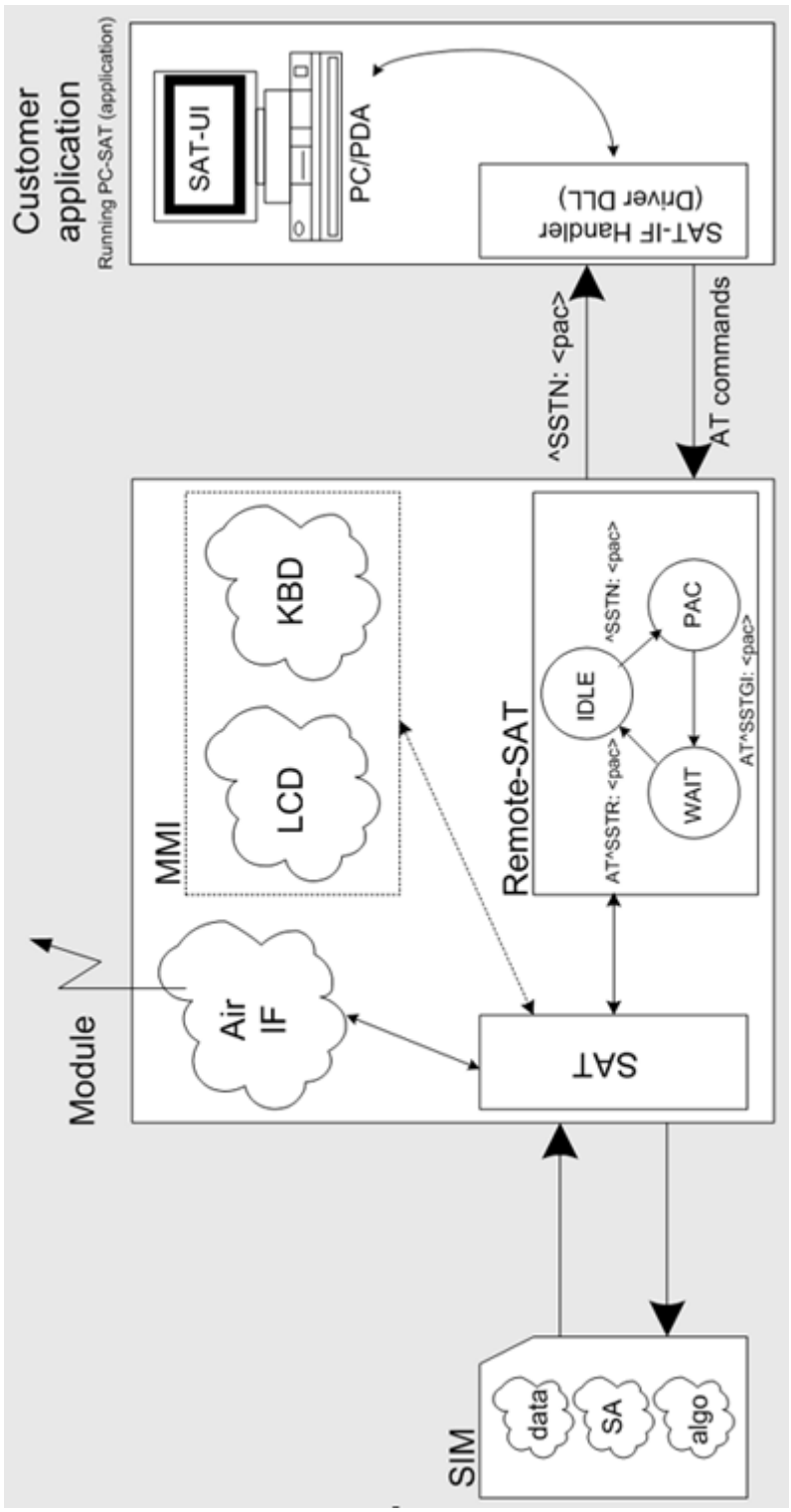

Figure 9.1: Remote-USAT Context Diagram

9.1 Usage of Remote-SAT

If USAT functionality is delivered by the USIM provider, the related USAT commands have to be handled. Otherwise other USIM functionality may not working correctly (e.g. SMS-PP downloads).
Therefore two possible modes are available.

9.1.1 Automatic Response Mode (AR Mode)

If the UE operates in this (default) mode, usage of any Remote-USAT AT commands is not necessary. In this case, all commands and responses are exchanged automatically between the UE and the USIM application. The type of Terminal Response (TR) to a USAT Proactive Command issued by the USIM application used in AR mode is listed at Table 9.6, Command Type Table, column "Auto Terminal Response". However, even while using AR Mode it is crucial to react on USAT REFRESH Proactive Commands, indicating that data read from the USIM has been changed!

Additionally a "+CIEV: "simdata"" URC is issued if a Refresh is rejected (<status> and <statAddInfo> are visible).
This URC is independent from Remote-USAT modes (Autoresponse mode and Explicit Response mode). This can happen if it is not possible to refresh an EF (e.g. EF_IMSI during a call). In this case the customer have to cancel all Calls as soon as possible and wait for the next Refresh command from the SIM card.
If the Refresh will not occour again, please restart the module to complete the Refresh request.
Therefore, enable handling of AT^SIND, using parameter <indDescr>="simdata" to get informed about USAT REFRESH events.
Furthermore it is recommended to activate the AT^SCKS URC, because for USAT REFRESH Type SIM RESET the same internally functionality as for physical remove and insertion of the USIM is done.

To take full advantage of Remote-USAT the ER mode has to be enabled using AT^SSTA=1. This setting is stored in the non-volatile memory and takes effect after next switch-on of the UE.

9.1.2 Explicit Response Mode (ER Mode)

As a Wireless Modem does not have an MMI, Remote-USAT differs from a phone implementation of USAT. It uses a special set of AT commands to pass data, e.g. a list of menu items, to the TE and to receive responses, e.g. a selected menu item.
The TE is required to monitor the status of an ongoing USAT Proactive Command (PAC) and, if required, sends appropriate AT commands, depending upon users input.
The "+CIEV: "simdata"" URC is issued if a Refresh is rejected (<status> and <statAddInfo> are visible).
This can happen if it is not possible to refresh an EF (e.g. EF_IMSI during a call). In this case the customer have to cancel all Calls as soon as possible and wait for the next Refresh command from the SIM card.
If the Refresh will not occour again, please restart the module to complete the Refresh request.

9.1.3 Character Sets

Strings are passed as UCS2 characters, but using the GSM alphabet is also possible. Use of GSM alphabet is not recommended since a USIM can contain text which might be not displayable, e.g. Greek characters. Use the AT^SSTA command to select the type of alphabet both for input and output. UCS is specified in ISO/IEC 10646. There are 2 and 4 octet versions available, of which only the 2-octet variant is used, known as UCS2. The 65536 positions in the 2-octet form of UCS are divided into 256 rows, each with 256 cells. The first octet of a character representation gives the row number, the second the cell number. The first row, row 0, contains exactly the same characters as ISO/IEC 8859-1. The first 128 characters are thus the ASCII characters. The octet representing an ISO/IEC 8859-1 character is easily transformed to the representation in UCS by putting a 0 octet in front of it. UCS includes the same control characters as ISO/IEC 8859 which are located in row 0.

9.1.4 USIM Update Initiated by the Network

If a Customer Application (TE) uses data of the USIM card please consider that the contents of all elementary files are subject to change at any time. This happens because the network can change the USIM data in the background via the USIM Application Toolkit (USAT) procedure "Data download to USIM". For a detailed description refer to 3GPP TS 11.14 [22], 3GPP TS 31.111 [23], ETSI TS 102 223 [24]. In order to receive the information that an elementary file has been changed the TE has to activate Remote-USAT and needs to look for the USAT Proactive Command "REFRESH", Section 9.7, SAT Get Information - Refresh (1).

9.1.5 Icon Handling

Several USAT Proactive commands may provide an icon identifier. Icons are intended to enhance the MMI by providing graphical information to the user. The display of icons is optional for the UE.
The USIM indicates to the UE whether the icon replaces an alpha identifier or text string, or whether it accompanies it (icon qualifier).

If both an alpha identifier or text string, and an icon are provided with a proactive command, and both are requested to be displayed, but the UE is not able to display both together on the screen, then the alpha identifier or text string takes precedence over the icon.

If the USIM provides an icon identifier with a proactive command, then the UE shall inform the USIM if the icon could not be displayed by sending the response "Command performed successfully, but requested icon could not be displayed" (via AT^SSTR).

Icon data can be fetched directly from the USIM using the AT+CRSM command, for details please refer to 3GPP TS 11.11 [18], 3GPP TS 31.101 [19], 3GPP TS 31.102 [20]. Icon data can be read from the USIM on system start then cached.

9.1.6 Using SMS Related AT Commands

UE activities triggered by USAT often end in sending or receiving short messages. Usually, a short message containing a service request is sent to the network, for example a request to send the latest news. Subsequently, the network returns a short message containing the requested information. This short message needs to be read by the Customer Application.

Set SMS text mode
AT+CMGF=1

Activate the display of a URC on every received SMS
AT+CNMI=1,1

If needed activate extended SMS text mode parameter output
AT+CSDH=1
This is useful in order to obtain more detailed header information along with the incoming SMS (e.g. SMS class). Please refer to 3GPP TS 23.038 [37] for details.

As a result, a URC will be output each time a short message is received
"+CMTI": "MT", 1 where
• the first parameter "MT" specifies the storage type of the SMS
• the second parameter contains a unique location number.
In the given example, the short message was stored to the memory type "MT" at location number 1.
The short message storage "MT" is a logical storage. For more detailed information please refer to AT+CPMS.

To read the SMS data use
AT+CMGR=<location>
where <location> is the location number of the received SMS, e.g. 1 in the example above.

To list all stored short messages use
AT+CMGL="ALL"

To delete a certain SMS after reading use
AT+CMGD=<location>

9.2 Remote-SAT States

In order to communicate with the SIM Application Toolkit it is necessary to use AT commands which are explained in detail in the following chapters. In general, the type of AT command which should be issued depends on the current state of the Remote-SAT interface.
The current state of Remote-SAT is determined by

1. the Remote-SAT operating mode (AR or ER mode),
2. the application running on the SIM,
3. the Customer Application (in case of ER mode only), and
4. internal actions of the UE (especially SAT and Call Control).

9.2.1 Remote-SAT State Transition Diagram

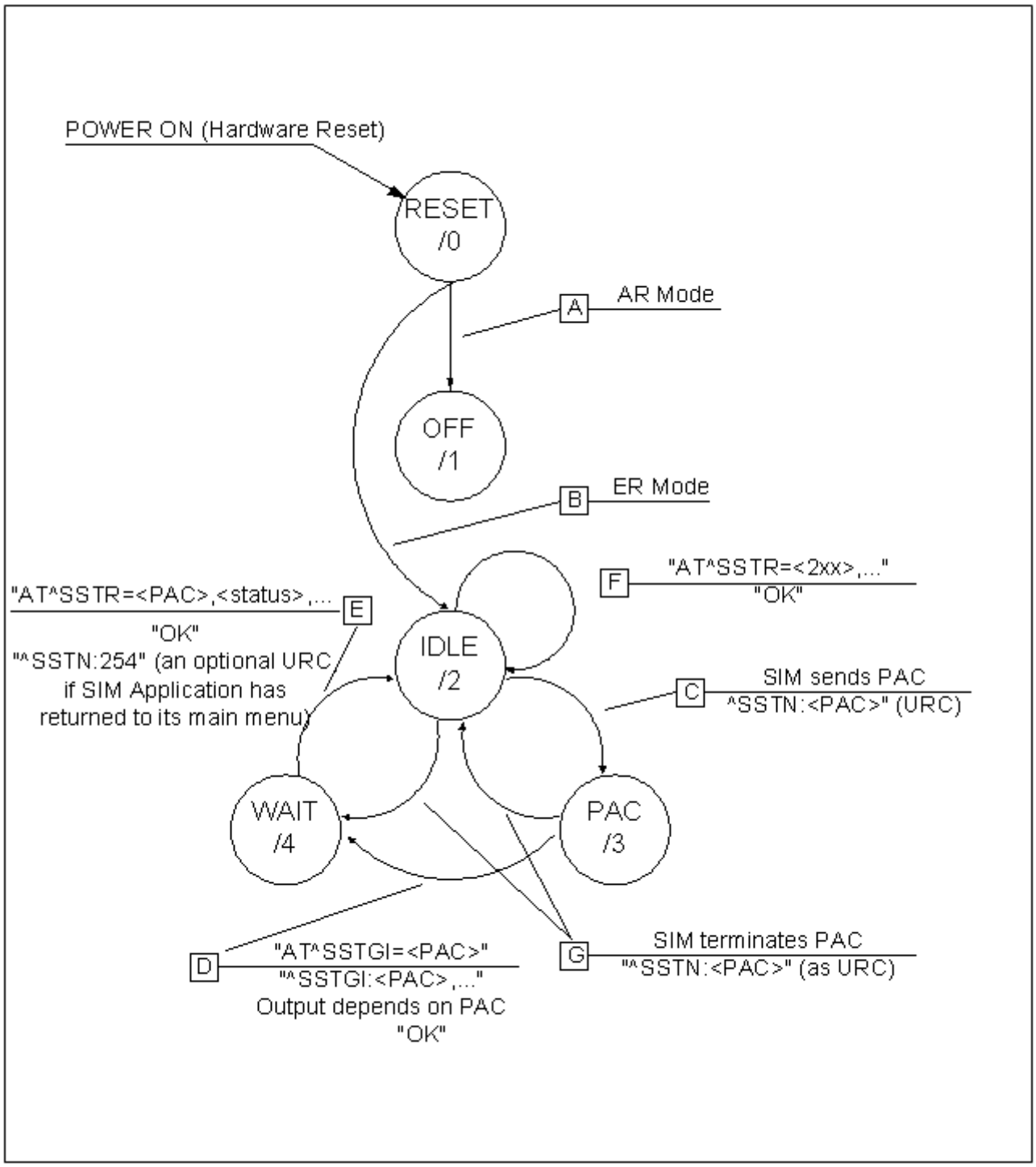

Figure 9.2: Remote-SAT State Transition Diagram

9.2.2 Remote-SAT State Transition Table

The following table outlines which AT commands can be issued during certain states. However, the test and read AT commands are available at any time. This way it is possible to determine the current state of the interface via AT^SSTA?.

Meaning of options usable in column "M/O/X" of the following tables:
M: The TE has to issue the AT command to get Remote-SAT service (mandatory).
O: Usage of AT command is optional.
X: Usage of AT command is not allowed or not useful at this time and may cause an error message.

Table 9.1: State: RESET description

RESET: State after power on the UE.		
AT command	M/O/X	Description
^SSTA=0,n	O	Enable AR Mode (with alphabet type <n>)
^SSTA=1,n	O	Enable ER Mode (with alphabet type <n>)
^SSTGI=<pac>	X	
^SSTR=<pac>	X	
^SSTR=<event>	X	

Table 9.2: State: OFF description

OFF: UE is in Auto Response Mode.		
AT command	M/O/X	Description
^SSTA=0,n	O	Enable AR Mode (with alphabet type <n>)
^SSTA=1,n	O	Enable ER Mode (with alphabet type <n>)
^SSTGI=<pac>	X	
^SSTR=<pac>	X	
^SSTR=<event>	X	

Table 9.3: State: IDLE description

IDLE: UE is in Explicit Response Mode.		
AT command	M/O/X	Description
^SSTA=0,n	O	Enable AR Mode (with alphabet type <n>)
^SSTA=1,n	O	Enable ER Mode (with alphabet type <n>)
^SSTGI=<pac>	O	Show PAC information
^SSTR=<pac>	X	
^SSTR=<event>	O	

Table 9.4: State: PAC description

PAC[1]: SIM application has issued a proactive command. This event is signalled to the TE via ^SSTN: <cmdType>.		
AT command	M/O/X	Description
^SSTA=0,n	O	Enable AR Mode (with alphabet type <n>)
^SSTA=1,n	O	Enable ER Mode (with alphabet type <n>)
^SSTGI=<pac>	M	Show PAC information
^SSTR=<pac>	X	
^SSTR=<event>	X	

Table 9.5: State: WAIT description

WAIT[1]: SIM application is waiting for the response to the ongoing proactive command.		
AT command	M/O/X	Description
^SSTA=0,n	O	Enable AR Mode (with alphabet type <n>)
^SSTA=1,n	O	Enable ER Mode (with alphabet type <n>)
^SSTGI=<pac>	O	Show PAC information
^SSTR=<pac>	M	
^SSTR=<event>	X	

1) To limit the time Remote-SAT is kept in states PAC or WAIT, any ongoing (but unanswered) PAC will be aborted after 5 minutes automatically. For details refer to AT^SSTA, parameter <userTOut>.

9.3 Remote-SAT Command Types

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

cmdType is the parameter that comes first in AT commands, in responses to AT^SSTGI and AT^SSTR commands, and in the "^SSTN" URC. Also, the cmdType values may be used as Next Action Indicator for the SETUP MENU and for SELECT ITEM.

USAT implementation supports SAT class 3 (as specified by 3GPP TS 11.14 [22], 3GPP TS 31.111 [23], ETSI TS 102 223 [24] Release 99, letter class "c").

Table 9.6: Command Type Table

Proactive Toolkit commands vs. Terminal Responses			
Proactive Toolkit command (AT^SSTR=<cmdType>)	Terminal Response in Automatic Response Mode (see AT^SSTA=0)	Terminal Response user choices in Explicit Response Mode (see AT^SSTR=<cmdType>,<status>)	Terminal Response after user timeout in Explicit Response Mode (see URC ^SSTN: <cmdTerminateValue>)
REFRESH (1)	0,4	0	0
SET UP EVENT LIST (5)	0	0, 32, 48, 132	132
SET UP CALL (16)	0,4	0, 4, 16, 20, 32, 34, 35, 48, 132	132
SEND SS (17)	0,4	0, 4, 20, 32, 48, 132	132
SEND USSD (18)	0,4	0, 4, 20, 32, 48, 132	132
SEND SHORT MESSAGE (19)	0,4	0, 4, 32, 48, 132	132
SEND DTMF (20)	0,4	0, 4, 16, 32, 48, 132	132
LAUNCH BROWSER (21)	0,4,48	0, 4, 32, 34, 38, 48, 132, 138, 238, 239	132
PLAY TONE (32)	0,4	0, 4, 16, 32, 48, 132	132
DISPLAY TEXT (33)	0,4	0, 4, 16, 17, 18, 32, 48, 132	132
GET INKEY (34)	48	0, 4, 16, 17, 18, 19, 32, 48, 132	18
GET INPUT (35)	48	0, 4, 16, 17, 18, 19, 32, 48, 132	18
SELECT ITEM (36)	48	0, 4, 16, 17, 18, 19, 32, 48, 132	18
SET UP MENU (37)	0,4	0, 4, 32, 48, 132	132
SET UP IDLE MODE TEXT (40)	0,4	0, 4, 32, 48, 132	132
LANGUAGE NOTIFICATION (53)	0	0	0
OPEN CHANNEL (64)	0,4	0, 4, 16, 32, 48, 132	132
CLOSE CHANNEL (65)	0,4	0, 4, 16, 32, 48, 132	132
RECEIVE DATA (66)	0,4	0, 4, 16, 32, 48, 132	132
SEND DATA (67)	0,4	0, 4, 16, 32, 48, 132	132

9.4 AT^SSTA Remote-SAT Interface Activation

AT^SSTA write command can be used to determine the Remote-SAT activation mode <mode> and, if Explicit Response mode is enabled, to activate the Remote-SAT interface. Removing and inserting the SIM does not affect the activation status.
SAT commands which are not using the AT interface (non-MMI related SAT commands, e.g. PROVIDE LOCAL INFORMATION) are executed without activating Remote-SAT.
The read command can be used to request the current operating status and the used alphabet of the Remote-SAT interface.

Syntax

Test Command

AT^SSTA=?

Response(s)

^SSTA: (list of supported <state>s), (list of supported <Alphabet>s)
OK

Read Command

AT^SSTA?

Response(s)

^SSTA: <state>, <Alphabet>, <allowedInstance>, <SatProfile>, <userTOut>, <AppType>
OK

Write Command

AT^SSTA=<mode>[, <Alphabet>]

Response(s)

OK

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<state>(num)

UE Remote-SAT interface states

0	RESET
1	OFF
2	IDLE
3	PAC
4	WAIT

<Alphabet>(num)(NV)

Setting becomes effective after restarting the UE.

0(D)	GSM character set Input of a character requests one byte, e.g. "Y".
1	UCS2 To display the 16 bit value of characters represented in UCS2 alphabet a 4 byte string is required, e.g. "0059" is coding the character "Y". For details please refer to ISO/IEC 10646.

<allowedInstance>(num)

Remote-SAT handling (i.e. "^SSTN" URC, AT^SSTGI and AT^SSTR sequence) is only usable via the serial channnel on which the Explicit Response (ER) mode was activated.
To change the serial channel execute AT^SSTA=1 on the desired channel and perform a restart.

0	Not applicable
1	SAT may be started on this instance via the write version of this command.

<SatProfile>(str)

SAT or USAT Terminal Profile according to 3GPP TS 11.14 [22], 3GPP TS 31.111 [23], ETSI TS 102 223 [24].
UE supports different profiles for 2G SIM and 3G USIM applications. The type of profile issued by AT^SSTA read command depends on the inserted SIM or USIM.
In case of no SIM is inserted the SAT Terminal Profile will be issued.
The profile tells the SIM Application which features (e.g. Proactive Commands) are supported by the SIM Application Toolkit implementation of the UE.

<userTOut>(num)

PAC user timeout in seconds.
To limit the time Remote-SAT is kept in states PAC or WAIT, any ongoing (but unanswered) proactive command will be aborted automatically after 5 minutes. In this case, the terminal response is either "ME currently unable to process command", or if applicable, "No response from user". In addition a URC "Terminate Proactive Command" will be sent to the external application.

<AppType>(num)

SIM Application type.
This parameter shows the type of SIM application currently running.

0	(U)SIM not inserted
1	2G Application (SAT)
2	3G Application (USAT)

<mode>(num)(NV)

Select Remote-SAT activation mode.
Setting becomes effective after restarting the UE. Removing and inserting the SIM does not affect the activation status.

0(D)	Automatic Response (AR) mode. All commands and responses are exchanged automatically between the UE and the SIM application. This eliminates the need to enter any Remote-SAT commands including the AT^SSTA command. If AR mode is enabled the UE enters the OFF state (<state>=1) after restart.
1	Explicit Response (ER) mode. This mode is intended for use with an MMI. If ER mode is enabled the MMI is required to handle, via UE's Remote-SAT interface, all commands and responses transmitted to or from the SIM or USIM. If ER mode is enabled the UE enters the IDLE state (<state>=2) after reboot.

9.5 ^SSTN SAT Notification

Unsolicited Result Codes

URC 1

Proactive command notification

^SSTN: <cmdType>

Every time the SIM Application issues an MMI relevant proactive command, via the UE, the TE will receive a notification. This indicates the type of proactive command issued.
AT^SSTGI must then be used by the TE to request the parameters of the proactive command from the UE.
Upon receiving the ^SSTGI response from the UE, the TE must send AT^SSTR to confirm the execution of the proactive command and provide any required user response, e.g. a selected menu item.

URC 2

Terminate proactive command notification

^SSTN: <cmdTerminateValue>

When the SIM Application has issued a proactive command to the UE, it is possible that this command will be terminated later. URC "^SSTN" is sent with a different proactive command type number (added terminate offset 100) to indicate the termination of the specified command.
The state changes to idle. Therefore the TE should avoid sending any further commands related to the terminated proactive command, e.g. AT^SSTGI or AT^SSTR.

URC 3

Notification to the TE when the SIM Application has finished a command cycle and does not issue a subsequent proactive command.

^SSTN: 254

The TE does not need to respond directly, i.e. AT^SSTR is not required. The next action is left as an implementation decision to the manufacturer of the Customer Application (TE). Examples:

- If a Toolkit menu "^SSTN: 37" (SET UP MENU) proactive command was received at startup, the customer application can return to this Toolkit menu again after receiving the "^SSTN: 254" URC.
- In a Windows Mobile environment, the ToolkitUI application can be closed after receiving this URC.

Important notes:

- The Idle Mode text transferred with the SET UP IDLE MODE TEXT proactive command should not be removed as a result of this URC.
- If the text transferred with the DISPLAY TEXT proactive command is coded with an immediate response object set to "1" (see parameter <immediateResponse> of the AT^SSTGI=33 command), the text should not be removed as a result of this URC.

URC 4

SIM reset notification

^SSTN: 255

Notification to the TE indicating that the SIM is lost, e.g. if a proactive command "REFRESH - SIM Reset" has been issued by the SIM Application, please refer to AT^SSTGI=1.
This URC should be used to set the Customer Application to its initial state since the SIM Application will start from the beginning, too.
The TE does not need to respond directly, i.e. related AT^SSTGI and AT^SSTR are neither required nor allowed.
After reset SIM PIN authentication is required.

Parameter Description

<cmdType>(num)

Proactive Command number

`<cmdTerminateValue>`(num)

Defined as `<cmdType>` + terminate offset. The terminate offset equals 100.

9.6 AT^SSTGI SAT Get Information

This command shall be used upon receipt of a URC "^SSTN" to request the parameters of the Proactive Command.
Then the TE is expected to acknowledge the AT^SSTGI response with AT^SSTR to confirm that the Proactive Command has been executed. AT^SSTR will also provide some user information, e.g. a selected menu item.
The Proactive Command type value specifies to which "^SSTN" the command is related.

Syntax

Test Command

```
AT^SSTGI=?
```

Response(s)

```
^SSTGI:(list of supported <state>s), (list of supported <cmdType>s)
OK
```

Read Command

```
AT^SSTGI?
```

Response(s)

```
^SSTGI: <state>, <cmdType>
OK
```

Write Command

```
AT^SSTGI=<cmdType>
```

Response(s)

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

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<state>(num)

PLS8-US-R4 Remote-SAT interface states

0	RESET
1	OFF
2	IDLE
3	PAC
4	WAIT

<cmdType>(num)

Related Proactive Command

9.7 AT^SSTGI SAT Get Information - Refresh (1)

The AT^SSTGI=1 command shall be used after receiving the URC "^SSTN: 1". This URC notifies the TE that one or more Elementary Files on the USIM have been changed as a result of a USIM application activity, usually caused by the network provider. The response to the AT^SSTGI=1 command indicates what type of USIM refresh has occurred. The change requires that the Elementary Files of the USIM be synchronized with the equivalent information (if any) stored inside the TE. Depending on the type of USIM refresh the TE may need to use the AT+CRSM command to read out the Elementary Files and store the refreshed information.

The response parameters <pathLen>, <fileNum> and <fileList> are mandatory if <commandDetails> equals 1 or 2. In all other cases they are optional and can be ignored.

Syntax

Write Command

```
AT^SSTGI=1
```

Response(s)

```
^SSTGI: <cmdType>,<commandDetails>[,<pathLen>,<fileNum>,<fileList>]
OK
ERROR
+CME ERROR: <err>
```

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<cmdType>(num)

1	Proactive command ID, see Section 9.3, Remote-SAT Command Types and Table 9.6.

<commandDetails>(num)

For every return value of <commandDetails> other than 4 (USIM Reset) the TE shall complete the proactive command cycle using AT^SSTR=1,0.

0	USIM Initialization and Full File Change Notification
1	File Change Notification
2	USIM Initialization and File Change Notification
3	USIM Initialization
4	Value "4" means USIM Reset, but the value itself never appears. This is because value "4" is mapped to the URC "^SSTN: 255" which will be sent when a USIM reset occurs. In this case, the TE does not need to respond, i.e. the USIM Refresh commands AT^SSTGI and AT^SSTR are neither required nor allowed. Instead, as the USIM application restarts, the Toolkit application inside the TE should also return to initial state after receiving the URC "^SSTN: 255". For more information on USIM reset and the URC "^SSTN: 255" refer to Section 9.5, ^SSTN SAT Notification.
5...255	Reserved values

<pathLen>(num)

Number of bytes coded in <fileList>

<fileNum>(num)

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

<fileList>(str)

String containing Elementary File paths. Each path contains at least two file entries; each file entry (MF, EF or DF) consists of two bytes, e.g. '3F002FE2' or '3F007F206FAD'. Every path in the file description begins with the Master File (MF). There can be any number of Dedicated File (DF) entries between Master File and Elementary File.

Example

In general, the TE only needs to take care of USIM content synchronization if it is permanently interested in the latest contents of one or more specific USIM files, e.g. because the TE has its own cache for specific USIM information. In this case, the TE needs to know exactly the paths and file IDs of these specific USIM files. Paths and file IDs can be found in 3GPP TS 11.11 [18], 3GPP TS 31.101 [19], 3GPP TS 31.102 [20] and ETSI TS 102 221 [21].

When <commandDetails> equals 0, 2 or 3 or the "^SSTN: 255" notification is received (refer to Section 9.5, ^SSTN SAT Notification), the TE shall synchronize its own cache for USIM information in any case.

When <commandDetails> equals 1, reloading the USIM information is only necessary if the TE finds that an important file is included in the Refresh <fileList>. For example, assuming that the TE is always interested in the latest contents of the "FD" (Fixed Dialing) phonebook, it has to know that EF_FDN is located at path "3F00\7F10\6F3B". Then, during normal operation, the TE should always check the Refresh <fileList>, if it includes the path and file ID of EF_FDN. An example is given below:

^SYSSTART	UE has been started.
AT+CLCK="FD",2	Request "FD" lock state.
+CLCK: 1	"FD" lock is enabled.
OK	
AT+CPBS="FD"	Select the "FD" phonebook.
OK	
AT+CPBR=1	Read first "FD" phonebook entry.
+CPBR: 1,"123",129,"ABC"	This is the "FD" phonebook content before Refresh.
OK	
^SSTN: 1	Indicates that a SIM Refresh has occurred.
AT^SSTGI=1	Request type of SIM Refresh.
^SSTGI: 1,1,6,1,"3F007F106F3B"	The Refresh <fileList> includes path and file ID 3F00\7F10\6F3B which corresponds to EF_FDN, indicating that its contents may have changed.
OK	
AT^SSTR=1,0	Terminate the proactive command.
OK	
^SSTN: 254	Session finished.
AT+CPBR=1	Read first "FD" phonebook entry.
+CPBR: 1,"0123456789",129,"ABC"	This is the "FD" phonebook content after the Refresh.
OK	

Please keep in mind that this process is only necessary if the TE has it's own cache for SIM/USIM information (e.g. SIM/USIM phonebook is cached inside the TE). If the TE does not have a cache for USIM information (e.g. USIM phonebook is read by the TE only at the user's request, directly from the USIM), it is not necessary to synchronize the content. The TE USIM content synchronization is not required for a proper operation of the UE. As long as the TE answers the "^SSTN: 1" notification with the commands AT^SSTGI=1 and AT^SSTR=1,0, the UE will use the latest USIM contents and will continue to work flawlessly, regardless of a possible TE USIM content synchronization.

9.8 AT^SSTGI SAT Get Information - Set Up Event List (5)

This command shall be used after receiving the URC ^SSTN: 5.
However, please refer to the note below.
The response informs the TE of the events that it must monitor within itself. If any of these events occur the TE must report them to the UE.

Syntax

Write Command

```
AT^SSTGI=5
```

Response(s)

```
^SSTGI: <cmdType>, <commandDetails>, <eventList>
OK
ERROR
+CME ERROR: <err>
```

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<cmdType>(num)

5	Proactive command ID, see Table 9.6, Command Type Table.

<commandDetails>(num)

This byte is RFU.

<eventList>(num)

The event list tells the TE which events have to be reported to the UE via the related commands AT^SSTR=(232, 233, 235, 236)

0...65535	Used as bit field
bit 1-4	RFU
bit 5	0: User Activity not in Event List
	1: Any user activity (keyboard press) has to be signaled to the UE
bit 6	0: Idle Screen Available not in Event List
	1: Any idle screen available event has to be signaled to the UE.
bit 7	RFU
bit 8	0: Language Selection not in Event List
	1: Language Selection events have to be signaled to the UE.
bit 9	0: Browser Termination not in Event List
	1: Browser Termination events have to be signaled to the UE
bit 10-16	RFU

Note

- It is possible to issue AT^SSTGI during states IDLE, PAC and WAIT for this proactive command without previously receiving a URC ^SSTN:<cmdType>, see AT^SSTGI.

9.9 AT^SSTGI SAT Get Information - Set Up Call (16)

This command shall be used after receiving the URC ^SSTN: 16. If the SIM Application attempts to set up a call it uses this response to inform the TE of the call parameters.

The sequence of events is as follows:
1. After the Remote-SAT notification 16 was issued the TE has to request the command parameter using AT^SSTGI=16.
2. If the SIM Application does not supply a confirmation text or icon parameter, the TE gives other information to the user, e.g. the telephone number. In this case refer to step 4.
3. If the SIM Application supplies a non empty confirmation text or icon parameter, the TE uses only these to ask the user whether or not he wishes to set up the call.
4. If the user confirms to set up the call, the response AT^SSTR=16,0 shall be sent.
5. If the user denies to set up the call, the response AT^SSTR=16,34 shall be sent.
6. After confirmation phase the TE may present a dialing animation on the screen until a mandatory parameter line ^SSTR: 16, <TermQualifier>, <TerminationCauseText> is issued.
7. If <TermQualifier> is not equal to 0 the call setup process has not been successfully. If <TerminationCause-Text> is not an empty string, this text shall be shown to the user for an appropriate time, e.g. 2 seconds. The text contains information regarding the dial termination cause, e.g. call barring through Call Control by SIM mechanism. If <TerminationCauseText> is an empty string, the TE shall give an own indication to the user.
8. If <TermQualifier> is equal to 0, the call setup process has been started:
If <TerminationCauseText> is not an empty string, this text shall be used to inform the user during the call setup. If <TerminationCauseText> is an empty string, <callSetupText> and/or <confirmationIconId> shall be used to inform the user during call setup. However, if <callSetupText> contains no data, too, no indication shall be shown.
9. The TE shall give the user an opportunity to end an ongoing call, set up by the Proactive Command. In this case the TE shall send an AT command to hang up the call.

Syntax

Write Command

```
AT^SSTGI=16
```

Response(s)

```
^SSTGI: <cmdType>, <commandDetails>, <confirmationText>, <calledNumber>,
<callSetupText>, <confirmationIconQualifier>, <confirmationIconId>,
<callSetupIconQualifier>, <callSetupIconId>
OK
ERROR
+CME ERROR: <err>
```

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<cmdType>(num)	
16	Proactive command ID, see Table 9.6, Command Type Table.

<commandDetails>(num)	
0	Set up call, but only if not currently busy on another call
1	Set up call, but only if not currently busy on another call, with redial
2	Set up call, putting all other calls (if any) on hold
3	Set up call, putting all other calls (if any) on hold, with redial
4	Set up call, disconnecting all other calls (if any)

5	Set up call, disconnecting all other calls (if any), with redial
6...255	Reserved Values

`<confirmationText>`(str)

String for user confirmation stage

`<calledNumber>`(num)

String containing called number

`<callSetupText>`(str)

String for call set up stage

`<confirmationIconQualifier>`(num)

0...255	Used as bit field
bit 1	0: Icon is self explanatory and replaces text
	1: Icon is not self-explanatory and shall be displayed with the text Determined value only if associated icon ID is not 0 (an icon exists).
bit 2-8	RFU

`<confirmationIconId>`(num)

0...255

0	No Icon

`<callSetupIconQualifier>`(num)

0...255	Used as bit field
bit 1	0: Icon is self explanatory and replaces text
	1: Icon is not self-explanatory and shall be displayed with the text Determined value only if associated icon ID is not 0 (an icon exists).
bit 2-8	RFU

`<callSetupIconId>`(num)

0...255

0	No Icon

Note

- If the Fixed Dialling Number service is enabled, the number included in the SET UP CALL proactive command shall not be checked against those of the FDN list.

9.10 AT^SSTGI SAT Get Information - Send SS (17)

This command shall be used after receiving the URC ^SSTN: 17
The module is sending a supplementary service request to the network, and is alerting the user of this. Text and an icon identifier shall be passed to the TE to display to the user.

Syntax

Write Command

```
AT^SSTGI=17
```

Response(s)

```
^SSTGI: <cmdType>[, <commandDetails>][, <text>], <iconQualifier>, <iconId>
OK
ERROR
+CME ERROR: <err>
```

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<cmdType>(num)

17	Proactive command ID, see Table 9.6, Command Type Table.

<commandDetails>(num)

This byte is RFU.

<text>(str)

String to provide the user with information.
If the string is provided by the SIM, the TE shall use it to inform the user. This is also an indication that the TE should not give any other information to the user on the fact that the UE is sending an SS request.
If the alpha identifier is not provided by the SIM, the UE may give information to the user concerning what is happening.

<iconQualifier>(num)

0...255	Used as bit field
bit 1	0: Icon is self explanatory and replaces text
	1: Icon is not self-explanatory and shall be displayed with the text Determined value only if associated icon ID is not 0 (an icon exists).
bit 2-8	RFU

<iconId>(num)

0...255	
0	No Icon

9.11 AT^SSTGI SAT Get Information - Send USSD (18)

This command shall be used after receiving the URC ^SSTN: 18
The module is sending an unstructured supplementary service request to the network, and is alerting the user of this.
Text and an icon identifier shall be passed to the TE to display to the user.

Syntax

Write Command

```
AT^SSTGI=18
```

Response(s)

```
^SSTGI: <cmdType>[, <commandDetails>][, <text>], <iconQualifier>, <iconId>
OK
ERROR
+CME ERROR: <err>
```

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<cmdType>(num)

18	Proactive command ID, see Table 9.6, Command Type Table.

<commandDetails>(num)

This byte is RFU.

<text>(str)

String to provide the user with information.
If the string is provided by the SIM, the TE shall use it to inform the user. This is also an indication that the TE should not give any other information to the user on the fact that the UE is sending a USSD request.
If the alpha identifier is not provided by the SIM, the UE may give information to the user concerning what is happening.

<iconQualifier>(num)

0...255	Used as bit field
bit 1	0: Icon is self explanatory and replaces text
	1: Icon is not self-explanatory and shall be displayed with the text Determined value only if associated icon ID is not 0 (an icon exists).
bit 2-8	RFU

<iconId>(num)

0...255	
0	No Icon

9.12 AT^SSTGI SAT Get Information - Send Short Message (19)

This command shall be used after receiving the URC ^SSTN: 19
The SIM Application is sending a Short Message and the TE is informed of this. The user can be passed a string containing information to display.

Syntax

Write Command

```
AT^SSTGI=19
```

Response(s)

```
^SSTGI: <cmdType>, <commandDetails>, <textInfo>, <iconQualifier>, <iconId>
OK
ERROR
+CME ERROR: <err>
```

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<cmdType>(num)

19	Proactive command ID, see Table 9.6, Command Type Table.

<commandDetails>(num)

This byte is RFU.

<textInfo>(str)

String to provide the user with information.
If the string is provided by the SIM, the TE shall use it to inform the user. This is also an indication that the TE should not give any other information to the user on the fact that the UE is sending a short message.
If the alpha identifier is not provided by the SIM, the UE may give information to the user concerning what is happening.

<iconQualifier>(num)

0...255	Used as bit field
bit 1	0: Icon is self explanatory and replaces text
	1: Icon is not self-explanatory and shall be displayed with the text Determined value only if associated icon ID is not 0 (an icon exists).
bit 2-8	RFU

<iconId>(num)

0...255	
0	No Icon
1	An icon is provided by the SIM, the icon indicated in the command may be used by the UE to inform the user, in addition to, or instead of the alpha identifier, as indicated with the icon qualifier.

9.13 AT^SSTGI SAT Get Information - Send DTMF (20)

This command shall be used after receiving the URC ^SSTN: 20
The SIM Application is sending DTMF tones to the network, and can provide the TE with some information about this.
Text and an icon identifier can be passed to the TE to display to the user.

Syntax

Write Command

```
AT^SSTGI=20
```

Response(s)

```
^SSTGI: <cmdType>, <commandDetails>, <text>, <iconQualifier>, <iconId>
OK
ERROR
+CME ERROR: <err>
```

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<cmdType>(num)

20	Proactive command ID, see Table 9.6, Command Type Table.

<commandDetails>(num)

This byte is RFU.

<text>(str)

String to provide the user with information.
If the string is provided by the SIM, the TE shall use it to inform the user. This is also an indication that the TE should not give any other information to the user on the fact that the UE is performing a SEND DTMF command. If the alpha identifier is not provided by the SIM, the UE may give information to the user concerning what is happening.

<iconQualifier>(num)

0...255	Used as bit field
bit 1	0: Icon is self explanatory and replaces text
	1: Icon is not self-explanatory and shall be displayed with the text Determined value only if associated icon ID is not 0 (an icon exists).
bit 2-8	RFU

<iconId>(num)

0...255	
0	No Icon

9.14 AT^SSTGI SAT Get Information - Launch Browser (21)

This command shall be used after receiving the URC ^SSTN: 21.
If the SIM Application attempts to start an Internet Browser, it uses this response to inform the TE of the launch parameters.

The sequence of events is as follows:
1. After the Remote-SAT notification 21 was issued the TE shall ask for the command parameters via AT^SSTGI=21.
2. The UE shall ask the user for confirmation using the Alpha Identifier/Icon Identifier (user confirmation phase) if present, when it receives a LAUNCH BROWSER command which requests to connect the existing browser session to a new URL or to terminate a browser session.
3. If the user confirms to start the browser, the response AT^SSTR=21,0 shall be sent.
4. If the user rejects to start the browser, the response AT^SSTR=21,34 shall be sent.
5. The SIM Application will end the proactive session.
6. The UE shall request content using the given URL. However, if no URL string is supplied a default URL shall be used.
7. If the response AT^SSTR=21,0 was issued, the browser session may still be active while a next proactive command is issued. Therefore the end of the browser session shall be reported to the UE via browser termination event command asynchronously if determined by the event list.
For details please refer to AT^SSTR.

Syntax

Write Command

```
AT^SSTGI=21
```

Response(s)

```
^SSTGI: <cmdType>, <commandDetails>, <confirmationText>,
<confirmationIconQualifier>, <iconId>, <browserIdentity>, <url>, <bearerList>,
<fileRefList>, <gatewayIdentity>
OK
ERROR
+CME ERROR: <err>
```

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<cmdType>(num)

21	Proactive command ID, see Remote-SAT Command Types

<commandDetails>(num)

This byte is RFU.

<confirmationText>(str)

String for user confirmation stage

<confirmationIconQualifier>(num)

0...255	Used as bit field
bit 1	0: Icon is self explanatory and replaces text

	1: Icon is not self-explanatory and shall be displayed with the text Determined value only if associated icon ID is not 0 (an icon exists).
bit 2-8	RFU

`<iconId>`(num)

0...255	
0	No Icon

`<browserIdentity>`(num)

0...255	Browser to be used
0	Default Browser shall be used.
1...255	RFU

`<url>`(str)

String containing URL to be used by the TE to request content. The way the UE requests content using the URL is out of the scope of the present document. This is specified in RFC 1738 Annex K for example.

`<bearerList>`(str)

“00“	SMS
“01“	CSD
“02“	USSD
“03“	GPRS
FF...04	RFU

`<fileRefList>`(str)

String containing full path to the provisioning file. The first byte contains the number of files. Every comma separated path is the concatenation of file identifiers starting from the Master File (e.g. 3F007F206FXY). The file contains a single unambiguous set of parameters required to make the connection. The content of the file is expected to be consistent with the format defined for provisioning information for the requested type of browser.

`<gatewayIdentity>`(str)

String containing the Gateway/Proxy Identity which gives to the mobile the name/identity of the Gateway/Proxy to be used for connecting to the URL. This Gateway/Proxy identity is required when the bearer data object is present.

9.15 AT^SSTGI SAT Get Information - Play Tone (32)

This command shall be used after receiving the URC ^SSTN: 32.
The UE has been instructed to generate an audible tone, and may pass to the TE some information to support this.

Syntax

Write Command

```
AT^SSTGI=32
```

Response(s)

```
^SSTGI: <cmdType>, <commandDetails>, <infoText>, <tone>, <durationUnit>, <duration>,
<iconQualifier>, <iconId>
OK
ERROR
+CME ERROR: <err>
```

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<cmdType>(num)

32	Proactive command ID, see Remote-SAT Command Types

<commandDetails>(num)

This byte is RFU.

<infoText>(str)

String to accompany tone

<tone>(str)

Tone generated by the UE

01...08	Standard supervisory tones:
“01“	Dial tone
“02“	Called subscriber busy
“03“	Congestion
“04“	Radio path acknowledge
“05“	Radio path not available / Call dropped
“06“	Error / Special information
“07“	Call waiting tone
“08“	Ringing tone
16...18	UE proprietary tones:
“16“	General beep
“17“	Positive acknowledgement tone
“18“	Negative acknowledgement or error tone

<durationUnit>(num)	
0	Minutes
1	Seconds
2	Tenth of Seconds

<duration>(num)	
1...255	Duration of tone, expressed in units

<iconQualifier>(num)	
0...255	Used as bit field
bit 1	0: Icon is self explanatory and replaces text
	1: Icon is not self-explanatory and shall be displayed with the text Determined value only if associated icon ID is not 0 (an icon exists).
bit 2-8	RFU

<iconId>(num)	
0...255	
0	No Icon

9.16 AT^SSTGI SAT Get Information - Display Text (33)

This command shall be used after receiving the URC ^SSTN: 33. The TE gets a message to be displayed to the user. The message can have different display characteristics.

Syntax

Write Command

```
AT^SSTGI=33
```

Response(s)

```
^SSTGI: <cmdType>, <commandDetails>, <text>, <immediateResponse>, <iconQualifier>,
<iconId>
OK
ERROR
+CME ERROR: <err>
```

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<cmdType>(num)

33	Proactive command ID, see Section 9.3, Remote-SAT Command Types and Table 9.6.

<commandDetails>(num)

0...255	Used as bit field
bit 1	0: Normal priority (see note).
	1: High priority (see note).
bit 2-7	RFU
bit 8	0: Clear message after a delay.
	1: Wait for user to clear message.

<text>(str)

String to be displayed

<immediateResponse>(num)

This parameter indicates whether the UE should sustain the display beyond sending the TERMINAL RESPONSE.

0	Send TERMINAL RESPONSE when text is cleared from screen.
1	Send TERMINAL RESPONSE immediately and continue to display the text until one of the following events occurs: • A subsequent proactive command is received, containing display data. • A short delay notified with <commandDetails> has expired. • User intervention.

- A higher priority event occurs, e.g. a mobile terminated call.

No further TERMINAL RESPONSE shall be sent when the UE removes the text from the display, regardless of the cause.
If the <immediateResponse> parameter equals "1" the subsequent "^SSTN: 254" URC should not be used to clear the text from the screen - in this case the text should remain on the screen until one of the above events occurs.

<iconQualifier>(num)	
0...255	Used as bit field
bit 1	0: Icon is self explanatory and replaces text. 1: Icon is not self-explanatory and shall be displayed with the text Determined value only if associated icon ID is not 0 (an icon exists).
bit 2-8	RFU

<iconId>(num)	
0...255	
0	No Icon

Notes

- The MMI shall reject normal priority text commands if the screen is currently used for more than its normal standby display, e.g. if the MMI is in sub-menu. If the command is rejected, the MMI sends the TERMINAL RESPONSE message to the SIM (UE currently unable to process command - screen busy).
- High priority text shall be displayed on the screen immediately, except if a priority conflict of the alerting events occurs, e.g. incoming call or a URC if the battery needs to be charged, see 3GPP TS 11.14 [22], 3GPP TS 31.111 [23], ETSI TS 102 223 [24].

9.17 AT^SSTGI SAT Get Information - Get Inkey (34)

This command shall be used after receiving the URC ^SSTN: 34.
The TE is asked to prompt the user for an input, which is a single character. Help can be requested by the user, if available.

Syntax

Write Command

```
AT^SSTGI=34
```

Response(s)

```
^SSTGI: <cmdType>, <commandDetails>, <text>, <iconQualifier>, <iconId>
OK
ERROR
+CME ERROR: <err>
```

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<cmdType>(num)	
34	Proactive command ID, see Remote-SAT Command Types

<commandDetails>(num)	
0...255	Used as bit field
bit 1	0: Digits only (0 9, *, # and +)
	1: Alphabet set
bit 2	0: SMS default alphabet (GSM character set)
	1: UCS2 alphabet
bit 3	0: Character sets defined by bit 1 and bit 2 are enabled
	1: Character sets defined by bit 1 and bit 2 are disabled and the "Yes/No" response is requested
bit 4-7	RFU
bit 8	0: No help information available
	1: Help information available

<text>(str)
String as prompt for text.

<iconQualifier>(num)	
0...255	Used as bit field
bit 1	0: Icon is self explanatory and replaces text
	1: Icon is not self-explanatory and shall be displayed with the text Determined value only if associated icon ID is not 0 (an icon exists).
bit 2-8	RFU

<iconId>(num)	
0...255	
0	No Icon

9.18 AT^SSTGI SAT Get Information - Get Input (35)

This command shall be used after receiving the URC ^SSTN: 35.
The TE is asked to prompt the user for an input, of a specified length and type, e.g. digits only. Help can be requested by the user, if available.

Syntax

Write Command

```
AT^SSTGI=35
```

Response(s)

```
^SSTGI: <cmdType>, <commandDetails>, <text>, <responseMin>, <responseMax>[,
<defaultText>], <iconQualifier>, <iconId>
OK
ERROR
+CME ERROR: <err>
```

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<cmdType>(num)

35	Proactive command ID, see Remote-SAT Command Types

<commandDetails>(num)

0...255	Used as bit field
bit 1	0: Digits only (0 9, *, # and +)
	1: Alphabet set
bit 2	0: SMS default alphabet (GSM character set)
	1: UCS2 alphabet
bit 3	0: UE may echo user input on the display
	1: User input shall not be revealed in any way (see note)
bit 4	0: User input to be in unpacked format
	1: User input to be in SMS packed format
bit 5-7	RFU
bit 8	0: No help information available
	1: Help information available

<text>(str)

String as prompt for text

<responseMin>(num)

0...255	Minimum length of user input.

<responseMax>(num)

0...255	Maximum length of user input.

<defaultText>(str)
String supplied as default response text

<iconQualifier>(num)	
0...255	Used as bit field
bit 1	0: Icon is self explanatory and replaces text
	1: Icon is not self-explanatory and shall be displayed with the text Determined value only if associated icon ID is not 0 (an icon exists).
bit 2-8	RFU

<iconId>(num)	
0...255	
0	No Icon

Note

- Hidden entry mode (see 3GPP TS 11.14 [22], 3GPP TS 31.111 [23], ETSI TS 102 223 [24]) is only available when using digit input. In hidden entry mode only characters ('0', '9', '*' and '#') are allowed.

9.19 AT^SSTGI SAT Get Information - Select Item (36)

This command shall be used after receiving the URC ^SSTN: 36.
The TE is supplied with a list of items allowing the user to select one. Help can be requested by the user, if available and the presentation style is specified. In addition to text strings and icon identifiers, a next action indicator informs the user of the likely result of selecting a chosen item.

Syntax

Write Command

`AT^SSTGI=36`

Response(s)

The first line of output from the ME is:
`^SSTGI: <cmdType>, <commandDetails>, <numOfItems>, <titleText>, <defaultItemId>, <itemIconsPresent>, <itemIconsQualifier>, <titleIconQualifier>, <titleIconId>`
One line follows for every item, repeated for `<numOfItems>`:
`^SSTGI: <cmdType>, <itemId>, <itemText>, <nextActionId>, <iconId>`
`OK`
`ERROR`
`+CME ERROR: <err>`

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

`<cmdType>`(num)	
36	Proactive command ID, see `Remote-SAT Command Types`

`<commandDetails>`(num)	
0...255	Used as bit field
bit 1	0: Presentation type is not specified
	1: Presentation type is specified in bit 2
bit 2	0: Presentation as a choice of data values, if bit 1 = '1'
	1: Presentation as a choice of navigation options if bit 1 is '1'
bit 3	0: No selection preference
	1: Selection using soft key preferred
bit 4-7	RFU
bit 8	0: No help information available
	1: Help information available

`<numOfItems>`(num)
Number of items in the list

`<titleText>`(str)
String giving menu title

<defaultItemId>(num)

ID of default item
The SIM may supply with the list an indication of the default item, e.g. the previously selected item

0	No default item issued by the SIM application
1...255	Id of the default Item

<itemIconsPresent>(num)

0	No icons
1	Icons present

<itemIconsQualifier>(num)

0...255	Used as bit field
bit 1	0: Icon is self explanatory and replaces text
	1: Icon is not self-explanatory and shall be displayed with the text Determined value only if associated icon ID is not 0 (an icon exists).
bit 2-8	RFU

<titleIconQualifier>(num)

0...255	Used as bit field
bit 1	0: Icon is self explanatory and replaces text
	1: Icon is not self-explanatory and shall be displayed with the text Determined value only if associated icon ID is not 0 (an icon exists).
bit 2-8	RFU

<titleIconId>(num)

0...255

0	No Icon

<itemId>(num)

Item identifier (1 - <numOfItems>)

<itemText>(str)

String giving menu title

<nextActionId>(num)

The next proactive command type to be issued upon execution of the menu item. See Remote-SAT Command Types

0	Next Action information available

<iconId>(num)

0...255

0	No Icon

9.20 AT^SSTGI SAT Get Information - Set up Menu (37)

This command shall be used after receiving the URC ^SSTN: 37. The response provides the main menu of the SIM Application to the TE. It needs to be stored by the TE so that it can be displayed without invoking a proactive session.

As with every proactive command the TE is expected to acknowledge the ^SSTGI response with AT^SSTR to confirm that the proactive command has been executed.
Terminal Response via AT^SSTR will not provide any user information in case of this proactive command. Refer to AT^SSTR.

AT^SSTGI can be issued during states IDLE, PAC and WAIT for this proactive command without previously receiving a URC ^SSTN:<cmdType>, see AT^SSTGI.

Syntax

Write Command

AT^SSTGI=37

Response(s)

The first line of output from the ME is:
^SSTGI: <cmdType>, <commandDetails>, <numOfItems>, <titleText>, <menuItemIconsPresent>, <menuItemIconsQualifier>, <titleIconQualifier>, <titleIconId>
One line follows for every item, repeated for <numOfItems>:
^SSTGI: <cmdType>, <itemId>, <itemText>, <nextActionId>, <iconId>
OK
ERROR
+CME ERROR: <err>

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<cmdType>(num)

37	Proactive command ID, see Remote-SAT Command Types

<commandDetails>(num)

0...255	Used as bit field
bit 1	0: No selection preference
	1: Selection using soft key preferred
bit 2-7	RFU
bit 8	0: No help information available
	1: Help information available

<numOfItems>(num)

Number of menu items in the list

<titleText>(str)

String displaying menu title

<menuItemIconsPresent>(num)

0	No icons
1	Icons present

<menuItemIconsQualifier>(num)

0...255	Used as bit field
bit 1	0: Icon is self explanatory and replaces text
	1: Icon is not self-explanatory and shall be displayed with the text Determined value only if associated icon ID is not 0 (an icon exists).
bit 2-8	RFU

<titleIconQualifier>(num)

0...255	Used as bit field
bit 1	0: Icon is self explanatory and replaces text
	1: Icon is not self-explanatory and shall be displayed with the text Determined value only if associated icon ID is not 0 (an icon exists).
bit 2-8	RFU

<titleIconId>(num)

0...255

0	No Icon

<itemId>(num)

Menu item identifier (1 - <numOfItems>)

<itemText>(str)

Title of menu item

<nextActionId>(num)

The next proactive command type to be issued upon execution of the menu item. See Remote-SAT Command Types

0	No next Action information available

<iconId>(num)

0...255

0	No Icon

9.21 AT^SSTGI SAT Get Information - Set up Idle Mode Text (40)

This command shall be used after receiving the URC ^SSTN: 40.
It provides text and optionally an icon to be displayed by the TE when the display is Idle.

Syntax

Write Command

```
AT^SSTGI=40
```

Response(s)

```
^SSTGI: <cmdType>, <commandDetails>, <text>, <iconQualifier>, <iconId>
OK
ERROR
+CME ERROR: <err>
```

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<cmdType>(num)

40	Proactive command ID, see Remote-SAT Command Types

<commandDetails>(num)

This byte is RFU.

<text>(str)

Text to be displayed when TE in IDLE mode

<iconQualifier>(num)

0...255	Used as bit field
bit 1	0: Icon is self explanatory and replaces text
	1: Icon is not self-explanatory and shall be displayed with the text Determined value only if associated icon ID is not 0 (an icon exists).
bit 2-8	RFU

<iconId>(num)

0...255	
0	No Icon

Note

- AT^SSTGI can be issued during states IDLE, PAC and WAIT for this proactive command without previously receiving a URC ^SSTN:<cmdType>, see AT^SSTGI.

9.22 AT^SSTGI SAT Get Information - Language Notification (53)

This command shall be used after receiving the URC ^SSTN: 53.
It provides text to inform the TE about the language currently used for any text string within proactive commands or envelope command responses.
The notified language remains valid until the end of the card session or upon executing another LANGUAGE NOTIFICATION command.
If the Toolkit application is not aware of the currently selected language, no specific language or several languages will be used. The SIM may notify non-specific language. All LANGUAGE NOTIFICATION previously made will be cancelled.
Two types of language notification are defined:
• specific, where a two-character language notification is issued in <langText>,
• non-specific, where no language notification is issued, i.e. <langText> is an empty string.
The TE may use the language included in LANGUAGE NOTIFICATION as appropriate. For instance, this could be done to avoid a mix of languages in screen displays combining UE MMI and SIM Toolkit originating text strings.

Syntax

Write Command

```
AT^SSTGI=53
```

Response(s)

```
^SSTGI: <cmdType>, <commandDetails>, <langText>
OK
ERROR
+CME ERROR: <err>
```

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<cmdType>(num)

53	Proactive command ID, see Remote-SAT Command Types

<commandDetails>(num)

0...255	Used as bit field
bit 1	0: non-specific language notification
	1: specific language notification
bit 2-8	RFU

<langText>(str)

Language code string provided as a pair of alpha-numeric characters, defined in ISO 639. Each alphanumeric character is coded on one byte using the SMS default 7-bit coded alphabet as defined in 3GPP TS 23.038[37].

Note

- AT^SSTGI can be issued during states IDLE, PAC and WAIT for this proactive command without previously receiving a URC ^SSTN:<cmdType>, see AT^SSTGI.

9.23 AT^SSTGI SAT Get Information - Open Channel (64)

The SIM Application is opening a data session for the Bearer Independent Protocol, and can provide the TE with some information about this.
Text and an icon identifier can be passed to the TE for display to the user.

Syntax

Write Command

```
AT^SSTGI=64
```

Response(s)

```
^SSTGI: <cmdType>, <commandDetails>, <text>, <iconQualifier>, <iconId>
OK
ERROR
+CME ERROR: <err>
```

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<cmdType>(num)

64	Proactive command ID, see Table 9.6, Command Type Table.

<commandDetails>(num)

This byte is RFU.

<text>(str)

String to provide the user with information.
If the string is provided by the SIM, the TE shall use it to inform the user. This is also an indication that the TE should not give any other information to the user on the fact that the UE is performing an Open Channel command.
If the alpha identifier is not provided by the SIM, the UE may give information to the user concerning what is happening.

<iconQualifier>(num)

0...255	Used as bit field
bit 1	0: Icon is self explanatory and replaces text
	1: Icon is not self-explanatory and shall be displayed with the text Determined value only if associated icon ID is not 0 (an icon exists).
bit 2-8	RFU

<iconId>(num)

0...255	
0	No Icon

9.24 AT^SSTGI SAT Get Information - Close Channel (65)

The SIM Application is closing a data session for the Bearer Independent Protocol, and can provide the TE with some information about this.
Text and an icon identifier can be passed to the TE for display to the user.

Syntax

Write Command

```
AT^SSTGI=65
```

Response(s)

```
^SSTGI: <cmdType>, <commandDetails>, <text>, <iconQualifier>, <iconId>
OK
ERROR
+CME ERROR: <err>
```

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<cmdType>(num)

65	Proactive command ID, see Table 9.6, Command Type Table.

<commandDetails>(num)

This byte is RFU.

<text>(str)

String to provide the user with information.
If the string is provided by the SIM, the TE shall use it to inform the user. This is also an indication that the TE should not give any other information to the user on the fact that the UE is performing a Close Channel command.
If the alpha identifier is not provided by the SIM, the UE may give information to the user concerning what is happening.

<iconQualifier>(num)

0...255	Used as bit field
bit 1	0: Icon is self explanatory and replaces text
	1: Icon is not self-explanatory and shall be displayed with the text Determined value only if associated icon ID is not 0 (an icon exists).
bit 2-8	RFU

<iconId>(num)

0...255	
0	No Icon

9.25 AT^SSTGI SAT Get Information - Receive Data (66)

The SIM Application receives data in an open session for the Bearer Independent Protocol, and can provide the TE with some information about this.
Text and an icon identifier can be passed to the TE for display to the user.

Syntax

Write Command

```
AT^SSTGI=66
```

Response(s)

```
^SSTGI: <cmdType>, <commandDetails>, <text>, <iconQualifier>, <iconId>
OK
ERROR
+CME ERROR: <err>
```

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<cmdType>(num)

66	Proactive command ID, see Table 9.6, Command Type Table.

<commandDetails>(num)

This byte is RFU.

<text>(str)

String to provide the user with information.
If the string is provided by the SIM, the TE shall use it to inform the user. This is also an indication that the TE should not give any other information to the user on the fact that the UE is performing an Open Channel command.
If the alpha identifier is not provided by the SIM, the UE may give information to the user concerning what is happening.

<iconQualifier>(num)

0...255	Used as bit field
bit 1	0: Icon is self explanatory and replaces text
	1: Icon is not self-explanatory and shall be displayed with the text Determined value only if associated icon ID is not 0 (an icon exists).
bit 2-8	RFU

<iconId>(num)

0...255	
0	No Icon

9.26 AT^SSTGI SAT Get Information - Send Data (67)

The SIM Application sends data in an open session for the Bearer Independent Protocol, and can provide the TE with some information about this.
Text and an icon identifier can be passed to the TE for display to the user.

Syntax

Write Command

```
AT^SSTGI=67
```

Response(s)

```
^SSTGI: <cmdType>, <commandDetails>, <text>, <iconQualifier>, <iconId>
OK
ERROR
+CME ERROR: <err>
```

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<cmdType>(num)

67	Proactive command ID, see Table 9.6, Command Type Table.

<commandDetails>(num)

This byte is RFU.

<text>(str)

String to provide the user with information.
If the string is provided by the SIM, the TE shall use it to inform the user. This is also an indication that the TE should not give any other information to the user on the fact that the UE is performing an Open Channel command.
If the alpha identifier is not provided by the SIM, the UE may give information to the user concerning what is happening.

<iconQualifier>(num)

0...255	Used as bit field
bit 1	0: Icon is self explanatory and replaces text
	1: Icon is not self-explanatory and shall be displayed with the text Determined value only if associated icon ID is not 0 (an icon exists).
bit 2-8	RFU

<iconId>(num)

0...255	
0	No Icon

9.27 AT^SSTR SAT Response

The TE is expected to acknowledge the AT^SSTGI response with AT^SSTR to confirm that the Proactive Command has been executed. AT^SSTR will also provide any user information, e.g. a selected menu item.

Syntax

Test Command

AT^SSTR=?

Response(s)

^SSTR: (list of supported <state>s), (list of supported <cmdType>s)
OK

Read Command

AT^SSTR?

Response(s)

^SSTR: <state>, <cmdType>
OK

Write Command

AT^SSTR=<cmdType>, <status>[, <inputNumber>][, <inputString>][, <statAddInfo>]

Response(s)

^SSTR: <cmdType>[, <TerminationQualifier>, <TerminationCauseText>]
OK

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<state>(num)

PLS8-US-R4 Remote-SAT interface states

0	RESET
1	OFF
2	IDLE
3	PAC
4	WAIT

<cmdType>(num)

Number related to Proactive Command or event type according to 3GPP TS 11.14 [22], 3GPP TS 31.111 [23], ETSI TS 102 223 [24].

<TerminationQualifier>(num)

0	The proactive command has been successfully finished.
1...255	The proactive command did not perform successfully.

<TerminationCauseText>(str)

This text has to be shown to the user for an appropriate time, e.g. 2 seconds. The text contains information regarding the termination cause, e.g. in case of a failed dialing process call barring through Call Control by SIM mechanism may be indicated.
If <TerminationCauseText> is an empty string and <TerminationQualifier> is not equal to 0, the TE may give an own indication to the user.

<status>(num)

Command status return regarding the type of action that has taken place, e.g. action performed by the user. Values are in accordance with 3GPP TS 11.14 [22], 3GPP TS 31.111 [23], ETSI TS 102 223 [24].

<inputNumber>(num)

Response number entered by user

<inputString>(str)

Response string entered by user

<statAddInfo>(num)

Optional additional command status; for possible values refer to 3GPP TS 11.14 [22], 3GPP TS 31.111 [23], ETSI TS 102 223 [24].

9.28 AT^SSTR SAT Response - Refresh (1)

The TE is expected to acknowledge the AT^SSTGI response with AT^SSTR to confirm that the Proactive Command has been executed.

Syntax

Write Command
AT^SSTR=1, <status>, , [, <statAddInfo>]
Response(s)
OK

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<status>(num)

0...255

0	Command performed successfully

<statAddInfo>(num)

Optional additional command status; for possible values refer to 3GPP TS 11.14 [22], 3GPP TS 31.111 [23], ETSI TS 102 223 [24].

0...255

Note

- The refresh action (SIM data cache update) will be performed in any case, i.e. <status> values other than 0 will be ignored.

9.29 AT^SSTR SAT Response - Set Up Event List (5)

The TE is expected to acknowledge the AT^SSTGI response with AT^SSTR to confirm that the Proactive Command has been executed. The TE acknowledges that the event list has been set up correctly.

Syntax

Write Command
AT^SSTR=5, <status>, , [, <statAddInfo>]
Response(s)
OK

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<status>(num)

0...255

0	Command performed successfully
32	UE currently unable to process command
48	Command beyond UE's capabilities
132	UE currently unable to process command because screen is busy

<statAddInfo>(num)

Optional additional command status; for possible values refer to 3GPP TS 11.14 [22], 3GPP TS 31.111 [23], ETSI TS 102 223 [24].

0...255

9.30 AT^SSTR SAT Response - Set Up Call (16)

The TE is expected to acknowledge the AT^SSTGI response with AT^SSTR to confirm that the Proactive Command has been executed.

Syntax

Write Command

AT^SSTR=16, <status>, , [, <statAddInfo>]

Response(s)

^SSTR: 16, <TerminationQualifier>, <TerminationCauseText>
OK

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<status>(num)

0...255

0	Command performed successfully. Indicate that the user has accepted the call request.
4	Command performed successfully, but requested icon could not be displayed.
16	Proactive SIM session terminated by user
20	USSD/SS Transact terminated by user
32	UE currently unable to process command
34	User did not accept the proactive command. Indicate that the user has denied the call request
35	User cleared down call before connection or network release
48	Command beyond UE's capabilities
132	UE currently unable to process command because screen is busy

<statAddInfo>(num)

Optional additional command status; for possible values refer to 3GPP TS 11.14 [22], 3GPP TS 31.111 [23], ETSI TS 102 223 [24].

0...255

Note

- After confirmation phase the TE may show a dialling animation on the screen until a mandatory response parameter is issued.
  ^SSTR: <cmdType>, <TerminationQualifier>, <TerminationCauseText>

9.31 AT^SSTR SAT Response - Send SS (17)

The TE is expected to acknowledge the AT^SSTGI response with AT^SSTR to confirm that the Proactive Command has been executed.

Syntax

Write Command

AT^SSTR=17, <status>

Response(s)

^SSTR: 17, <TerminationQualifier>, <TerminationCauseText>
OK

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<status>(num)	
0...4	
0	Command performed successfully. Indicate that the user has accepted the SS request.
4	Command performed successfully, but requested icon could not be displayed.

9.32 AT^SSTR SAT Response - Send USSD (18)

The TE is expected to acknowledge the AT^SSTGI response with AT^SSTR to confirm that the Proactive Command has been executed.

Syntax

Write Command

AT^SSTR=18, <status>

Response(s)

^SSTR: 18, <TerminationQualifier>, <TerminationCauseText>
OK

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<status>(num)	
0...4	
0	Command performed successfully. Indicate that the user has accepted the USSD request.
4	Command performed successfully, but requested icon could not be displayed.

9.33 AT^SSTR SAT Response - Send Short Message (19)

The TE is expected to acknowledge the AT^SSTGI response with AT^SSTR to confirm that the Proactive Command has been executed.

Syntax

Write Command

AT^SSTR=19, <status>

Response(s)

^SSTR: 19, <TerminationQualifier>, <TerminationCauseText>
OK

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<status>(num)	
0...4	
0	Command performed successfully. Indicate that the user has accepted the SMS request.
4	Command performed successfully, but requested icon could not be displayed.

9.34 AT^SSTR SAT Response - Send DTMF (20)

The TE is expected to acknowledge the AT^SSTGI response with AT^SSTR to confirm that the Proactive Command has been executed.

Syntax

Write Command

AT^SSTR=20, <status>, , [, <statAddInfo>]

Response(s)

OK

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<status>(num)

0...255

0	Command performed successfully. Indicate that the user has accepted the Send DTMF request.
4	Command performed successfully, but requested icon could not be displayed.
16	Proactive SIM session terminated by user
32	UE currently unable to process command
48	Command beyond UE's capabilities
132	UE currently unable to process command because screen is busy

<statAddInfo>(num)

Optional additional command status; for possible values refer to 3GPP TS 11.14 [22], 3GPP TS 31.111 [23], ETSI TS 102 223 [24].

0...255

9.35 AT^SSTR SAT Response - Launch Browser (21)

The TE is expected to acknowledge the AT^SSTGI response with AT^SSTR to confirm that the Proactive Command has been executed.

Syntax

Write Command
AT^SSTR=21, <status>, , [, <statAddInfo>]
Response(s)
OK

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<status>(num)

0...255

0	Command performed successfully. Indicates that the user has accepted the Launch Browser request.
4	Command performed successfully, but requested icon could not be displayed.
32	UE currently unable to process command
34	User did not accept the proactive command. Indicates that the user has denied the Launch Browser request
38	Launch Browser generic error with additional information "No specific cause can be given".
48	Command beyond UE's capabilities
132	UE currently unable to process command because screen is busy
138	Launch Browser generic error with additional information "Bearer unavailable".
238	Launch Browser generic error with additional information "Browser unavailable".
239	Launch Browser generic error with additional information "UE unable to read the provisioning data".

<statAddInfo>(num)

For the general result "Launch Browser generic error code", it is mandatory for the UE to provide additional information.

0...255

0	"No specific cause can be given"
1	"Bearer unavailable"
2	"Browser unavailable"
3	"UE unable to read the provisioning data"

9.36 AT^SSTR SAT Response - Play Tone (32)

The TE is expected to acknowledge the AT^SSTGI response with AT^SSTR to confirm that the Proactive Command has been executed.

Syntax

Write Command

AT^SSTR=32, <status>, , [, <statAddInfo>]

Response(s)

OK

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<status>(num)

0...255

0	Command performed successfully. Indicates that the user has accepted the Play Tone request.
4	Command performed successfully, but requested icon could not be displayed.
16	Proactive SIM session was terminated by user.
32	UE or TE currently unable to process command.
48	Command beyond UE's (respectively TE's) capabilities.
132	TE currently unable to process command because screen is busy.

<statAddInfo>(num)

Optional additional command status; for possible values refer to 3GPP TS 11.14 [22], 3GPP TS 31.111 [23], ETSI TS 102 223 [24].

0...255

Note

- This command starts playing the tone by the UE. It is possible for the TE to stop playing the tone via user break, i.e. issue any character whilst the command is running.

9.37 AT^SSTR SAT Response - Display Text (33)

The TE is expected to acknowledge the AT^SSTGI response with AT^SSTR to confirm that the Proactive Command has been executed.

Syntax

Write Command
AT^SSTR=33, <status>, , [, <statAddInfo>]
Response(s)
OK

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<status>(num)

0...255

0	Command performed successfully. Indicates that the user has accepted the Display Text request.
4	Command performed successfully, but requested icon could not be displayed.
16	Proactive SIM session terminated by user
17	Backward move in the proactive SIM session requested by the user
18	No response from user
32	UE currently unable to process command
48	Command beyond UE's capabilities
132	UE currently unable to process command because screen is busy

<statAddInfo>(num)

Optional additional command status; for possible values refer to 3GPP TS 11.14 [22], 3GPP TS 31.111 [23], ETSI TS 102 223 [24].

0...255

9.38 AT^SSTR SAT Response - Get Inkey (34)

The TE is expected to acknowledge the AT^SSTGI response with AT^SSTR to confirm that the Proactive Command has been executed.

Syntax

Write Command

AT^SSTR=34, <status>, , <inputString>[, <statAddInfo>]

Response(s)

OK

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<status>(num)

0...255

0	Command performed successfully. Indicates that the user has accepted the Get Inkey request.
4	Command performed successfully, but requested icon could not be displayed.
16	Proactive SIM session terminated by user
17	Backward move in the proactive SIM session requested by the user
18	No response from user
19	Help information required by the user
32	UE currently unable to process command
48	Command beyond UE's capabilities
132	UE currently unable to process command because screen is busy

<inputString>(str)

User response entered as a string parameter

<statAddInfo>(num)

Optional additional command status; for possible values refer to 3GPP TS 11.14 [22], 3GPP TS 31.111 [23], ETSI TS 102 223 [24].

0...255

Notes

- Coding of any input character is related to the selected alphabet:
  - Input of a character in case of GSM character set requests one byte, e.g. "Y".
  - Input of any characters in UCS2 alphabet requests a 4 byte set, e.g. "0059" is coding the same character "Y".
  - If, as a user response, a binary choice (Yes/No) is requested by the SIM application using bit 3 of the <commandDetails> parameter the valid content of the <inputString> is:
    a) GSM alphabet: "Y" or "y" (positive answer) and "N" or "n" (negative answer).
    b) UCS2 alphabet "0079" or "0059" (positive answer) and "006E" or "004E" (negative answer). For more detailed information refer to AT^SSTGI.
  - Coding of an empty string is done as a "\1b" string with every alphabet.

- The <Alphabet> parameter of AT^SSTA determines the alphabet used on the AT command interface, while the value reported by the <commandDetails> bit 2 of the AT^SSTGI=34 command determines the set of characters allowed. If these alphabet settings are different, the following applies:
  Example: If UCS2 alphabet is selected with AT^SSTA and the <commandDetails> bit 2 of the AT^SSTGI=34 command is reported as "SMS default alphabet (GSM character set)" any input has to be done in UCS2 alphabet. However, take care to enter only UCS2 characters for which equivalent characters are defined in the SMS (GSM) default alphabet. In this case, the ME will correctly translate the given UCS2 data into a TERMINAL RESPONSE coded in SMS (GSM) default alphabet. See also Section 1.7.2, UCS2 and GSM character coding and conversion.

9.39 AT^SSTR SAT Response - Get Input (35)

The TE is expected to acknowledge the AT^SSTGI response with AT^SSTR to confirm that the Proactive Command has been executed.

Syntax

Write Command
AT^SSTR=35, <status>, , <inputString>[, <statAddInfo>]
Response(s)
OK

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<status>(num)

0...255

0	Command performed successfully. Indicates that the user has accepted the Get Input request.
4	Command performed successfully, but requested icon could not be displayed.
16	Proactive SIM session terminated by user
17	Backward move in the proactive SIM session requested by the user
18	No response from user
19	Help information required by the user
32	UE currently unable to process command
48	Command beyond UE's capabilities
132	UE currently unable to process command because screen is busy

<inputString>(str)

User response entered as a string, length depends on the <responseMin> and <responseMax> values returned by the related AT^SSTGI=35 command.

<statAddInfo>(num)

Optional additional command status; for possible values refer to 3GPP TS 11.14 [22], 3GPP TS 31.111 [23], ETSI TS 102 223 [24].

0...255

Notes

- Coding of any input character is related to the selected alphabet:
  - Input of a character in case of GSM character set requests one byte, e.g. "Y".
  - Input of any characters in UCS2 alphabet requests a 4 byte set, e.g. "0059" is coding the same character "Y".
  - Coding of an empty string is done as a "\1b" string with every alphabet.

- The <Alphabet> parameter of AT^SSTA determines the alphabet used on the AT command interface, while the value reported by the <commandDetails> bit 2 of the AT^SSTGI=35 command determines the set of characters allowed. If these alphabet settings are different, the following applies:
  Example: If UCS2 alphabet is selected with AT^SSTA and the <commandDetails> bit 2 of the AT^SSTGI=35 command is reported as "SMS default alphabet (GSM character set)" any input has to be done in UCS2 alphabet. However, take care to enter only UCS2 characters for which equivalent characters are defined in the SMS (GSM) default alphabet. In this case, the UE will correctly translate the given UCS2 data into a TERMINAL RESPONSE coded in SMS (GSM) default alphabet. See also Section 1.7.2, UCS2 and GSM character coding and conversion.

9.40 AT^SSTR SAT Response - Select Item (36)

The TE is expected to acknowledge the AT^SSTGI response with AT^SSTR to confirm that the Proactive Command has been executed. The TE sends a response that can indicate the user's intentions, e.g. when the user is requesting help or selecting a menu item.

For compatibility reasons <itemId> is optional in case of <status>=19 ("Help information required by the user"). In this case <itemId>=0 is sent to the USIM.

Syntax

Write Command

AT^SSTR=36, <status>, <itemId>[, <statAddInfo>]

Response(s)

OK

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<status>(num)

0...255

0	Command performed successfully. Indicates that the user has accepted the Select Item request.
4	Command performed successfully, but requested icon could not be displayed.
16	Proactive SIM session terminated by user
17	Backward move in the proactive SIM session requested by the user
18	No response from user
19	Help information required by the user
32	UE currently unable to process command
48	Command beyond UE's capabilities
132	UE currently unable to process command because screen is busy

<itemId>(num)

Item IDs are supplied by the SIM Application

1...255	ID of selected item can be issued if a <status> value of 0 is returned

<statAddInfo>(num)

Optional additional command status; for possible values refer to 3GPP TS 11.14 [22], 3GPP TS 31.111 [23], ETSI TS 102 223 [24].

0...255

9.41 AT^SSTR SAT Response - Set Up Menu (37)

The TE is expected to acknowledge the AT^SSTGI response with AT^SSTR to confirm that the Proactive Command has been executed.

Syntax

Write Command
AT^SSTR=37, <status>, , [, <statAddInfo>]
Response(s)
OK

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<status>(num)

0...255

0	Command performed successfully. Indicates that the user has accepted the Set Up Menu request.
4	Command performed successfully, but requested icon could not be displayed.
32	UE currently unable to process command
48	Command beyond UE's capabilities
132	UE currently unable to process command because screen is busy

<statAddInfo>(num)

Optional additional command status; for possible values refer to 3GPP TS 11.14 [22], 3GPP TS 31.111 [23], ETSI TS 102 223 [24].

0...255

Note

- The response simply conveys, to the SAT, the information that the main menu was received and set up on the user interface. It does not transmit any information about a selected item, like in the case of AT^SSTR.

  Once this command was executed the user can proceed as described in the AT^SSTR SAT Response - Setup Menu (37).

9.42 AT^SSTR SAT Response - Set Up Idle Mode Text (40)

The TE is expected to acknowledge the AT^SSTGI response with AT^SSTR to confirm that the Proactive Command has been executed.

Syntax

Write Command
AT^SSTR=40, <status>, , [, <statAddInfo>]
Response(s)
OK

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<status>(num)

0...255

0	Command performed successfully. Indicates that the user has accepted the Set Up Idle Mode Text request.
4	Command performed successfully, but requested icon could not be displayed.
32	UE currently unable to process command
48	Command beyond UE's capabilities
132	UE currently unable to process command because screen is busy

<statAddInfo>(num)

Optional additional command status; for possible values refer to 3GPP TS 11.14 [22], 3GPP TS 31.111 [23], ETSI TS 102 223 [24].

0...255

9.43 AT^SSTR SAT Response - Language Notification (53)

The TE is expected to acknowledge the AT^SSTGI response with AT^SSTR to confirm that the Proactive Command has been executed. The TE indicates whether the Language Notification command was correctly executed.

Syntax

Write Command
AT^SSTR=53, <status>, , [, <statAddInfo>]
Response(s)
OK

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<status>(num)

0...255

0	Command performed successfully. Indicates that the user has accepted the Language Notification request.

<statAddInfo>(num)

Optional additional command status; for possible values refer to 3GPP TS 11.14 [22], 3GPP TS 31.111 [23], ETSI TS 102 223 [24].

0...255

9.44 AT^SSTR SAT Response - Open Channel (64)

The TE is expected to acknowledge the AT^SSTGI response with AT^SSTR to confirm that the Proactive Command has been executed.

Syntax

Write Command
AT^SSTR=64, <status>, , [, <statAddInfo>]
Response(s)
OK

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<status>(num)

0...255

0	Command performed successfully. Indicates that the user has accepted the Open Channel request.
4	Command performed successfully, but requested icon could not be displayed.
16	Proactive SIM session terminated by user
32	UE currently unable to process command
48	Command beyond UE's capabilities
132	UE currently unable to process command because screen is busy

<statAddInfo>(num)

Optional additional command status; for possible values refer to 3GPP TS 11.14 [22], 3GPP TS 31.111 [23], ETSI TS 102 223 [24].

0...255

9.45 AT^SSTR SAT Response - Close Channel (65)

The TE is expected to acknowledge the AT^SSTGI response with AT^SSTR to confirm that the Proactive Command has been executed.

Syntax

Write Command
AT^SSTR=65, <status>, , [, <statAddInfo>]
Response(s)
OK

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<status>(num)

0...255

0	Command performed successfully. Indicates that the user has accepted the Close Channel request.
4	Command performed successfully, but requested icon could not be displayed.
16	Proactive SIM session terminated by user
32	UE currently unable to process command
48	Command beyond UE's capabilities
132	UE currently unable to process command because screen is busy

<statAddInfo>(num)

Optional additional command status; for possible values refer to 3GPP TS 11.14 [22], 3GPP TS 31.111 [23], ETSI TS 102 223 [24].

0...255

9.46 AT^SSTR SAT Response - Receive Data (66)

The TE is expected to acknowledge the AT^SSTGI response with AT^SSTR to confirm that the Proactive Command has been executed.

Syntax

Write Command

AT^SSTR=66, <status>, , [, <statAddInfo>]

Response(s)

OK

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<status>(num)

0...255

0	Command performed successfully. Indicates that the user has accepted the Receive Data request.
4	Command performed successfully, but requested icon could not be displayed.
16	Proactive SIM session terminated by user
32	UE currently unable to process command
48	Command beyond UE's capabilities
132	UE currently unable to process command because screen is busy

<statAddInfo>(num)

Optional additional command status; for possible values refer to 3GPP TS 11.14 [22], 3GPP TS 31.111 [23], ETSI TS 102 223 [24].

0...255

9.47 AT^SSTR SAT Response - Send Data (67)

The TE is expected to acknowledge the AT^SSTGI response with AT^SSTR to confirm that the Proactive Command has been executed.

Syntax

Write Command

AT^SSTR=67, <status>, , [, <statAddInfo>]

Response(s)

OK

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<status>(num)

0...255

0	Command performed successfully. Indicates that the user has accepted the Send Data request.
4	Command performed successfully, but requested icon could not be displayed.
16	Proactive SIM session terminated by user
32	UE currently unable to process command
48	Command beyond UE's capabilities
132	UE currently unable to process command because screen is busy

<statAddInfo>(num)

Optional additional command status; for possible values refer to 3GPP TS 11.14 [22], 3GPP TS 31.111 [23], ETSI TS 102 223 [24].

0...255

9.48 AT^SSTR SAT Event - Menu Selection (211)

The TE specifies the user's selection of an item from the main menu, which was set up using SETUP MENU command. Alternatively help can be requested.

Syntax

Write Command
AT^SSTR=211, <status>, <itemId>
Response(s)
OK

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<status>(num)

0...255

0	Command performed successfully.
19	Help information required by the user, no other value can be returned.

<itemId>(num)

ID of selected item

0...255

9.49 AT^SSTR SAT Event - User Activity (232)

Sent by the customer application to indicate that a key has been pressed.

Syntax

Write Command
AT^SSTR=232
Response(s)
OK

PIN	MDM	APP	✈	Last
-	+	+	+	-

9.50 AT^SSTR SAT Event - Idle Screen Available (233)

Sent by the customer application to indicate that the screen has become idle.

Syntax

Write Command
AT^SSTR=233
Response(s)
OK

PIN	MDM	APP	✈	Last
-	+	+	+	-

9.51 AT^SSTR SAT Event - Language Selection (235)

Sent by the customer application to indicate that the customer application has changed the language.
The last value given via this command is also provided to the SIM as response to the proactive command "Provide Local Information (Language Setting)".

Syntax

Write Command

AT^SSTR=235, , , <inputString>

Response(s)

OK

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<inputString>(str)

Two character language tag, e.g. "en" for English or "de" for German. Default value is "en".

9.52 AT^SSTR SAT Event - Browser Termination (236)

Sent by the customer application to indicate that the internet browser application has been terminated.

Syntax

Write Command
AT^SSTR=236, , , <TermCause>
Response(s)
OK

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<TermCause>(num)	
Browser Termination Cause	
0...255	
0	User termination
1	Error termination

9.53 AT^SSTR SAT Event - Terminate Command (254)

This command allows the TE to finish an ongoing proactive command session. As a result, the UE will attempt to return to IDLE mode. This is done by sending repeatedly a Terminal Response ("ME currently unable to process command") to the SIM (see 3GPP TS 11.14 [22], 3GPP TS 31.111 [23], ETSI TS 102 223 [24]), if issued in states PAC or WAIT. No action is performed if the interface is already in IDLE state, however, the command returns "OK".
The reaction to the Terminal Response depends on the SIM application: The UE may either be kept in IDLE state or requested to perform another action.

Syntax

Write Command
AT^SSTR=254
Response(s)
OK

PIN	MDM	APP	✈	Last
-	+	+	+	-

9.54 Examples for Using Remote-SAT

To give you an idea of how to start and use Remote-SAT, you may follow the steps described below:

// Start after switch on the module
at
OK

// Switch on verbose error messages
at+cmee=2
OK

// Enter the PIN code (if necessary due to SIM configuration)
at+cpin=1234
OK

// Query the Remote-SAT activation status
at^ssta?
^SSTA: 1,0,1,"FFFFFFFF7F1F00DFFF00001FE20000000360",300,1 for USIM (3G)
or
^SSTA: 1,0,1,"7FFFFFFF7F0F00DFFF00001FE200000003",300,1 for SIM (2G).
OK
// First '1' indicates that the interface is in OFF state, i.e. the Automatic Response (AR) mode is enabled. During this mode all SAT Proactive Commands are handled internally by the UE.

// Tell the module that the TE is interested in handling SAT, i.e. switch to Explicit Response (ER) mode.
at^ssta=1,0
OK

// This setting takes effect after next start of the UE only, so switch off first
AT^SMSO
OK

// Switch on UE again

// Switch on verbose error messages
at+cmee=2
OK

// Enter the PIN code (if necessary due to SIM configuration)
at+cpin=1234
OK

// Receiving the first proactive command (if the mounted SIM carries a SIM Application)
^SSTN:37

// Requesting parameter details
at^sstgi=37

// These are the details:
^SSTGI: 37,0,3,"SAT Special Menu",0,1,1,0
^SSTGI: 37,1,"News",0,0
^SSTGI: 37,2,"EMail",0,0
^SSTGI: 37,3,"Banking",0,0

OK

// To query the status of the proactive command
at^sstr=37,0

OK

// SAT indicates that the proactive session has ended and enters its main menu (which should then be opened on the screen by an MMI): ^SSTN:254

// Selecting item number 1 of the menu sent before:
at^sstr=211,0,1

OK

// Receiving the next proactive command:
^SSTN:36

// Requesting more information...
at^sstgi=36

// ... and get it:
^SSTGI: 36,0,12,"Rubriken >",0,0,1,1,0
^SSTGI: 36,1,"News >",0,0
^SSTGI: 36,2,"Stock Infos>",0,0
^SSTGI: 36,3,"Aktien D >",0,0
^SSTGI: 36,4,"Aktien INT >",0,0
^SSTGI: 36,5,"Sports >",0,0
^SSTGI: 36,6,"1.BL-Clubs >",0,0
^SSTGI: 36,7,"Unterhaltung>",0,0
^SSTGI: 36,8,"Horoskop >",0,0
^SSTGI: 36,9,"Wetter D >",0,0
^SSTGI: 36,10,"Wetter INT >",0,0
^SSTGI: 36,11,"Wetter spez>",0,0
^SSTGI: 36,63,"Extras >",0,0

OK

// Remember to acknowledge:
at^sstr=36,0,63

OK

// And again: Receiving the next proactive command:
^SSTN:36
// ...

Examples

EXAMPLE 1

```
// Switch on verbose error messages
at+cmee=2
OK
```

EXAMPLE 2

```
// Enter the PIN code
at+cpin=1234
OK
```

EXAMPLE 3

```
// Start Remote-SAT
at^ssta=1,0
OK
```

EXAMPLE 4

```
// Proactive command "GET INKEY" is issued by the SIM
^SSTN: 34
```

EXAMPLE 5

```
// Get complete data
at^sstgi=34
^SSTGI: 34,0,"<COLOUR-ICON>",1,2
OK
```

EXAMPLE 6

```
// Use GET RESPONSE command (192) to analyze SIM file EF-IMG (hex. 4F20)
at+crsm=192,20256,0,0,15
+CRSM: 144,0,000000644F20040014F04401020114
OK
```

EXAMPLE 7

```
// Use READ RECORD command (178) to get its content
at+crsm=178,20256,2,4,20
+CRSM: 144,0,010808214F0200000016FFFFFFFFFFFFFFFFFFFF
OK
```

EXAMPLE 8

```
// Use READ BINARY command (176) to get content of image instance data file (e.g. hex 4F02)
at+crsm=176,20226,0,0,22
+CRSM: 144,0,080802030016AAAA800285428142814281528002AAAA
OK

at+crsm=176,20226,0,22,9
+CRSM: 144,0,FF000000FF000000FF
OK
```

EXAMPLE 9

```
// Finalize Proactive Command session
at^sstr=34,0,,"+"
OK
```

EXAMPLE 10

```
// Session end indication, i.e. display SAT main menu
^SSTN: 254
```

10. Short Message Service (SMS) Commands

The AT Commands described in this chapter allow an external application to use the Short Message Service with the PLS8-US-R4.

10.1 SMS parameters

This section provides an overview of parameters included in SMS related AT commands and lists references to 3GPP TS specifications.

Parameter Description

<ackpdu>(num)

Format is same for <pdu> in case of SMS, but without 3GPP TS 24.011 [41] SC address field and parameter shall be bounded by double quote characters like a normal string type parameter.

<ct>(num)

Command Type

3GPP TS 23.040 [38] TP-Command-Type in integer format

[0]...255

<da>(str)(+CSCS)

Destination Address

3GPP TS 23.040 [38] TP-Destination-Address Address-Value field in string format; BCD numbers (or GSM default alphabet characters) are converted into characters; type of address given by <toda>

<data>(num)(+CSCS)

User Data (in text mode)

In case of SMS: 3GPP TS 23.040 [38] TP-User-Data in text mode responses; format:

- If <dcs> indicates that 3GPP TS 23.038 [37] default alphabet is used and <fo> indicates that 3GPP TS 23.040 [38] TP-User-Data-Header-Indication is not set: UE converts GSM alphabet into current TE character set according to rules covered in Annex A.
- If <dcs> indicates that 8-bit or UCS2 data coding scheme is used, or <fo> indicates that 3GPP TS 23.040 [38] TP-User-Data-Header-Indication is set: UE converts each 8-bit octet into hexadecimal numbers con-taining two IRA characters (e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65).

In case of CBS: 3GPP TS 23.041 [39] CBM Content of Message in text mode responses; format:

- If <dcs> indicates that 3GPP TS 23.038 [37] default alphabet is used: UE converts GSM alphabet into current TE character set according to rules covered in Annex A.
- If <dcs> indicates that 8-bit or UCS2 data coding scheme is used: UE converts each 8-bit octet into hexa-decimal numbers containing two IRA characters.

<dt>(num)

Discharge Time

Parameter for Status Reports: 3GPP TS 23.040 [38] TP-Discharge-Time in time-string format: "yy/MM/dd,hh:mm:ss+zz", where characters indicate year (two last digits), month, day, hour, minutes, seconds and time zone. For example, 6th of May 1994, 22:10:00 GMT+2 hours equals "94/05/06,22:10:00+08"

<index>(num)

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

<length>(num)

Message Length

For PDU mode (<mode>=0):
Integer type value indicating in PDU mode (AT+CMGF=0), the length of the actual TP data unit in octets (i.e. the RP layer SMSC address octets are not counted in the length).

For Text mode (<mode>=1):
In Text mode the value of the <length> parameter depends on the <dcs>parameter in following way:

- If <dcs> indicates that GSM 7 bit default alphabet is used: every character counts as 1, i.e. for "ABC" <length>= 3.
- If <dcs> indicates that 8-bit data coding scheme is used: every coded character (2 IRA characters) counts as 1, i.e. for "414243" (= "ABC") <length>= 3.
- If <dcs> indicates that UCS2 data coding scheme is used: every coded character (4 IRA characters) counts as 1, i.e. for "004100420043" (= "ABC") <length>= 3.

<mem1>(str)

Memory to be used when listing, reading and deleting messages:

“SM“	SIM message storage
“ME“	UE message storage
“MT“	Same as "ME" storage
“SR“	Status report storage Received status reports are not stored by the module. Therefore, AT+CMGR, AT+CMGL, AT^SMGR, AT^SMGL commands will show only status reports previously stored to the "SR" memory.

<mem2>(str)

Memory to be used when writing and sending messages:

“SM“	SIM message storage
“ME“	UE message storage
“MT“	Same as "ME" storage
“SR“	Status report storage

<mem3>(str)

Received messages will be placed in this memory storage if routing to TE is not set. See command AT+CNMI with parameter <mt>=2.

“SM“	SIM message storage
“ME“	UE message storage
“MT“	Same as "ME" storage
“SR“	Status report storage

<mid>(num)

Message Identifier

3GPP TS 23.041 [39] CBM Message Identifier in integer format

<mn>(num)

Message Number

3GPP TS 23.040 [38] TP-Message-Number in integer format

<mr>(num)

Message Reference

3GPP TS 23.040 [38] TP-Message-Reference in integer format

<oa>(str)(+CSCS)

Originating Address

3GPP TS 23.040 [38] TP-Originating-Address Address-Value field in string format; BCD numbers (or GSM default alphabet characters) are converted into characters; type of address given by <tooa>

<page>(num)

Page Parameter

3GPP TS 23.041 [39] CBM Page Parameter bits 4-7 in integer format

<pages>(num)

Page Parameter

3GPP TS 23.041 [39] CBM Page Parameter bits 0-3 in integer format

<pdu>(num)

In the case of SMS: 3GPP TS 24.011 [41] SC address followed by 3GPP TS 23.040 [38] TPDU in hexadecimal format: UE converts each octet of TP data unit into hexadecimal numbers containing two IRA characters (e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65)). In the case of CBS: <ra> 3GPP TS 23.040 [38] TP-Recipient-Address Ad-dress-Value field in string format; BCD numbers (or GSM default alphabet characters) are converted into characters; type of address given by <tora>

<ra>(str)(+CSCS)

Recipient Address

3GPP TS 23.040 [38] TP-Recipient-Address Address-Value field in string format; BCD numbers (or GSM default alphabet characters) are converted to characters of the currently selected TE character set (refer to command AT+CSCS.); type of address given by <tora>

<sca>(str)(+CSCS)

Service Center Address

3GPP TS 24.011 [41] RP SC address Address-Value field in string format; BCD numbers (or GSM default alphabet characters) are converted to characters of the currently selected TE character set (refer to command AT+CSCS); type of address given by <tosca>

<scts>(num)

Service Centre Time Stamp

3GPP TS 23.040 [38] TP-Service-Centre-Time-Stamp in time-string format (refer <dt>)

<sn>(num)

Serial Number

3GPP TS 23.041 [39] CBM Serial Number in integer format

<st>(num)

Status

3GPP TS 23.040 [38] TP-Status in integer format for Status Report

0...255

<stat>(str)

Message status

3GPP 27.005 Interface of SMS and CB. Indicates the status of message in memory.

Description	text mode (<mode>=1)	PDU mode (<mode>=0)	Default
Received unread messages	"REC UNREAD"	0	for SMS reading commands
Received read messages	"REC READ"	1	
Stored unsent messages	"STO UNSENT"	2	for SMS writing commands
Stored sent messages	"STO SENT"	3	
All messages	"ALL"	4	

<toda>(num)

Type of Destination Address

3GPP TS 24.011 [41] TP-Destination-Address Type-of-Address octet in integer format (when first character of <da> is + (IRA 43) default is 145, otherwise default is 129)

0...255

<tooa>(num)

Type of Originating Address

3GPP TS 24.011 [41] TP-Originating-Address Type-of-Address octet in integer format (default refer <toda>)

<tora>(num)

Type of Recipient Address

3GPP TS 24.011 [41] TP-Recipient-Address Type-of-Address octet in integer format (default refer <toda>)

<tosca>(num)

Type of Service Center Address

3GPP TS 24.011 [41] RP SC address Type-of-Address octet in integer format (default refer <toda>)

10.2 AT+CMGC Send an SMS command

Syntax

Test Command

AT+CMGC=?

Response(s)

OK

Write Command

If text mode (see AT+CMGF=1)

AT+CMGC=<fo>, <ct>[, <pid>[, <mn>[, <da>[, <toda>]]]]<CR> Text can be entered <CTRL-Z>/<ESC>

Response(s)

+CMGC: <mr>[, <scts>]
If sending fails
ERROR
+CMS ERROR: <err>

Write Command

If PDU mode (see AT+CMGF=0)

AT+CMGC=<length><CR> PDU can be entered <CTRL-Z>/<ESC>

Response(s)

+CMGC: <mr>[, <ackpdu>]
OK
ERROR
+CMS ERROR: <err>

PIN	MDM	APP	✈	Last
+	+	+	-	-

Reference(s)

3GPP TS 27.005 [48]

Note

- After invoking the commands AT+CMGW, AT+CMGS or AT+CMGC it is necessary to wait for the prompt ">" before entering text or PDU.

10.3 AT+CMGD Delete short message

The write command deletes a short message from the preferred message storage <mem1> location <index>.

Syntax

Test Command

AT+CMGD=?

Response(s)

+CMGD: (list of used <index>s)
OK

Write Command

AT+CMGD=<index>

Response(s)

OK
ERROR
+CMS ERROR: <err>

PIN	MDM	APP	✈	Last
+	+	+	+	-

Reference(s)

3GPP TS 27.005 [48]

Notes

- If there is no short message stored at the selected index, the response is OK too.
- Users should be aware that error will occur when using this AT command quickly after SIM PIN authentication due to the fact the SIM data may not yet be accessible.

10.4 AT+CMGF Select SMS message format

The AT+CMGF command specifies the input and output format of the short messages.

Syntax

Test Command

AT+CMGF=?

Response(s)

+CMGF: (list of supported<mode>s)
OK

Read Command

AT+CMGF?

Response(s)

+CMGF: <mode>
OK

Write Command

AT+CMGF=<mode>

Response(s)

OK

PIN	MDM	APP	✈	Last
+	+	+	+	-

Reference(s)

3GPP TS 27.005 [48]

Parameter Description

<mode>(num)(&V)(&W)	
[0](&F)	PDU mode
1	Text mode

10.5 AT+CMGL List SMS messages from preferred store

The write command returns messages with status value <stat> from message storage <mem1> to the TE. If the status of the message is 'received unread', the status in the storage changes to 'received read'.
The execute command is the same as the write command with the given default for <stat>.

Syntax

Test Command

AT+CMGL=?

Response(s)

+CMGL: (list of supported <stat>s)
OK

Exec Command

AT+CMGL

Response(s)

+CMGL: (see write command for default of <stat>)
OK

Write Command

AT+CMGL=<stat>

Response(s)

Output if text mode (AT+CMGF=1) and command successful:
For SMS- SUBMITs and/or SMS-DELIVERs
+CMGL: <index>, <stat>, <oa>/<da>, , [<scts>][, <tooa>/<toda>, <length>]
<data>
[...]
OK

For SMS-Commands
+CMGL: <index>, <stat>, <fo>, <ct>
[...]
OK

Output if PDU mode AT+CMGF=0 and command successful:
For SMS-SUBMITs and/or SMS-DELIVERs
+CMGL: <index>, <stat>, , <length>
<pdu>
[...]
OK

If error is related to ME functionality
ERROR
+CMS ERROR: <err>

PIN	MDM	APP	✈	Last
+	+	+	+	-

Reference(s)

3GPP TS 27.005 [48]

Notes

- The selected <mem1> can contain different types of SMs (e.g. SMS-DELIVERs, SMS-SUBMITs and SMS-COMMANDs), the response may be a mix of the responses of different SM types. TE application can recognize the response format by examining the third response parameter.
- Users should be aware that error will occur when using this AT command quickly after SIM PIN authentication due to the fact the SIM data may not yet be accessible.
- Status reports are not stored by the module and therefore are not displayed by AT+CMGR and AT+CMGL commands.

10.6 AT+CMGR Read SMS messages

The write command returns SMS message with location value <index> from message storage <mem1> to the TE. If status of the message is 'received unread', status in the storage changes to 'received read'.

Syntax

Test Command

AT+CMGR=?

Response(s)

OK

Write Command

AT+CMGR=<index>

Response(s)

Output if text mode (AT+CMGF=1) and command successful:
For SMS-DELIVER
+CMGR: <stat>, <oa>, , <scts>[, <tooa>, <fo>, <pid>, <dcs>, <sca>, <tosca>, <length>]
<data>
[...]
OK

For SMS-SUBMIT
+CMGR: <stat>, <da>, [, <toda>, <fo>, <pid>, <dcs>, [<vp>], <sca>, <tosca>, <length>]
<data>
[...]
OK

For SMS-Commands
+CMGR: <stat>, <fo>, <ct>[, <pid>[<mn>], [<da>], [<toda>], <length>]
<data>
[...]
OK

Output if PDU mode (AT+CMGF=0) and command successful:
For SMS-SUBMITs and/or SMS-DELIVERs
+CMGR: <stat>, , <length>
<pdu>
[...]
OK
ERROR
+CMS ERROR: <err>

PIN	MDM	APP	✈	Last
+	+	+	+	-

Reference(s)

3GPP TS 27.005 [48]

Notes

- If AT+CMGR is used to read an empty record the response is: OK.
- If AT+CMGR is used to read a non-existent record index the response is: "+CMS ERROR: 321" (invalid memory index).
- Users should be aware that error will occur when using this AT command quickly after SIM PIN authentication due to the fact the SIM data may not yet be accessible.
- Status reports are not stored by the module and therefore are not displayed by AT+CMGR and AT+CMGL commands.

10.7 AT+CMGS Send Short Message

The write command transmits a short message from TE to network (SMS-SUBMIT).
After invoking the write command wait for the prompt ">" and then start to write the message. To send the message simply enter <CTRL-Z>.
To abort sending use <ESC>. Abortion is acknowledged with "OK", though the message will not be sent.
The message reference <mr> is returned to the TE on successful message delivery. The value can be used to identify the message in a delivery status report provided as an unsolicited result code.

Syntax

Test Command

AT+CMGS=?

Response(s)

OK

Write Command

If text mode (see AT+CMGF=1)

AT+CMGS=<da>[, <toda>]<CR> Text can be entered. <CTRL-Z>/<ESC>

Response(s)

+CMGS: <mr>[, <scts>]
OK
ERROR
+CMS ERROR: <err>

Write Command

If PDU mode (see AT+CMGF=0)

AT+CMGS=<length><CR> PDU can be entered. <CTRL-Z>/<ESC>

Response(s)

+CMGS: <mr>[, <ackpdu>]
OK
ERROR
+CMS ERROR: <err>

PIN	MDM	APP	✈	Last
+	+	+	-	-

Reference(s)

3GPP TS 27.005 [48]

Notes

- Note that some providers do not recognize an @ symbol used in a short message. A widely used alternative is typing "*" as defined in 3GPP TS 23.040 [38].
- Message Length in Text Mode:
  The maximum length of a short message depends on the used coding scheme: It is 160 characters if the 7 bit GSM coding scheme is used, and 140 characters according to the 8 bit GSM coding scheme.

10.8 AT+CMGW Write Short Messages to Memory

The execute and write commands transmit a short message (either SMS-DELIVER or SMS-SUBMIT) from TE to memory storage <mem2>. Memory location <index> of the stored message is returned. Message status will be set to 'stored unsent' unless otherwise given in parameter <stat>.
After invoking the execute or write command wait for the prompt ">" and then start to write the message. To save the message simply enter <CTRL-Z>.
To abort writing use <ESC>. Abortion is acknowledged with "OK", though the message will not be saved.

Syntax

Test Command

AT+CMGW=?

Response(s)

OK

Exec Command

If text mode (see AT+CMGF=1):

AT+CMGW

Response(s)

<CR> Text can be entered. <CTRL-Z>/<ESC>
+CMGW: <index>
OK
ERROR
+CMS ERROR: <err>

Write Command

If text mode (see AT+CMGF=1):

AT+CMGW=<oa>/<da>[, [<tooa>/<toda>][, <stat>]]<CR> Text can be entered. <CTRL-Z>/<ESC>

Response(s)

+CMGW: <index>
OK
ERROR
+CMS ERROR: <err>

Write Command

If PDU mode (see AT+CMGF=0):

AT+CMGW=<length>[, <stat>]<CR> PDU can be entered. <CTRL-Z>/<ESC>

Response(s)

+CMGW: <index>
OK
If writing fails see notes below.

PIN	MDM	APP	✈	Last
+	+	+	+	-

Reference(s)

3GPP TS 27.005 [48]

Notes

- Note that some providers do not recognize an @ symbol used in a short message. A widely used alternative is typing "*" as defined in 3GPP TS 23.040 [38].
- Message Length in Text Mode:
  The maximum length of a short message depends on the used coding scheme: It is 160 characters if the 7 bit GSM coding scheme is used, and 140 characters according to the 8 bit GSM coding scheme.

10.9 AT+CMSS Send short messages from storage

The write command sends message with location value <index> from message storage <mem2> to the network (SMS-SUBMIT or SMS-COMMAND).
If new recipient address <da> is given for SMS-SUBMIT, it shall be used instead of the one stored with the message. Reference value <mr> is returned to the TE on successful message delivery. Value can be used to identify message upon unsolicited delivery status report result code.
If the optional parameter <da> is given, the old status of the short message at <index> remains unchanged (see <stat>).

Syntax

Test Command

AT+CMSS=?

Response(s)

OK

Write Command

If text mode (AT+CMGF=1):

AT+CMSS=<index>[, <da>[, <toda>]]

Response(s)

+CMSS: <mr>[, <scts>]
OK
If sending fails
ERROR
+CMS ERROR: <err>

Write Command

If PDU mode (AT+CMGF=0):

AT+CMSS=<index>[, <da>[, <toda>]]

Response(s)

+CMSS: <mr>[, <ackpdu>]
OK
ERROR
+CMS ERROR: <err>

PIN	MDM	APP	✈	Last
+	+	+	-	-

Reference(s)

3GPP TS 27.005 [48]

10.10 AT+CNMA New Message Acknowledgement to UE/TE

The AT+CNMA write and execute commands confirm successful receipt of a new message (SMS-DELIVER or SMS-STATUS-REPORT) routed directly to the TE. If the PLS8-US-R4 does not receive acknowledgement within required time (network timeout), it sends an "RP-ERROR" message to the network. The UE will automatically disable routing to the TE by setting both <mt> and <ds> values of AT+CNMI to zero.

Please see AT^SCFG subcommand "Sms/AutoAck", parameter <SmsAcknl>, for options of automatically acknowledging incoming short messages rather than using AT+CNMA.

Syntax

Test Command

```
AT+CNMA=?
```

Response(s)

```
+CNMA: (list of supported <n>s)
OK
```

Exec Command

```
AT+CNMA
```

Response(s)

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

Write Command

```
AT+CNMA=<n>
```

Response(s)

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

PIN	MDM	APP	✈	Last
+	+	+	-	-

Reference(s)

3GPP TS 27.005 [48]

Parameter Description

<n>(num)

Parameter required only for PDU mode.

0	Command operates similarly as in text mode.
1	Send positive (RP-ACK) acknowledgement to the network. Accepted only in PDU mode.
2	Send negative (RP-ERROR) acknowledgement to the network. Accepted only in PDU mode.

Note

- Execute and write command shall only be used when AT+CSMS parameter <service> equals 1 (= phase 2+) and an appropriate URC has been issued by the module, i.e.:
  <+CMT> for <mt>=2 incoming message classes 0,1,3 and none;
  <+CMT> for <mt>=3 incoming message classes 0 and 3;
  <+CDS> for <ds>=1.

10.11 AT+CNMI SMS Event Reporting Configuration

AT+CNMI controls details of the SMS related URC presentation. It selects the procedure how the receipt of a new SMS from the network is indicated to the TE when TE is active.
The rules <mt>=2 and <mt>=3 for storing received messages are possible only if phase 2+ compatibility is activated with AT+CSMS=1. The parameter <ds>=1 is also only available in phase 2+.

Syntax

Test Command

AT+CNMI=?

Response(s)

+CNMI: (list of supported<mode>s), (list of supported <mt>s), (list of supported <bm>s), (list of supported <ds>s), (list of supported <bfr>s)
OK

Read Command

AT+CNMI?

Response(s)

+CNMI: <mode>, <mt>, <bm>, <ds>, <bfr>
OK

Write Command

AT+CNMI=[[<mode>][[, <mt>][[, <bm>][[, <ds>][[, <bfr>]]]]]]

Response(s)

OK
ERROR
+CMS ERROR: <err>

PIN	MDM	APP	✈	Last
+	+	+	+	-

Reference(s)

3GPP TS 27.005 [48]

Unsolicited Result Codes

URC 1

<mt>=1,2 or 3 - indication only (text and PDU mode):

+CMTI: <mem3>, <index>

Indicates that new message has been received

URC 2

<mt>=1,2 or 3 - directly routed message (PDU mode enabled):

+CMT: <length><CR><LF><pdu>

Indicates that new message has been received

URC 3

<mt>=1,2 or 3 - directly routed message (text mode enabled):

+CMT: <oa>, , <scts>[, <tooa>, <fo>, <pid>, <dcs>, <sca>, <tosca>, <length>]<CR><LF><data>

Indicates that new message has been received

URC 4

<bm>=2 (PDU mode enabled):

+CBM: <length><CR><LF><pdu>

Indicates that new cell broadcast message has been received

URC 5

<bm>=2 (text mode enabled):

+CBM: <sn>, <mid>, <dcs>, <page>, <pages><CR><LF><data>

Indicates that new cell broadcast message has been received

URC 6

<ds>=1 (PDU mode enabled):

+CDS: <length><CR><LF><pdu>

Indicates that new SMS status report has been received

URC 7

<ds>=1 (text mode enabled):

+CDS: <fo>, <mr>[, <ra>][, <tora>], <scts>, <dt>, <st>

Indicates that new SMS status report has been received

Parameter Description

<mode>(num)(&V)(&W)	
0(&F)(D)	SMS related URCs are always buffered in the UE. If the buffer is full, the oldest indications are discarded and replaced with newly received indications.
1	SMS related URCs are forwarded directly to the TE. However, if this is not possible because UE-TE link is reserved, e.g. during a data call, these URCs are discarded.
2	SMS related URCs are forwarded directly to the TE. However, if this is not possible because UE-TE link is reserved these URCs are buffered and flushed to the TE afterwards. Additionally, while UE-TE link is reserved, buffered URCs can be signaled to the TE by activating the RING line, according to parameters AT^SCFG "URC/Ringline" <urcRinglineCfg> and AT^SCFG "URC/Ringline/ActiveTime" <urcRinglineDuration>.

<mt>(num)(&V)(&W)	
Rules for storing received short messages depend on the relevant data coding method (refer to 3GPP TS 23.038 [37]), preferred memory storage setting (AT+CPMS) and this value.	
0(&F)(D)	No SMS-DELIVER indications are routed to the TE.
1	Class 0 SMS-DELIVERs are routed directly to the TE via URC. For all other messages the following applies: If SMS-DELIVER is stored in UE, indication of the memory location is routed to the TE via URC.
2	SMS-DELIVERs, except class 2 messages and messages in the message waiting indication group (store message) are routed directly to the TE via URC. Class 2 messages and messages in the message waiting indication group (store message) result in indication as defined for <mt>=1
3	Class 0 and 3 SMS-DELIVERs are routed directly to the TE via URCs defined in <mt>=2. Messages of other data coding schemes result in indication as defined in <mt>=1.

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

Rules for storing received CBMs depend on the relevant data coding method (refer to 3GPP TS 23.038 [37]), the setting of Select CBM Types (AT+CSCB) and this value:

0(&F)(D)	No CBM indications are routed to the TE.
2	New CBMs are routed directly to the TE via URC.

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

0(&F)(D)	No SMS-STATUS-REPORTs are routed to the TE. Also see notes.
1	SMS-STATUS-REPORTs are routed to the TE via URC.

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

1(&F)(D)	UE's buffer of SMS related URCs is cleared when <mode> changes from 0 to 1, 2.

<index>(num)

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

Notes

- With <mt>=2,3 and <ds>=1 messages routed directly to the TE (either short messages or status reports) have to be acknowledged with AT+CNMA. To do this, GSM Phase 2+ has to be enabled (see AT+CSMS).
- If Phase 2+ is enabled and either a short message or a status report is not acknowledged within the required time, then <mt> and <ds> will be set to zero. See AT+CNMA for further detail.
- Received status reports are not stored by the module. Therefore, AT+CMGR, AT+CMGL, AT^SMGR, AT^SMGL commands will show only status reports previously stored to the "SR" memory.

10.12 AT+CPMS Preferred SMS message storage

The AT+CPMS write command selects memory storages <mem1>,<mem2>, <mem3> to be used for reading, writing, etc.
The AT+CPMS test command lists the supported memory storages.
The AT+CPMS read command indicates the currently selected memory storages incl. the numbers of used and total entries.

Syntax

Test Command

```
AT+CPMS=?
```

Response(s)

```
+CPMS: (list of supported <mem1>s), (list of supported <mem2>s), (list of supported <mem3>s)
OK
```

Read Command

```
AT+CPMS?
```

Response(s)

```
+CPMS: <mem1>, <used1>, <total1>, <mem2>, <used2>, <total2>, <mem3>, <used3>, <total3>
OK
ERROR
+CMS ERROR: <err>
```

Write Command

```
AT+CPMS=<mem1>[, <mem2>[, <mem3>]]
```

Response(s)

```
+CPMS: <used1>, <total1>, <used2>, <total2>, <used3>, <total3>
OK
ERROR
+CMS ERROR: <err>
```

PIN	MDM	APP	✈	Last
+	+	+	+	-

Reference(s)

3GPP TS 27.005 [48]

Parameter Description

<used1>(num)

Number of messages currently in <mem1>

<used2>(num)

Number of messages currently in <mem2>

<used3>(num)

Number of messages currently in <mem3>

<total1>(num)

Number of messages storable in <mem1>

<total2>(num)

Number of messages storable in <mem2>

<total3>(num)

Number of messages storable in <mem3>

Notes

- The Mobile Equipment storage "ME" offers space for 255 short messages, see <mem1>.
- The <mem1>, <mem2> and <mem3> parameters will be stored in non-volatile memory.
- Incoming Class 1 short messages (ME specific) will be preferably stored to "ME" and may be transferred to the "SM" storage if "ME" is used up.
  Incoming Class 2 messages (SIM specific) will be stored to the SIM card only, no matter whether or not there is free "ME" space. For more information regarding SIM and ME specific message classes refer to parameter <dcs> and the following specification: 3GPP TS 23.038 [37].
- While <mem3> equals "SM" and <mem1> equals "ME" it is possible that, after deleting short messages from "ME", the freed space on "ME" is reclaimed for new incoming short messages, when there is no space left on the "SM" storage. As it is often the clients concern to have received short messages stored only to the SIM card, inconsistent settings should be generally avoided. This can be achieved simply by using the same memory for all parameters.
- Users should be aware that error will occur when using this AT command quickly after SIM PIN authentication due to the fact the SIM data may not yet be accessible.

10.13 AT+CPNER Notification event reporting

The AT command handles reporting of primary notification events when received from the network . Primary notification events are used for public warning systems like ETWS (Earthquake and Tsunami Warning Systems). Duplicate primary notifications will be discarded by the UE independant of <reporting>.
Read command returns the current settings.
Test command returns supported values as a compound value.

Syntax

Test Command

```
AT+CPNER=?
```

Response(s)

```
+CPNER: (list of supported<reporting>s)
```

Read Command

```
AT+CPNER?
```

Response(s)

```
+CPNER: <reporting>
OK
```

Write Command

```
AT+CPNER=<reporting>
```

Response(s)

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

PIN	MDM	APP	✈	Last
-	+	+	-	-

Reference(s)

3GPP TS 27.005 [48]

Unsolicited Result Codes

URC 1

```
+CPNERU: <message>, <number>, <warning>
```

URC 2

```
^SSNERU: <serviceId>, <serialNr>, <scope>
```

Parameter Description

<reporting>(num)

Controlling reporting of primary notification events

0(P)	Disable primary notification events.
1	Enable reporting of primary notification events without security information, unsolicited result code "+CPNERU".

<message>(num)

The parameter contains the message identifier (2 bytes) of the primary notification in hexadecimal characters.

<number>(num)

The parameter contains the serial number (2 bytes) of the primary notification in hexadecimal characters.

<warning>(num)

The parameter contains the warning type (2 bytes) of the primary notification in hexadecimal characters.

<serviceId>(num)

The parameter contains the service identifier (2 bytes) in hexadecimal characters.

<serialNr>(num)

The parameter contains the serial number (2 bytes) in hexadecimal characters.

<scope>(num)

The parameter contains the scope type (2 bytes) in hexadecimal characters.

0(P)	Immediate Cell.
1	Public Land Mobile Network.
2	Location area defined by Location Area Code.
3	Normal Cell.

Note

- The notification is considered a duplicate of the previous if it has equal <message> and <number> and arrives from the same PLMN. A primary notification message stored to detect duplication is cleared automatically after three hours of not receiving any message.

10.14 AT+CSCA SMS Service Center Address

Write command updates the SMSC address, through which mobile originated SMs are transmitted. In text mode, setting is used by send and write commands. In PDU mode, setting is used by the same commands, but only when the length of the SMSC address coded into the <pdu> parameter equals zero.

Syntax

Test Command

```
AT+CSCA=?
```

Response(s)

```
OK
```

Read Command

```
AT+CSCA?
```

Response(s)

```
+CSCA: <sca>, <tosca>
OK
```

Write Command

```
AT+CSCA=<sca>[, <tosca>]
```

Response(s)

```
OK
```

PIN	MDM	APP	✈	Last
+	+	+	+	-

Reference(s)

3GPP TS 27.005 [48]

Notes

- The SMS service center address should be entered as specified by the service provider.
- An empty string ("") for <sca> is not accepted and denied with error.

10.15 AT+CSCB Select Cell Broadcast Message Indication

The test command returns the supported <operation>s as a compound value.
The read command displays the accepted message types.
Depending on the <operation> parameter, the write command adds or deletes the message types accepted by the ME.

Syntax

Test Command

```
AT+CSCB=?
```

Response(s)

```
+CSCB: (list of supported <operation>s)
OK
ERROR
+CMS ERROR: <err>
```

Read Command

```
AT+CSCB?
```

Response(s)

```
+CSCB: <operation>, <mids>, <dcss>
OK
ERROR
+CMS ERROR: <err>
```

Write Command

```
AT+CSCB=[<operation>[, <mids>[, <dcss>]]]
```

Response(s)

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

PIN	MDM	APP	✈	Last
+	+	+	+	-

Reference(s)

3GPP TS 27.005 [48]

Parameter Description

<operation>(num)

Add/delete operation

0(&F)(P)	Add new message types defined in <mids> to the list of accepted message types by ME and replace types defined in <dcss>. In case of using this operation code without parameters default (0-65535) range will be added to the list of <mids>.
1	Delete message types defined in <mids> from the list of accepted message types by ME and replace types defined in <dcss>. In case of using this operation code without parameters all <mids>s will be deleted. (for more see notes)

<mids>(str)(NV)

Cell Broadcast Message ID specification

All different possible combinations of CBM message identifiers; e.g. "0,1,5,320-478,922". Maximum length of the input string in the AT+CSCB write command is 50 characters (including ',' as separator and '-' in ranges).

""(D)

<dcss>(str)

CBM data coding scheme specification

All different possible combinations of CBM data coding schemes (e.g. "0-3,5"). Maximum length of the string is 50 characters (including ',' as separator and '-' in ranges). A given <dcss> replaces any former value and is used for consecutive requests.

""(&F)(P)

Default is empty string and if it is used all CBMs are received independent of their dcss.

Note

- The <operation> parameter shown in the AT+CSCB read command response retains the value last used in the write command. This way, the read command response always reflects the last action done: 0 means that the last action was adding new channel(s), 1 means that the last action was deleting channel(s).

10.16 AT+CSDH Show SMS text mode parameters

The write command sets whether or not detailed header information is shown in text mode result codes.

Syntax

Test Command
AT+CSDH=?
Response(s)
+CSDH: (list of supported <show>s) OK
Read Command
AT+CSDH?
Response(s)
+CSDH:<show> OK
Write Command
AT+CSDH=<show>
Response(s)
OK

PIN	MDM	APP	✈	Last
+	+	+	+	-

Reference(s)

3GPP TS 27.005 [48]

Parameter Description

<show>(num)(&W)	
0(&F)(D)	Do not show header values defined in commands AT+CSCA and AT+CSMP (<sca>, <tosca>,<fo>,<vp>, <pid> and <dcs>) nor <length>, <toda> or <tooa> in "+CMT", AT+CMGL, AT+CMGR result codes for SMS-DELIVERs and SMS-SUBMITs in text mode; for SMS-COMMANDs in +CMGR result code, do not show <pid>,<mn>,<da>, <toda>, <length>
1	Show the values in result codes

10.17 AT+CSMP Set SMS Text Mode Parameters

AT+CSMP controls additional parameters needed when an SMS is sent to the network or placed in a storage if text format message mode is selected.
It is possible to set the validity period starting from the time when the short message is received by the SMSC (<vp> is in the range 0... 255) or define an absolute time for validity period termination (<vp> is a string). The format of <vp> is given by <fo>. The enhanced validity period format is given as hexadecimal coded string (e.g. <pdu>) with quotes.

Syntax

Test Command

```
AT+CSMP=?
```

Response(s)

```
OK
```

Read Command

```
AT+CSMP?
```

Response(s)

```
+CSMP:<fo>, <vp>/ <scts>, <pid>, <dcs>
OK
```

Write Command

```
AT+CSMP=[<fo>[, <vp>/<scts>[, <pid>[, <dcs>]]]]
```

Response(s)

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

PIN	MDM	APP	✈	Last
+	+	+	+	-

Reference(s)

3GPP TS 27.005 [48]

Parameter Description

<fo>(num)

First Octet

Depending on the command or result code: First octet of 3GPP TS 23.040 [38] SMS-DELIVER, SMS-SUBMIT, SMS-STATUS-REPORT, or SMS-COMMAND in integer format. If a valid value has been entered once, parameter can be omitted.

0...255

<vp>(num)

Validity Period

Depending on SMS-SUBMIT <fo> setting: 3GPP TS 23.040 [38] TP-Validity-Period either in integer format or in time-string format (refer <dt>).

0...255

<pid>(num)

Protocol Identifier

3GPP TS 23.040 [38] TP-Protocol-Identifier in integer format.

0(&F)...255

<dcs>(num)

Data Coding Scheme

3GPP TS 23.038 [37] SMS Data Coding Scheme, or Cell Broadcast Data Coding Scheme in integer format.

0(&F)...247

Notes

- When storing a SMS DELIVER from the TE to the preferred memory storage in text mode (using the AT+CMGW write command), <vp> field can be used for <scts>.
- AT+CSMP stores parameters <dcs> and <pid> in UE's non-volatile memory.

10.18 AT+CSMS Select Message Service

Syntax

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

Read Command
AT+CSMS?
Response(s)
+CSMS: <service>, <mt>, <mo>, <bm> OK

Write Command
AT+CSMS=<service>
Response(s)
+CSMS: <mt>, <mo>, <bm> OK ERROR +CMS ERROR: <err>

PIN	MDM	APP	✈	Last
+	+	+	+	-

Reference(s)
3GPP TS 27.005 [48]

Parameter Description

<service>(num)(&V)(&W)	
0(&F)	3GPP TS 23.040 [38] and 3GPP TS 23.041 [39] (the syntax of SMS AT commands is compatible with 3GPP TS 27.005 [48] Phase 2 version 4.7.0; Phase 2+ features which do not require new command syntax may be supported, e.g. correct routing of messages with new Phase 2+ data coding schemes)
1	3GPP TS 23.040 [38] and 3GPP TS 23.041 [39] (the syntax of SMS AT commands is compatible with 3GPP TS 27.005 [48] Phase 2+ version; the requirement of <service> setting 1 is mentioned under corresponding command descriptions).

<mt>(num)(&V)	
Mobile Terminated Messages:	
0	Type not supported
1	Type supported

<mo>(num)(&V)	
Mobile Originated Messages:	
0	Type not supported
1	Type supported

<bm>(num)(&V)

Broadcast Type Messages:	
0	Type not supported
1	Type supported

Note

- Phase 2+ (<service>=1) must be set before acknowledging incoming short messages with AT+CNMA is possible. Acknowledgements are required for directly routed messages delivered using "+CMT" and "+CDS" URCs. Direct routing is used for certain message classes when <mt>=2, <mt>=3 or <ds>=1.

10.19 AT^SMGL List Short Messages from preferred store without setting status to REC READ

The write command allows to select a status type and lists, from the message storage <mem1>, all messages that currently have the specified <stat>. The major difference over the standard command AT+CMGL is that the status of the listed messages remains u n c h a n g e d (unread remains unread).
The execute command is the same as the write command, but uses the given default of <stat>.

Syntax

Test Command

AT^SMGL=?

Response(s)

same as AT+CMGL

Exec Command

AT^SMGL

Response(s)

^SMGL: (For default values of <stat>, see "Section 10.1, SMS parameters.)
OK

Write Command

AT^SMGL=<stat>

Response(s)

same as AT+CMGL

PIN	MDM	APP	✈	Last
+	+	+	+	-

Notes

- The selected <mem1> can contain different types of SMs (e.g. SMS-DELIVERs, SMS-SUBMITs and SMS-COMMANDs), the response may be a mix of the responses of different SM types. TE application can recognize the response format by examining the third response parameter.
- Users should be aware that when using this AT command quickly after SIM PIN authentication the SIM data may not yet be accessible, resulting in an error or a short delay before the requested AT command response is returned.

10.20 AT^SMGR Read short message without setting status to REC READ

The AT^SMGR command is a proprietary command which has the same syntax as AT+CMGR. The only functional difference is that the status "REC UNREAD" of a short message is not overwritten to "REC READ".

Syntax

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

Write Command
AT^SMGR=<index>
Response(s)
see AT+CMGR

PIN	MDM	APP	✈	Last
+	+	+	+	-

Note

- Users should be aware that when using this AT command quickly after SIM PIN authentication the SIM data may not yet be accessible, resulting in a short delay before the requested AT command response is returned.

10.21 AT^SSDA Set SMS Display Availability

AT^SSDA determines whether to display an incoming Class 0 short message directly to the user or to store it automatically in the SMS memory. This means, for Class 0 short messages, AT^SSDA overrides the AT+CNMI <mt> settings.
For all other short message classes AT^SSDA is not effective, i.e. they will be indicated as specified with AT+CNMI.

In case of Class 0 SMS, the <da> setting modifies the AT+CNMI functionality for <mt> as follows:

- If AT^SSDA=0:
  The UE handles Class 0 short messages as though there was no message class: SMS-DELIVER is stored in the UE and indication of the memory location is routed to the TE via URC. This approach is compliant with 3GPP TS 23.038 [37].
- If AT^SSDA=1:
  Class 0 SMS-DELIVERs are routed directly to the TE via URC.

Syntax

Test Command
AT^SSDA=?
Response(s)
^SSDA: (list of supported <da>s) OK

Read Command
AT^SSDA?
Response(s)
^SSDA: <da> OK

Write Command
AT^SSDA=<da>
Response(s)
OK

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<da>(num)(NV)	
Display Availability	
0	Application is not able to display incoming short message
1(&F)(D)	Application is able to display incoming short message

11. Internet Service Commands

PLS8-US-R4 has an embedded TCP/IP stack that is driven by AT commands and enables the host application to easily access the Internet. The advantage of this solution is that it eliminates the need for the application manufacturer to implement own TCP/IP and PPP stacks, thus minimizing cost and time to integrate Internet connectivity into a new or existing host application. This chapter is a reference guide to all the AT commands and responses defined for use with the TCP/IP stack.

The embedded TCP/IP stack provides the following services:

1. Socket Services:
   - TCP Client in Non-Transparent or Transparent Mode
   - UDP Client in Non-Transparent or Transparent Mode
   - Transparent TCP Listener
   - Standard TCP Listener in Non-Transparent or Transparent Mode
   - Non-Transparent UDP Endpoint
2. FTP Client
3. HTTP Client
4. SMTP Client

Step-by-step overview of how to configure and use TCP/IP communications with PLS8-US-R4:

- Use AT+CGDCONT to create an Internet connection profile (= bearer). The PDP context IDs set with <cid> will later be used as "conId" parameter when creating a service profile with AT^SISS. Optionally, you can specify DNS preferences using AT^SICS. To activate or deactivate the bearer use the AT^SICA command.
- Use AT^SISS to create service profile(s), each identified by the <srvProfileId>. The service profile specifies the type of Internet service to use, e.g., Socket, FTP, HTTP, SMTP.
- Once the bearer has been established with AT^SICA, and the service profile is created with AT^SISS, an Internet session can be opened by entering the AT^SISO write command and the desired <srvProfileId>. A URC indicates how to proceed. The "^SIS" URC with <urcCause> "5" shows that an opened listener or endpoint is ready. The "^SISW" URC means that data can be sent. The "^SISR" URC means that received data are available for reading. Error or event information is reported by the "^SIS" URC with <urcCause> "0".
- The next steps differ depending on the service type and the transfer mode (Non-Transparent or Transparent).
- Once a service is opened, the AT^SISI command shall be used to monitor the progress of the session. The command reports the service state of the used service profile and indicates the number of bytes sent and received, and, in the case of sending, the number of bytes acknowledged or unacknowledged at TCP layer.
- If an error occurs during a session you can enter the AT^SISE command and the <srvProfileId> to identify the reason. This is especially important in polling mode.
- Finally, to close an opened service, enter the AT^SISC write command and the <srvProfileId>. Then you can deactivate the bearer using AT^SICA.
  AT^SISH disconnects a remote client from a Transparent TCP Listener without closing the listener (see also below).

Transparent Mode or Non-Transparent Mode:

- *Transparent Mode* is stream-oriented, i.e. a single data stream can be sent, and another single data stream can be received. Packetizing of data is done automatically by the embedded TCP/IP stack.
  Transparent Mode is activated with AT^SIST and then indicated by the "CONNECT" result code. The mode eliminates the need for AT^SISW and AT^SISR read and write sequences.
  Transparent Mode may be used either on the Modem interface or on the dedicated Mux Channels 5 and 6. This solution requires that Multiplex Mode is enabled.
- *Non-Transparent Mode* is packet oriented, i.e. data is transferred in separate packets. Maximum packet size is 1500 bytes for TCP, 1460 bytes for UDP. To read and write data AT^SISW and AT^SISR sequences shall be used. FTP, HTTP, SMTP employ Non-Transparent Mode, for Socket services it is optional.
  To send or receive more than 1500 bytes, the read or write action shall be repeated until the data transfer has

completed. Each read or write action requires that the command response (of AT^SISR or AT^SISW) confirms that the service is ready to send or receive data. The read/write cycles can be controlled by URCs or polling. For details see below, section "URC mode and polling mode".
To end an upload data stream set the <eodFlag> in the last AT^SISW command.
Non-Transparent Mode may be used on the Modem instance or on the Application instance.

- FTP, HTTP, SMTP and UDP Endpoint employ Non-Transparent Mode.
  TCP Client, UDP client and Standard TCP Listener can employ both modes, and may even mix both modes in the same connection.

Listener services:
A listener is waiting for incoming remote client requests. PLS8-US-R4 supports two listener types: Transparent TCP Listener and Standard TCP Listener.
After opening a listener with AT^SISO no "^SISW" URC appears. Instead, the "^SIS" URC with <urcCause> "5" shows that the opened listener is ready and starts listening. Additionally, the states can be verified with AT^SISI which shows state "4" (Up - listening).
An incoming remote client request is indicated by the "^SIS" URC. For details please refer to Section 11.14, Internet Service URC, escpecially parameters <urcCause> and <urcInfoId>.

- *Transparent TCP Listener:*
  - The Transparent TCP Listener can accept 1 remote client. The connection to the remote client does not need an additional service profile, as it uses the Transparent TCP Listener instance.
  - To define a listener service profile as Transparent TCP Listener the "etx" parameter is mandatory in the address. See AT^SISS.
  - AT^SISS allows some specific options for the Transparent TCP Listener service, such as "autoconnect", "connecttimeout", "addrfilter";
  - If autoconnect is enabled an incoming remote client is indicated by the "^SIS" URC with <urcCause> "3" (Transparent) and <urcInfoId> "1" (= autoconnect enabled). The request is automatically accepted. The Listener profile instantly changes to Server mode (AT^SISO <socketState> to 4 = SERVER) and opens transparent data mode (indicated by "CONNECT" result code).
  - If autoconnect is disabled, the remote client connection request is indicated by the "^SIS" URC with <urcCause> "3" (Transparent) and <urcInfoId> "0" (= autoconnect disabled). The request can be accepted with AT^SISO or rejected with AT^SISH. In all cases the same <srvProfileId> shall be used. After accepting the client the Listener profile instantly changes to Server mode (AT^SISO <socketState> to 4 = SERVER).
    If a remote client connection request is not accepted within the configured 'connecttimeout', it will be rejected automatically, and the URC "^SIS" is sent with <urcCause> set to '4'.
  - As long as one remote client is connected all other remote client requests are rejected automatically without displaying the "^SIS" URC. The <rejCounter> in the response of the AT^SISO read command indicates such hidden rejects.
  - AT^SISH disconnects a remote client, without closing the service, allowing the Transparent TCP Listener to wait for the next remote client.
    AT^SISC both disconnects the remote client and shuts down the Transparent TCP Listener.
  - An example can be found in Section 11.14, Internet Service URC and Section 11.15.5, Transparent TCP Listener: Accepting / Rejecting Incoming Remote Client
- *Standard TCP Listener:*
  - The Standard Listener can accept several remote clients. Each incoming remote client connection request is dynamically assigned to the next free service profile indicated as <srvProfileId> within the "^SIS" URC. <urcCause> in the "^SIS" URC equals "1" (Non-Transparent). The dynamically assigned profile acts as Server (AT^SISO <socketState> equals 4 = SERVER). Its <srvProfileId> shall be used to accept the remote client with AT^SISO, or to reject it with AT^SISC. The number of acceptable remote clients depends on the number of free service profiles.
  - To transfer data it is possible to proceed with Transparent Mode using AT^SIST, or Non-Transparent Mode using AT^SISR and AT^SISW read / write sequences.
  - An example can be found in Section 11.14, Internet Service URC and Section 11.15.3, Configuring Non-Transparent Listener

Socket service used with UDP protocol
The significant differences between the TCP and UDP protocols imply that UDP sometimes requires particular procedures or even specific parameters. Details on how to handle UDP services can be found in extra notes or are included in the general parameter descriptions.
The PLS8-US-R4 offers two kinds of Socket service with UDP protocol.

- *UDP Client:* Intended for connections to a given remote host. In this case the IP address and the UDP port of the remote host are set as a fixed parameter in the service profile. The UDP Client can use Transparent Mode and Non-Transparent Mode.
- *Non-Transparent UDP Endpoint:* IP address and UDP port of the remote hosts are handled in each read (AT^SISR) and write (AT^SISW) request. This enables the host application to communicate with different remote hosts.
  See example in Section 11.15.9, UDP Scenario.

Secure connection (TLS)
All services except Listener services support server and client authentication for Transport Layer Security (TLS).

- To set TLS add "s" to the address type, such as socktcps, sockudps, ftps, https, smtps. For details see AT^SISS <srvParmTag> parameter "address".
- To create, load, delete and read customized TLS certificates use the commands AT^SBNW and AT^SBNR.
- The AT^SISS session profile parameter "secopt" specifies whether or not to check certificates received from the server against the local certificate store (if at least one local certificate is set).
- The AT^SCFG subcommand "Tcp/TLS/Version" specifies the security level.
- The used certificates can be shown in text format (issuer, serial, subject, signatureAlg, thumbprint). For this purpose it is recommended to enable the "+CIEV: "is_cert" URC, see AT^SIND.

Destination Interface for URCs
Particularly when using Non-Transparent Mode bear in mind that all URCs are, by default, generated on the Application instance (depending on AT^SSRVSET settings and Multiplex Mode). To handle AT commands and URCs on the same interface, you have two options:

- Use the Application instance.
- When working on the Modem instance you may use the AT^SCFG subcommand "URC/DstIfc" and select the Modem instance for URC output. See parameter <urcDestIfc>.

URC mode or polling mode (for non-Transparent Mode only)
The PLS8-US-R4 offers two modes of controlling a Non-Transparent Mode session opened with AT^SISO. To select the mode use the AT^SCFG command, parameter "Tcp/WithURCs" (refer to <tcpWithUrc>).

- URC mode (delivery default):
  The progress of a Non-Transparent Mode session is URC driven. The URCs notify the host whether data can be sent or received, whether data transfer has completed, whether the service can be closed or whether an error has occurred. This mechanism eliminates the need to poll the service until the necessary progress information is received.
  To enable the URC mode select: AT^SCFG="Tcp/WithURCs",on.
- Polling mode:
  In polling mode, the presentation of URCs related to the Internet Services is disabled. The host is responsible to retrieve all the status information needed for controlling the Internet session. This is done by polling, where the host application keeps sending the commands AT^SISR, AT^SISW, AT^SISI.
  To enable the polling mode select: AT^SCFG="Tcp/WithURCs",off.
  The disabled URCs are the following: "^SISR" URC, "^SISW" URC and "^SIS" URC for parameter <urcCause>=0 (Internet service events), but not for all other <urcCause>s (needed for listener or endpoint and therefore always enabled).

Address notation
Server addresses shall be provided as IPv4 addresses in standard dot format, e.g. "192.168.1.2", or as IPv6 addresses in standard colon format enclosed in square brackets, e.g. "[FE80::2]", or as server address names

resolvable by a DNS server.

Timeouts
Timeouts are not part of the Internet AT command functionality implemented in PLS8-US-R4 and, if desired, are the responsibility of the host application. It is recommended that the host application validates URCs and AT command responses and reacts adequately, for example by sending a close message or starting a timer.

Using the DCD line to detect the connection status of Internet services
With AT&C you can configure the DCD line of the used serial interface to indicate whether an Internet service is active. For Socket, HTTP the states "Up" or "Connecting" are indicated, for FTP and transparent TCP only the state "Up", for the Transparent TCP Listener service the states "Up", "Alerting", "Connected" and "Released".

11.1 AT^SICA Internet Connection Activate or Deactivate

The AT^SICA write command can be used to activate or deactivate an Internet service connection using a PDP context defined with AT+CGDCONT. To track activation errors the AT^SIND indicator "ceer" should be used.

The AT^SICA read command shows whether a connection for Internet services is active and which PDP context is used for it. If no connection is active, then the read command just returns OK.

Syntax

Test Command

```
AT^SICA=?
```

Response(s)

```
^SICA: (list of supported <state>s), (list of supported <cid>s)
OK
ERROR
+CME ERROR: <err>
```

Read Command

```
AT^SICA?
```

Response(s)

```
[^SICA: <cid>, <state>]
[^SICA: ...]
OK
ERROR
+CME ERROR: <err>
```

Write Command

```
AT^SICA=<state>, <cid>
```

Response(s)

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

PIN	MDM	APP	✈	Last
+	+	+	-	-

Parameter Description

<state>(num)

0	Deactivate(d)
1	Activate(d)

<cid>(num)

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

11.2 AT^SICS Internet Connection Settings

AT^SICS serves to specify additional settings for Internet connection specified with the AT+CGDCONT command. Currently only setup and query of DNS server addresses is supported.

Table 11.1: Applicability of AT^SICS <conParmTag> values

<conParmTag>	Mandatory or optional
"dns1"	optional
"dns2"	optional
"ipv6dns1"	optional
"ipv6dns2"	optional

Syntax

Test Command

```
AT^SICS=?
```

Response(s)

```
OK
```

Read Command

```
AT^SICS?
```

Response(s)

```
^SICS: <conProfileId>, <conParmTag>, <conParmValue>
[^SICS: ...]
OK
```

Write Command

```
AT^SICS=<conProfileId>[, <conParmTag>, <conParmValue>]
```

Response(s)

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

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<conProfileId>(num)(NV)

Internet connection profile as specified with AT+CGDCONT parameter <cid>. Invoking command only with this parameter will delete related DNS server address.

<conParmTag>(str)(NV)

Internet connection parameter.

“dns1“	Primary DNS server address (IP address in dotted-four-byte format). This value determines whether to use the DNS server addresses dynamically assigned by the network or a specific DNS server address given by the user. "dns1" = "0.0.0.0" (default) means that the connection profile uses dynamic DNS assignment. Any other address means that the Primary DNS is manually set. The default value applies automatically if no other address is set. Note that the

	AT^SICS read command only returns a manually configured IP address, while the value "0.0.0.0" is not indicated at all, no matter whether assumed by default or explicitly specified. See also note below.
“dns2“	Secondary DNS server address (IP address in dotted-four-byte format). If "dns1" = "0.0.0.0" this setting will be ignored. Otherwise this value can be used to manually configure an alternate server for the DNS1. If "dns1" is not equal "0.0.0.0" and no "dns2" address is given, then "dns2"="0.0.0.0" will be assumed automatically. The AT^SICS read command only returns a manually configured IP address, while the value "0.0.0.0" is not indicated at all, no matter whether assumed by default or explicitly specified.
“ipv6dns1“	Primary IPV6 DNS server address (IP address Each group is written as 4 hexa-decimal digits and the groups are separated by colons (:). The whole address is encapsulated by brackets ([]]. This value determines whether to use the DNS server addresses dynamically assigned by the network or a specific DNS server address given by the user. "ipv6dns1" = "" (default) means that the connection profile uses dynamic DNS assignment. Any other address means that the Primary DNS is manually set. The default value applies automatically if no other address is set. Note that the AT^SICS read command only returns a manually configured IP v6 address, while the value "" is not indicated at all, no matter whether assumed by default or explicitly specified. See also note below.
“ipv6dns2“	Secondary IPV6 DNS server address (IP address Each group is written as 4 hexadecimal digits and the groups are separated by colons (:). The whole address is encapsulated by brackets ([]]. "ipv6dns2" = "" (default) means that the connection profile uses dynamic DNS assignment. Any other address means that the secondary DNS is manually set. The default value applies automatically if no other address is set. Note that the AT^SICS read command only returns a manually configured IP v6 address, while the value "" is not indicated at all, no matter whether assumed by default or explicitly specified.

<conParmValue>(str)(NV)

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

Note

- If a network does not support or is not correctly configured for automatic DNS address assignment the TCP/IP stack cannot resolve fully qualified domain names. In this case, a warning message will be returned when trying to open an Internet service configured for automatic DNS address assignment.

11.3 AT^SIPS Internet Profile Storage

AT^SIPS saves and loads the settings of the Internet service profiles in the non-volatile memory. AT^SIPS can also be used to reset the settings to their default values without saving.

Syntax

Test Command

AT^SIPS=?

Response(s)

^SIPS:(list of supported <type>s), (list of supported <action>s), (list of supported <ProfileId>s)
OK

Write Command

AT^SIPS=<type>, <action>[, <ProfileId>]

Response(s)

OK
ERROR
+CME ERROR: <err>

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<type>(str)

Internet profile storage type parameter.

“service“	Handle AT^SISS parameter set.
“all“	Implemented for compatibility with other products. For PLS8-US-R4, same effect as value "service".

<action>(str)

Internet profile storage action parameter

“reset“	Reset current profile(s) for given <type> to default settings without saving. If <ProfileId> is given only specific profile will be reset. Only the connections which are in "Down" status and the services which are in "Allocated" status could be affected.
“save“	Stores current profile(s) for given <type>. If <ProfileId> is given only specific profile will be stored.
“load“	Loads stored profile(s) for given <type>. If <ProfileId> is given only specific profile will be loaded.

<ProfileId>(num)

Internet service profile storage identifier

0...9	Possible profile identifiers of used <type>

11.4 AT^SISS Internet Service Setup Profile

AT^SISS specifies the Internet service profiles needed to control data connections by using AT^SICA, AT^SISO, AT^SISC, AT^SISR, AT^SISW, AT^SIST and AT^SISE.

The AT^SISS read command requests the current settings of all Internet service profiles. One line is issued for every possible parameter of a given <srvParmTag> "srvType" value.

The AT^SISS write command specifies the parameters for a service profile identified by <srvProfileId>. At first the type of Internet service needs to be selected via <srvParmTag> value "srvType". This determines the applicability of all other <srvParmTag> values related to this "srvType" and, partially, sets their defaults. Changing the <srvParmTag> "srvType" of an existing service profile will reset all <srvParmTag> values.

To change the settings the write command needs to be executed for each single <srvParmTag>. All profile parameters set with AT^SISS are volatile. mandatory (= m) or optional (= o).

Table 11.2: Applicability of AT^SISS <srvParmTag> values

<srvParmTag>	Socket	FTP	HTTP	SMTP
SrvType	m	m	m	m
conId	m	m	m	m
address	m	m	m	m
tcpMR	o	o	o	o
tcpOT	o	o	o	o
cmd		m	m	o
files		o	o	o
ftpath		o		
smFrom				m
smRcpt				m
smCC				o
smSubj				m
smMsg				o
smAuth				m
hcContent			o	
hcContLen			m	
hcUserAgent			o	
hcProp			o	
user (as separate parameter or in address field)		m	o	m
passwd (as separate parameter or in address field		m	o	m
alphabet	o	o	o	o
ipVer	o	o	o	o
secopt	o	o	o	o

Syntax

Test Command

AT^SISS=?

Response(s)

OK

Read Command

AT^SISS?

Response(s)

^SISS: <srvProfileId>, <srvParmTag>, <srvParmValue>
[^SISS: ...]
OK
ERROR
+CME ERROR: <err>

Write Command

AT^SISS=<srvProfileId>, <srvParmTag>, <srvParmValue>

Response(s)

OK
ERROR
+CME ERROR: <err>

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<srvProfileId>(num)

Internet service profile identifier.
The <srvProfileId> is used to reference all parameters related to the same service profile. Furthermore, when using the AT commands AT^SISO, AT^SISR, AT^SISW, AT^SIST, AT^SISH and AT^SISC the <srvProfileId> is needed to select a specific service profile.

0...9

<srvParmTag>(u)

Internet service profile parameter.

srvType	Type of Internet service to be configured with consecutive usage of AT^SISS. For supported values of <srvParmValue> refer to <srvParmValue-srvType>.
alphabet	Selects the character set for input and output of string parameters within a profile. The selected value is bound to the specific profile. This means that different profiles may use different alphabets. Unlike other parameters the alphabet can be changed no matter whether the <srvParmTag> value "srvType" has been set. For supported values of <srvParmValue> refer to <srvParmValue-alphabet>.
user	User name string for FTP, HTTP, SMTP authentication. The user name can be set by <srvParmTag> parameter "user" or as part of "address" parameter. For HTTP only simple authentication is supported. Length: 32 octects

passwd	Password string for FTP, HTTP, SMTP authentication. The password can be set by <srvParmTag> parameter "password" or as part of "address" parameter. Length: 32 octects
conId	Internet connection profile as defined with AT+CGDCONT. The value is one of the PDP context IDs set with parameter <cid>.
address	String value containing the URL for the specific service: **1.** Socket Service URLs: - TCP Client URL: "socktcp[s]://<host>:<remotePort>[;etx[=<etx-Char>][;timer=<value>][;bufsize=<value>]][;keepidle=<value>][;keepcnt=<value>][;keepintvl=<value>]" - UDP Client URL: "sockudp[s]://<host>:<remotePort>[;etx[=<etx-Char>][;timer=<value>][;bufsize=<value>]][;port=<localPort>]" - UDP Endpoint URL: "sockudp://:<localPort>" - TCP server URL: "socktcp://listener:<localPort>[;keepidle=<value>][;keepcnt=<value>][;keepintvl=<value>]" - Transparent TCP Listener URL: "socktcp:// listener:<localPort>;etx[=<etxChar>][;timer=<value>][;bufsize=<value>][;autoconnect='0|1'][;connecttimeout=<value>][;keepidle=<value>][;keepcnt=<value>][;keepintvl=<value>][;addrfilter=<filter>]" Socket service URL parameters: - <host>: IPv4 address in standard dot format, e.g. "192.168.1.2", or IPv6 address in standard colon format enclosed in square brackets, e.g. "[FE80::2]". - <remotePort>: 1 ... 2^{16}-1 for the remote port number. - <localPort>: 1 ... 2^{16}-1 for the local port number. - "etx": This parameter allows a socket service to use Transparent Mode. For the Transparent Listener "etx" is mandatory. For the Client services "etx" is optional, but required for using the Transparent Mode parameters "etxChar" and "timer". Please note that even though "etx" is set in a service profile, data transfer can be performed by a mixing Transparent Mode (AT^SIST) and Non-Transparent Mode (AT^SISW / AT^SISR cycles) in the same connection. This applies both to the Transparent Listener and to Client services. - "<etxChar>": Specifies the character used to change from Transparent Mode to AT Command Mode. range: 1...15,17...255 (16 is not allowed because it is used as DLE (0x10)) If parameter is not set no escaping is configured, thus requiring either +++ or DTR ON-OFF transition for changing to AT command mode. If value is set, the transmitted bytes are parsed for the DLE (0x10) character followed by the specified <etxChar> value. If both characters are found the service returns to AT command mode without transmitting these two bytes. If you wish to send DLE characters as normal text string within your payload data the characters shall be doubled (DLE DLE). - "bufsize": For Transparent Mode only: specifies maximum packet size for sending data with AT^SIST. range: 1..[1460]

- "timer": The parameter configures the Nagle algorithm, which is used in Transparent Mode.
  range: 0, 20...[100]...500 milliseconds in steps of 20
  Value 0 disables the Nagle algorithm.
- "keepidle": specifies the TCP parameter TCP_KEEPIDLE (see RFC1122, Section 4.2.3.6; not for Transparent UDP client)
  range: 1...65535 seconds; disabled if no value set (default).
- "keepcnt": specifies the TCP parameter TCP_KEEPCNT (see RFC1122, Section 4.2.3.6; not for Transparent UDP client); ignored if option "keepidle" is not set
  range: 1...[9]...127
- "keepintvl": specifies the TCP parameter TCP_KEEPINTVL (see RFC1122, Section 4.2.3.6; not for Transparent UDP client); ignored if option "keepidle" is not set
  range: 1...[75]...255 seconds
- "autoconnect" (for Transparent TCP Listener service only):
  0 ... disabled (default)
  1 ... automatically accept incoming client connects
- "connecttimeout": specifies the time after which incoming client connects are rejected automatically (for Transparent TCP Listener service only)
  range: 1...[30]...180 seconds
- "addrfilter": This option allows to filter incoming client connects based on the IP address of the client (for Transparent TCP Listener service only). It is possible to specify a maximum of 3 filters separated by commas.
  If the IP address of any incoming client connect does not match any of the specified filters, then the connect is rejected automatically. If the option is not specified, then all client connects are allowed.
  In IPv4: Each filter is specified as 4 numbers separated by dots ("<n>.<n>.<n>.<n>"). Each number n can be in the range between 0 and 254. It is allowed to use the wildcard "*" instead of n which matches all.
  Example: "addrfilter=10.10.0.*,80.190.158.9" - allows connects from 10.10.0.81 and 80.190.158.9 but not from 10.10.17.81 and 80.190.158.10.
  In IPv6: Each filter is specified by up to 8 bytes separated by colons ("<x7>:<x6>:...:<x0>"). Each byte can be in the range between 0 and [f,F]. It is allowed to use the wildcard "*" which matches all.
  Examples: *:5678:9abc:def0:1234:5678:9ABC:D*F0
  1234::
  ::1**4
  1*34:*::3456

2. FTP Client URL
   "ftp[s]://[<user>:<passwd>@]<host>[:<port>][/<path>]"
   "ftp://": The default TCP port 21 for ftp server is used.
   "ftps://": The default SSL port 990 for secure ftp server is used.
   <host>: element can be an IPv4 address, or an IPv6 address enclosed in square brackets, or a DNS FQDN string.
   <port>: element can be set optionally to replace the default port.
   <user>: username for authentication, 32 octets. Can be set as part of "address" or separately by `<srvParmTag>` parameter "user".
   <passwd>: password for authentication, 32 octets. Can be set as part of "address" or separately by `<srvParmTag>` parameter "passwd".
   <path>: path of file or directory. To read a root directory or subdirectory path shall be terminated with slash: <path>/.
3. HTTP Client URL
   Length: 6...255
   "http[s]://[<user>:<passwd>@]<server>[:<port>/<path>]"
   <server>: element can be an FQDN, or an IPv4 address, or an IPv6 address enclosed in square brackets.

<path>: path of file or directory.
<port>: If parameter is omitted the service connects to HTTP default port 80.
<user>: username for authentication, 32 octets.
<passwd>: password for authentication, 32 octets.
"https://": Used for SSL connection.
Refer to "IETF-RFC 2616".

4. SMTP Client URL
"smtp[s]://[<user>:<passwd>@]<host>[:<Port>]"
"smtp://": The default TCP port 25 for smtp server is used.
"smtps://": The default SSL port 465 for secure smtp server is used.
<host>: element can be an IPv4 address, or an IPv6 address enclosed in square brackets, or a DNS FQDN string.
<port>: element can be set optional and replace the default port.
<user>: username for authentication, 32 octets. Can be set as part of "address" or separately by <srvParmTag> parameter "user".
<passwd> is for authentication, 32 octets. Can be set as part of "address" or separately by <srvParmTag> parameter "passwd".

cmd

1. HTTP service
   - "0" or "get": Send HTTP GET request to server
   - "1" or "post": Send HTTP POST request to server
   - "2" or "head": Send HTTP HEAD request to server
2. FTP service
   - get [<OffsetString>]: get a single file from FTP server.
   - put [<OffsetString>]: create and write a single file to FTP server using AT^SISW.
   - dir: List the directory on the FTP server and show file size.
   - list: List the directory on the FTP server without showing file size.
   - size: Request the size of the file element on the FTP server. The size result is output as "^SIS" URC.
   - del: Delete a file specified with <srvParmTag> parameter "files" on FTP server.
   - append: Append data to existing file on FTP server
   - unique: Selects the FTP Store Unique command to create a file name unique to the current directory. If the file name is assigned by the server then the "^SIS" URC will appear, indicating <urcInfoId> 2100 and the file name.

   <OffsetString> is an optional parameter for "get" and "put". It allows resuming a broken uplink or downlink transfer to resend data. The <OffsetString> value specifies the offset in number of octets to start the transfer from. Maximum length is 16 digits. For "get" the <OffsetString> value must be calculated from the <urcInfoId> 2100 of the "^SIS" URC requested before by using "size".
3. SMTP service
   - at: send attachment(s) listed in the <srvParmTag> parameter "files". Max. 5 files are allowed. The content of the attachment(s) should be provided using AT^SISW after the service was opened with AT^SISO.

ftpath

Specifies the path of the remote FTP server after login. If no path is set the default path will be used.

files	Name of a file for upload from the AT command interface to a server, or download from a server to the AT command interface if the "cmd" parameter is given - with "get" or "post" in case of HTTP, - with "get", "put" or "del" in case of FTP, - with "at" in case of SMTP. In case of SMTP max. 5 files can be handled, each separated by comma. In case of FTP and HTTP only a single file can be handled.
hcContent	HTTP "POST": Variable mode. Optional parameter if HTTP "post" is set with <srvParmTag> parameter "cmd". Length: 1...255 bytes Can be used to transfer a small amount of data. The content of this string will only be sent if "hcContLen" = 0. To transmit a larger amount of data "hcContLen" must be set to a non-zero value. In this case the "hcContent" string will be ignored, and data transmission from the client to the server is done with AT^SISW. Usage example: AT^SISS=x,cmd,"POST" AT^SISS=x,hcContent,"This text will be sent to the server now ..... response OK" OK AT^SISS=x,hcContLen,0 AT^SISO=x OK ^SIS: x,0,2200,"Http connect 10.42.228.61:80" ^SISW: x,2 Please take care not to exceed the maximum "hcContent" length 255 bytes. Otherwise data is truncated.
hcContLen	HTTP "POST": Fixed mode. Mandatory parameter if HTTP "post" is set with <srvParmTag> parameter "cmd". Length: 0...2^{31}-1 The content length shall be set in the header of the HTTP "Post" request before the data part is transferred. If "hcContLen" = 0 then the data given in the "hcContent" string will be posted. If "hcContLen" > 0 then the AT^SISW command will be used to send data from the client to the server. In this case, "hcContLen" specifies the total amount of data to be sent. The data can be sent in one or several parts. For each part, the transmission is triggered by the URC "^SISW: x, 1", then the AT^SISW write command can be executed. After the exact number of bytes are transferred, the HTTP client will go from service state "Up" to service state "Closing" (see parameters <srvState> and <srvState> for detail). Finally, the URC "^SISW: x, 2" indicates that all data have been transferred and the service can be closed with AT^SISC.
hcUserAgent	The user agent string must be set by the application to identify the mobile. Usually operation system and software version info is set with this browser identifier. Length: 0...63
hcProp	Parameter for several HTTP settings. Length: 0...127 The general format is 'key': <space> 'value' Multiple settings can be given separated by "\0d\0a" sequences within the string, do not put them at the end. Possible 'key' values are defined at HTTP/1.1 Standard RFC 2616.

smFrom	Email sender address, i.e. "MAIL FROM" address (string). Length: 6...254 A valid address parameter consists of local part and domain name delimited by a '@' character, e.g. "john.smith@somedomain.de".
smRcpt	Recipient address of the email, i.e. "RCPT TO" address (string). Length: 6...254 If multiple recipient addresses are to be supplied the comma character is used as delimiter to separate individual address values, e.g. "john.smith@somedomain.de,tom.meier@somedomain.de". Some mail servers do not accept recipient addresses without brackets <>. It is recommended to use the "RCPT TO" variable with brackets.
smCC	CC recipient address of the email (string). Length: 6...254 If multiple CC recipient addresses are to be supplied the comma character is used as delimiter to separate individual address values, e.g. "john.smith@somedomain.de,tom.meier@somedomain.de".
smSubj	Subject content of the email (string). Length: 0...254 If no subject is supplied the email will be sent with an empty subject.
smAuth	SMTP authentication control flag (string). If "smAuth" = "0" or "none": No authentication (for test environment only, not applicable to real network) If "smAuth" = "1" or "plain" (default): Authentication with PLAIN authentification If "smAuth" = "2" or "login": Authentication with LOGIN authentification If "smAuth" = "3" or "cram": Authentication with CRAM authentification
smMsg	SMTP message body. If no attachment is defined this is only the content of the email. Length: 0...254
tcpMR	Parameter can be used to overwrite the global AT^SCFG parameter "Tcp/MaxRetransmissions" <tcpMr> for a specific Internet Service connection profile. If the parameter is not specified the value specified with AT^SCFG will be used. Supported values <srvParmValue> for this parameter are the same as described for <tcpMr>. Setting is not relevant for Internet Service "Socket" with type "UDP".
tcpOT	Parameter can be used to overwrite the global AT^SCFG parameter "Tcp/OverallTimeout" <tcpOt> for a specific Internet Service connection profile. If the parameter is not specified the value specified with AT^SCFG will be used. Supported values <srvParmValue> for this parameter are the same as described for <tcpOt>. Setting is not relevant for Internet Service "Socket" with type "UDP".
ipVer	Used IP Protocol version: This parameter limits the IP Protocol version for the Internet service when the PDP context defined with AT+CGDCONT supports IPv4 and IPv6. 4 Values 4 (default) or 6 can be used for the following situations only: 6 An IPv4v6 PDP context is employed, and this context provides both IPv4 and IPv6 interfaces, and - either the service acts as a listener, - or the client address is a hostname, and the DNS server provides both IPV4 and IPV6 addresses. In such case value 4 allows IPv4 addresses only, and value 6 allows IPv6 addresses only.

	10	Value 10 can be used for TCP listener and UDP endpoint only. It is possible to use this value for every PDP context type. If an IPv4v6 PDP context is used, and this context provides both IPv4 and IPv6 interfaces, then it is possible to connect to an IPv4 client and an IPv6 client at the same time. Addresses are always shown in IPv6 format. For IPv4 connections, IPv4-mapped IPv6 address notation is used, i.e. [::ffff:10.66.90.170]. For AT^SISO?, TCP listener and UDP endpoint show "[::]" as local address. Please use AT+CGPADDR to read local address information in this case.
secopt	Security Option of IP service. Values: 1 (default) 0 NOTE: Local store is created with AT^SBNW,is_cert.	Check received certificates from server against local store, if local store has at least one certificate. Do not check received certificates from server against the local store.

<srvParmValue>(str)(+CSCS)

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

<srvParmValue-srvType>(str)

Supported Internet service type values in <srvParmValue> for <srvParmTag> value "srvType".
Before changing the "srvType" of an existing service profile be sure that the profile is closed. To verify the connection state of the service profile enter the read command AT^SISI. Only when <srvState>=2 is returned for this specific service profile you can change its service type.

“Socket“	PLS8-US-R4 acting as client or server (listener) for TCP or UDP. "etx" subparameter in URL configures Transparent mode for Socket service.
“Ftp“	PLS8-US-R4 acting as FTP client.
“Http“	PLS8-US-R4 acting as HTTP client.
“Smtp“	PLS8-US-R4 acting as SMTP client.
“none“	Reset Internet service profile settings. Operation is not allowed if profile is in use, i.e. it was activated via AT^SISO.

<srvParmValue-alphabet>(str)

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

[“0“]	Applicable character set is determined by current setting of AT+CSCS.
“1“	International Reference Alphabet (IRA, seven bit ASCII).

Notes

- String parameters are truncated if greater than the maximum length specified above.
- For correct input of the @ character in address parameters please refer to Section 1.7, Supported character sets.

11.5 AT^SISI Internet Service Information

AT^SISI serves to monitor the status of Internet service profiles defined with AT^SISS.

The AT^SISI read command requests the current status of all defined Internet service profiles.

The AT^SISI write command requests the status of the specified Internet service profile. If the specified service profile is not defined yet, "+CME ERROR" is returned.

Syntax

Test Command

```
AT^SISI=?
```

Response(s)

```
[^SISI:(list of defined <srvProfileId>s)]
OK
```

Read Command

```
AT^SISI?
```

Response(s)

```
If response is related to service profile(s) created / opened on this interface:
[^SISI: <srvProfileId>, <srvState>, <rxCount>, <txCount>, <ackData>, <unackData>]
[^SISI: ...]

If response is related to service profile(s) created / opened on other interface(s):
[^SISI: <srvProfileId>, <srvParmTag>value "srvType"]
[^SISI: ...]
OK
ERROR
```

Write Command

```
AT^SISI=<srvProfileId>
```

Response(s)

```
^SISI: <srvProfileId>, <srvState>, <rxCount>, <txCount>, <ackData>, <unackData>
OK
ERROR
+CME ERROR: <err>
```

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<srvProfileId>(num)

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

0...9

<srvState>(num)

Internet service state (for details see AT^SISO parameter <srvState>).

2	Allocated
3	Connecting
4	Up
5	Closing
6	Down
7	Alerting
8	Connected

<rxCount>(num)

Number of bytes received via AT^SISR or AT^SIST since last successful AT^SISO write command.
This is the same value as displayed by the AT^SISO read command with the parameter <rxCount>.

<txCount>(num)

Number of bytes sent via AT^SISW or AT^SIST since last successful AT^SISO write command.
This is the same value as displayed by the AT^SISO read command with the parameter <txCount>.

<ackData>(num)

Number of data bytes already sent and acknowledged at TCP layer. Value 0 indicates that no sent data is acknowledged yet.
Parameter is not applicable to HTTP, SMTP, Socket with UDP. For these services the counter is always set to 0.

<unackData>(num)

Number of data bytes already sent but not yet acknowledged at TCP layer. A value 0 indicates that all sent data is already acknowledged.
This is the same value as displayed in the response of the AT^SISW write command with the parameter <unackData>.
Parameter is not applicable to HTTP, SMTP, Socket with UDP. For these services the counter is always set to 0.

Note

- If a service is in state "Down" the responses for <rxCount>, <txCount>, <ackData> and <unackData> are the last known values for the service in the states "Connecting", "Up/Listening", "Connected" and "Closing".

11.6 AT^SISO Internet Service Open

The AT^SISO write command starts an Internet service configured with AT^SISS. Before you can start a service it is necessary to activate the bearer with with AT^SICA.
The command may be aborted by any character sent from the TE to the UE during execution.

Syntax

Test Command

AT^SISO=?

Response(s)

OK

Read Command

AT^SISO?

Response(s)

^SISO: <srvProfileId>, <srvType>[, <srvState>, <socketState>, <rxCount>, <txCount>, <locAddr>, <remAddr>, <rejCounter>]
[^SISO: ...]
OK

Write Command

AT^SISO=<srvProfileId>[, <optParam>]

Response(s)

OK
ERROR
+CME ERROR: <err>

PIN	MDM	APP	✈	Last
-	+	+	-	-

Parameter Description

<srvProfileId>(num)

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

<srvType>(str)

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

<srvState>(num)

Internet service state.
Please note, that the state of an Internet service may influence the state of the serial DCD line. For details see description of value 2 for parameter <value> of command AT&C.

2	Allocated Service profile resources are allocated, i.e. at least the service type has been set (parameter <srvParmTag>, value "srvType" of AT^SISS). The service is not opened, but ready for configuration.
3	Connecting State after opening a service with AT^SISO where the connection is being established. If connection setup is successful the service proceeds to the state "4" (Up) and one of the URCs "^SISW" and "^SISR" may follow. If connection setup is not successful, the "^SIS" URC may appear and the service enters <srvState> 6 (Down).

	In the case of FTP, <srvState>=3 means that the command channel is being established. If the service profile is configured as Standard Listener, then the Listener always stays at <srvState>=3 and <socketState>=3 (LISTENER), while the <srvState> and <socketState> of the dynamically assigned service profile may change. See examples in Section 11.15.5.
4	Up The service performs its purpose. The data transfer process is the major function at this state. FTP: Data channel is up. Transparent TCP Listener service: the service is listening to remote client connection requests. Not applicable to Standard Listener. See examples in Section 11.15.6.
5	Closing Internet Service is closing the network connection. FTP: Command channel is released.
6	Down This state is entered if - the service has successfully finished its session (see note on Socket), - the remote peer has reset the connection or - the IP connection has been closed because of an error (see note below on service or network errors). If a service in this state be sure to close it with AT^SISC before reopening it.
7	Alerting A client tries to connect to the Transparent TCP Listener service. Not applicable to Standard Listener.
8	Connected A client is connected with the Transparent TCP Listener service. Not applicable to Standard Listener.
9	Released The client has disconnected from the Transparent TCP Listener service but there are unread data. To go back into Up/Listening state read the pending data using AT^SIST or discard them by using AT^SISH.

<socketState>(num)

Socket state identifier.

1	Socket not assigned, i.e. no TCP/UDP connection active.
2	Socket assigned as CLIENT.
3	Socket assigned as LISTENER or UDP Endpoint.
4	Socket assigned as SERVER.

<rxCount>(num)

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

<txCount>(num)

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

<locAddr>(str)

Recently used local IPv4 address in dotted-four-byte format and TCP port separated by colon, e.g. "192.60.10.10:80", or recently used local IPv6 address in colon format enclosed in square brackets, e.g. "[FE80::2]" and TCP port separated by colon, e.g. "[FE80::2]:80".

<remAddr>(str)

Remote IPv4 address in dotted-four-byte format and TCP port, separated by colon, e.g. "192.60.10.10:80", or remote IPv6 address in colon format enclosed in square brackets, e.g. "[FE80::2]" and TCP port separated by colon, e.g. "[FE80::2]:80".
If the Socket service is configured as UDP Endpoint, a remote IP address cannot be assigned, and a default value will be shown instead.

<rejCounter>(num)

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

<optParam>(num)

1	Show only parameters of service profile for given <srvProfileId>.

Notes

- If the bearer cannot be established and AT^SISO returns an error there might be a general mobile network problem. To identify the reason you can take advantage of the AT+CEER command. Using AT+CEER is especially recommended when the <infoID> parameter of the AT^SISE command equals 0.
- If a service or network error occurs during an IP session and the "^SIS" URC or the AT^SISE command display an error message, the service enters <srvState>=5 and then 6, i.e. the IP connection is closed. In this case, the service still allows reading the data stored in the buffer, but writing data is denied. After reading, close the service and open it again.
- If an FTP connection is no longer available after network loss or server shutdown a 3-minute closing timeout for each of the two used sockets takes effect, adding up to 6 minutes. The timeout is effective if the AT^SISC is not sent. Please keep in mind that this time may vary depending on the settings of <tcpMr> and <tcpOt>.
- As in polling mode no error URCs are available you are advised to integrate the commands AT^SISI and AT^SISE into the command sequences for upload and download jobs. So, the AT^SISO command may be followed by AT^SISI to check that the service has entered the <srvState>=4 before sending AT^SISR, AT^SISW or AT^SIST. This helps you to detect errors even though the "^SIS" URCs are disabled. A typical example is that the service fails to be opened because the service profile contains a wrong destination address. In such a case, after opening with AT^SISO and OK response, the service quickly enters the states <srvState>=2, 4 and 6, with an error being returned no earlier than after sending the first AT^SISR or AT^SISW command. In URC mode, an error URC, such as "Host not found" would be received in this situation, but in polling mode the only way to detect the state is using AT^SISI or, alternatively, AT^SISO.

11.7 AT^SISC Internet Service Close

The AT^SISC write command closes the TCP/IP connection to the remote peer which was opened with AT^SISO. All resources are released, all status information parameters, e.g. <srvState>, <rxCount> and <txCount> counters are reset. Only the initial configuration settings are preserved. The service can be restarted any time, using the same configuration or a new one.

Syntax

Test Command

```
AT^SISC=?
```

Response(s)

```
OK
```

Write Command

```
AT^SISC=<srvProfileId>
```

Response(s)

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

PIN	MDM	APP	✈	Last
±	+	+	-	-

Parameter Description

<srvProfileId>(num)

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

11.8 AT^SISR Internet Service Read Data

The AT^SISR write command can be used to read data for the specified service. It may return the following errors: The AT^SISR command either triggers a read operation (download) or queries the number of bytes in the internal buffer.
The "^SISR: x, 1" URC is also used to report status changes of the transparent TCP service while the client is in AT command mode.

The AT^SISR write command may return the following errors:

- "+CME ERROR: operation failed" if there is a problem on application, socket, PPP or network level. The AT^SISE command and the "^SIS" URC offer additional error information.
- "+CME ERROR: operation temporary not allowed" e.g. if the service has not network resources allocated.
- "+CME ERROR: operation not allowed" e.g. if the service is not configured.

Syntax

Test Command

```
AT^SISR=?
```

Response(s)

```
OK
```

Write Command

```
AT^SISR=<srvProfileId>, <reqReadLength>
```

Response(s)

```
^SISR: <srvProfileId>, <cnfReadLength>[, <remainUdpPacketLength>[, <Udp_RemClient>]]
```

Number of data bytes are sent as specified by <cnfReadLength>. If peek operator was used no data bytes are sent.

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

PIN	MDM	APP	✈	Last
-	+	+	-	+

Unsolicited Result Code

```
^SISR: <srvProfileId>, <urcCauseId>
```

Data availability status of the Internet service configured with AT^SISS has changed. The URC is issued when:

- data is available after opening an Internet service or
- less data was confirmed (in <cnfReadLength>) than requested (with <reqReadLength>) during the last "Read Data" operation and new data is available.

The URC is disabled in polling mode. See AT^SCFG, parameter "Tcp/WithURCs", <tcpWithUrc>.

Parameter Description

<srvProfileId>(num)

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

<reqReadLength>(num)	
0	Peek Operator: Query number of received bytes within internal buffers. The behaviour of the peek operator depends on the selected Internet service, i.e. it may not be supported by all IP Services. For "Socket" service configured for UDP the size of the next available UDP packet is returned.
1...1500	Requested number of data bytes to be read via the Internet service specified in <srvProfileId>.

<cnfReadLength>(num)	
-2	Indicates end of data. Data transfer has been finished (all data have been read) and the service can be closed with AT^SISC.
-1	Applies only to HTTP: Querying number of available bytes is not supported by the HTTP service.
0	Indicates that no further data is available at the moment.
>0	Number of available data bytes. The range is determined by <reqReadLength>: If <reqReadLength> was greater than 0, then <cnfReadLength> may be less or equal to the value requested with <reqReadLength>. If <reqReadLength> equals 0 (peek operator) the value indicated by <cnfReadLength> may be greater than 1500.

<urcCauseId>(num)	
Indicates whether or not data is available for reading with AT^SISR and AT^SIST.	
1	*Meaning of value "1" for all services except Transparent TCP service:* Data is available and can be read by sending the AT^SISR command. The URC appears when less data was confirmed (in <cnfReadLength>) than requested (with <reqReadLength>) during the last "Read Data" operation and new data is available. *Meaning of value "1" for Transparent TCP service:* If the Transparent TCP service is in AT command mode the "^SISR: x, 1" URC notifies the client that the server has sent new data. In this case the client shall enter the AT^SIST command to go to transparent access mode and read the data.
2	End of data. Data transfer has completed (all data read). The service can be closed with AT^SISC.

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

If the currently read datagram is smaller than the number of bytes requested by the host the <remainUdpPacketLength> parameter is omitted.
Further write attempts with AT^SISR are denied as long as the <remainUdpPacketLength> is unequal 0 or is not omitted. In this case the service returns "+CME ERROR: operation of service temporary not allowed".

0	Indicates that all bytes of the current UDP datagram are read.
(max. data size)-1...1	Indicates that the currently read UDP datagram is not yet complete. The displayed value is the remaining number of bytes. <remainUdpPacketLength> is unequal 0 until reading all parts of the current datagram is finished.

<Udp_RemClient>(str)

Service specific parameter of the AT^SISR write command response. If the Socket service is configured as UDP endpoint this parameter shows the IP address and the UDP port of the remote host that has sent the current UDP data. See example in Section 11.15.9, UDP Scenario.

11.8.1 Example: Socket Host Reads Small Amounts of UDP Data Packets (URC Mode)

This section applies only to the Socket service using the UDP protocol. The example shows how to read UDP packets if the buffer of the host application can handle only a few bytes. There are two datagrams available for reading.
Buffer size: 6 bytes
Datagram A = 18 bytes (content "THIS_IS_DATAGRAM_A")
Datagram B = 3 bytes (content "NEW")

^SISR: 0,1	Service profile 0 is configured for Socket service and UDP. The URC notifies host that data is available for reading.
at^sisr=0,6	The host requests to read 6 bytes.
^SISR: 0,6,12 THIS_I OK	The first 6 bytes of datagram A are confirmed and transmitted. Another 12 bytes are still available.
at^sisr=0,6	The host requests to read the next part of 6 bytes.
^SISR: 0,6,6 S_DATA OK	The next 6 bytes of datagram A are confirmed and transmitted. Another 6 bytes are still available.
at^sisr=0,6	The host requests to read the next part of 6 bytes.
^SISR: 0,6,0 GRAM_A OK	Last part of datagram A was received, no remainder is left.
at^sisr=0,6	Again, the host requests to read 6 bytes. This time, the request refers to datagram B which has only 3 bytes. As the read datagram is smaller than the size requested by the host, the response does not include the <remainUdpPacketLength>.
^SISR: 0,3 NEW OK	3 bytes are confirmed and transmitted. Datagram B was properly received.

11.9 AT^SISW Internet Service Write Data

AT^SISW triggers a write operation (upload) and queries the amount of data already sent, but not acknowledged at the TCP layer. The URC "^SISW: <srvProfileId>, <urcCauseId>" will be issued if the PLS8-US-R4 is ready to accept user data.

The AT^SISW write command may return the following errors:

- "+CME ERROR: operation failed" if there is a problem on application, socket, PPP or network level. The AT^SISE command and the "^SIS" URC offer additional error information.
- "+CME ERROR: operation temporary not allowed" e.g. if the service has not network resources allocated.
- "+CME ERROR: operation not allowed" e.g. if the service is not configured.

Syntax

Test Command

```
AT^SISW=?
```

Response(s)

```
OK
```

Write Command

```
AT^SISW=<srvProfileId>, <reqWriteLength>[, <eodFlag>[, <Udp_RemClient>]]
```

Response(s)

```
^SISW: <srvProfileId>, <cnfWriteLength>, <unackData>
```
Number of data bytes as specified by <cnfWriteLength>.
```
OK
ERROR
+CME ERROR: <err>
```

PIN	MDM	APP	✈	Last
±	+	+	-	+

Unsolicited Result Code

```
^SISW: <srvProfileId>, <urcCauseId>
```

The URC indicates the following status changes:

- After opening a TCP Client or UDP Client with AT^SISO the "^SISW" URC indicates that the service is ready to accept data. After this initial "^SISW" URC, the TCP Client or UDP Client can proceed in Transparent Mode or Non-Transparent Mode.
  The initial "^SISW" URC is not issued after a Transparent Listener or UDP Endpoint was opened, because for listening services the "^SIS" URC will be issued.
- During AT^SISW write cycles the "^SISW" URC indicates that the service is ready to accept new data, or that data transfer has finished successfully.

The URC is disabled in polling mode. See AT^SCFG, parameter "Tcp/WithURCs", <tcpWithUrc>.

Parameter Description

<srvProfileId>(num)

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

<reqWriteLength>(num)

0...1500

Specifies the number of bytes to be sent with AT^SISW or, if set to 0, requests the amount of data already sent with AT^SISW but not yet acknowledged:

- Parameter <reqWriteLength> may be 1...1500 bytes to specify the amount of data to be sent with AT^SISW.
- If parameter <reqWriteLength> equals 0, AT^SISW does not expect any data, but a normal query is performed. This allows the application to explictly request, in particular at the end of an upload job, the amount of unacknowledged data at the TCP layer indicated by <unackData>.
- If Socket service is selected with UDP protocol
  - <reqWriteLength>=0 can be used to send an empty UDP packet;
  - it is recommended that the size of each data packet be limited to 1460 bytes. Otherwise, it is possible that the following URC occurs: "^SIS: <id>, 0, 9, The supplied buffer was too small / large".

<eodFlag>(num)

End of data indication flag. See also Section 11.9.1.

[0]	No end of data. Other data may follow to be transmitted via the Internet service. Notes: - UDP Endpoint service: Value 0 must be set before <Udp_RemClient> parameter although <eodFlag> is not effective for UDP Endpoint. - <eodFlag> is not intended and not usable for HTTP.
1	End of data is signalled to the Internet Service. Further AT^SISW write commands return an error response. However, reading data may be possible. The <eodFlag> is effective only if the <reqWriteLength> equals <cnfWriteLength>, in particular if the <reqWriteLength> equals 0. End-of-data flag must be enabled for following actions: - FTP "cmd","put" (sending single file to FTP server) - SMTP "cmd","at" (sending attachment from AT command interface)

<Udp_RemClient>(str)

Service specific parameter of the AT^SISW write command. If the Socket service is configured as UDP endpoint this parameter is mandatory and specifies the IP address (in dotted format) and the UDP port of the remote host. For each write request another IP address and UDP port may be given. See example in Section 11.15.9, UDP Scenario.

<cnfWriteLength>(num)

0...1500	Confirmed number of data bytes which can be transmitted via the Internet service configured in <srvProfileId>. This number may be less or equal to the value requested with <reqWriteLength>. The application has to deliver exactly the number of bytes indicated by <cnfWriteLength>. A 0 value means that no data can be written at this time, i.e. it serves as a flow control mechanism.

<unackData>(num)

Number of data bytes already sent but not yet acknowledged at the TCP layer.
The value is constantly changing until the entire upload job has completed. If the value equals 0 all data sent so far is acknowledged.
<unackData> includes the <cnfWriteLength> value of the pending write operation. Therefore, the very first write operation of an upload job returns identical values for <cnfWriteLength> and <unackData>.
This mechanism allows the host application to easily verify whether or not the remote host has successfully received the data.
Parameter is not applicable to HTTP, SMTP, Socket with UDP protocol. For these services the counter is always set to 0.

<urcCauseId>(num)

1	The service is ready to accept new user data.
2	Data transfer has been finished successfully and Internet service may be closed without loss of data.

Note

- Do not send any characters after AT^SISW command line termination until "^SISW" URC is received. This is necessary to avoid that any characters related to the AT command can be interpreted as being part of the data stream to be transferred. Also refer to Section 1.5, AT Command Syntax.

11.9.1 Usage of parameter <eodFlag>

Service type	
Socket	Parameter is optional for Socket services. Not applicable to Socket with UDP protocol, i.e. value is ignored. After the service accepts the end-of-data flag the service state changes to "Closing". No further user data is accepted. After releasing the TCP link the service remains in state "Down".
FTP	Parameter is mandatory for FTP "put" (sending single file to FTP server). After accepting the end-of-data flag the service state changes to "Closing" and starts to end the running FTP session. No further user data is accepted. After the FTP session is completed on FTP protocol level the service state switches to "Down". In case of successful completion the URC "^SISW: x,2" is generated.
SMTP	Parameter is mandatory for SMTP "cmd","at" (sending attachment from AT command interface. SMTP service sends some "closing" commands to the SMTP server which are necessary to mark the email as successfully sent on the server. The service enters "Closing" state and remains in it until the final protocol exchange with the SMTP server has been completed. The "OK" response following AT^SISW indicates that the SMTP service has accepted the last data - IT DOES NOT indicate the successful completion of the SMTP service. Successful completion will be indicated either by the appropriate URC "^SISW:x,2" or due to the fact that the SMTP service state changes to "Down" state without any error.
HTTP	Parameter is not indended and not usable for HTTP.

11.10 AT^SIST Transparent Mode

AT^SIST activates / deactivates Transparent Mode. Transparent Mode enables the UE to transparently send or receive payload data stream either over dedicated multiplex channels or over the Modem instance.

The handling of Transparent Mode largely depends on whether you are using AT^SIST on the dedicated multiplex channels or on the Modem interface. The major difference is that the second method blocks the AT command interface used for transparent access, and the first method does not.

1. Using Transparent Mode on dedicated multiplex channels 5 and 6:
In this case, enter the AT^SIST write command either on the Application instance or the Modem instance along with the parameters <muxChannelId> and <muxChannelState> "1". The advantage is that the Application or Modem instance remains accessible for AT commands and URCs, while Transparent Mode is assigned to a dedicated multiplex channel. The multiplex channel is only used for transferring payload data. Therefore, result codes such as "CONNECT" or "NO CARRIER" will not appear. The DCD line goes active when Transparent Mode starts, and inactive when it stops. If a transparent socket is closed (remotely by the server or locally by the client) the Transparent Mode closes automatically.

2. Using Transparent Mode without dedicated multiplex channels:
In this case, enter the AT^SIST write command on the Modem interface with <srvProfileId> only. Please note that this method is not supported on the Application interface (trying to do so will be denied with "+CME ERROR: operation not allowed").
After entering AT^SIST the CONNECT response notifies that the UE has entered Transparent Mode and is ready to transfer payload data over the Modem interface.
There are several ways to quit Transparent Mode and revert to AT command mode on the used interface:

- +++ escape sequence (also transmitted over the air)
- DTR ON-OFF transition (see AT&D for configuring DTR handling)
- "etx" parameter set within the server address for Transparent Mode (see AT^SISS, <srvParmTag> "address").

Switching back and forth between both modes does not affect the underlying socket and has no influence on the service <srvState>.
If the service is released, for example with AT^SISC or by the remote server, and the service is in Transparent Mode (CONNECT mode) the following applies: The UE returns to AT command mode, issues the 2 bytes 0x10 (DLE) and 0x04 (EOT) before the final result code "NO CARRIER", and goes to <srvState> 6 ("Down") for transparent client services and to 4 ("Up/Listening") for Transparent TCP Listener services.
The result codes "CONNECT" and "NO CARRIER" are not influenced by ATV.
In AT command mode or after releasing the service, you can use AT^SISO to check the <srvState>.

Syntax

Test Command

```
AT^SIST=?
```

Response(s)

```
OK
```

Read Command

```
AT^SIST?
```

Response(s)

```
[^SIST: <srvProfileId>, <ChannelId>]
OK
```

Write Command

```
AT^SIST=<srvProfileId>[, <muxChannelId>, <muxChannelState>]
```

Response(s)

```
CONNECT
(indicates that the Modem interface has entered Transparent Mode. Not issued on multiplex channels 5 or 6.)
OK
```

Write Command (Continued)
AT^SIST=<srvProfileId>[, <muxChannelId>, <muxChannelState>]
Response(s)
ERROR +CME ERROR: <err>

PIN	MDM	APP	✈	Last
-	+	+	-	+

Parameter Description

<srvProfileId>(num)

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

<muxChannelId>(num)

5...6

Identifier of the dedicated multiplex channel to be used for data exchange.
If the parameter is not specified, then the Modem interface instead of a dedicated multiplex channel is used to exchange the data. In this case AT^SIST is allowed to be executed on the Modem interface only.

<ChannelId>(num)

0	Transparent Mode is activated on the Modem interface.
5...6	Transparent mode is activated on a multiplex channel. The value refers to <muxChannelId>.

<muxChannelState>(num)

Control the Transparent Mode on a dedicated multiplex channel.

[0]	Stop Transparent Mode
1	Start Transparent Mode

Note

- If AT^SIST is running for a certain <srvProfileId>, then the commands AT^SISR and AT^SISW are not usable for the same <srvProfileId>.

11.11 AT^SISH Disconnect Remote Client

AT^SISH is intendend only for a Transparent TCP Listener service. It allows to reject an incoming remote client connection request or to disconnect an established client connection from server side.

Syntax

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

Write Command
AT^SISH=<srvProfileId>[, <mode>]
Response(s)
OK ERROR +CME ERROR: <err>

PIN	MDM	APP	✈	Last
-	+	+	-	-

Parameter Description

<srvProfileId>(num)	
0...9	A Transparent TCP Listener service <srvProfileId> defined with AT^SISS.

<mode>(num)	
Specifies disconnect mode.	
[0]	Socket is closed with graceful option
1	Socket is closed without graceful option

11.12 AT^SISX Internet Service Execution

The AT^SISX command can be used to send ICMP (Internet Control Message Protocol) Echo Requests to a target IP address or DNS host name (also referred to as Ping command). This command can also be used to resolve DNS host names to IP addresses (HostByName) or resolve the network time, NTP protocol, in UTC.
The AT^SISX command can be used any time while a connection profile (bearer) is active. If issued although no connection is active, then AT^SISX returns ERROR.
If the AT^SISX write command is executed for Ping, then the command returns one row for every ICMP Echo Request. The last Ping response line is followed by two lines to report a statistic calculated from the Echo Request responses. After starting the Ping command the AT channel is blocked until all ICMP requests are executed. To stop the periodic Ping early, send any character (user break).
It is also possible to cancel the HostByName or NTP service by user break. But this may temporarily block further AT^SISX write commands which is indicated by the error response "+CME ERROR: operation temporary not allowed". As soon as the background activity for the last started HostByName service is finished the AT^SISX write command can be used again.

Syntax

Test Command

AT^SISX=?

Response(s)

^SISX:"Ping", (list of supported <conProfileId>s), , (range of supported <request>s), (range of supported <timelimit>s)
^SISX:"HostByName", (list of supported <conProfileId>s)
^SISX:"NsLookup", (list of supported <conProfileId>s)
^SISX:"Ntp", (list of supported <conProfileId>s)
OK

Write Command

AT^SISX=<service>, <conProfileId>, <address>[, <request>[, <timelimit>]]

Response(s)

In case of <pingInfoType>= 1: ICMP Echo Requests (1 - 30 rows)
^SISX:"Ping", <pingInfoType>, <conProfileId>, <ip-address>, <roundTripTime>
[...]

In case of <pingInfoType>= 2: Packet statistic (1 row)
^SISX:"Ping", <pingInfoType>, <conProfileId>, <sent>, <received>, <lost>, <lostPercent>

In case of <pingInfoType>= 3: Time statistic (1 row)
^SISX:"Ping", <pingInfoType>, <conProfileId>, <minRTT>, <maxRTT>, <meanRTT>

In case of <service>= "HostByName"
^SISX:"HostByName", <ip-address>
[...]

In case of <service>= "NsLookup"
^SISX:"NsLookup", <ip-address>, <ttl>
[...]

In case of <service>= "Ntp"
^SISX:"Ntp", <ntp>

OK
ERROR
+CME ERROR: <err>

PIN	MDM	APP	✈	Last
+	+	+	-	-

Parameter Description

<service>(str)

“Ping“	Ping host.
“HostByName“	Get first address from a host.
“NsLookup“	Get all addresses including TTL from a host.
“Ntp“	Network time protocol.

<conProfileId>(num)

Internet connection profile to be used as specified with AT+CGDCONT parameter <cid>.

<address>(str)(+CSCS)

In case of "Ping" this is the target host as FQDN or IP address (i.e. "192.168.1.3"), in case of "HostByName" this is the FQDN to be resolved into the IP address.

<ip-address>(str)

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

<request>(num)

[1]...30	Number of "Ping" ICMP Echo Requests to be sent. Not supported for "HostByName".
4	IPV4 only in case of "HostByName" or "NsLookUp"
6	IPV6 only in case of "HostByName" or "NsLookUp"

<timelimit>(num)

200...[5000]...10000	Amount of time, in milliseconds, to wait for an ICMP Echo Response message related to a previously sent Echo Request message. Parameter is not supported for "HostByName".

<pingInfoType>(num)

Indicate the type and format of the information given in the command responses (see syntax of the AT^SISX write command above).

1	Ping status received for the ICMP Echo Request(s). Depending on parameter <request> 1 - 30 rows. Address and Round Trip Time are returned for each request.
2	one row packet statistic calculated from the ping response(s) received for <pingInfoType>=1.
3	one row time statistics calculated from the ping response(s) received for <pingInfoType>=1 (displayed only if at least one Echo response message was received).

<roundTripTime>(num)

Round Trip Time in milliseconds. If the Echo Response message is not received within the time specified by <timelimit> the value -1 is returned (e.g. when the bearer shuts down during command execution).

`<sent>`(num)

Number of sent packets.

`<received>`(num)

Number of received packets.

`<lost>`(num)

Number of lost packets.

`<lostPercent>`(num)

Lost packets in percent.

`<minRTT>`(num)

Minimum Round Trip Time in milliseconds.

`<maxRTT>`(num)

Maximum Round Trip Time in milliseconds.

`<meanRTT>`(num)

Average Round Trip Time in milliseconds.

`<ntp>`(num)

time in extended format UTC

`<ttl>`(num)

The TTL value for this address in seconds.

11.13 AT^SISE Internet Service Error Report

The AT^SISE write command returns the current error status of the specified Internet service profile. If the service profile is not defined or the value is invalid "+CME ERROR" response is returned.
The error status is identical to the content of the "^SIS" URC last issued or if a service fails the commands AT^SISR, AT^SISW or AT^SIST will return an error response. However, if the AT^SISE command returns <infoID>=0 it is recommended to use the AT+CEER command because a general network problem might be the reason.

Syntax

Test Command

```
AT^SISE=?
```

Response(s)

```
OK
```

Write Command

```
AT^SISE=<srvProfileId>
```

Response(s)

```
^SISE: <srvProfileId>, <infoID>[, <info>]
OK
ERROR
+CME ERROR: <err>
```

PIN	MDM	APP	✈	Last
-	+	+	-	-

Parameter Description

<srvProfileId>(num)

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

0...9

<infoID>(num)

Reason for Internet service error. This is a subset of the <urcInfoId>s which can be found in Section 11.14, Internet Service URC.
The value 0 indicates there is no special Internet service error. In this case the application may use AT+CEER to check for general network problems.

<info>(str)

Information text related to <infoID>. This is a subset of the <urcInfoText>s which can be found in Section 11.14, Internet Service URC.

Note

- In particular cases, the AT^SISE command may deliver information and warnings. This applies the following services:
  FTP: Information 2100
  SMTP: Warnings
  If an error occurs the information and warning messages are overwritten by error messages.

11.14 Internet Service URC

This section first describes the syntax and the parameters of the "^SIS" URC. The second part consists of tables listing the information elements delivered within the "^SIS" URC and the command response of AT^SISE.

The presentation of the "^SIS" URC containing the parameter <urcCause>=0 or <urcCause>=5 can be disabled or enabled depending on whether polling mode or URC mode is preferred. To do so, use the AT^SCFG command, parameter "Tcp/WithURCs" (refer to <tcpWithUrc>). However, if related to <urcCause>=1, 2, 3 or 4, the "^SIS" URC will always be delivered regardless of the setting made with AT^SCFG.

Unsolicited Result Code

Indicates an event, an error or an information element. The same information can be obtained via AT^SISE.

^SIS: <srvProfileId>, <urcCause>[, [<urcInfoId>][, <urcInfoText>]]

The URC may appear if an event or an error occurs, for example after opening an Internet service with AT^SISO or any time during operation. The URC also indicates a request for a mobile terminated Internet service client connection, or a failure if a mobile terminated request is rejected. Furthermore, the URC may deliver an information element resulting from a specific command given in the service profile.

A list of possible causes can be found in the tables below. The tables contain the <urcInfoId> and, if applicable, a specific <urcInfoText>. If marked with *) the precise text related to a <urcInfoId> varies greatly depending on the scenario and the implementation of the remote server. In these cases, only a brief explanation of the scenario can be found in the table column "Description".

Parameter Description

<urcCause>(num)	
URC cause identifier.	
0	An event has occurred after opening or while using an Internet service. The event number is presented via <urcInfoId> and may be an error, a warning, an information element or a note. Optionally additional information may be supplied via <urcInfoText>.
1	Indicates that an opened Standard TCP Listener service (in Non-Transparent Mode) is receiving a connection request from a remote client. The incoming socket connection is dynamically assigned to the next free Internet service profile. In this case, the parameter <urcInfoId> inside the "^SIS" URC equals the <srvProfileId> of the dynamically assigned service profile. This ID shall be used to accept the connection request with AT^SISO or to reject it with AT^SISC. The connection status may be requested by using the AT^SISI read or write command or the AT^SISO read command. Among other details, the response indicates the IP address of the remote client (parameter <remAddr>). This may be helpful to decide whether to accept or reject the request.
2	Incoming Socket service client connection has failed. The client request was rejected automatically because no free Internet service profile was available.
3	Indicates that an opened Transparent TCP Listener service is receiving a connection request from a remote client. The parameter <urcInfoId> then indicates whether auto answering is active for the service (<urcInfoId>=1) or not. Parameter <urcInfoText> contains the remote IP address and the port of the connecting client. Example: "^SIS: 5,3,0,"192.168.105.17:1712" means that a client from host 192.168.105.17 tries to connect from port 1712 to our listening Transparent TCP Listener with profile 5. Auto answering is disabled.
4	Indicates for a Transparent TCP Listener service, that a remote client which is allowed due to the used address filter (see option "addrfilter" for AT^SISS), was internally rejected, e.g. because the connect timeout has expired (see option "connecttimeout" for AT^SISS). The URC is not generated if the remote

	client is rejected because its IP address is not matching the address filters. If <urcCause> equals "4", then <urcInfoId> always equals "0". This cause is also used if UE is not in Transparent Mode and a connected client has closed the connection remotely.
5	Only for TCP Listeners, Non-Transparent UDP Endpoint. Indicates that the service is ready.

<urcInfoId>(num)

Information identifier related to <urcCause>. See tables below for further detail. The <urcInfoId> number ranges indicate the type of information element:
0: Service is working properly.
1 - 2000: Error, service is aborted and enters <srvState>=6 (Down). Value 1000 notifies that service profile contains invalid parameter(s).
2001 - 4000: Information related to progress of service.
4001 - 6000: Warning, but no service abort.
6001 - 8000: Notes
Additional information for Socket service: As stated above, if a Socket connection request from a remote client is received (see <urcCause>=1) the <urcInfoId> equals the <srvProfileId> of the dynamically assigned free service profile.
If <urcCause> is 3, <urcInfoId> is used as auto answer indicator. If the value is 0, auto answering is disabled, if the value is 1, auto answering is enabled.

<urcInfoText>(str)

Information text related to <urcCause>. See tables below for further detail. The maximum length of an information text is 255 bytes. Any longer messages will be truncated.
If <urcCause> is 3, <urcInfoText> is used to indicate the IP address and port of the connecting client, e.g. "192.168.105.17:1712".

11.14.1 Information Elements Related to the Service Application

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

<urcInfoId>	<urcInfoText>	Description
Information Elements Returned by the TCP/IP socket		
2	Invalid socket descriptor	Socket error
3	Bad address specified	Socket error
4	Invalid operation	Socket error
5	No free socket descriptors	Socket error
6	The operation would block	Socket error
7	A previous attempt at thisoperation is still ongoing	Socket error
8	Socket is not bound	Socket error
9	The supplied buffer is too small / large	Socket error
10	Flags not supported	Socket error
11	Operation not supported	Socket error
12	The address is already in use	Socket error
13	The network is unavailable	Socket error
14	An established connection was aborted (transmission time-out or protocol error)	Socket error

<urcInfoId>	<urcInfoText>	Description
15	Remote host has reset the connection	Socket error
16	No buffer space available	Socket error
17	The socket is already connected	Socket error
18	For TCP/IP sockets, the socket is not connected	Socket error
19	Socket has been shut down	Socket error
20	Connection timed out	Socket error
21	Remote host has rejected the connection	Socket error
22	Remote host is unreachable	Socket error
23	An unexpected error occurred	Socket error
24	Host not found	DNS error
25	An error occurred that may be transient; a further attempt may succeed.	DNS error
26	An unrecoverable error occurred	DNS error
General Information Elements		
46	Fatal: The service has detected an unknown error	
47	*)	Indicates that the remote service has closed the connection. The host shall close the service.
48	Remote peer has closed the connection	Remote peer has closed the connection unexpectedly, and no data are available. The host shall close the service. Note that the "^SIS" URC only indicates the <urcInfoId>, but the AT^SISE command indicates both the <urcInfoId> and the <urcInfoText>.
49	Fatal: No memory is available for service action	
50	Fatal: Service has detected an internal error	
51	Application Task ID is not registered	
52	Fatal: Entity not supported	
53	No free Entity available	
54	Index not supported	
55	Service is not writeable	
56	Syntax error in URL	
57	Configuration Error	
58	No more data available	
59	Peek operation rejected	
60	Service don't accept further data	
61	Fatal: Service has no socket connection	
62	Unknown internal TLS error	SSL error
63	Wrong format of certificate data	SSL error
64	Certificate validity period is in future	SSL error
65	Certificate validity period expired	SSL error

<urcInfoId>	<urcInfoText>	Description
66	Peer certificate is not confirmed	SSL error
67	Wrong signature key format	SSL error
68	Unsupported signature key type	SSL error
69	Wrong protocol data format	SSL error
70	Wrong protocol data format	SSL error
71	No memory available for TLS	SSL error
72	Buffer error in TLS	SSL error
73	Wrong input data for RSA operation	SSL error
74	TLS/SSL protocol error	SSL error
75	Internat error in TLS	SSL error
76	Certificate format error	SSL error
77	The certificate does not exist	SSL error
78	Unknown TLS error code!	SSL error
80		Connection profile not defined.
84	PPP LCP FAILED	PPP error
85	PAP Authentication failed	PPP error
86	CHAP Authentication failed	PPP error
87	IPCP failed	PPP error
89	PDP: can not obtain controling task	
90	PDP: internal error 1	
91	PDP: internal error 2	
92	PDP: no authentication req	
93	PDP: internal error 3	
94	PDP: conection failed	
95	PDP: internal error 4	
96	PDP: no IP assigned	
97	PDP: no network	
98	PDP: network is not up	
99	PDP: internal error 5	
119	PDP: no DNS received	
120	DNS: no data	
121	DNS: timeout	
122	DNS: connection refused	
123	DNS: terminated lookup	
124	DNS: domain name is too long	
125	DNS: invalid server	
126	DNS: undefined error	
General Information Elements		

<urcInfoId>	<urcInfoText>	Description
1000	PARA-ERR: <Info>	Notifies that service profile contains a wrong parameter. <Info> text indicates the service profile parameter that contains an error.
6001		General progress information for connection setup.

*) Text varies depending on scenario.

11.14.2 Information Elements Related to FTP Service

<urcInfoId>	<urcInfoText>	Description
2100	<info>	<info> text depends on FTP server implementation

11.14.3 Information Elements Related to HTTP Service

<urcInfoId>	<urcInfoText>	Description
Error URCs		
200	HTTP-ERR: Not connected - cannot send request HTTP-ERR: failed on sending request	
201	<HTTP Response Str>	Client error
202	<HTTP Response Str> HTTP-ERR: Service unavailable	Server error
203	HTTP-ERR: Redirect failed - too many redirects HTTP-ERR: Redirect failed - not allowed HTTP-ERR: Redirect failed - location missing	Max. number of allowed redirects: 6
204	HTTP-ERR: auth failed - user name or password missing HTTP-ERR: auth failed - user name or password wrong HTTP-ERR: Authority required for this URL HTTP-ERR: No access to this URL allowed	
Info URCs		
2200	HTTP Redirect to: <Host>:<Port> <Path>	
2201	HTTP Response <Response code> Example: ^SIS: 2,3,2201, "HTTP Response: HTTP/1.1 200 OK"	

11.14.4 Information Elements Related to SMTP Service

<urcInfoId>	<urcInfoText>	Description
Errors		
400	***)	Indicates that the SMTP service could not be executed successfully.

<urcInfoId>	<urcInfoText>	Description
Warnings		
4400	***)	SMTP specific warning

***) Text varies depending on scenario.

11.15 Examples of how to Configure and Use Internet Service Profiles

Below you can find selective examples of how to configure and use Internet service profiles. To visualize the difference between URC mode and polling mode the operation of services (after opening with AT^SISO) is explained in separate examples for either mode.

11.15.1 Selecting URC Mode or Polling Mode

To enable or disable the presentation of URCs for the Internet services use the AT^SCFG command, type "TcpIp/WithURCs" and select "on" or "off" for parameter <tcpWithUrc>.

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

11.15.2 Configuring an Internet Connection Profile

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

11.15.3 Configuring Non-Transparent Listener

Keep in mind that if the host is configured as Non-Transparent Listener another service profile must be left free to be dynamically assigned as Server when the Non-Transparent Listener receives a connection request from a remote client.

Configure the service profile 4 for use as Non-Transparent Listener:

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

`AT^SISS=4,address,"socktcp://listener:65534"`
 	
`OK`
	The host specifies its local port 65534 to be used for the Socket listener service. The local IP address will be dynamically assigned when the service is opened with `AT^SISO`.

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

`AT^SISO=4`
`OK`
`AT^SISO?`
`^SISO: 0,""`
`^SISO: 1,""`
 	
`^SISO: 2,""`
`^SISO: 3,""`
`^SISO: 4,"Socket",3,3,0,0,"10.10.0.187:65534","0.0.0.0:0"`
`^SISO: 6,""`
`^SISO: 7,""`
`^SISO: 8,""`
`^SISO: 9,""`
`OK`
	Open the Listener service.
	
	Query the current status of services. All service profiles are unused, except for service profile 4 which is running in listener mode, where `<srvState>`=3 (listening) and `<socketState>`=3 (LISTENER). The response also indicates the IP address dynamically assigned to the listener.

11.15.4 Configuring TCP Client for Calling a TCP Listener

Configure the client's service profile for calling a TCP Listener on another host:

`AT^SISS=1,srvType,"Socket"`
`OK`
`AT^SISS=1,conId,"1"`
`OK`
`AT^SISS=1,address,"socktcp://10.10.0.187:65534"`
 	
`OK`
	Select service type Socket.
	
	Select connection profile.
	
	Add the IP address and the TCP port of the remote host (from example in Section 11.15.3, Configuring Non-Transparent Listener.

11.15.5 Transparent TCP Listener: Accepting / Rejecting Incoming Remote Client

Host 1: Configure Transparent TCP Listener with Autoconnect disabled:

`AT^SISS=1,"srvType","Socket"`
`OK`
`AT^SISS=1,conId,"1"`
`OK`
`AT^SISS=1,"address","socktcp://listener:2000;etx=26;autoconnect=0"`
`OK`
`AT^SISS=1,"tcpMR","3"`
`OK`
`AT^SISS=1,"tcpOT","5555"`
`OK`
	Select service type Socket.
	
	Select connection profile.
	
	"etx" configures Transparent mode. Autoconnect disabled.

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

AT^SISO=1	
OK	
^SIS: 1,5	Listener ready, listening (value 5).
AT^SISO=1,1	Query status of profile 1.
^SISO: 1,"Socket",4,3,0,0,"10.10.0.187:65534","0.0.0.0:0"	Profile is running in listener mode, where <srvState>=4 (listening) and <socketState>=3 (LISTENER). Dynamic IP address is shown.
OK	

Host 2: Configure TCP Client:

AT^SISS=0,srvType,"Socket"	Select service type Socket.
OK	
AT^SISS=0,conId,"1"	Select connection profile.
OK	
AT^SISS=0,"address","socktcp://"10.10.0.187:65534"	Set Listener's IP address.
OK	
AT^SISS=0,"tcpMR","3"	
OK	
AT^SISS=0,"tcpOT","5555"	
OK	

Host 2: Start TCP Client

AT^SISO=0	
OK	
^SISW: 0,1	URC indicates that sending data is possible.

Host 1: Listener rejects incoming connection request from host 2:

^SIS: 1,3,0,"10.66.90.165:46723"	URC indicates incoming connection request.
AT^SISH=1	Listener rejects connection request.
OK	
AT^SISO=1,1	Query status of profile 1.
1,"Socket",4,3,0,0,"10.10.0.187:65534","0.0.0.0:0"	Listener is listening again.
OK	

Host 1: Listener accepts incoming connection request from host 2:

^SIS: 1,3,0,"10.66.90.165:46723"	URC indicates incoming connection request.
AT^SISO=1	Listener accepts connection request, profile changes to Server mode.
OK	
^SISW: 1,1	URC indicates that data transmission is possible.
AT^SISO=1,1	Query status of profile 1.
1,"Socket",8,4,0,0,"10.10.0.187:65534","10.66.90.165:46723",0	Service connected (value 8) and in Server mode / value 4).
OK	
AT^SIST=0	Change to transparent access mode.
CONNECT	Service enters transparent access mode.
Hello	For further handling see examples below, e.g. Section 11.15.11, Opening and Closing Transparent TCP Service, Section 11.15.12, Transparent TCP Client Receives Data While in AT Command Mode

11.15.6 Transparent TCP Listener: Autoanswering Incoming Remote Client

Host 1: Configure Transparent TCP Listener with Autoconnect enabled.

AT^SISS=1,"srvType","Socket"	Select service type Socket.
OK	
AT^SISS=1,conId,"1"	Select connection profile.
OK	
AT^SISS=1,"address","socktcp://listener:2000;etx=26;autoconnect=1"	"etx" configures Transparent mode. Autoconnect enabled.
OK	
AT^SISS=1,"tcpMR","3"	
OK	
AT^SISS=1,"tcpOT","5555"	
OK	

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

AT^SISO=1	
OK	
^SIS: 1,5	Listener ready, listening (value 5).
AT^SISO=1,1	Query status of Listener profile.
^SISO: 1,"Socket",4,3,0,0,"10.10.0.187:2000","0.0.0.0:0"	Listener ready, listening (value 4). Dynamic IP address is shown.
OK	
^SISW: 1,1	

Host 2: Configure TCP Client.

AT^SISS=0,srvType,"Socket"	Select service type Socket.
OK	
AT^SISS=0,conId,"1"	Select connection profile.
OK	
AT^SISS=0,"address","socktcp://10.10.0.187:2000"	Set Listener's IP address.
OK	
AT^SISS=0,"tcpMR","3"	
OK	
AT^SISS=0,"tcpOT","5555"	
OK	

Host 2: Start TCP Client

AT^SISO=0	
OK	
^SISW: 0,1	

Host 1: Transparent TCP Listener automatically accepts connection request from host 2:

^SIS: 1,3,1,"10.66.90.165:46723"	URC indicates incoming connection request.
CONNECT	Service autoconnects to client and enters Transparent Mode.
Hello	For further handling see examples below, e.g. Section 11.15.11, Opening and Closing Transparent TCP Service, Section 11.15.12, Transparent TCP Client Receives Data While in AT Command Mode Type +++ to return to AT command mode (+++ not visible in example).
OK	
AT^SISO=1,1	Query status of profile 1.

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

11.15.7 Socket Client Sends Data via TCP Connection (Polling Mode)

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

AT^SISO=0 OK	The host opens service profile 0. Note: URC ^SISW:0,1 does not appear! The host must poll the service state by means of AT^SISI until the service is in <srvState> "Up".
AT^SISI=0 ^SISI: 0,3,0,0,0,0 OK	The service is still in <srvState> "Connecting".
AT^SISI=0 ^SISI: 0,4,0,0,0,0 OK	The service is now in <srvState> "Up" and is ready to accept data.
AT^SISW=0,10 ^SISW: 0,10,10 0123456789 OK	The host requests to write 10 bytes. Response that 10 bytes can be sent and are unacknowledged.
AT^SISW=0,10,1 ^SISW: 0,0,10 OK	The host requests to write next 10 bytes and enables the <eodFlag>. But the service refuses the request, even the end-of-data flag remains without effect.
AT^SISW=0,10,1 ^SISW: 0,10,20 0123456789 OK	Next try (polling). Response that the service accepts 10 bytes and this data and the previously sent data are unacknowledged.
AT^SISW=0,0,0 ^SISW: 0,0,10 OK	Polling to request unacknowledged data. There are 10 bytes still unacknowledged.
AT^SISI=0 ^SISI: 0,5,0,20,10,10 OK	Polling for <srvState> change ("Closing" -> "Down"). 20 bytes are transfered via serial interface, 10 bytes are acknowledged by remote peer, 10 bytes are on the way.
AT^SISI=0 ^SISI: 0,6,0,20,20,0 OK	Polling for <srvState> change ("Closing" -> "Down"). The Service is in state "Down" and all data is confirmed by the remote peer.
AT^SISC=0 OK	Closing the Socket service.

11.15.8 Socket Client Sends Data via TCP Connection with URCs

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

AT^SISO=0	The host opens service profile 0.
OK	
^SISW: 0,1	Socket service is ready for upload.
AT^SISW=0,10	The host requests to write 10 bytes.
^SISW: 0,10,10	Response that 10 bytes can be sent and are unacknowledged.
0123456789	
OK	
^SISW: 0,1	The URC indicates that the Socket service is ready to transfer more data. Data of the last AT^SISW command are transferred to the remote host.
AT^SISW=0,10,1	The host requests to write next 10 bytes and enables the <eodFlag> to notify that these are the last 10 bytes of the session.
^SISW: 0,10,20	Response that the service accepts 10 bytes and this data and the previously sent data are unacknowledged.
0123456789	
OK	
------	Waiting for URC.
^SISW: 0,2	Data transfer has been finished.
AT^SISC=0	Closing the Socket service.
OK	

11.15.9 UDP Scenario

The following example shows a communication between a UDP endpoint (host 1) and a UDP client (host 2).
Part 1 of the example refers to the UDP endpoint and shows the configuration which allows the UDP endpoint to communicate with any UDP client.
Part 2 shows the settings of a UDP client.
Part 3 and 4 are running in parallel: Part 3 shows the procedures on the UDP endpoint side done when communicating with a UDP client. Part 4 shows the equivalent steps done by the UDP client when communicating with the UDP endpoint.

Part 1 - host 1 is configured for use as UDP endpoint:

AT^SISS=0,srvtype,socket	Select service type Socket.
OK	
AT^SISS=0,conid,1	Select connection profile 1.
OK	
AT^SISS=0,alphabet,1	Choose ASCII alphabet.
OK	
AT^SISS=0,address,"sockudp://:6666"	Specify the local UDP port.
OK	

Part 2 - host 2 is configured for use as UDP client:

AT^SISS=1,srvtype,socket	Select service type Socket.
OK	
AT^SISS=1,conid,1	Select connection profile 1.
OK	
AT^SISS=1,alphabet,1	Choose ASCII alphabet.
OK	
AT^SISS=1,address,"sockudp:// 10.10.0.219:6666"	Specify the address of host 1.
OK	

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

`AT^SISO=0`	Open the service.
`OK`	
`^SIS: 0,5`	URC indicates that host 1 is waiting (on UDP port 6666).
`AT^SISO=0,1`	
`^SISO: 0,"Socket",4,3,0,0,"10.10.0.219:6666","0.0.0.0:0"`	Request connection status.
`OK`	
`^SISR: 0,1`	URC indicates that host 2 has opened the connection to host 1 and has sent some data.
`AT^SISR=0,100`	Host 1 requests to read 100 bytes.
`OK`	
`^SISR: 0,22,"10.10.0.222:6561"` `Hello, I'm the client!`	Host 1 is reading the text string received from host 2 (see part 4 of the example) and gets information about the remote client, i.e. the address of host 2.
`OK`	
`AT^SISW=0,25,0,"10.10.0.222:6561"`	Host 1 starts sending 25 bytes to host 2.
`^SISW: 0,25,0`	Host 1 is sending the message "Hi, I'm the UDP endpoint!" (25 bytes) to host 2. As a result, host 2 is receiving the URC "^SISR: 1,1" shown below in part 4 of the example.
`OK`	
`^SISW: 0,1`	URC confirms that host 1 can send data again.
`AT^SISC=0`	Close the service.
`OK`	

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

`AT^SISO=1`	Open the service.
`OK`	
`^SISW: 1,1`	URC indicates that host 2 can send data.
`AT^SISO=1,1`	
`^SISO: 1,"Socket",4,2,0,0,"10.10.0.222:6561","10.10.0.219:6666"`	Request connection status.
`OK`	
`AT^SISW=1,22`	Host 2 starts to write 22 bytes.
`^SISW: 1,22,0`	Host 2 is writing the message "Hello, I'm the client!" (22 bytes). As a result, host 1 is receiving the URC "^SISR: 0,1" shown above in part 3 of this example.
`OK`	
`^SISW: 1,1`	URC confirms that host 2 could send data.
`^SISR: 1,1`	URC indicates that host 2 has received data from host 1.
`AT^SISR=1,100`	Host 2 requests to read 100 bytes.
`^SISR: 1,25` `Hi, I'm the UDP endpoint!`	Response indicates that host 2 has received 25 characters from host 1.
`OK`	
`AT^SISC=1`	Close the service.
`OK`	

11.15.10 Creating Transparent TCP Socket Client

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

11.15.11 Opening and Closing Transparent TCP Service

AT^SISO=1	Open Transparent TCP service.
OK	
^SISW: 1,1	URC indicates that Transparent TCP service is ready.
at^sist=1	Open transparent access mode.
CONNECT	Service is ready to send or receive data. Client is sending data, e.g Good Morning (not visible in example). Client types +++ to return to AT command mode (+++ not visible in example).
OK	
at^sisi=1	Check the service state of service profile 1.
^SISI: 1,4,0,16,16,0	Service is in state "Up" (4). 0 bytes received, 16 bytes sent and acknowledged.
OK	
AT^SISO?	Check the service state of service profile 1.
^SISO: 0,""	
^SISO: 1,"Socket",4,2,0,16,"10.10.0.200:1024","10.10.0.108:65532"	Service is in state "Up" (4). Socket is assigned. 0 bytes received, 16 bytes sent. Local and remote IP address are assigned.
^SISO: 2,""	
^SISO: 3,""	
^SISO: 4,""	
^SISO: 5,""	
^SISO: 6,""	
^SISO: 7,""	
^SISO: 8,""	
^SISO: 9,""	
OK	
AT^SISC=1	Close the service.
OK	
at^sisi=1	Check the service state of service profile 1.
^SISI: 1,2,0,0,0,0	Service profile 1 is in state "Allocated" (2).
OK	
AT^SISO?	Check the service state of service profile 1.
^SISO: 0,""	
^SISO: 1,"Socket",2,1,0,0,"0.0.0.0:0","0.0.0.0:0"	Service is in state "Allocated" (2). Socket not assigned.
^SISO: 2,""	
^SISO: 3,""	
^SISO: 4,""	
^SISO: 5,""	
^SISO: 6,""	

```
^SISO: 7,""
^SISO: 8,""
^SISO: 9,""
OK
```

11.15.12 Transparent TCP Client Receives Data While in AT Command Mode

`AT^SISO=1`	Open Transparent TCP service.
`OK`	
`^SISW: 1,1`	URC indicates that Transparent TCP service is ready.
`at^sist=1`	Open transparent access mode.
`CONNECT`	Service is ready to send or receive data.
`Hello`	Client is reading received data.
	Client types +++ to return to AT command mode (+++ not visible in example).
`OK`	
`^SISR: 1,1`	URC indicates that new data is available for the client.
`at^sist=1`	Return to transparent access mode.
`CONNECT`	Service is ready to send or receive data.
`Goodbye`	Client is reading received data.
	Client types +++ to return to AT command mode (not visible in example).
`OK`	
`at^sisi=1`	Check the service state of service profile 1.
`^SISI: 1,4,12,6,6,0`	Service is in state "Up" (4). 12 bytes received, 6 bytes sent and acknowledged.
`OK`	
`AT^SISO?`	Check the service state of service profile 1.
`^SISO: 0,""`	
`^SISO: 1,"Socket",4,2,12,6,"10.10.0.200:1025","10.10.0.108:65532"`	Service is in state "Up" (4). Socket is assigned. 12 bytes received, 6 bytes sent. Local and remote IP address are assigned.
`^SISO: 2,""`	
`^SISO: 3,""`	
`^SISO: 4,""`	
`^SISO: 5,""`	
`^SISO: 6,""`	
`^SISO: 7,""`	
`^SISO: 8,""`	
`^SISO: 9,""`	
`OK`	
`AT^SISC=1`	Close the service.
`OK`	
`at^sisi=1`	Check the service state of service profile 1.
`^SISI: 1,2,0,0,0,0`	Service profile 1 is in state "Allocated" (2).
`OK`	
`AT^SISO?`	Check the service state of service profile 1.
`^SISO: 0,""`	
`^SISO: 1,"Socket",2,1,0,0,"0.0.0.0:0","0.0.0.0:0"`	Service is in state "Allocated" (2). Socket not assigned.
`^SISO: 2,""`	
`^SISO: 3,""`	

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

11.15.13 Remote Server Disconnects While Transparent TCP Service is in Transparent Access Mode

AT^SISO=1	Open Transparent TCP service.
OK	
^SISW: 1,1	URC indicates that Transparent TCP service is ready.
at^sist=1	Open transparent access mode.
CONNECT	Service is ready to send or receive data.
Good Morning NO CARRIER	Remote server has sent data and disconnected. Client reads data. Then client gets NO CARRIER in AT command mode.
at^sisi=1	Check the service state of service profile 1.
^SISI: 1,6,12,0,0,0	Service is in state "Down" (6). 12 bytes received.
OK	
AT^SISO?	Check the service state of service profile 1.
^SISO: 0,""	
^SISO: 1,"Socket",6,2,12,0,"10.10.0.200:1026","10.10.0.108:65532"	Service is in state "Down" (6). Socket is assigned. 6 bytes received. 12 bytes sent. Local and remote IP address are assigned.
^SISO: 2,""	
^SISO: 3,""	
^SISO: 4,""	
^SISO: 5,""	
^SISO: 6,""	
^SISO: 7,""	
^SISO: 8,""	
^SISO: 9,""	
OK	
AT^SISC=1	Close the service.
OK	
at^sisi=1	Check the service state of service profile 1.
^SISI: 1,2,0,0,0,0	Service profile 1 is in state "Allocated" (2).
OK	

11.15.14 Server Disconnects While Transparent TCP Service is in AT Command Mode and Data is Pending

AT^SISO=1	Open Transparent TCP service.
OK	
^SISW: 1,1	URC indicates that Transparent TCP service is ready.
at^sist=1	Open transparent access mode.
CONNECT	Service is ready to send or receive data.
Good Morning	Client is reading data.

	Client types +++ to return to AT command mode (not visible in example).
OK	
^SISR: 1,1	Remote server has sent data and closed the connection (not visualized in this example). URC indicates that remaining data is available for reading.
at^sisi=1	Check service state of service profile 1.
OK	
^SISI: 1,4,12,3,3,0	Service profile 1 is in state "Up" (4). 12 bytes received. 3 bytes sent and acknowledged.
OK	
AT^SISO?	Check the service state of service profile 1.
^SISO: 0,""	
^SISO: 1,"Socket",4,2,12,3,"10.10.0.200:1027","10.10.0.108:65532"	Service is in state "Up" (4). Socket is assigned. 12 bytes received. 3 bytes sent. Local and remote IP address are assigned.
^SISO: 2,""	
^SISO: 3,""	
^SISO: 4,""	
^SISO: 5,""	
^SISO: 6,""	
^SISO: 7,""	
^SISO: 8,""	
^SISO: 9,""	
OK	
at^sist=1	Return to transparent access mode.
CONNECT	Service is ready to send or receive data.
Good bye	Client reads remaining data. Then client gets NO CARRIER in AT command mode.
NO CARRIER	
at^sisi?	Check service state of service profile 1.
^SISI: 1,6,20,3,3,0	Service is in service "Down" state (6). 20 bytes received. 3 bytes sent and acknowledged.
OK	
AT^SISO?	Check the service state of service profile 1.
^SISO: 0,""	
^SISO: 1,"Socket,20,3,"10.10.0.200:1027","10.10.0.108:65532"	Service is in state "Down" (6). Socket is assigned. 20 bytes received. 3 bytes sent. Local and remote IP address are assigned.
^SISO: 2,""	
^SISO: 3,""	
^SISO: 4,""	
^SISO: 5,""	
^SISO: 6,""	
^SISO: 7,""	
^SISO: 8,""	
^SISO: 9,""	
OK	
AT^SISC=1	Close the service.
OK	
at^sisi=1	Check service state of service profile 1.
^SISI: 1,2,0,0,0,0	Service profile 1 is in state "Allocated" (2).
OK	
AT^SISO?	Check the service state of service profile 1.
^SISO: 0,""	
^SISO: 1,"Socket",2,1,0,0,"0.0.0.0:0","0.0.0.0:0"	Service is in state "Allocated" (2). Socket is not assigned. Local and remote IP address not assigned.
^SISO: 2,""	

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

11.15.15 FTP Upload Single File (URC Mode)

Configure the service profile 2 for FTP:

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

Make an FTP connection:

`AT^SISO=2`	Open the service.
`OK`	Bearer is established, service is getting started.
`^SIS: 2,0,2100,"Ftp open(testnetwork:21)"`	"^SIS" URC with <urcInfoId> 2100 (FTP) status information from FTP server.
`^SIS: 2,0,2100,"220 FTP server (Version 6.4/OpenBSD/Linux-ftpd-0.17) ready."`	
`^SIS: 2,0,2100,"FTP Login OK"`	
`^SIS: 2,0,2100,"put newdata.txt"`	
`^SISW: 2,1`	URC indicates that FTP service is ready for upload.
`AT^SISW=2,40`	Client requests to send 40 bytes.
`^SISW: 2,40,0`	The write command response confirms that 40 bytes must be transferred now.
`0123456789012345678901234567890123456789`	User data is transferred.
`OK`	
`^SISW: 2,1`	URC indicates that the FTP service is ready to transfer more data.
`AT^SISW=2,40`	Client requests to send 40 bytes.
`^SISW: 2,40,0`	The write command response confirms that 40 bytes must be transferred now.
`0123456789012345678901234567890123456789`	User data is transferred.
`OK`	
`^SISW: 2,1`	URC indicates that the FTP service is ready to transfer more data.
`AT^SISW=2,0,1`	No more data available. <eodFlag> set. File "newdata.txt" shall be closed on FTP server.
`^SISW: 2,0,0`	
`OK`	
`^SIS: 2,0,2100,"226 Transfer complete."`	
`^SISW: 2,2`	URC indicates that data transfer finished successfully. Connection to the FTP server closes.

```
AT^SISC=2                                   Close the FTP service.
OK
```

11.15.16 HTTP Download Using TLS

Configure the service profile 4 for HTTPS:

```
AT^SISS=4,srvType,"Http"                    Select service type HTTP.
OK
AT^SISS=4,conId,"1"                         Select connection profile 1.
OK
AT^SISS=4,address,"https://www.face-        Specify access to Facebook website (always
book.com"                                   secured).
OK
AT^SISS=4,cmd,"get"                         Select command type download.
OK
```

Opening connection:

```
AT^SISO=4                                   Open the service.
OK
^SISS: 4,0,2200,"Http www.facebook.com:443"


^SISR: 4,1                                  URC indicates that the HTTP service is ready to read
                                            data.
AT^SISR=4,1000                              Read 1000 bytes.
^SISR: 4,1000
<?xml version="1.0" encoding="utf-8"?> <!DOCTYPE html PUBLIC "-//WAPFORUM//DTD XHTML
Mobile 1.0//EN" "http://www.wapforum.org


OK
AT^SISR=4,1000                              Repeat reading data n times.
^SISR: 4,1000
....
^SISR: 4,2                                  URC indicates that data transfer finished success-
                                            fully. Connection to the HTTP server closes.
AT^SISC=4                                   Close the HTTP service.
OK
```

11.15.17 HTTP Post

Configure the service profile 6 for HTTP:

```
AT^SISS=6,srvType,"Http"                    Select service type HTTP.
OK
AT^SISS=6,conId,"1"                         Select connection profile 1.
OK
AT^SISS=6,"address","http://testnetwork/    Specify URL.
cgi/first.pl"
OK
AT^SISS=6,"user","myuser"                   Specify user name.
OK
AT^SISS=6,"passwd","mypasswd"               Specify password.
OK
AT^SISS=6,cmd,"post"                        Select command type download.
```

```
OK
AT^SISS=6,"hcContent"," "                    Parameter is ignored.
OK
AT^SISS=6,"hcContLen","60"                   "hcContlen" specifies to send 60 bytes. Data will be
                                             sent from AT command interface.
OK
```

Opening connection:

```
AT^SISO=6                                    Open the service.
OK
^SISS: 6,0,2200,"Http pegasus.testnetz.sw5:80"

^SISW: 6,1                                   URC indicates that the HTTP service is ready to
                                             send data.
AT^SISW=6,30                                 Send 30 bytes.
^SISW: 6,30,0
OK
^SISW: 6,1                                   URC indicates that the HTTP service is ready to
                                             send data.
AT^SISW=6,30                                 Send 30 bytes.
^SISW: 6,30,0
OK
^SISW: 6,1                                   URC indicates that the HTTP service is ready to
                                             send data.
^SISW: 6,2                                   URC confirms: all data sent to server.
^SIS: 6,0,2200,"HTTP POST: http://testnetwork/cgi/first.pl"

6,0,2200,"HTTP POST Response: 200"
AT^SISC=6                                    Close the HTTP service.
OK
```

11.15.18 Ping

This example shows a Ping output. The example uses the Internet connection profile shown in Section 11.15.2.

```
AT^SISX=Ping,1,"74.125.39.99",5,5000
^SISX: "Ping",1,1,"74.125.39.99",1696
^SISX: "Ping",1,1,"74.125.39.99",175
^SISX: "Ping",1,1,"74.125.39.99",174
^SISX: "Ping",1,1,"74.125.39.99",174
^SISX: "Ping",1,1,"74.125.39.99",2111
^SISX: "Ping",2,1,5,5,0,0
^SISX: "Ping",3,1,174,2111,865
OK
```

11.15.19 Resolving DNS Host Name to IP Address

This example uses the Internet connection profile shown in Section 11.15.2.

```
AT^SISX=HostByName,1,"www.google.de"
^SISX: "HostByName","74.125.39.99"
OK
```

12. Supplementary Service Commands

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

12.1 AT+CACM Accumulated call meter (ACM) reset or query

The AT+CACM read command returns the current ACM value.

The AT+CACM write command resets the Advice of Charge related to the accumulated call meter (ACM) value in SIM file EF(ACM). ACM contains the total number of home units for both the current and preceding calls.

Syntax

Test Command

```
AT+CACM=?
```

Response(s)

```
OK
```

Read Command

```
AT+CACM?
```

Response(s)

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

Write Command

```
AT+CACM=[<passwd>]
```

Response(s)

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

PIN	MDM	APP	✈	Last
+	+	+	+	-

Reference(s)

3GPP TS 27.007 [49]

Parameter Description

<acm>(str)

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

<passwd>(str)

SIM PIN2

12.2 AT+CAMM Accumulated call meter maximum (ACMmax) set or query

The AT+CAMM read command returns the current ACMmax value.

The AT+CAMM write command sets the Advice of Charge related to the accumulated call meter maximum value in SIM file EF (ACMmax). ACMmax contains the maximum number of home units allowed to be consumed by the subscriber.

Syntax

Test Command

```
AT+CAMM=?
```

Response(s)

```
OK
```

Read Command

```
AT+CAMM?
```

Response(s)

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

Write Command

```
AT+CAMM=<acmmax>[, <passwd>]
```

Response(s)

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

PIN	MDM	APP	✈	Last
+	+	+	+	-

Reference(s)

3GPP TS 27.007 [49]

Parameter Description

<acmmax>(str)

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

<passwd>(str)

SIM PIN2

12.3 AT+CCFC Call forwarding number and conditions control

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

Syntax

Test Command

AT+CCFC=?

Response(s)

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

Write Command

AT+CCFC=<reason>, <mode>[, [<number>][, [<type>][, [<class>][, [<sub-number>][, [<sub-type>][, [<time>]]]]]]]

Response(s)

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

PIN	MDM	APP	✈	Last
+	+	+	-	-

Reference(s)

3GPP TS 27.007 [49],
3GPP TS 22.004 [27],
3GPP TS 22.082 [32],
3GPP TS 24.082

Parameter Description

<reason>(num)

Reason for call forwarding

0	Unconditional
1	Mobile busy
2	No reply
3	Not reachable
4	All call forwarding (includes reasons 0, 1, 2 and 3)
5	All conditional call forwarding (includes reasons 1, 2 and 3)

<mode>(num)

Network operation to be performed for Supplementary service "call forwarding"

0	Disable call forwarding (disable service)
1	Enable call forwarding (enable service)
2	Query status of call forwarding (query service status)

3	Register <number> and activate call forwarding (register service)
4	Erase <number> and deactivate call forwarding (erase service)

<number>(str)

String type phone number of forwarding address in format specified by <type>. If you select <mode>= 3, the phone <number> will be registered in the network. This allows you to disable / enable CF to the same destination without the need to enter the phone number once again. Depending on the services offered by the provider the registration may be mandatory before CF can be used. The number remains registered in the network until you register another number or erase it using <mode> = 4. Default is an empty number

<type>(num)

Type of address octet

145	Dialing string <number> includes international access code character '+'
129	Otherwise
[0]	May rejected by network

<class>(num)

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 [27].

1	Voice
2	Data <class> 2 (data) comprises all those <class> values between 16 and 128, that are supported both by the network and the MS. This means, a setting made for <class> 2 applies to all remaining data classes (if supported). In addition, you can assign a different setting to a specific class. For example, you can activate call forwarding for all data classes, but deactivate it for a specific data class.
4	Fax (only for compatibility reasons, not supported by PLS8-US-R4)
8	SMS
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 compatibilty reasons).

<sub-number>(str)

String type phone number of sub address in format specified by <type>. Default is an empty sub address

<sub-type>(num)

Type of sub-address octet

145	International access code character '+'
[128]	Otherwise

<time>(num)

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

<status>(num)	
0	Call forwarding not active
1	Call forwarding active

Notes

- For some networks, the interrogation command will return the same result for each requested class.
- You can register, disable, enable and erase <reason> 4 and 5 as described above. However, querying the status of <reason> 4 and 5 with AT+CCFC will result in an error.
- Most networks will not permit registration of new parameters for conditional call forwarding (reasons 1,2,3,5) while unconditional call forwarding is enabled.
- The AT+CCFC command offers a broad range of call forwarding options according to the 3GPP Technical Specifications. However, when you attempt to set a call forwarding option which is not provisioned or not yet subscribed to, the setting will not take effect regardless of the response returned. The responses in these cases vary with the network (for example "OK", "Operation not allowed", "Operation not supported" etc.). To make sure check the call forwarding status with <mode>=2.
- Some networks may choose to have certain call forwarding condtions permanently enabled (e.g. forwarding to a mailbox if the mobile is not reachable). In this case, erasure or deactivation of call forwarding for these conditions will not be successful, even if the CCFC request is answered with response "OK".
- The command has been implemented with the full set of <class> parameters according to 3GPP TS 27.007 [49]. For actual applicability of SS "call forwarding" to a specific service or service group (a specific <class> value) please consult table A.1 of 3GPP TS 22.004 [27].
- There is currently no release of 3GPP TS 22.004 [27], in which the call forwarding supplementary service is defined as applicable to SMS services.
- As stated above <class> 2 is intended only to send the data classes 16/32/64/128 to the network. However, the responses returned when the subscriber sets or queries call forwarding refer only to the status of the data classes received from the network. This means that the responses will display only those data classes between 16 and 128 which are supported by the network and currently activated. There will be no output for class 2, nor for classes which are not supported or not set.
- The parameter <class> will not be sent to the network if <mode>=2. Therefore it may happen that the response of the query command contains information about classes which were not requested, or it shows only the inactive status of the class 1 or 255, This means that the status is valid for all classes. The reponse shows the status in the order of the network response.

Example

Please note that when you configure or query call forwarding without specifying any classes, the settings will refer to classes 1, 2 and 4 only (= default).

- To register the destination number for unconditional call forwarding (CFU):

```
at+ccfc=0,3,"+493012345678",145
OK
```

  The destination number will be registered for above default classes.
  In most networks, the registration will also cause call forwarding to be activated for these <class> values.

- To query the status of CFU without specifying <class>:

```
at+ccfc=0,2
+CCFC: 1,1,"+493012345678",145
+CCFC: 1,4,"+493012345678",145
OK
```

- To erase the registered CFU destination number:

```
at+ccfc=0,4
OK
```

  Now, when you check the status, no destination number will be indicated:

```
at+ccfc=0,2
+CCFC: 0,1
+CCFC: 0,4
OK
```

- To query the status of CFU for all classes:

```
at+ccfc=0,2,,,255
+CCFC: 0,255
OK
```

- <reason> 4 or 5 cannot be used to query the status of all call forwarding reasons (see also notes above):

```
at+ccfc=4,2
error
at+ccfc=5,2
error
```

12.4 AT+CCWA Call Waiting

The AT+CCWA write command controls the call waiting supplementary service according to 3GPP TS 22.083 [33]. Activation, deactivation and status query are supported. The read command returns the current value of <n>.

Syntax

Test Command

AT+CCWA=?

Response(s)

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

Read Command

AT+CCWA?

Response(s)

+CCWA: <n>
OK

Write Command

AT+CCWA=[<n>[, <mode>[, <class>]]]

Response(s)

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

PIN	MDM	APP	✈	Last
+	+	+	-	-

Reference(s)

3GPP TS 27.007 [49],
3GPP TS 22.004 [27],
3GPP TS 22.083 [33],
3GPP TS 24.083

Unsolicited Result Code

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

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

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

Parameter Description

<n>(num)

Switch URCs "+CCWA" for call waiting on/off

0	Disable display of URCs "+CCWA"
1	Enable display of URCs "+CCWA"

<mode>(num)

Network operation to be performed for Supplementary service call waiting

0	Disable call waiting (disable service)
1	Enable call waiting (enable service)
2	Query status of call waiting (query service status)

<class>(num)

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 22.083 [33] In the write command, parameter <class> specifies the class of the active call during which an incoming call of any class is to be regarded as a waiting call. In URC "+CCWA: <calling number>, <type of number>[, <class>][, , <CLI validity>]", parameter <class> specifies the class of the waiting call.

1	Voice
2	Data <class> 2 (data) comprises all those <class> values between 16 and 128, that are supported both by the network and the MS. This means, a setting made for <class> 2 applies to all remaining data classes (if supported). In addition, you can assign a different setting to a specific class. For example, you can activate call waiting for all data classes, but deactivate it for a specific data class.
4	Fax (only for compatibility reasons, not supported by PLS8-US-R4)
8	SMS
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 compatibilty reasons). If the <class> parameter is omitted, the default value 7 is used.

<status>(num)

0	Call waiting service is not active
1	Call waiting service is active

<calling number>(str)

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

<type of number>(num)

Type of address octet in integer format (refer to 3GPP TS 24.008 [42], subclause 10.5.4.9)

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

<CLI validity>(num)

0	CLI valid

1	CLI has been withheld
2	CLI is not available

Notes

- With AT+CHLD, it is possible to establish a multiparty call or to set the active voice call on hold and then accept a waiting voice call (not possible with data call).
- Users should be aware that if call waiting is activated (<mode>=1), the presentation of URCs needs to be enabled, too (<n>=1).
  Otherwise, on the one hand, a waiting caller would be kept waiting due to lack of BUSY signals, while, on the other hand, the waiting call would not be indicated to the called party.
- AT+CCWA offers a broad range of options according to 3GPP Technical Specifications. However, when you attempt to enable call waiting for a <class> for which the service is not provisioned or not supported , the setting will not take effect regardless of the response returned. The responses in these cases vary with the network (for example "OK", "Operation not allowed", "Operation not supported" etc.). To make sure check the current call waiting settings with <mode>=2.
- AT+CCWA has been implemented with the full set of <class> parameters according to 3GPP TS 27.007 [49]. For actual applicability of SS call waiting to a specific service or service group (a specific <class> value) please consult table A.1 of 3GPP TS 22.004 [27] .
- Despite the specifications stated in 3GPP TS 22.004 [27] call waiting is not handled uniformly among all networks:
  3GPP TS 22.004 [27], Annex A, provides the following specification:
  "The applicability of call waiting refers to the telecommunication service of the active call and not of the waiting call. The incoming, waiting, call may be of any kind." Nevertheless, networks do differ on the actual implementation of the service. For example, the activation of call waiting for a data <class> causes some networks to send a call waiting indication if a call "of any kind" comes in during an active data call, but others may (with the same settings active) indicate a waiting data call during any kind of active call. Thus, the only reliable way to receive or prevent a call waiting indication under any circumstances and in any network, is to activate or deactivate call waiting for all tele- and bearer services (<class> 255).
- As stated above <class> 2 is intended only to send the data classes 16/32/64/128 to the network. However, the responses returned when the subscriber sets or queries call waiting refer only to the status of the data classes received from the network. This means that the responses will display only those data classes between 16 and 128 which are supported by the network and currently activated. There will be no output for class 2, nor for classes which are not supported or not set.
- The parameter <class> will not be sent to the network if <mode>= 2. Therefore it may happen that the response of the query command contains information about classes which were not requested or it shows only the inactive status of the class 1 or 255. This means, that the status is valid for all classes.

12.5 AT+CHLD Call Hold and Multiparty

The AT+CHLD command controls the Supplementary Services Call Hold and Multiparty. Calls can be put on hold, recovered, released and added to a conversation.
Like for all Supplementary Services, the availability and detailed functionality of Call Hold and Multiparty services depends on the configuration of the network. The PLS8-US-R4 can only request the service, but the network decides whether and how the request will be answered.

Syntax

Test Command

```
AT+CHLD=?
```

Response(s)

```
+CHLD: (list of supported <n>s)
OK
```

Write Command

```
AT+CHLD=[<n>]
```

Response(s)

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

PIN	MDM	APP	✈	Last
+	+	+	-	-

Reference(s)

3GPP TS 27.007 [49]

Parameter Description

<n>(num)	
0	Release all held calls or set User Determined User Busy (UDUB) for a waiting call: • If a call is waiting, release the waiting call. The calling party will receive a "BUSY" indication (Supplementary Service User Determined User Busy "UDUB") • Otherwise, terminate all held calls (if any).
1	Terminate all active calls (if any) and accept "the other call" as the active call: • If a call is waiting, the waiting call will be accepted. • Otherwise, if a held call is present, the held call becomes active.
1X	Terminate a specific call X. The call may be active, held or waiting. The remote party of the terminated call will receive a "NO CARRIER" indication. Parameter X is the call number <idx> in the list of current calls indicated by AT+CLCC. Instead of AT+CLCC, the AT^SLCC command with parameter <idx> can be used.
2	Place all active calls on hold (if any) and accept "the other call" as the active call: • If a call is waiting, the waiting call will be accepted. • Otherwise, if a held call is present, the held call becomes active.
2X	Place all active calls on hold except call X. Parameter X is the call number <idx> in the list of current calls indicated by AT+CLCC. Instead of AT+CLCC, the AT^SLCC command with parameter <idx> can be used.

3	Add a held call to the active calls in order to set up a conference (multiparty) call.
4	Connect the two calls of a multiparty call and disconnects the subscriber from both calls (ECT).

Notes

- The AT+CHLD command offers a broad range of options according to 3GPP Technical Specifications. However, if you attempt to invoke an option which is not provisioned by the network, or not subscribed to, invocation of this option will fail. The responses in these cases may vary with the network (for example "Operation not allowed", "Operation not supported" etc.).
- The handling of the supplementary service Call hold and Multiparty varies with the types of calls. This is because only voice calls can be put on hold, while data calls cannot. The following procedures apply: With AT+CHLD=2 the user can simultaneously place a voice call on hold and accept another waiting voice or data call. If the waiting call is a data call, it is also possible to put the voice call on hold. The user needs to wait for the RING signal and manually answer the data call with ATA. To switch back from the active data call to the held voice call the active call must be terminated with AT+CHLD=1. If all active and held calls are voice calls it is possible to switch back and forth with AT+CHLD=2.
- In conflict situations, e.g. when a waiting call comes while there are already held calls, the above procedures apply to the waiting call only. For example, <n>=0 rejects the waiting call, but does not affect the held calls.
- See also the AT+CCWA command for details on how to display waiting calls.
- The commands AT+CHLD=2x and AT+CHLD=4 are not supported by VoLTE.

12.6 AT+CLIR Calling Line Identification Restriction

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

Syntax

Test Command

AT+CLIR=?

Response(s)

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

Read Command

AT+CLIR?

Response(s)

+CLIR<n>, <m>
OK
ERROR
+CME ERROR: <err>

Write Command

AT+CLIR=<n>

Response(s)

OK
ERROR
+CME ERROR: <err>

PIN	MDM	APP	✈	Last
+	+	+	-	-

Reference(s)

3GPP TS 27.007 [49]

Parameter Description

<n>(num)

Parameter shows the settings for outgoing calls:

0(&F)(P)	Presentation indicator is used according to the subscription of the CLIR service
1	CLIR invocation
2	CLIR suppression

<m>(num)

Parameter shows the subscriber CLIR service status in the network:

0	CLIR not provisioned
1	CLIR provisioned in permanent mode
2	Unknown (e.g. no network, etc.)
3	CLIR temporary mode presentation restricted
4	CLIR temporary mode presentation allowed

Note

- The settings made with AT+CLIR=1 or AT+CLIR=2 are used for all outgoing calls until the UE is switched off or AT+CLIR=0 is used.

12.7 AT+CSSN Supplementary service notifications

Syntax

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

Read Command
AT+CSSN?
Response(s)
+CSSN: <n>, <m> OK

Write Command
AT+CSSN=<n>[, <m>]
Response(s)
OK ERROR +CME ERROR: <err>

PIN	MDM	APP	✈	Last
+	+	+	-	-

Reference(s)
3GPP TS 27.007 [49]

Unsolicited Result Codes

URC 1

+CSSI: <code 1>

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

URC 2

+CSSU: <code 2>

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

Command Description

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

Parameter Description

<n>(num)	
0(&F)(P)	Suppress "+CSSI" URCs
1	Activate "+CSSI" URCs

<m>(num)	
0(&F)(P)	Suppress "+CSSU" URCs
1	Activate "+CSSU" URCs

<code 1>(num)	
0	Unconditional call forwarding is active
1	Some of the conditional call forwardings are active
2	Call has been forwarded
3	Waiting call is pending
5	Outgoing call is barred

<code 2>(num)	
0	The incoming call is a forwarded call
2	Call has been put on hold (during a voice call)
3	Call has been retrieved (during a voice call)
5	Held call was terminated by other party
10	Additional incoming call forwarded

Note

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

12.8 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 [36]. 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	MDM	APP	✈	Last
+	+	+	-	-

Reference(s)

3GPP TS 27.007 [49],
3GPP TS 22.090 [36],
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>(num)	
0(&F)	Disable "+CUSD" URC presentation.
1	Enable "+CUSD" URC presentation. If a USSD send request is sent via ATD or handled by Remote-USAT (in ER mode) this setting is activated implicitly.
2	Cancel session (not applicable to read command response).

<ussdReq>(str)(+CSCS)

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>(str)(+CSCS)

Unstructured Supplementary Service Data (USSD) received from the network.
If <ussdDCS> indicates that 3GPP TS 23.038 [37] 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 [48], Annex A. See also Section 1.7, Supported character sets. However, in case of invalid or omitted <ussdDCS>, conversion of <ussdRsp> is not possible.

<ussdDCS>(num)

3GPP TS 23.038 [37] 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>(num)

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 <ussdStatus>=1 the user input needs to be sent via an additional AT+CUSD action <ESC>.
2	USSD exchange is terminated by network.
3	A (UE local) client has responded, i.e. the interface was not idle and a busy indication was sent to the network.
4	Operation not supported (e.g. wrong input value given).
5	Network timeout.

Note

- It is recommended to finalize or escape a pending USSD user interaction before further actions are done to prevent blocking situations.

12.9 AT+CLIP Calling Line Identification Presentation

AT+CLIP refers to the supplementary service CLIP (Calling Line Identification Presentation) that enables a called subscriber to get the calling line identity (CLI) of the calling party when receiving a mobile terminated call. The AT+CLIP write command enables or disables the presentation of the CLI. It has no effect on the execution of the supplementary service CLIP in the network.
The AT+CLIP read command gives the status of <clipUrcMode>, and also triggers an interrogation of the provision status of the CLIP service according to 3GPP TS 22.081 [31] (given in <clipStatus>).

Syntax

Test Command

```
AT+CLIP=?
```

Response(s)

```
+CLIP: (list of supported<clipUrcMode>s)
OK
ERROR
+CME ERROR: <err>
```

Read Command

```
AT+CLIP?
```

Response(s)

```
+CLIP: <clipUrcMode>,<clipStatus>
OK
ERROR
+CME ERROR: <err>
```

Write Command

```
AT+CLIP=<clipUrcMode>
```

Response(s)

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

PIN	MDM	APP	✈	Last
+	+	+	-	-

Reference(s)

3GPP TS 27.007 [49],
3GPP TS 22.081 [31]

Unsolicited Result Code

```
+CLIP: <clipNumber>, <clipNumType>, , [, <clipAlpha>][, <CLI validity>]
```

If CLIP is enabled (and is permitted by the calling subscriber), this URC is delivered after every "RING" or "+CRING" URC when a mobile terminated voice call occurs. For data calls the URC is delivered only once.

Parameter Description

<clipUrcMode>(num)(&V)(&W)	
[0](&F)	Suppress unsolicited result codes
1	Display unsolicited result codes

<clipStatus>(num)	
0	CLIP not provisioned

1	CLIP provisioned
2	Unknown

<clipNumber>(str)

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

<clipNumType>(num)

Type of address octet in integer format as received by the network. For further details see 3GPP TS 24.008 [42], subclause 10.5.4.7.
Most common values are:

128	Number is restricted or unknown.
161	National <clipNumber>. Network support of this type is optional.
145	Dialing string <clipNumber> includes international access code character '+'.

<clipAlpha>(str)

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

<CLI validity>(num)

0	CLI valid
1	CLI has been withheld by the originator.
2	CLI is not available due to interworking problems or limitations of originating network. <clipNumber> shall be an empty string ("") and <clipNumType> value will not be significant.

When CLI is not available (<CLI validity>=2), <clipNumber> shall be an plus string ("+") and <clipNumType> value will be "145". Nevertheless, the UE returns value 128 for <clipNumType> if TON/NPI is unknown in accordance with 3GPP TS 24.008 [42], subclause 10.5.4.7.

When CLI has been withheld by the originator, (<CLI validity>=1) and the CLIP is provisioned with the "override category" option (refer to 3GPP TS 22.081 [31] and 3GPP TS 23.081), <clipNumber> and <clipNumType> is provided. Otherwise, the UE returns the same setting for <clipNumber> and <clipNumType> as if the CLI was not available.

Note

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

12.10 AT+COLP Connected Line Identification Presentation

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

Syntax

Test Command

```
AT+COLP=?
```

Response(s)

```
+COLP:(list of supported <n>s)
OK
```

Read Command

```
AT+COLP?
```

Response(s)

```
+COLP: <n>,<m>
OK
ERROR
+CME ERROR: <err>
```

Write Command

```
AT+COLP=[<n>]
```

Response(s)

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

PIN	MDM	APP	✈	Last
+	+	+	-	-

Reference(s)

3GPP TS 27.007 [49]

Unsolicited Result Code

Call response format:

```
+COLP: <number>, <type>[, <sub-number>][, <sub-type>][, <alpha>]
```

Parameter Description

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

<m>(num)	
0	COLP not provisioned (no presentation)
1	COLP provisioned
2	Unknown

<number>(str)

String type phone number of connected address in format specified by <type>

<type>(num)

Type of address octet in integer format.

128	Number is restricted.
161	National <number>
145	Number string <number> includes international access code character '+'.
129	Otherwise

<sub-number>(str)

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

<sub-type>(num)

Type of sub-address octet

145	international access code character '+'
129	otherwise

<alpha>(str)

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

Note

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

13. 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.

13.1 AT+CGDCONT Define PDP Context

AT+CGDCONT specifies the parameters for a PDP context identified by the context identifier <cid>. The number of contexts that may be in a defined state at the same time is given by the range returned by the AT+CGDCONT test command. A special form of the write command (AT+CGDCONT=<cid>) causes the values for context <cid> to become undefined. If context 1 is undefined on startup, it will be recreated automatically with <PDP_type> "IPV4V6" and all other parameters set to their defaults.
It is not allowed to undefine an already activated context.
The AT+CGDCONT read command returns the current settings for each defined PDP context.

PDP contexts can be associated with APN Classes configurable with AT^SGAPN. Please note that changing the PDP context definitions with AT^SGAPN will also affect the settings of AT+CGDCONT.

Syntax

Test Command

```
AT+CGDCONT=?
```

Response(s)

```
+CGDCONT: (range of supported <cid>s), "IP", , , (list of supported <d_comp>s), (list of supported <h_comp>s), (list of supported <IPv4AddrAlloc>s), (list of supported <emergency_indication>s), (list of supported <P-CSCF_discovery>s), (list of supported <IM_CN_Signalling_Flag_Ind>s)
+CGDCONT: (range of supported <cid>s), "PPP", , , (list of supported <d_comp>s), (list of supported <h_comp>s), (list of supported <IPv4AddrAlloc>s), (list of supported <emergency_indication>s), (list of supported <P-CSCF_discovery>s), (list of supported <IM_CN_Signalling_Flag_Ind>s)
+CGDCONT: (range of supported <cid>s), "IPV6", , , (list of supported <d_comp>s), (list of supported <h_comp>s), (list of supported <IPv4AddrAlloc>s), (list of supported <emergency_indication>s), (list of supported <P-CSCF_discovery>s), (list of supported <IM_CN_Signalling_Flag_Ind>s)
+CGDCONT: (range of supported <cid>s), "IPV4V6", , , (list of supported <d_comp>s), (list of supported <h_comp>s), (list of supported <IPv4AddrAlloc>s), (list of supported <emergency_indication>s), (list of supported <P-CSCF_discovery>s), (list of supported <IM_CN_Signalling_Flag_Ind>s)
OK
ERROR
+CME ERROR: <err>
```

Read Command

```
AT+CGDCONT?
```

Response(s)

```
+CGDCONT: [<cid>, <PDP_type>, <APN>, <PDP_addr>, <d_comp>, <h_comp>, <IPv4AddrAlloc>, <emergency_indication>, <P-CSCF_discovery>, <IM_CN_Signalling_Flag_Ind>]
[+CGDCONT: <cid>, <PDP_type>, <APN>, <PDP_addr>, <d_comp>, <h_comp>, <IPv4AddrAlloc>, <emergency_indication>, <P-CSCF_discovery>, <IM_CN_Signalling_Flag_Ind>]
[+CGDCONT: ...]
OK
ERROR
+CME ERROR: <err>
```

Write Command

AT+CGDCONT=<cid>[, <PDP_type>[, <APN>[, <PDP_addr>[, <d_comp>[, <h_comp>[, <IPv4AddrAlloc>[, <emergency_indication>[, <P-CSCF_discovery>[, <IM_CN_Signalling_Flag_Ind>]]]]]]]]

Response(s)

OK
ERROR
+CME ERROR: <err>

PIN	MDM	APP	✈	Last
-	+	+	+	-

Reference(s)

3GPP TS 27.007,
3GPP TS 23.003,
3GPP TS 24.301,
3GPP TS 25.323,
3GPP TS 44.065

Parameter Description

<cid>(num)(NV)

PDP Context Identifier

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

1...16

<PDP_type>(str)(NV)

Packet Data Protocol type

Specifies the type of the packet data protocol.
Changing the PDP type with AT+CGDCONT will also change the AT^SGAPN value.

“IP“	Internet Protocol (IETF STD 5) Applicable to dialup connections, WWAN interface, embedded TCP/IP stack
“PPP“	Point to Point Protocol (IETF STD 51) Intended only for dialup connections (e.g. ATD*99#)
“IPV6“	Internet Protocol, version 6 (see RFC 2460)
“IPV4V6“	Virtual <PDP_type> introduced to handle dual IP stack UE capability. (See 3GPP TS 24.301). Not applicable to PPP (dialup) connections).

<APN>(str)(NV)

Access Point Name

Logical name used to select the GGSN or the external packet data network. Maximum length: 100 characters.
An Access Point Name has to follow the syntax rules specified in 3GPP TS 23.003 in section 9.1.
If the value is null or omitted, then the subscription value will be requested.
Changing the APN with AT+CGDCONT will also change the AT^SGAPN value.

<PDP_addr>(str)(NV)

Packet Data Protocol address

Identifies the MT in the address space applicable to PDP (e.g. IPv4 address for PDP type IP). If the value is null or omitted, then a value may be provided by the TE during the PDP startup procedure or, failing that, a dynamic address will be requested. The read command will continue to return the null string even if an address has been allocated during the PDP startup procedure. A string consisting of the values 0.0.0.0 for IPV4 or 0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0 for IPV6 has the same meaning as a null string. The allocated address may be read using AT+CGPADDR.

`<d_comp>`(num)(NV)

Data Compression

Controls the PDP data compression (applicable for Subnetwork Dependent Convergence Protocol (SNDCP) only); see 3GPP TS 44.065 and GPP TS 23.003 for details.

[0]	off
1	on
2	V.42bis

`<h_comp>`(num)(NV)

Header Compression

Controls the PDP header compression; see 3GPP TS 44.065 and 3GPP TS 25.323 for details.

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

`<IPv4AddrAlloc>`(num)(NV)

Numeric parameter that controls how the MT/TA requests to get the IPv4 address information.

[0]	IPv4 Address Allocation through NAS Signalling

`<emergency_indication>`(num)(NV)

Numeric parameter used to indicate whether the PDP context is for emergency bearer services or not.

[0]	PDP context is not for emergency bearer services
1	PDP context is for emergency bearer services

`<P-CSCF_discovery>`(num)(NV)

Numeric parameter influences how the MT/TA requests to get the P-CSCF address, see 3GPP TS 24.229 [89] annex B and annex L.

[0]	Preference of P-CSCF address discovery not influenced by +CGDCONT
1	Preference of P-CSCF address discovery through NAS Signalling
2	Preference of P-CSCF address discovery through DHCP

`<IM_CN_Signalling_Flag_Ind>`(num)(NV)

Numeric parameter used to indicate to the network whether the PDP context is for IM CN subsystem-related signalling only or not.

[0]	UE indicates that the PDP context is not for IM CN subsystem-related signaling only
1	UE indicates that the PDP context is for IM CN subsystem-related signaling only

13.1.1 Attaching to LTE Networks and Registering to IMS

To allow access to the PDN (Packet Data Network) and to the IMS (IP-based Multimedia Subsystem), the UE has to perform attach and context activation procedures. The initial PDN attach is prerequisite for LTE services. For Voice service in LTE (VoLTE), the PDN attach is followed by IMS registration attempt if network support is available.

The correct APNs shall be specified *before* the UE tries to attach. For ease of use, the UE comes with preconfigured provider profiles. Depending on the selected provider configuration the UE either loads
- a standard profile intended for a great variety of operators (referred to as Fallback profile),
- or a dedicated profile preconfigured for a specific network operator.
For details on provider configurations see ATI61 and the AT^SCFG subcommands "MEopMode/Prov/Cfg" and "MEopMode/Prov/AutoSelect". To check the currently defined PDP contexts use the AT+CGDCONT read command.

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

In contrast to 2G (GSM) and 3G (UMTS) where PDN attach and context activation are performed separately, a successful LTE attach and registration procedure always includes the automatic activation of a PDN PDP context. If IMS (IP-based Multimedia Subsystem) is enabled and supported by the network, the IMS PDP context will also be activated when the UE attaches to LTE.

Many network operators allow to assign the 1st PDP context to the PDN APN, and the 2nd to the IMS APN. This way, the 1st PDP context serves both for LTE attach and Internet access. For PLS8-US-R4 this means that the AT^SWWAN command can simply reuse the 1st PDP context to establish data connections to the Internet. PDP contexts defined for IMS or IMS Emergency signalling cannot be used for AT^SWWAN.
NOTE: Only few operators require separate APNs for LTE attach and for Internet access, for example German Telecom and China Mobile. Therefore, the profile preconfigured for the German Telecom inside the UE defines the 1st PDP context only for Internet access without usage for LTE attach, while the 2nd PDP context is assigned to IMS and used for LTE attach. The benefit is that German Telecom subscribers may also set up AT^SWWAN connections at the 1st PDP context. For China Mobile the 5th PDP context is preconfigured for LTE attach.

How to trigger the attach procedure:
To ensure that the UE properly attaches to LTE it is necessary to retain the auto attach ability, by default enabled with AT^SCFG="GPRS/AutoAttach". This way, the UE automatically tries to attach to LTE and IMS after SIM PIN1 authentication has completed. Manual attach / detach procedures by AT+CGATT are not recommended for LTE and IMS, and should be used only for GSM and UMTS.

To verify whether LTE attach and IMS registration were successful use the following AT commands:
- AT+CGACT? read command shows the automatically activated PDP contexts for PDN and IMS.
- AT+CGPADDR shows the IP addresses dynamically assigned to each PDP context.
- AT+CGCONTRDP shows the APNs, EPS bearer IDs, IP addresses.
Please remember that AT+CGACT? does not indicate active WWAN connections set up with AT^SWWAN.

As long as the UE is attached and registered to LTE any attempt to deactivate the active PDP context (e.g AT+CGACT=0,1) will be denied with "+CME ERROR: operation not allowed". The detach command AT+CGATT=0 is accepted but will cause the UE to deregister from LTE.
Likewise, an active PDP context assigned to IMS can neither be deactivated.

LTE attach with no APN
If no PDN APN is specified (for most operators at <cid> 1) when the UE attaches to LTE, the network will automatically select the so called default APN, specified in the HSS, to establish the initial context (PDN connection/ default bearer). Although the LTE attach procedure will be successful in that case, the context for the default APN

might be configured with restrictions concerning the transmission of data, depending on operator settings.

LTE attach with wrong APN
If a wrong PDN APN is configured during the LTE attach procedure, e.g. if an application allows the user to change SIM cards and the APN was not set correctly after the SIM change, the LTE attach will be rejected by the network. As result, the RAT type LTE will be disabled by the UE for a limited amount of time and the UE will only use 2G and 3G RAT types for PS access. The duration while RAT type LTE is disabled depends on network configuration (timer T3402, default 12 minutes). To get notifications on the T3402 timer you can take advantage of the AT^SIND "ltebot" indicator.

Recommendations for LTE attach
When using LTE auto attach, the application shall ensure that the correct PDN APN is specified *before* the UE attaches to LTE. To do so, use the command AT+CGDCONT=<cid>,<PDP_type>,<APN>.
If the application cannot ensure that the correct PDN APN is configured *before* the UE attempts to attach to LTE, the application shall employ one of the following command sequences:

- AT+COPS=2 to deregister from the network, AT+CGDCONT to set the APN, then AT+COPS=0 to force a new network registration, thus enabling a new LTE auto attach attempt. If running, the T3402 timer will be stopped by AT+COPS=0.
- AT+COPS=2 to deregister from the network, AT+CGDCONT to set the APN, then AT+CFUN=1,1 to restart the UE (since the AT+CGDCONT setting is non-volatile).

13.2 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 <state>s)
OK
```

Read Command

```
AT+CGATT?
```

Response(s)

```
+CGATT: <state>
OK
```

Write Command

```
AT+CGATT=[<state>]
```

Response(s)

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

PIN	MDM	APP	✈	Last
+	+	+	-	-

Reference(s)

3GPP TS 27.007 [49]

Parameter Description

<state>(num)

Indicates the state of PS attachment.

0(P)	Detached
[1]	Attached

13.3 AT+CGACT PDP Context Activate or Deactivate

AT+CGACT write command is used to activate or deactivate the specified PDP context(s). After command has completed, the MT remains in V.250 command state. If any PDP context is already in the requested state, the state for that context remains unchanged. If MT is not PS attached when the activation form of the command is executed, MT firstly performs a PS attach and then attempts to activate the specified contexts. If no <cid>s are specified the activation/deactivation form of the command activates/deactivates all defined contexts.

AT+CGACT read command returns the current activation states for all defined PDP contexts.

AT+CGACT test command is used for requesting information on supported PDP context activation states.

Syntax

Test Command

```
AT+CGACT=?
```

Response(s)

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

Read Command

```
AT+CGACT?
```

Response(s)

```
+CGACT: [<cid>, <state>]
[+CGACT: <cid>, <state>]
...
OK
ERROR
+CME ERROR: <err>
```

Write Command

```
AT+CGACT=<state>[, <cid>[, <cid>]]
```

Response(s)

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

PIN	MDM	APP	✈	Last
+	+	+	-	-

Reference(s)

3GPP TS 27.007 [49]

Parameter Description

<state>(num)

Indicates the state of PDP context activation.

0	Deactivated
1	Activated

<cid>(num)

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

Notes

- A maximum of 3 PDP contexts, each for a different APN, can be activated at the same time.
  1 PDP context can be activated on the modem (no matter which interface), and max. 2 PDP contexts can be activated for the WWAN interfaces using AT^SWWAN. If the UE is registered to LTE and IMS AT+CGACT shows the active state of both PDP contexts, and any attempt to deactivate them with AT+CGACT will be denied. See more information in Section 13.1.1, Attaching to LTE Networks and Registering to IMS.
  Remember that contexts may be activated implicitly by using other commands, e.g. AT+CGDATA or ATD*99#. Contexts activated by AT^SWWAN are not indicated by AT+CGACT.
- Contexts activated by , e.g. AT+CGDATA or ATD*99# can not be handled by the AT+CGACT write command but their activation state is still visible via AT+CGACT read command. A write command without specifying any <cid> will always fail as long as some contexts are still in use by AT+CGDATA or ATD*99#.
- If activation or deactivation of a context fails, then AT+CEER may provide further informations about the reason.

13.4 AT+CGDATA Enter Data State

AT+CGDATA write command causes the MT to perform all actions which are necessary to establish communication between the TE and the network using one or more Packet Domain PDP types. This may include performing a PS attach and one or more PDP context activations. Commands following the AT+CGDATA command in the AT command line will not be processed by the MT.
If the write command is successful, the MT issues the intermediate result code CONNECT and enters V.250 online data state.
The application that initiates the PPP mode must be designed to start all LCP configure requests in accordance with TS 27.060 par 9.1. Otherwise the MT remains, after the CONNECT, infinitely in a waiting state.
After data transfer is complete, and layer 2 protocol termination procedure has completed successfully, command state is reentered and MT returns the final result code OK.
If <L2P> parameter value is unacceptable to the MT it returns ERROR or +CME ERROR.
In the event of erroneous termination or a failure to start up, command state is reentered and MT returns NO CARRIER, or if enabled +CME ERROR.

AT+CGDATA test command is used for requesting information on the supported layer 2 protocols to be used between TE and MT.

Syntax

Test Command

```
AT+CGDATA=?
```

Response(s)

```
+CGDATA: (list of supported <L2P>s)
OK
```

Write Command

```
AT+CGDATA=[<L2P>[, <cid>]]
```

Response(s)

```
CONNECT
NO CARRIER
ERROR
+CME ERROR: <err>
```

PIN	MDM	APP	✈	Last
+	+	-	-	+

Reference(s)

3GPP 27.007

Parameter Description

<L2P>(str)

Layer 2 protocol to be used between TE and MT.

[“PPP“]	Layer 2 protocol PPP

<cid>(num)

Parameter specifies a particular PDP context definition (see AT+CGDCONT parameter <cid>).
If parameter is not specified, then the first defined primary context is used.

13.4.1 Automatic deactivation of PDP context during dial-up PPP

From using AT+CGDATA write command or ATD*99# follows that MT issues intermediate result code CONNECT and enters V.250ter online data state. In V.250 online data state, first some LCP protocol exchange between MT and TE is performed to set up the PPP link. After successfully establishing the PPP link, the MT performs PDP context activation procedure if the context is not already activated. As a result, MT is in a "PDP context activated" state within the PLMN, the PPP link is established on the mobile side and the mobile is ready for IP data transfer.
If the TE wants to close the LCP link the MT may perform an LCP termination request procedure on PPP level. After this LCP termination procedure the MT deactivates the PDP context automatically and the MT returns to V.250 command mode and issues the final result code NO CARRIER.
If DTR is configured to disconnect data connections (AT&D2), the application should not toggle DTR during implicit PDP context deactivation and before "NO CARRIER" is received.

13.5 AT+CGPADDR Show PDP Address

The AT+CGPADDR exec command returns a list of PDP addresses for all defined contexts.

The AT+CGPADDR write command returns a list of PDP addresses for the specified context identifiers. If a context is not defined, then no output line is generated for it. If no <cid> is specified, the addresses for all defined contexts are returned.

The AT+CGPADDR test command returns a list of defined <cid>s.

Syntax

Test Command

```
AT+CGPADDR=?
```

Response(s)

```
[+CGPADDR: (list of defined <cid>s)]
OK
```

Exec Command

```
AT+CGPADDR
```

Response(s)

```
[+CGPADDR: <cid>[, <PDP_address_1>[, <PDP_address_2>]]]
[+CGPADDR: ...]
OK
ERROR
+CME ERROR: <err>
```

Write Command

```
AT+CGPADDR=[<cid>[,<cid>[, ...]]]
```

Response(s)

```
[+CGPADDR: <cid>[, <PDP_address_1>[, <PDP_address_2>]]]
[+CGPADDR: ...]
OK
ERROR
+CME ERROR: <err>
```

PIN	MDM	APP	✈	Last
+	+	+	+	-

Reference(s)

3GPP 27.007

Parameter Description

<cid>(num)

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

<PDP_address_1>(str)

A string that identifies the MT in the address space applicable to the PDP. The address may be static or dynamic. If address is not available parameter is omitted.
Parameter specifies the assigned address as a dot-separated numeric (0-255) parameter of the form "a1.a2.a3.a4" for IPv4 and "a1.a2.a3.a4.a5.a6.a7.a8.a9.a10.a11.a12.a13.a14.a15.a16" for IPv6.
The settings of AT+CGPIAF can influence the format of the IPv6 address.

<PDP_address_2>(str)

A string that identifies the MT in the address space applicable to the PDP. The address may be static or dynamic. Parameter is displayed only when both IPv4 and IPv6 addresses are assigned, with <PDP_address_1> containing the IPv4 address and this parameter the IPv6 address.
Parameter specifies the assigned IPv6 address as a dot-separated numeric (0-255) parameter of the form "a1.a2.a3.a4.a5.a6.a7.a8.a9.a10.a11.a12.a13.a14.a15.a16".
The settings of AT+CGPIAF can influence the format of this parameter.

13.6 AT+CGPIAF Select Printing IP address format

AT+CGPIAF specifies the format to print IPV6 address parameters of other AT commands. See RFC 4291 for details of the IPv6 address format. The +CGPIAF parameters <format>, <subnet>, <lzeros> and <czeros> affect the following commands and parameters:

- in AT+CGDCONT, the <PDP_addr>;
- in AT+CGPADDR, the <PDP_address_1> and <PDP_address_2>;
- in AT+CGCONTRDP, the <LocalAddr and SubNetMask>, <DNS_prim_addr> and <DNS_sec_addr>.

The read command returns the current command parameter settings.
The test command returns supported parameter values.

Syntax

Test Command

AT+CGPIAF=?

Response(s)

+CGPIAF: (list of supported <format>s), (list of supported <subnet>s), (list of supported <lzeros>s), (list of supported <czeros>s)
OK

Read Command

AT+CGPIAF?

Response(s)

+CGPIAF: <format>, <subnet>, <lzeros>, <czeros>
OK

Write Command

AT+CGPIAF=[<format>[, <subnet>[, <lzeros>[, <czeros>]]]]

Response(s)

OK
ERROR
+CME ERROR: <err>

PIN	MDM	APP	✈	Last
+	+	+	+	-

Reference(s)

3GPP 27.007

Parameter Description

<format>(num)

A numeric parameter which decides the IPv6 address format. Relevant for all AT command parameters that can hold an IPv6 address.

0(P) Use IPv4-like dot-notation. IP address, and subnetwork mask if applicable, are dot-separated, e.g.
"32.1.13.184.0.0.205.48.0.0.0.0.0.0.0.0.255.255.255.255.255.255.255.240.0.0.0.0.0.0.0.0"
for parameters holding address and subnet mask and
"32.1.13.184.0.0.205.48.0.0.0.0.0.0.0.0"
for other IP address parameters.

1	Use IPv6-like colon-notation. IP address, and subnetwork mask if applicable and when given explicitly, are separated by a space, e.g. "2001:0DB8:0000:CD30:0000:0000:0000:0000 FFFF:FFFF:FFFF:FFF0:0000:0000:0000:0000" for parameters holding address and subnet mask and "2001:0DB8:0000:CD30:0000:0000:0000:0000" for other IP address parameters.

`<subnet>`(num)

A numeric parameter which decides the subnet-notation for parameters that hold remote address and subnet mask Setting does not apply if `<format>`= 0.

0(P)	Both IP Address and subnet mask are stated explicitly, separated by a space, e.g. "2001:0DB8:0000:CD30:0000:0000:0000:0000 FFFF:FFFF:FFFF:FFF0:0000:0000:0000:0000".
1	The printout format is applying / (forward slash) subnet-prefix Classless Inter-Domain Routing (CIDR) notation, e.g. ":0DB8:0000:CD30:0000:0000:0000:0000/60"

`<lzeros>`(num)

A numeric parameter which decides whether leading zeros are omitted or not. Setting does not apply if `<format>`= 0.

0(P)	Leading zeros are omitted, e.g. "2001:DB8:0:CD30:0:0:0:0".
1	Leading zeros are included, e.g. "2001:0DB8:0000:CD30:0000:0000:0000:0000".

`<czeros>`(num)

A numeric parameter which decides whether 1-n instances of 16-bit zero-values are replaced by only '::'. This applies only once. Setting does not apply if `<format>`= 0.

0(P)	No zero compression, e.g. "2001:DB8:0:CD30:0:0:0:0".
1	Use zero compression, e.g. "2001:DB8:0:CD30::".

13.7 AT+CGEREP Packet Domain Event Reporting

The AT+CGEREP write command enables or disables sending of unsolicited result codes, +CGEV URCs from MT to TE in the case of certain events occurring in the Packet Domain MT or the network.
Parameter <mode> controls the processing of unsolicited result codes specified within this command. <bfr> controls the effect on buffered codes when <mode> 1 or 2 is entered. If a setting is not supported by the MT, ERROR or +CME ERROR: is returned.

The AT+CGEREP read command returns the current <mode> and buffer settings.

The AT+CGEREP test command returns the modes and buffer settings supported by the MT as compound values.

Syntax

Test Command

```
AT+CGEREP=?
```

Response(s)

```
+CGEREP: (list of supported <mode>s), (list of supported <bfr>s)
OK
```

Read Command

```
AT+CGEREP?
```

Response(s)

```
+CGEREP: <mode>, <bfr>
OK
```

Write Command

```
AT+CGEREP=[<mode>[, <bfr>]]
```

Response(s)

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

PIN	MDM	APP	✈	Last
+	+	+	+	-

Reference(s)

3GPP TS 27.007 [49]

Unsolicited Result Codes

URC 1

```
+CGEV: REJECT <PDP_type>, <PDP_addr>
```

A network request for PDP context activation occurred when the MT was unable to report it to the TE with a +CRING unsolicited result code and was automatically rejected.

URC 2

```
+CGEV: NW REACT <PDP_type>, <PDP_addr>[, <cid>]
```

The network has requested a context reactivation. The <cid> that was used to reactivate the context is provided if known to the MT.

URC 3

```
+CGEV: NW DEACT <PDP_type>, <PDP_addr>[, <cid>]
```

The network has forced a context deactivation. The <cid> that was used to activate the context is provided if known to the MT.

URC 4

+CGEV: ME DEACT <PDP_type>, <PDP_addr>[, <cid>]

The UE has forced a context deactivation. The <cid> that was used to activate the context is provided if known to the MT.

URC 5

+CGEV: NW DETACH

The network has forced a PS detach.

URC 6

+CGEV: ME DETACH

The mobile equipment has forced a PS detach.

URC 7

+CGEV: NW CLASS <class>

The network has forced a change of MS class. The highest available class is reported.

URC 8

+CGEV: ME CLASS <class>

The UE has forced a change of MS class. The highest available class is reported.

URC 9

+CGEV: PDN ACT <cid>

A context activation has been forced. The <cid> that was used to activate the context is provided if known to the MT. The context represents a PDN connection in LTE or a Primary PDP context in GSM/UMTS.

URC 10

+CGEV: PDN DEACT <cid>

A context deactivation has been forced. The <cid> that was used to activate the context is provided if known to the MT. The context represents a PDN connection in LTE or a Primary PDP context in GSM/UMTS.

URC 11

+CGEV: NW MODIFY <cid>,<change-reason>,<event-type>

The network has modified a context. The associated <cid> is provided to the TE in addition to the <change-reason> and <event-type>. The format of the parameter <cid> is found in command AT+CGDCONT.

URC 12

+CGEV: ME MODIFY <cid>, <change-reason>, <event-type>

The mobile termination has modified a context. The associated <cid> is provided to the TE in addition to the <change-reason> and <event-type>.

URC 13

+CGEV: ME PDN ACT <cid>[, <reason>]

The UE has activated a context. The context represents a Primary PDP context in GSM/UMTS/LTE. The <cid> for this context is provided to the TE. This event is sent either in result of explicit context activation request (AT+CGACT), or in result of implicit context activation request associated to attach request (AT+CGATT=1).

Parameter Description

<mode>(num)	
0(P)	Buffer unsolicited result codes in the MT. Currently 3 +CGEV URCs can be buffered. If MT result code buffer is full, the oldest ones will be discarded. No codes are forwarded to the TE.

1	Discard unsolicited result codes when MT TE link is reserved (e.g. in on line data mode); otherwise forward them directly to the TE.
2	Buffer unsolicited result codes in the MT when MT TE link is reserved (e.g. in on line data mode) and flush them to the TE when MT TE link becomes available; otherwise forward them directly to the TE. Currently 3 +CGEV URCs can be buffered. If MT result code buffer is full, the oldest URCs will be discarded.

<bfr>(num)

0	MT buffer of unsolicited result codes defined within this command is cleared when <mode> 1 or 2 is entered
1	MT buffer of unsolicited result codes defined within this command is flushed to the TE when <mode> 1 or 2 is entered (OK response will be given before flushing the codes). Buffer is empty afterwards.

<class>(str)

Parameter indicates the GPRS mobile class.

“A“	Class A (highest)
“B“	Class B
“CG“	Class C in GPRS mode
“CC“	Class C in circuit switched mode

<reason>(num)

Indicates the reason why the context activation request for PDP type IPv4v6 was not granted. This parameter is only included if the requested PDP type associated with <cid> is IPv4v6, and the PDP type assigned by the network for <cid> is either IPv4 or IPv6.

0	IPV4 only allowed
1	IPV6 only allowed
2	Single address bearers only allowed
3	Single address bearers only allowed and MT initiated context activation for a second address type bearer was not successful.

<change-reason>(num)

Integer type parameter indicates what kind of change occurred.

0	Not available
1	TFT only changed
2	Qos only changed
3	Both TFT and QoS changed

<event-type>(num)

Integer type parameter indicates whether this is an informational event or whether the TE has to acknowledge it.

0	Informational event

13.8 AT+CGREG Packet Domain Network Registration Status

The AT+CGREG write command enables the presentation of the URC "+CGREG: <stat>" when <n>=1 and ME's Packet Domain network registration status in 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	MDM	APP	✈	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>(num)	
0(&F)(P)	Disable Packet Domain network registration URC
1	Enable Packet Domain network registration URC "+CGREG: <stat>"
2	Enable Packet Domain network registration URC "+CGREG: <stat>[, <lac>][, <ci>][, <AcT>]"

<stat>(num)	
0	Not registered, ME is not currently searching an operator to register to.
1	Registered, home network.
2	Not registered, but ME is currently trying to attach or searching an operator to register to.
3	Registration denied.
4	Unknown
5	Registered, roaming.

<lac>(str)

Two byte location area code in hexadecimal format.

<ci>(str)

Cell ID in hexadecimal format:
- 16 bit for 2G
- 28 bit for 3G

<AcT>(num)

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)

13.9 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>][, <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> and <ci> are returned only if <n>=2 and ME is registered to the network.

Syntax

Test Command

```
AT+CEREG=?
```

Response(s)

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

Read Command

```
AT+CEREG?
```

Response(s)

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

Exec Command

```
AT+CEREG
```

Response(s)

```
OK
```

Write Command

```
AT+CEREG=<n>
```

Response(s)

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

PIN	MDM	APP	✈	Last
+	+	+	+	-

Reference(s)

3GPP TS 27.007 [49]

Unsolicited Result Codes

URC 1

+CEREG: <stat>

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

URC 2

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

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

Parameter Description

<n>(num)	
0(&F)(P)	Disable network registration unsolicited result code

1	Enable network registration URC "+CEREG: <stat>"
2	Enable network registration URC "+CEREG: <stat>[, <tac>][, <ci>][, <AcT>]"

<stat>(num)

0	Not registered, ME is not currently searching an operator to register to.
1	Registered, home network.
2	Not registered, but ME is currently trying to attach or searching an operator to register to.
3	Registration denied.
4	Unknown, e.g. out of LTE coverage
5	Registered, roaming.

<tac>(str)

Two byte tracking area code in hexadecimal format (e.g. "00C3" equals 195 in decimal)

<ci>(str)

Four byte LTE cell ID in hexadecimal format.

<AcT>(num)

Radio access technology

0	GSM (not applicable)
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

13.10 AT+CGCONTRDP PDP context read dynamic parameters

The AT+CGCONTRDP write command returns dynamic parameters for the active non-secondary PDP context specified with <cid>.
The AT+CGCONTRDP execute command returns dynamic parameters for all active non-secondary PDP contexts. For contexts of <PDP_type> "IPV4V6" the response of exec and write command will have two lines per <cid>. First line describes the IPV4 dynamic parameters followed by another line with the IPV6 dynamic parameters.

Syntax

Test Command

```
AT+CGCONTRDP=?
```

Response(s)

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

Exec Command

```
AT+CGCONTRDP
```

Response(s)

```
+CGCONTRDP: <cid>, <Bearer_ID>, <APN>[, <LocalAddr and SubNetMask>[, <GwAddr>[,
<DNS_prim_addr>[, <DNS_sec_addr>]]]]
+CGCONTRDP: <cid>, <Bearer_ID>, <APN>[, <LocalAddr and SubNetMask>[, <GwAddr>[,
<DNS_prim_addr>[, <DNS_sec_addr>]]]]
[+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>]]]]
OK
ERROR
+CME ERROR: <err>
```

PIN	MDM	APP	✈	Last
+	+	+	-	-

Reference(s)

3GPP TS 27.007 [49]

Parameter Description

<cid>(num)

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

<Bearer_ID>(num)

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

<APN>(str)

Access Point Name

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

<LocalAddr and SubNetMask>(str)

Shows the IP address and subnet mask of the UE in the format specified by AT+CGPIAF.

<GwAddr>(str)

Shows the Gateway Address of the UE in the format specified by AT+CGPIAF.

<DNS_prim_addr>(str)

Shows the IP address of the primary DNS server.
The settings of AT+CGPIAF influences the format of this parameter.

<DNS_sec_addr>(str)

Shows the IP address of the secondary DNS server.
The settings of AT+CGPIAF influences the format of this parameter.

13.11 AT+CGEQOS Define EPS Quality of Service

AT+CGEQOS 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 UTMS/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 <cid>s), (list of supported <QCI>s), (list of supported <DL_GBR>s), (list of supported <UL_GBR>s), (list of supported <DL_MBR>s), (list of supported <UL_MBR>s)
OK

Read Command

AT+CGEQOS?

Response(s)

[+CGEQOS: <cid>, <QCI>, [<DL_GBR>, <UL_GBR>], [<DL_MBR>, <UL_MBR>]]
[+CGEQOS: ...]
OK

Write Command

AT+CGEQOS=<cid>[, <QCI>[, <DL_GBR>, <UL_GBR>[, <DL_MBR>, <UL_MBR>]]]

Response(s)

OK
ERROR
+CME ERROR: <err>

PIN	MDM	APP	✈	Last
-	+	+	+	-

Reference(s)

3GPP TS 27.007 [49]

Parameter Description

<cid>(num)

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

1...16

<QCI>(num)

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

<DL_GBR>(num)

Indicates DL GBR in case of GBR QCI. The value is in kbit/s. This parameter is omitted for a non-GBR QCI (see 3GPP TS 24.301 [44]).

<UL_GBR>(num)

Indicates UL GBR in case of GBR QCI. The value is in kbit/s. This parameter is omitted for a non-GBR QCI (see 3GPP TS 24.301 [44]).

<DL_MBR>(num)

Indicates DL MBR in case of GBR QCI. The value is in kbit/s. This parameter is omitted for a non-GBR QCI (see 3GPP TS 24.301 [44]).

<UL_MBR>(num)

Indicates UL MBR in case of GBR QCI. The value is in kbit/s. This parameter is omitted for a non-GBR QCI (see 3GPP TS 24.301 [44]).

13.12 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	MDM	APP	✈	Last
+	+	+	-	-

Reference(s)

3GPP TS 27.007 [49]

Parameter Description

<cid>(str)

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

<QCI>(num)

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>(num)

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>(num)

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>(num)

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>(num)

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>(num)

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

<UL_AMBR>(num)

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.

13.13 AT+CGSMS Select Service for MO Short Messages

AT+CGSMS specifies the service or service preference that the MT will use to send MO (mobile originated) short messages.

Syntax

Test Command

```
AT+CGSMS=?
```

Response(s)

```
+CGSMS: (list of supported <service>s)
OK
```

Read Command

```
AT+CGSMS?
```

Response(s)

```
+CGSMS: <service>
OK
```

Write Command

```
AT+CGSMS=<service>
```

Response(s)

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

PIN	MDM	APP	✈	Last
+	+	+	+	-

Reference(s)

3GPP 27.007

Parameter Description

<service>(num)(NV)

A numeric parameter which indicates the service or service preference to be used.

0	Packet Domain
1(D)	Circuit switched
2	Packet Domain preferred (use circuit switched SMS transfer if mobile is not PS attached)
3	Circuit switched preferred (use Packet Domain if circuit switched is not available)

13.14 AT+CNMPSD No more PS data

The AT+CNMPSD command indicates that no application on the MT is expected to exchange data. Upon receiving this command, the final result code OK is returned. When in UTRAN, if further conditions defined in 3GPP TS 25.331 [47] are met, this can cause transmission of a SIGNALLING CONNECTION RELEASE INDICATION message with the cause "UE Requested PS Data session end".

Syntax

Test Command

```
AT+CNMPSD=?
```

Response(s)

```
OK
```

Exec Command

```
AT+CNMPSD
```

Response(s)

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

PIN	MDM	APP	✈	Last
+	+	+	-	+

Reference(s)

3GPP 27.007

13.15 ATD*99# Request Packet Domain service

This command causes the MT to perform whatever actions are necessary to establish a communication between the TE and the external PDN.
The V.250 'D' (Dial) command causes the MT to enter the V.250 online data state and, with the TE, to start the specified layer 2 protocol. No further commands may follow on the AT command line. PS attachment and PDP context activation procedures may take place prior to or during the PDP startup if they have not already been performed using the AT+CGATT and AT+CGACT commands.
To confirm acceptance of the command before entering the V.250 online data state command will respond with CONNECT.
The application that initiates the PPP mode must be designed to start all LCP configure requests in accordance with TS 27.060 par 9.1. Otherwise the MT remains, after the CONNECT, infinitely in a waiting state.
When the layer 2 protocol has terminated, either as a result of an orderly shut down of the PDP or an error, the MT enters V.250 command state and returns NO CARRIER (for details refer to Section 13.4.1, Automatic deactivation of PDP context during dial-up PPP).
ATD*99# is blocked when the Fixed Dialing lock is enabled and the number "*99#" is not present in the "FD" phonebook (see AT+CLCK SIM Fixed Dialing lock). In this case "+CME ERROR: call barred" is returned.

Syntax

Exec Command

```
ATD*99[* [<called_address>][* [<L2P>][* [<cid>]]]]#
```

Response(s)

```
CONNECT
NO CARRIER
ERROR
+CME ERROR: <err>
```

PIN	MDM	APP	✈	Last
+	+	-	-	+

Reference(s)

3GPP TS 27.007

Parameter Description

<called_address>(str)

IP V4 address in the form w.x.y.z, which identifies the called party; if it is provided, the MT will automatically set up a virtual call to the specified address after the context has been activated.

<L2P>(num)

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

[1]	layer 2 protocol PPP

<cid>(num)

Parameter specifies a particular PDP context definition (see AT+CGDCONT parameter <cid>).
If parameter is not specified, then the first defined primary context is used.

13.16 AT^SGAPN Configure APN class settings

Command allows to query or set APN class parameters for PDP contexts.
The AT^SGAPN test command returns the supported ranges of the APN class parameters.
The read command returns the current values for the APN class parameters for all defined PDP contexts.
The write command can be used to set the APN class parameters for a PDP context already defined by AT+CGDCONT and identified by the context identifier <cid>. If a context is newly defined by using AT+CGDCONT, then its APN class is 0, the APN bearer is "ANY", it is enabled and its inactivity timer is disabled.
When parameter settings are changed for an active context, it is necessary to close and reestablish the connection to make the changes take effect. Modules manufactured / configured for other operators are delivered with all contexts undefined. See also AT^SCFG "MEopMode/Prov/Cfg" parameter <provCfg>.

Syntax

Test Command

AT^SGAPN=?

Response(s)

^SGAPN: (list of supported <cid>s), (list of supported <apnClass>s), (list of supported <apnType>s), , (list of supported <bearer>s), (list of supported <enabledFlag>s), (range of supported <inactivityTimeout>s)
OK
ERROR
+CME ERROR: <err>

Read Command

AT^SGAPN?

Response(s)

[^SGAPN: <cid>, <apnClass>, <apnType>, <APN>, <bearer>, <enabledFlag>, <inactivityTimeout>]
[^SGAPN: ...]
OK
ERROR
+CME ERROR: <err>

Write Command

AT^SGAPN=<cid>, <apnClass>[, <apnType>[, <APN>[, <bearer>[, <enabledFlag>[, <inactivityTimeout>]]]]]

Response(s)

OK
ERROR
+CME ERROR: <err>

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<cid>(num)(NV)

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

1...16

<apnClass>(num)(NV)

Parameter specifies an APN class. If not provided in the write command, the current setting is unchanged.

0...16

<APN>(str)(NV)

Access Point Name

Parameter specifies the logical name used to select the GGSN or the external packet data network. It is the same parameter as the AT+CGDCONT parameter <APN>.
Changing this parameter using AT^SGAPN will also change the AT+CGDCONT value.
If parameter is not provided in write command, then the current setting is unchanged.

<apnType>(str)(NV)

Parameter specifies the type of the APN. It is the same parameter as the AT+CGDCONT parameter <PDP_type>.
Changing this parameter using AT^SGAPN will also change the AT+CGDCONT value.
If parameter is not provided in write command, then the current setting is unchanged.

“IP“

“PPP“

“IPV6“

“IPV4V6“

<bearer>(str)(NV)

Parameter specifies the APN bearer. If parameter is not provided in write command, then the current setting is unchanged.

“GSM“

“WCDMA“

“LTE“

“ANY“

<enabledFlag>(str)(NV)

Parameter specifies whether an APN is enabled or not. A disabled APN can not be used to establish a connection.
If parameter is not provided in write command, then the current setting is unchanged.

“Enabled“

“Disabled“

<inactivityTimeout>(num)(NV)

For each APN exists an inactivity timer. If enabled, then for connections without data transfer the connection will be terminated after the timer expires.
If parameter is not provided in write command, then the current setting is unchanged.

0	Inactivity timer disabled
1...122820	Inactivity timeout value in s

13.17 AT^SGAUTH Set Type of Authentication for PDP-IP Connections

AT^SGAUTH specifies the authentication protocol, password and user name to be given if a Packet Domain network requires authentication and the subscriber uses AT+CGACT for PDP context activation.

See also parameter <gauth> provided by the configuration command AT^SCFG. This parameter specifies the authentication protocol applied by AT+CGDATA or ATD*99# during the PPP startup phase if no PDP context is activated yet.

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	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<cid>(num)(NV)

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

<auth_type>(num)(NV)

Indicates the types of authentication to be used for the specified context. If CHAP or PAP is selected two additional parameters <passwd> and <user> need to be specified.

[0]	none
1	PAP
2	CHAP

<passwd>(str)(NV)

Parameter specifies the password used for authentication. It is required for the authentication types PAP and CHAP.
Maximum length: 127 characters.

<user>(str)(NV)

Parameter specifies the user name used for authentication. It is required for the authentication types PAP and CHAP.
Maximum length: 127 characters.

13.18 AT^SWWAN PDP Context Activate or Deactivate

AT^SWWAN write command can be used to activate or deactivate a WWAN connection for a PDP context defined with AT+CGDCONT.

UE supports two WWAN adapters (also referred to as Wireless Adapters or RmNet interfaces). The benefit is that different APNs can be assigned to each WWAN adapter. Both WWAN adapters can be activated a the same time.

AT^SWWAN read command shows whether a WWAN connection is active and which PDP context is used for it. If no WWAN connection is active, then read command just returns OK. To track activation errors AT^SIND indicator "ceer" can be used.

Syntax

Test Command

AT^SWWAN=?

Response(s)

^SWWAN: (list of supported <state>s), (list of supported <cid>s), (list of supported <WWAN adapter>s)
OK
ERROR
+CME ERROR: <err>

Read Command

AT^SWWAN?

Response(s)

[^SWWAN: <cid>, <state>[, <WWAN adapter>]]
[^SWWAN: ...]
OK
ERROR
+CME ERROR: <err>

Write Command

Activate/Deactivate WWAN connection

AT^SWWAN=<action>, <cid>[, <WWAN adapter>]

Response(s)

OK
ERROR
+CME ERROR: <err>

PIN	MDM	APP	✈	Last
+	+	+	-	-

Parameter Description

<action>(num)	
0	Deactivate
1	Activate

<state>(num)	
0(P)	Deactivated
1	Activated

<cid>(num)

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

<WWAN adapter>(num)

1	First WWAN adapter If parameter <WWAN adapter> is omitted in the AT^SWWAN write command, the first WWAN adapter will be used.
2	Second WWAN adapter

Notes

- PDP contexts already activated by other commands as for example AT+CGACT cannot be reused for WWAN, except in LTE mode where the PDP context activated for LTE attach can also be used to start a WWAN connection. However, please note that some providers do not allow reusing this PDP context for data connectivity via Internet (e.g. German Telecom, China Mobile). For more information please refer to Section 13.1.1, Attaching to LTE Networks and Registering to IMS.
- PDP contexts defined for IMS and Emergency APNs cannot be used for WWAN connections.
  To check the currently defined PDP contexts use the AT+CGDCONT read command. The preconfigured APNs largely depend on the provider configuration, some APNs refer to IMS or SOS, others do not. Therefore, it is recommended to check especially the AT+CGDCONT parameter <P-CSCF_discovery> that is enabled (value 1) only in PDP contexts for IMS or IMS Emergency signalling.
- If activation or deactivation of a WWAN connection fails, then AT+CEER may provide further informations about the reason.

14. USIM related Commands

AT commands described in this chapter are related to the Universal Subscriber Identity Module (USIM) connected to the PLS8-US-R4.

Note:
If using data from the USIM please bear in mind that the content of all Elementary Files is *subject to change* at any moment!
This is because the network can change the USIM's data in the background via USIM Application Toolkit (USAT) procedure "Data download to USIM". For a detailed description please refer to 3GPP TS 11.14 [22], 3GPP TS 31.111 [23], ETSI TS 102 223 [24].
To get informed that changing Elementary Files has taken place the Customer Application (TE) needs to hook up USAT Proactive Command "REFRESH". For more information please refer to Chapter 9., USIM Application Toolkit (USAT) Commands and Section 9.7, SAT Get Information - Refresh (1) in particular.

14.1 AT+CCHC Close logical channel

AT+CCHC asks the UE to close a communication session with the USIM. The UE shall close the previously opened logical channel, and no more commands can be sent on this logical channel. The UICC will close the logical channel when receiving this command.

Syntax

Test Command

```
AT+CCHC=?
```

Response(s)

```
OK
```

Write Command

```
AT+CCHC=<sessionid>
```

Response(s)

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

PIN	MDM	APP	✈	Last
-	+	+	+	-

Reference(s)

3GPP TS 27.007 [49], 3GPP TS 11.11 [18], 3GPP TS 31.101 [19], 3GPP TS 31.102 [20]

Parameter Description

<sessionid>(num)

Session Id to be used in order to target a specific application on the USIM using the logical channels mechanism. The number is the <sessionid> returned by the channel open command AT+CCHO.

14.2 AT+CCHO Open logical channel

AT+CCHO asks the UE to open a communication session with USIM. The UICC will open a new logical channel for the selected application identified by <dfname> and the UE shall return <sessionid> as response. The UE shall restrict the communication between the TE and the UICC to this logical channel.
The <sessionid> shall be used when sending commands with the Generic Logical Channel access AT+CGLA command. It will also be used with AT+CCHC to close the channel.

Syntax

Test Command

```
AT+CCHO=?
```

Response(s)

```
OK
```

Write Command

```
AT+CCHO=<dfname>
```

Response(s)

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

PIN	MDM	APP	✈	Last
-	+	+	+	-

Reference(s)

3GPP TS 27.007 [49], 3GPP TS 11.11 [18], 3GPP TS 31.101 [19], 3GPP TS 31.102 [20]

Parameter Description

<dfname>(str)

All selectable applications in USIM are referenced by DF name coded on 1 to 16 bytes.

<sessionid>(num)

A session Id to be used in order to target a specific application on USIM using logical channels mechanism.

14.3 AT+CGLA Generic logical channel access

AT+CGLA allows direct control of the USIM by a remote application on the TE. The UE sends the <command> as it is to the USIM. The UE takes care of processing USIM information within the frame specified by GSM/UMTS. For parameter and USIM result coding please refer to 3GPP TS 11.11 [18], 3GPP TS 31.101 [19], 3GPP TS 31.102 [20].

Syntax

Test Command

```
AT+CGLA=?
```

Response(s)

```
OK
```

Write Command

```
AT+CGLA=<sessionid>, <length>, <command>
```

Response(s)

```
+CGLA: <length>,<response>
OK
ERROR
+CME ERROR: <err>
```

PIN	MDM	APP	✈	Last
-	+	+	+	-

Reference(s)

3GPP TS 27.007 [49], 3GPP TS 11.11 [18], 3GPP TS 31.101 [19], 3GPP TS 31.102 [20]

Parameter Description

<sessionid>(num)

Identifier of the session to be used in order to send the APDU commands to the USIM. The number is the <sessionid> returned by the channel open command AT+CCHO.

<length>(num)

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

<command>(str)

Command passed on by the UE to the USIM.

<response>(str)

Response data of the command returned by the USIM.

14.4 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-US-R4 handles internally all required USIM interface locking and file selection routines.
As response to the command, the PLS8-US-R4 sends the actual USIM information parameters and response data. "+CME ERROR" may be returned if the command cannot be passed to the USIM, e.g. if the USIM is not inserted. Failures to execute the command on the USIM will be reported by the <sw1> and <sw2> parameters.

Please beware of *possible changes to Elementary Files* by the network at any time, refer Chapter 14., USIM related Commands.

Syntax

Test Command

```
AT+CRSM=?
```

Response(s)

```
OK
```

Write Command

```
AT+CRSM=<command>[, <fileID>[, <P1>, <P2>, <P3>[, <data>]]]
```

Response(s)

```
+CRSM: <sw1>,<sw2>[,<response>]
OK
ERROR
+CME ERROR: <err>
```

PIN	MDM	APP	✈	Last
-	+	+	+	-

Reference(s)

3GPP TS 27.007 [49], 3GPP TS 11.11 [18], 3GPP TS 31.101 [19], 3GPP TS 31.102 [20] ETSI TS 102 221 [21]

Parameter Description

<command>(num)

USIM command number.

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

<fileID>(num)

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

<P1>(num)

Parameter to be passed on by the PLS8-US-R4 to the USIM.

0...255

<P2>(num)

Parameter to be passed on by the PLS8-US-R4 to the USIM.

0...255

<P3>(num)

Parameter to be passed on by the PLS8-US-R4 to the USIM.

0...255

<data>(str)

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

<sw1>(num)

Status information from the USIM about the execution of the actual command. It is returned in both cases, on successful or failed execution of the command.

0...255

<sw2>(num)

Status information from the USIM about the execution of the actual command. It is returned in both cases, on successful or failed execution of the command.

0...255

<response>(str)

Response data in case of a successful completion of the previously issued command.
"STATUS" and "GET RESPONSE" commands return data, which gives information about the currently selected elementary data field. This information includes the type of file and its size.
After "READ BINARY" or "READ RECORD" commands the requested data will be returned.
<response> is empty after "UPDATE BINARY" or "UPDATE RECORD" commands.

14.5 AT+CSIM Generic USIM Access

AT+CSIM allows direct control of the USIM.
Compared to the restricted USIM access command AT+CRSM, the definition of AT+CSIM allows to take more control over the USIM interface.
However, the USIM Application Toolkit functionality is not supported by AT+CSIM. Therefore the following USIM commands cannot be used: TERMINAL PROFILE, ENVELOPE, FETCH and TEMINAL RESPONSE.

Syntax

Test Command

```
AT+CSIM=?
```

Response(s)

```
OK
```

Write Command

```
AT+CSIM=<length>, <command>
```

Response(s)

```
+CSIM: <length>,<response>
OK
ERROR
+CME ERROR: <err>
```

PIN	MDM	APP	✈	Last
-	+	+	+	-

Reference(s)

3GPP TS 27.007 [49], 3GPP TS 11.11 [18], 3GPP TS 31.101 [19], 3GPP TS 31.102 [20] ETSI TS 102 221 [21]

Parameter Description

<length>(num)

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

<command>(str)

Command passed on by the PLS8-US-R4 to the USIM.
Parameter length: maximum 260 Bytes.

<response>(str)

Response data of the command returned by the USIM.
Parameter length: maximum 258 Bytes.

Note

- Access to datafields via SELECT is only allowed to files according to 3GPP TS 11.11 [18], 3GPP TS 31.101 [19], 3GPP TS 31.102 [20].

Examples

EXAMPLE 1

The following examples show SELECT and GET RESPONSE commands for a 2G SIM card.

AT+CSIM=14,"A0A40000027F10"	SELECT DF-Telecom.
+CSIM: 4,"9F19"	Command successful. Indicates that x19 bytes response data are available and can be requested by using GET RESPONSE.
OK	
AT+CSIM=14,"A0A40000026F3A"	SELECT EF-ADN (Abbreviated dialing numbers).
+CSIM: 4,"9F0F"	Command successful. Indicates that x0F bytes response data are available and can be requested by using GET RESPONSE.
OK	
AT+CSIM=10,"A0C000000F"	GET RESPONSE command requests x0F bytes EF-ADN data.
+CSIM: 34,"000002306F3A040011F0220102011C9000"	
OK	

EXAMPLE 2

The following examples show SELECT and GET RESPONSE commands for a 3G USIM card.

AT+CSIM=14,"00A40004023F00"	SELECT Master File (MF).
+CSIM: 4,"6138"	Command successful. Indicates that x38 bytes response data are available and can be requested by using GET RESPONSE.
OK	
AT+CSIM=10,"00C0000038"	GET RESPONSE command requests x38 bytes MF data.
+CSIM: 116,"6236.....A9000"	(Response truncated here.)
OK	

14.6 AT^SATR Query SIM's Answer to Reset Data

AT^SATR performs multiple USIM related commands. It serves to trigger a USIM restart and query of Answer to Reset (ATR) data. The ATR data string of up to 33 bytes sent from the USIM to the UE, contains information about the USIM and the supported data transfer protocols. For ATR coding refer to 3GPP TS 11.11 [18], 3GPP TS 31.101 [19], 3GPP TS 31.102 [20].

Syntax

Test Command

```
AT^SATR=?
```

Response(s)

```
OK
```

Write Command

```
AT^SATR=<command>
```

Response(s)

```
In case of <command>="GetAtr"
^SATR: <response>
OK
ERROR
+CME ERROR: <err>

For all other Commands
OK
ERROR
+CME ERROR: <err>
```

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<command>(str)

List of possible subcommands provided by AT^SATR.

“RestartSim“	Restart the currently inserted USIM.
“GetAtr“	Retrieve the Answer to Reset (ATR) data of the currently inserted USIM.
“SimPowerDown“	Perform USIM power down.
“SimPowerUp“	Perform USIM power up.

<response>(str)

GetAtr Response

Answer to Reset (ATR) data of currently inserted USIM.

14.7 AT^SCID USIM Identification Number

AT^SCID serves to query the USIM identification number. This information is retrieved from USIM elementary file EF_{ICCID}; for details refer to 3GPP TS 11.11 [18], 3GPP TS 31.101 [19], 3GPP TS 31.102 [20].

Syntax

Test Command

```
AT^SCID=?
```

Response(s)

```
OK
```

Exec Command

```
AT^SCID
```

Response(s)

```
^SCID: <cid>
OK
ERROR
+CME ERROR: <err>
```

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<cid>(text)

USIM identification number.

14.8 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	MDM	APP	✈	Last
-	+	+	+	-

Unsolicited Result Code

```
^SCKS: <SimStatus>
```

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

Parameter Description

<mode>(num)(&V)(&W)	
0(&F)	Disable URC "^SCKS".
1	Enable URC "^SCKS".

<SimStatus>(num)(&V)	
0	USIM is not inserted.
1	USIM inserted.
2	Possible reasons: • The USIM interface hardware has been deactivated to prevent possible damage (e.g. if a USIM with invalid or unsupported electrical specifications has been detected). The USIM interface can be reactivated only by restarting the UE, e.g. with "AT+CFUN= n,1".

	• In case a 5V USIM is inserted it might be possible that the USIM is not functional at all. As a result, URC "^SCKS: 0" occurs.
3	If during power up the USIM returns status words 6F00h (Technical problem, no precise diagnosis) to three consecutive APDUs sent by PLS8-US-R4, the USIM interface hardware has been deactivated. The USIM interface can be reactivated only by restarting the UE, e.g. via "AT+CFUN= n,1".

Note

- If <mode>=1 ("^SCKS" URC enabled) is stored to the user profile with AT&W it may happen that the "^SCKS" URC shows up after the "^SYSSTART" URC although the (U)SIM connection status has not changed.

14.9 AT^SSET USIM Data Ready Indication

After power-up and personalization (PIN entry if required) PLS8-US-R4 starts reading data from the USIM. AT^SSET controls the presentation of "^SSIM READY" URC which indicates that the UE has finished this initial reading. Afterwards all AT commands that depend on USIM data can be used, e.g. phonebook and SMS related AT commands.

Syntax

Test Command

```
AT^SSET=?
```

Response(s)

```
^SSET:(list of supported <n>s)
OK
```

Read Command

```
AT^SSET?
```

Response(s)

```
^SSET: <n>
OK
ERROR
+CME ERROR: <err>
```

Write Command

```
AT^SSET=<n>
```

Response(s)

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

PIN	MDM	APP	✈	Last
-	+	+	+	-

Unsolicited Result Code

```
^SSIM READY
```

This URC indicates that the UE has finished its initial USIM access.
Any attempt to access phonebook, SMS or other USIM data before having received the "^SSIM READY" URC, may either result in a "+CME: SIM busy" message or, in some cases, a couple of seconds delay before the command is executed.

Parameter Description

<n>(num)(&V)(&W)	
URC presentation mode	
0(&F)	Disable "^SSIM READY" URC.
1	Enable "^SSIM READY" URC.

15. Phonebook Commands

The AT commands described in this chapter allow the external application to access the phonebooks located in the PLS8-US-R4's memory or on the attached Subscriber Identity Module (SIM).

15.1 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.

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

Write Command (Continued)

For write access to FD phonebook

AT+CPBS=<storage>, <pin>

Response(s)

ERROR
+CME ERROR: <err>

PIN	MDM	APP	✈	Last
+	+	+	+	-

Reference(s)

3GPP TS 27.007 [49]

Parameter Description

<storage>(str)

"SM"(&F)(P)	USIM phonebook Capacity: depending on USIM Location: USIM
"DC"	Dialed calls list Capacity: max. 100 entries Location: ME AT+CPBW command is not applicable to this storage.
"FD"	Fixed dialing phonebook Capacity: depending on USIM Location: USIM
"LD"	Last number dialed phonebook. Stores all call numbers dialed with ATD. Capacity: Depending on USIM Location: USIM AT+CPBW command is not applicable to this storage.
"MC"	Missed (unanswered received) voice calls list Capacity: max. 100 entries Location: ME AT+CPBW command is not applicable to this storage.
"ME"	Mobile equipment phonebook Capacity: max. 500 entries Location: ME
"RC"	Received voice calls list Capacity: max. 100 entries Location: ME AT+CPBW command is not applicable to this storage.
"EN"	Emergency number Capacity: depending on USIM or ME Location: USIM or ME Can be accessed without entering PIN. AT+CPBW command is not applicable to this storage.
"ON"	MSISDN list Availability and capacity: depending on USIM Location: USIM
"VM"	CPHS voice mailbox phonebook Capacity: depending on USIM Location: USIM
"SD"	Service dialing number phonebook. Read only. Capacity: depending on USIM Location: USIM

<used>(num)

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

<total>(num)

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.
- The following call history rule applies to the phonebook types "DC", "LD", "MC" and "RC":
  When the same number is dialed several times in direct succession the "DC" and "LD" phonebook will store each entry, resulting in double or multiple "DC" and "LD" phonebook entries related to this number.
  Likewise, the "MC" or "RC" phonebook will store each entry when calls from the same number are received several times.
- 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. ATD For more details about emergency numbers see notes in ATD dial command.
- Emergency number ("EN") phonebook can be accessed (using AT+CPBS="EN") without entering PIN usually used by AT+CPIN="PIN1". Then AT+CPBS read command and AT+CPBR write command are also possible without entering PIN.
- Missed and received calls which are not presented to the called party are not stored in MC and RC phonebook.
- "LD" phonebook is only supported when corresponding Elementary File is available on USIM. Elementary Files belonging to "LD" phonebook are optional on USIM.
- If <tlength> of the number dialed and stored in the ME phonebook is higher then allowed for the "LD" phonebook then the "LD" phonebook doesn't store this number. In this case, use the "DC" phonebook.
- The <text> assigned to a phone <number> is stored to the "DC", "LD", "MC" and "RC" phonebooks only if the complete comparison with the number delivered by the network provider is successful.
- When a dial string includes DTMF digits, the DTMF digits are not saved at the "LD" or "DC" phonebook. ABCD can be used as DTMF digits within a ATD dial string, but cannot be saved due to BCD limitations.
- After having locked or unlocked the "FD" phonebook using the command AT+CLCK="FD",1 or 0,"PIN2" the refresh mechanism takes some seconds, therefore it is not possible to see the "SM" phonebook shortly after entering the lock or unlock command.
- The "SM" phonebook may or may not be available when FD lock is activated (see AT+CLCK), depending on USIM and its configuration.
- "LD" and "DC" phonebooks stores all call numbers dialed with ATD (except *# sequences). For details see Section 21.1, Star-Hash (*#) Network Commands.

15.2 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 parenthesizes.

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	MDM	APP	✈	Last
+	+	+	+	-

Reference(s)

3GPP TS 27.007 [49], 3GPP TS 24.008 [42], 3GPP TS 11.11 [18], 3GPP TS 31.101 [19], 3GPP TS 31.102 [20]

Parameter Description

<location1>(num)

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>(num)

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>(str)

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

<type>(num)

Type of address octet, which defines the used type of number (ton) and the numbering plan identification (npi). Please consider that for types other than 129 or 145 dialing from phonebook with ATD><mem><index> is, depending on the network, not always possible (refer to 3GPP TS 24.008 [42], subclause 10.5.4.7 for details). See also <type> of AT+CPBW.
Possible values are:

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

<text>(str)(+CSCS)

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 1.7, Supported character sets.

<maxloc>(num)

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>(num)

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>(num)

Maximum amount of memory of <text> assigned to the telephone number in bytes. The value is shown in the AT+CPBR test command response. For details please see AT+CPBW parameter <tlength>.

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. ATD For more details about emergency numbers see notes in ATD dial command.

- Emergency number ("EN") phonebook can be accessed (using AT+CPBS="EN") without entering PIN usually used by AT+CPIN="PIN1". Then AT+CPBS read command and AT+CPBR write command are also possible without entering PIN.
- There is no restriction reading unsupported values for <type>.

Example

`AT+CPBR=?`	First run the AT+CPBR test command to find out the maximum range of entries stored in the active phonebook.
`+CPBR: (1-100),20,17`	PLS8-US-R4 returns the supported values, where 100 is the supported range of location numbers, 20 is the length of the phone number and 17 is the maximum length of the associated text.

`AT+CPBR=1,3`
`+CPBR: 1,"+999999",145,"Charlie"`
`+CPBR: 2,"+777777",145,"Bill"`
`+CPBR: 3,"+888888",145,"Arthur"`
	Then use the AT+CPBR write command to display the phonebook entries sorted by location numbers.

15.3 AT+CPBW Write into phonebook

The AT+CPBW write command can be used to create, edit and delete a phonebook entry at a <location> of the active storage selected with AT+CPBS.
If <storage>="FD" (SIM fixed dialing numbers) is selected, PIN2 authentication has to be performed prior to any write access.

The AT+CPBW test command returns the location range supported by the current storage, the maximum length of the <number> field, the range of supported <type> values and the maximum length of the <text> field. Note: The length may not be available while SIM storage is selected. If storage does not offer format information, the format list contains empty parenthesizes.

Syntax

Test Command

```
AT+CPBW=?
```

Response(s)

```
+CPBW: (1-<maxloc>), <nlength>, (list of supported <type>s), <tlength>
OK
ERROR
+CME ERROR: <err>
```

Write Command

```
AT+CPBW=[<location>][, <number>[[, <type>][, <text>]]]
```

Response(s)

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

PIN	MDM	APP	✈	Last
+	+	+	+	-

Reference(s)

3GPP TS 27.007 [49], 3GPP TS 24.008 [42], 3GPP TS 11.11 [18], 3GPP TS 31.101 [19], 3GPP TS 31.102 [20]

Parameter Description

<location>(num)

Location number within phonebook memory. The maximum range supported by each storage type is indicated in the test command response. If <location> is not given, the first free entry will be used.
If <location> is given as the only parameter, the phonebook entry specified by <location> is deleted.

<number>(str)

Phone number in format specified by <type>. Parameter must be present, although it may be an empty string. Alphabetic characters are not permitted. The <number> may contain dialstring modifiers "*", "#", "+" or "P".
If other printable non-alphabetic characters are used the entry needs to be saved with <type>=209. Otherwise, if <type>=209 is not used any non-digit characters other than "*", "#", "+" or "P" will be removed from the string and only accepted modifiers from the GSM alphabet will be saved.
A <number> saved with <type>=209 requires double memory. In order to fit into a standard location, the number needs to be reduced to a maximum length of <nlength>/2, including all digits and dial string modifiers. Extended locations may be used as stated below for <nlength>.

<type>(num)

Type of address octet, which defines the used type of number (ton) and the numbering plan identification (npi). Please consider that for types other than 129 or 145 dialing from phonebook with ATD><mem><index> is, depending on the network, not always possible (refer 3GPP TS 24.008 [42], subclause 10.5.4.7 for details).
If <type> is not specified the unknown <type>=129 is used. If <number> contains a leading "+" <type>=145 (international) is used.
Supported values are:

128	Restricted <number> includes unknown type and format.
145	Dialing string <number> includes international access code character "+".
161	National number <number>. The network support for this type is optional.
209	Dialing string <number> will be saved as ASCII string. This is the default value, if <type> is not specified explicitly and characters other than "*", "#", "+" or "P" are included in <number>. Note that phonebook entries saved with this type cannot be dialed.
255	Dialing string <number> contains "*", "#" characters for Supplementary Service codes. Network support of this type is optional.
129	Unknown number. If <type> is unknown and the <number> contains a leading "+", then this sign is removed.

<text>(str)(+CSCS)

Text assigned to the phone number. The maximum length of this parameter is given in the test command response <tlength>. When using an ASCII terminal, characters which are coded differently in ASCII and GSM have to be entered via escape sequences as described in Section 1.7, Supported character sets.

<maxloc>(num)

Maximum number of locations supported by the currently selected storage. For phonebooks located on SIM, this value varies depending on the SIM card. See AT+CPBS for typical values.

<nlength>(num)

Maximum length of phone number for "normal" locations. Depending on the storage, a limited number of locations with extended memory is available per phonebook. These locations allow storing numbers with twice the standard length, which is 2*<nlength> digits for normal numbers, but only <nlength> digits for numbers saved with parameter <type>= 209. If all extended locations of the selected phonebook are used up, then any attempt to write a number which requires extended memory will be denied with "+CME ERROR: memory full".

<tlength>(num)

Maximum amount of memory of <text> assigned to the telephone number in bytes. The value is shown in the AT+CPBW test command response.
An internal optimization mechanism enables the UE to choose the most efficient method of storing <text>: Depending on the entered <text> characters, the UE internally converts them either to GSM or UCS2 alphabet, no matter which character set the TE is using for input and output (configured with AT+CSCS). For example, if AT+CSCS="UCS2" and, therefore, the TE enters the letter "A" as "0041" (two bytes) it is possible that the UE converts it to GSM alphabet, thus requiring only one byte of memory.
Note that escape sequences used in GSM coding require two bytes. Example: The € symbol will be stored as escape sequence "\1Be" in GSM, and "20AC" in UCS2.
For strings in UCS2 there are three different coding schemes. For detailed descriptions please refer to 3GPP TS 11.11 [18], 3GPP TS 31.101 [19], 3GPP TS 31.102 [20], 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.
- See for more details AT+CPBS select command which phonebook <storage> is possible to write by the user.
- DTMF transmission:
  If a dial string contains the call modifier "P" the digits after this call modifier will be saved as DTMF tones. The DTMF tones 'A','B','C' and 'D' can not be saved due to BCD limitations.

Examples

EXAMPLE 1

Make a new phonebook entry at the first free location

```
AT+CPBW=,"+431234567",145,"international"
```

EXAMPLE 2

Delete entry at location 1

```
AT+CPBW=1
```

EXAMPLE 3

The following examples are provided to illustrate the effect of writing phonebook entries with different types of dial string modifiers in <number>

```
AT+CPBW=5,"12345678",,"Arthur"
AT+CPBW=6,"432!P-765()&54*654#",,"John"
AT+CPBW=7,"432!P-765()&54*654#",129,"Eve"
AT+CPBW=8,"432!P-765()&54*654#",145,"Tom"
AT+CPBW=9,"432!P-765()&54*654#",209,"Richard"
```

EXAMPLE 4

Read phonebook entries from locations 5 - 9 via AT+CPBR

```
+CPBR:5,"12345678",129,"Arthur"
+CPBR:6,"432!P-765()&54*654#",209,"John"
+CPBR:7,"432P76554*654#",129,"Eve"
+CPBR:8,"+432P76554*654#",145,"Tom"
+CPBR:9,"432!P-765()&54*654#",209,"Richard"
```

15.4 AT+CSVM Set voice mail number

The number to the voice mail server is set by AT+CSVM command.
The parameters <number> and <type> can be left out if the parameter <mode> is set to 0. The read command returns the status (enabled <mode>=1 or disabled <mode>=0), the currently selected voice mail <number> and the <type>.
The test command returns supported <mode>s and <type>s.

Syntax

Test Command

AT+CSVM=?

Response(s)

+CSVM: (list of supported <mode>s), (list of supported<type>s)
OK
ERROR
+CME ERROR: <err>

Read Command

AT+CSVM?

Response(s)

+CSVM: <mode>, <number>, <type>
OK
ERROR
+CME ERROR: <err>

Write Command

AT+CSVM=<mode>[, <number>[, <type>]]

Response(s)

OK
ERROR
+CME ERROR: <err>

PIN	MDM	APP	✈	Last
+	+	+	+	-

Reference(s)

3GPP TS 27.007 [49]

Parameter Description

<mode>(num)

0	Disable the voice mail number
1	Enable the voice mail number

<number>(str)

Phone number in format specified by <type>. Parameter must be present when setting (<mode>=1) the voice mail number. Alphabetic characters are not permitted. The <number> may contain dialstring modifiers "*", "#", "+" or "P".
If other printable non-alphabetic characters are used the entry needs to be saved with <type>=209. A <number> saved with <type>=209 requires double memory. In order to fit into a standard location, the number needs to be reduced to a maximum length of <nlength>/2, including all digits and dial string modifiers.

<type>(num)

Type of address octet, which defines the used type of number (ton) and the numbering plan identification (npi). If <type> is not specified the unknown <type>=129 is used. If <number> contains a leading "+" <type>=145 (international) is used.
Please consider that for types other than 129 or 145 dialing from phonebook with ATD><mem><index> is, depending on the network, not always possible (refer to 3GPP TS 24.008 [42], subclause 10.5.4.7 for details). See also <type> of AT+CPBW.
Possible values are:

128	Restricted <number> includes unknown type and format.
145	Dialing string <number> includes international access code character "+".
161	National number <number>. The network support for this type is optional.
209	Dialing string <number> will be saved as ASCII string. This is the default value, if <type> is not specified explicitly and characters other than "*", "#", "+" or "P" are included in <number>. Note that phonebook entries saved with this type cannot be dialed.
255	Dialing string <number> is a command to control a Supplementary Service, i.e. "*", "#" codes are contained. Network support of this type is optional.
129	Unknown number. If <type> is unknown and the <number> contains a leading "+", then this sign is removed.

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.
- "VM" phonebook is only supported when corresponding Elementary File is available on USIM. Elementary Files belonging to "VM" phonebook are optional on USIM.
- If "VM" phonebook is available on USIM and has no write access it is not possible to use AT+CSVM write command.

Examples

EXAMPLE 1

Make a new voice mail number entry

AT+CSVM=1,"1234567890"	The <type> is not specified therefore the unknown <type>=129 is used.
OK	The voice mail number is written to UE.

EXAMPLE 2

Delete the voice mail number entry

AT+CSVM=0	The parameters <number> and <type> are not necessary.
OK	The voice mail number is deleted on UE.

EXAMPLE 3

Read an empty voice mail number entry

```
AT+CSVM?
+CSVM: 0,"",128
OK
```

15.5 AT+CNUM Read own numbers

AT+CNUM returns the subscribers own number(s) from the SIM.

Syntax

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

Exec Command
AT+CNUM
Response(s)
[+CNUM: [<alpha>], <number>, <type>] [+CNUM: ...] OK ERROR +CME ERROR: <err>

PIN	MDM	APP	✈	Last
+	+	+	+	-

Reference(s)
3GPP TS 27.007 [49]

Parameter Description

<alpha>(str)

Optional alphanumeric string associated with <number>.

<number>(str)

Phone number in format specified by <type>.

<type>(num)

Type of address octet, see also: AT+CPBR <type>.

Notes

- Users should be aware that when using this AT command quickly after SIM PIN authentication the SIM data may not yet be accessible, resulting in a short delay before the requested AT command response is returned.
- The subscribers own number(s) are stored in the "ON" phonebook and can be set using the AT+CPBW command.
- For alphanumeric representation the number stored in the phonebook must be identical to the number transported over the network - then the associated name will be recognized.

16. GNSS Commands

PLS8-US-R4 integrates a GNSS engine (Global Navigation Satellite System) which supports GPS (Global Positioning Sytem) and GLONASS (Globalnaja Nawigazionnaja Sputnikowaja Sistema) and GALILEO based on the NMEA 0183 V2.3 protocol.

To configure, activate or deactivate the GNSS engine, to choose Standalone GNSS or A-GNSS operation, to start and stop NMEA output, to select the NMEA output frequency, please use the AT^SGPSC command.

The GNSS receiver is always capable of receiving signals from all supported satellite systems, and decides on its own whether to calculate the position from GPS only, or any combination of the systems. The AT^SGPSC subcommands "Nmea/Gps", "Nmea/Glonass", "Nmea/Galileo" can be used to enable or disable the output of NMEA sentence types, but they do not switch off their usage for position calculation. Only the output of GALILEO data will instantly be disabled when the UE gets a GPS position fix over US territory.
The GNSS receiver is also capable of receiving SBAS signals (Satellite Based Augmentation Systems). SBAS capability is always enabled and cannot be configured. However, although visible in the GNSS sentences, SBAS satellites are not used for positioning as the GNSS receiver does not support DGPS (Differential GPS).

A-GNSS (Assisted GNSS) will improve the startup performance, i.e. the Time to First Fix (TTFF), if the GNSS engine has not yet precise location and time information. For A-GNSS, valid GpsOneXTRA assistance data shall be stored to the UE's FFS and injected into the GNSS receiver by using the AT^SBNW command. The assistance data files can be downloaded via HTTP from one of the GpsOneXTRA servers. For PLS8-US-R4 please use the xtra2.bin file which includes GPS and GLONASS.
The XTRA data is valid up to 7 days, although after 3 days the accuracy would start to degrade faster. We recommend to update XTRA data every 2 days. To check the validity of the injected XTRA data you can use the AT^SGPSC parameter <InfoXtraDurationMinutes>. In most cases, however, it will be sufficient to activate the GNSS driver since the GNSS engine dynamically determines the best startup scenario depending on the available position, time, Almanac and/or Ephemeris data.

If Multiplex mode is started NMEA data will be output on the third Multiplex channel. Otherwise NMEA data will be printed to the dedicated NMEA interface (depending on the settings made with AT^SSRVSET). The dedicated NMEA interfaces and the third Multiplex channel do not accept any AT commands. If the serial port ASC0 is selected for NMEA output please consider that NMEA data is transmitted at a fixed bit rate of 115200 bps regardless of the AT+IPR value set on ASC0.
In addition, the commands AT^SGPSC="Nmea/Output/","last" and AT^SGPSC="Nmea/Output/","gpsdataurc" and AT^SGPSC="Nmea/URC","on" can be used to get all GNSS information on the AT command instances(s), eliminating the need to poll the dedicated NMEA instance.

The UE may connect to an active or passive GNSS antenna. Active GNSS antennas need an extra power supply which can be switched on or off with AT^SGPSC. Take care that the antenna is capable of GPS and GLONASS as well (if required). Details on how to connect and handle active or passive antennas can be found in [2].

16.1 GNSS NMEA Sentences

A standard NMEA sentence set consists of the sentences listed below. Each single sentence starts with $ prefix and a Talker ID followed by a three letter Sentence ID. Both IDs are followed by data fields separated by comma. The data is provided in ASCII format.

Talker ID "GN" indicates that GPS is used in combination with GLONASS, GALILEO.

For GPS, the Talker ID is GP. The UE supports the following GPS related NMEA sentence types.

- GPGGA - GPS Fix Data, i.e. Time, Position and fix related data of GNSS receiver
- GPRMC - Recommended minimum data for GPS
- GPGSV - Number of satellites in view, elevation, azimuth and CNR for each satellite. Max. 16 satellites (= 4 satellites per GPGSV row, and max. 4 GPGSV rows in each NMEA sentence set).
- GPGSA - GPS DOP (Dilution of Precision) and active satellites
- GPVTG - Vector track and speed over the ground
- GNGNS - Fix Data, i.e. Time, Position and fix related data in case of mixed usage of satellite systems.

For GLONASS, the Talker ID is "GL". The UE supports the following GLONASS related NMEA sentence types

- GLGSV - Number of satellites in view, elevation, azimuth and CNR for each satellite. Max. 16 satellites (= 4 satellites per GLGSV row, and max. 4 GLGSV rows in each NMEA sentence set).
- GNGSA - GLONASS DOP and active satellites
- GNGNS - Fix Data, i.e. Time, Position and fix related data in case of mixed usage of satellite systems.

For GALILEO, the Talker ID "GA". The UE supports the following GALILEO related NMEA sentence types.

- GAGSV - Number of satellites in view, elevation, azimuth and CNR for each satellite. Max. 16 satellites (= 4 satellites per GAGSV row, and max. 4 GAGSV rows in each NMEA sentence set)
- GNGSA - GALILEO DOP and active satellites
- GNGNS - Fix Data, i.e. Time, Position and fix related data in case of mixed usage of satellite systems.

The following NMEA sentence can additionally be enabled using `<Pz90Val>` of the `AT^SGPSC` command.

- GLGNS - Detailed satellite data with longitude, latitude, altitude converted from WGS84 to PZ-90 system. Please note that the position in GLGNS sentence is calculated from data provided by employed GNSS systems. Due to that it does not require GLONASS to be enabled.

The following NMEA sentences can be enabled using `<DeadReckoningVal>` of the `AT^SGPSC` command. The device prefix "PC" is for Gemalto related data.

- PCWMV - a proprietary Gemalto NMEA sentence
- GPZDA - consists of NMEA 0183 standard Time and Date
- GPGRS - consists of the GPS Range Residuals

The PCWMV sentence will be decoded in the following way:
PCWMV,<1>,<2>,<3>,<4>,<5>,<6>,<7>,<8>*CS

Meaning of PCWMV fields:
<1> East velocity (m/s)
<2> North velocity (m/s)
<3> Up velocity (m/s)
<4> Position standard deviation estimate (m)
<5> Latitude uncertainty (m)
<6> Longitude uncertainty (m)
<7> Vertical uncertainty (m)
<8> Velocity uncertainty (m/s)
CS Checksum.

16.2 GNSS Power Saving Considerations

If GNSS is switched on (see AT^SGPSC parameters <EngineVal> and <OutVal>), GPS and GLONASS and GALILEO may altogether be employed for position calculation.
Usage of GLONASS or GALILEO is added only if needed to get position fix. If the GPS signal is sufficient to get a fix, the GNSS engine automatically deactivates the usage and output of GLONASS, GALILEO in order to reduce power consumption. The output of GPS sentences can also be switched off. See AT^SGPSC parameters <GlonassVal>, <GalileoVal>, <GpsVal>.

16.3 ^SGPSE GNSS Event Notification

The following URCs provide GNSS related status information. The URCs show up on the instance specified for URC output, by default the "app" instance (see AT^SCFG, parameter <urcDestIfc>).

Unsolicited Result Codes

URC 1

NMEA buffer notification (<UrcType> 0):

```
^SGPSE: <UrcType>, <BufferStatus>, <BufferCount>
```

URC 2

Position fix notification (<UrcType> 1):

```
^SGPSE: <UrcType>, <PositionStatus>
```

URC 3

XTRA file invalidity notification (<UrcType> 2):

```
^SGPSE: <UrcType>, <InfoUrcMinutes>
```

URC 4

NMEA data output (<UrcType> 3):

```
^SGPSE: <UrcType>, <NMEA_sentence>
[^SGPSE: <UrcType>, <NMEA_sentence>]
...
```

Parameter Description

<UrcType>(num)	
0	URC type "NMEA buffer notification". This URC type is enabled by setting the AT^SGPSC "Nmea/Output" subcommand with parameter <OutVal>= "buffered". The buffer mechanism and the URC are disabled if <OutVal>= "on" or "off". If the NMEA buffering mechanism is active (see <OutVal>), two URCs will be generated: The first URC will show up when approximately 80% of the buffer is filled. This way, the application has enough time to wake up and select <OutVal>= "on" in order to read and empty the buffer and get new NMEA sentences. The second URC will show up when the buffer is full.
1	URC type "Position fix notification". This URC type is enabled by setting the AT^SGPSC "Nmea/Urc" subcommand with parameter <FixUrcVal>= "on". <FixUrcVal>= "off" disables the URC. The URC is emitted each time when the state of the positioning fix changes, i.e. when the fix becomes valid or invalid.
2	URC type "XTRA file invalidity notification". This URC type is enabled by setting the AT^SGPSC subcommand "Info" with <InfoType>= "Urc" and <InfoUrcVal>= "on". Parameter <InfoUrcMinutes> specifies the number of minutes the URC shall show up before the injected XTRA file validity expires. <InfoUrcVal>= "Off" disables the URC.
3	URC type "NMEA sentence". If this URC type is enabled NMEA sentences will be handled as URCs. They will be printed to the URC destination instance, eliminating the need of the dedicated NMEA instance. For each single NMEA sentence, there will be a single URC. At the frequency specified with <FreqVal>, the UE will send a set of URCs for each set of NMEA sentences.

This URC type is enabled by setting the AT^SGPSC "Nmea/Output" subcommand with parameter <OutVal>= "gpsdataurc". The types of NMEA sentences have to be configured with AT^SGPSC "Nmea/Data" parameter <NmeaDataUrcMask>.

<BufferStatus>(num)

Status of NMEA buffer

0	Buffer fill status is 80%.
1	Buffer is full. If the buffer is not emptied buffering stops to retain the data buffered data. This allows the TE to store the buffered data, e.g. for position tracking.

<BufferCount>(num)

GNSS NMEA buffer count

Number of bytes located in NMEA buffer

<PositionStatus>(num)

0	Engine has no position fix.
1	Engine gets a fix position.

<InfoUrcMinutes>(num)

0	Injected XTRA file is invalid.
1...10080	Injected XTRA file will be invalid in <InfoUrcMinutes> minutes.

<NMEA_sentence>(num)

A single NMEA sentence starting with $ prefix, exactly as defined in Section 16.1, GNSS NMEA Sentences.

16.4 AT^SGPSC GNSS Configuration

AT^SGPSC is a configuration command that can be used to set GNSS parameters and to switch the GNSS engine on and off.

Syntax

Test Command

```
AT^SGPSC=?
```

Response(s)

```
^SGPSC: "Engine", (list of supported <EngineVal>s)
^SGPSC: "Info", (list of supported <InfoType>s), (list of supported <InfoUrcVal>s), (list of supported <InfoUrcMinutes>s)
^SGPSC: "Nmea/Freq", (list of supported <FreqVal>s)
^SGPSC: "Nmea/GPS", (list of supported <GpsVal>s)
^SGPSC: "Nmea/Glonass", (list of supported <GlonassVal>s)
^SGPSC: "Nmea/PZ90", (list of supported <Pz90Val>s)
^SGPSC: "Nmea/Galileo", (list of supported <GalileoVal>s)
^SGPSC: "Nmea/ExtGSV", (list of supported <ExtGSV>s)
^SGPSC: "Nmea/DeadReckoning", (list of supported <DeadReckoningVal>s)
^SGPSC: "Nmea/DRSync", (list of supported <DRSyncVal>s)
^SGPSC: "Nmea/Output", (list of supported <OutVal>s)
^SGPSC: "Nmea/Urc", (list of supported <FixUrcVal>s)
^SGPSC: "Nmea/Data", (list of supported <NmeaDataUrcMask>s)
^SGPSC: "Power/Antenna", (list of supported <AntVal>s)
^SGPSC: "Sens/MinElevAngle", (list of supported <Degree>s)
OK
ERROR
+CME ERROR: <err>
```

Read Command

```
AT^SGPSC?
```

Response(s)

```
^SGPSC: "Engine", <EngineState>
^SGPSC: "Info", "Urc"[, <InfoUrcVal>][, <InfoUrcMinutes>]
^SGPSC: "Nmea/Freq", <FreqVal>
^SGPSC: "Nmea/GPS", <GpsVal>
^SGPSC: "Nmea/Glonass", <GlonassVal>
^SGPSC: "Nmea/Galileo", <GalileoVal>
^SGPSC: "Nmea/ExtGSV", <ExtGSV>
^SGPSC: "Nmea/PZ90", <Pz90Val>
^SGPSC: "Nmea/DeadReckoning", <DeadReckoningVal>
^SGPSC: "Nmea/DRSync", <DRSyncVal>
^SGPSC: "Nmea/Output", <OutVal>
^SGPSC: "Nmea/Urc", <FixUrcVal>
^SGPSC: "Nmea/Data", <NmeaDataUrcMask>
^SGPSC: "Power/Antenna", <AntVal>
^SGPSC: "Sens/MinElevAngle", <Degree>
OK
ERROR
+CME ERROR: <err>
```

Write Command

Activating or deactivating GNSS engine.

AT^SGPSC="Engine"[, <EngineVal>]

Response(s)

^SGPSC: "Engine", <EngineState>[, <AssistDataError>]
OK
ERROR
+CME ERROR: <err>

Write Command

If <InfoType>= "Xtra": Requesting validity of XTRA file.

AT^SGPSC="Info", "Xtra"

Response(s)

^SGPSC: "Info", "Xtra", <InfoXtraWeek>, <InfoXtraMinute>, <InfoXtraDurationMinutes>
OK
ERROR
+CME ERROR: <err>

Write Command

If <InfoType>= "Urc": Configuring "^SGPSE" URC type "XTRA file invalidity notification".

AT^SGPSC="Info", "Urc"[, <InfoUrcVal>][, <InfoUrcMinutes>]

Response(s)

^SGPSC: "Info", "Urc", <InfoUrcVal>[, <InfoUrcMinutes>]
OK
ERROR
+CME ERROR: <err>

Write Command

Setting frequency of position requests.

AT^SGPSC="Nmea/Freq"[, <FreqVal>]

Response(s)

^SGPSC: "Nmea/Freq", <FreqVal>
OK
ERROR
+CME ERROR: <err>

Write Command

Setting GPS depending output.

AT^SGPSC="Nmea/GPS"[, <GpsVal>]

Response(s)

^SGPSC: "Nmea/GPS", <GpsVal>
OK
ERROR
+CME ERROR: <err>

Write Command

Setting GLONASS depending output.

AT^SGPSC="Nmea/Glonass"[, <GlonassVal>]

Response(s)

^SGPSC: "Nmea/Glonass", <GlonassVal>
OK
ERROR
+CME ERROR: <err>

Write Command

Setting GALILEO depending output.

AT^SGPSC="Nmea/Galileo"[, <GalileoVal>]

Response(s)

```
^SGPSC: "Nmea/Galileo", <GalileoVal>
OK
ERROR
+CME ERROR: <err>
```

Write Command

Enabling extended NMEA sentences.

AT^SGPSC="Nmea/ExtGSV"[, <ExtGSV>]

Response(s)

```
^SGPSC: "Nmea/ExtGSV", <ExtGSV>
OK
ERROR
+CME ERROR: <err>
```

Write Command

Configuring NMEA output for GLONASS PZ-90 Geodetic Reference System

AT^SGPSC="Nmea/PZ90"[, <Pz90Val>]

Response(s)

```
^SGPSC: "Nmea/PZ90", <Pz90Val>
OK
ERROR
+CME ERROR: <err>
```

Write Command

Setting dead reckoning related NMEA output.

AT^SGPSC="Nmea/DeadReckoning"[, <DeadReckoningVal>]

Response(s)

```
^SGPSC: "Nmea/DeadReckoning", <DeadReckoningVal>
OK
ERROR
+CME ERROR: <err>
```

Write Command

Configuring DR Sync line.

AT^SGPSC="Nmea/DRSync"[, <DRSyncVal>]

Response(s)

```
^SGPSC: "Nmea/DRSync", <DRSyncVal>
OK
ERROR
+CME ERROR: <err>
```

Write Command

Configuring output of NMEA sentences.

AT^SGPSC="Nmea/Output"[, <OutVal>]

Response(s)

```
^SGPSC: "Nmea/Output", <OutVal>
OK
ERROR
+CME ERROR: <err>
```

Write Command (Continued)

Configuring output of NMEA sentences.

AT^SGPSC="Nmea/Output"[, <OutVal>]

Response(s)

If <OutVal> is "last":
[^SGPSC: ...]
[Last NMEA sentence set received on dedicated NMEA instance]
OK
ERROR
+CME ERROR: <err>

Write Command

Configuring "^SGPSE" URC type "Position fix notification".

AT^SGPSC="Nmea/Urc"[, <FixUrcVal>]

Response(s)

^SGPSC: "Nmea/Urc", <FixUrcVal>
OK
ERROR
+CME ERROR: <err>

Write Command

Configuring URC output for NMEA data

AT^SGPSC="Nmea/Data"[, <NmeaDataUrcMask>]

Response(s)

^SGPSC: "Nmea/Data", <NmeaDataUrcMask>
OK
ERROR
+CME ERROR: <err>

Write Command

Configuring antenna supply.

AT^SGPSC="Power/Antenna"[, <AntVal>]

Response(s)

^SGPSC: "Power/Antenna", <AntVal>
OK
ERROR
+CME ERROR: <err>

Write Command

Configure the Minimum GNSS Elevation Angle.

AT^SGPSC="Sens/MinElevAngle"[, <Degree>]

Response(s)

^SGPSC: "Sens/MinElevAngle", <Degree>
OK
ERROR
+CME ERROR: <err>

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<EngineVal>(str)

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

"0"(P)	GNSS engine off.
"1"	Start GNSS engine without employing GpsOneXTRA assistance data. The GNSS engine dynamically determines the best startup scenario depending on the available position, time, Almanac and/or Ephemeris data. However, please consider that if GpsOneXTRA assistance data is still injected (due to previously used mode 2), this data might still be effective. To enable cold start in such case first delete assistance data using AT^SBNW="agps",-1 before employing AT^SGPSC="Engine","1".
"2"	Start GNSS engine in A-GNSS mode by employing the GpsOneXTRA assistance data previously stored to the FFS and injected to the GNSS engine with AT^SBNW. Remember that the RTC is correctly set (AT+CCLK) to Greenwich Mean Time (GMT): 0. Using mode 2 without GpsOneXTRA assistance data: If the following conditions are met you can use mode 2 instead of mode 1 even though GpsOneXTRA assistance data were not injected beforehand: Take care that the RTC is set to Greenwich Mean Time (GMT). If Ephemeris data is still valid, mode 2 enables faster TTFF than mode 1. If Ephemeris data has expired, TTFF is about the same in mode 2 or mode 1. Yet, when doing so, please ignore the <AssistDataError> code 3 returned (because no GpsOneXTRA assistance data are found): Example: AT^SGPSC="Engine","2" ^SGPSC: "Engine","1","3" OK

<EngineState>(str)

Parameter of the AT^SGPSC "Engine" read and write command responses. Shows the GNSS engine state.

"0"	GNSS engine off.
"1"	GNSS engine on.

<AssistDataError>(str)

Parameter of the AT^SGPSC "Engine" write command response. May appear in the write command response only if an error occurs while GpsOneXTRA assistance data are injected into the GNSS engine.
Possible error codes:

"1"	Bad CRC.
"2"	Validity time is out of range.
"3"	Internal resource error.
"4"	GNSS subsystem currently busy.
"5"	Time info error (AT+CCLK not correctly set to Greenwich Mean Time (GMT): 0).
"6"	GNSS subystem is locked.
"7"	GNSS state error.
"8"	Other error.

<InfoType>(str)

Parameter of the AT^SGPSC "Info" write command. Specifies the type of information which will be requested.

“Xtra“	Check the validity of the XTRA file which was successfully injected in the GNSS engine before. The write command AT^SGPSC="Info","Xtra" requests the validity of the injected XTRA.bin file and returns the parameters <InfoXtraWeek>, <InfoXtraMinute> and <InfoXtraDurationMinutes>.
“Urc“	Refers to the "^SGPSE" URC type "XTRA file invalidity notification". The URC shall be enabled / disabled by setting the <InfoUrcVal> parameter. Depending on the <InfoUrcMinutes> parameter, the URC will be emitted either before or at the moment when the validity of the injected XTRA file expires. XTRA file validity is checked at 1 minute frequency. The calculation uses AT+CCLK time. This must be GMT0.

<InfoXtraWeek>(str)

Parameter of the AT^SGPSC "Info" write command. Shows the GNSS week (time stamp since 1st epoch January 6th, 1980 Sunday 0:00) inside the injected XTRA.bin file. Together with <InfoXtraMinute> the value can be used to manually calculate the time difference to GMT0 time.

<InfoXtraMinute>(str)

Parameter of the AT^SGPSC "Info" write command. Shows the GNSS minutes of the current week inside the injected XTRA.bin file. When manually calculating the time difference to GMT0 time, this value has to be added to the <InfoXtraWeek> value.

0...10080	Time in minutes.

<InfoXtraDurationMinutes>(str)

Parameter of the AT^SGPSC "Info" write command. Counts down the validity duration of the currently injected XTRA file in minutes.
The calculation uses AT+CCLK time. This must be GMT0.

“0“	No saved XTRA file or the saved XTRA file is no longer valid.
1...10080	Validity of injected XTRA file in minutes.

<InfoUrcVal>(str)

Parameter of the AT^SGPSC "Info" write command. Enables / disables the "^SGPSE" URC type "XTRA file invalidity notification". Parameter <InfoUrcMinutes> is applicable only if parameter <InfoUrcVal> is set to "on". By default, the URC is emitted on the "APP" instance (see AT^SCFG, parameter <urcDestIfc>).

“off“(P)	Disable the "^SGPSE" URC type "XTRA file invalidity notification".
“on“	Enable the "^SGPSE" URC type "XTRA file invalidity notification".

<InfoUrcMinutes>(num)

Parameter of the AT^SGPSC "Info" write command. Specifies the number of minutes the "^SGPSE" URC type "XTRA file invalidity notification" shall show up before the validity of the injected XTRA file expires.

[0]	URC shall show up exactly at the time when the validity of the injected XTRA file has expired.
1...10080	Number of minutes the URC shall show up before the validity of the injected XTRA file expires.

<FreqVal>(num)

Parameter of the AT^SGPSC "Nmea/Freq" subcommand. Specifies the frequency of position requests (in seconds).
If a position fix is available the GNSS engine will start to output NMEA messages at the given <FreqVal>.
If there is no position fix yet, then NMEA data will be output usually every second, regardless of the specified frequency and until the position fix is found. This applies, for example, after starting the GNSS engine (see <EngineVal>) and the output of data is activated (see <OutVal>), or when a position fix was lost for some reason (due to poor signal quality).

1(P)...65534	NMEA data is output every n seconds. During the NMEA output intervals, the GNSS engine enters IDLE mode and saves power. Therefore, setting the GNSS engine into IDLE state is a trade-off between trying to save power and maintaining or getting a position fix. The longer the time set with <FreqVal>, the more time will be required to get a position fix.

<GpsVal>(str)(NV)

Parameter of the AT^SGPSC "Nmea/Gps" subcommand. This setting can only be changed when the GNSS engine is off (see parameter <EngineVal>).

“off“	Disables the output of GPS sentences.
“on“(D)	Enables the output of GPS sentences.

<GlonassVal>(str)(NV)

Parameter of the AT^SGPSC "Nmea/Glonass" subcommand. This setting can only be changed when the GNSS engine is off (see parameter <EngineVal>).

“off“	Disables the output of GLONASS sentences. Nevertheless, GLONASS data is still received by the UE as long as required for positional calculations. See also Section 16.2, GNSS Power Saving Considerations for details on power saving.
“on“(D)	Enables the output of GLONASS sentences, but only as long as used for position fix.

<GalileoVal>(str)(NV)

Parameter of the AT^SGPSC "Nmea/Galileo" subcommand. Setting can only be changed when the GNSS engine is off (see parameter <EngineVal>).

“off“	Disables the output of GALILEO sentences. Nevertheless, GALILEO data is still received by the UE as long as required for positional calculations. See also Section 16.2, GNSS Power Saving Considerations for details on power saving.
“on“(D)	Enables the output of GALILEO sentences, but only as long as used for position fix.

<ExtGSV>(str)(NV)

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

“off“	Disables the output of decimals in GSV elements Elevation, Azimuth, SNR/CN0. $GLGSV,3,1,10,73,25,324,45,66,48,101,52,82,58,307,51,80,30,261,43*64
“on“(D)	Enables the output of decimals in GSV elements Elevation, Azimuth, SNR/CN0. Example: $GLGSV,3,1,10,73,25.3,324.8,42.0,66,48.5,99.8,47.9,82,59.1,309.4,47.3,80,29.5,260.2,40.2*59

<Pz90Val>(str)(NV)

Parameter of the AT^SGPSC "Nmea/PZ90" subcommand. Configures support for the PZ-90 Geodetic Reference System. If enabled additional NMEA $GLGNS sentences are output on the dedicated NMEA instance (see Section 16.1, GNSS NMEA Sentences).

"off"(D)	Disables the output of $GLGNS sentences.
"on"	Enables the output of $GLGNS sentences.

The setting can only be changed when the GNSS engine is off (see parameter <EngineVal>).

<DeadReckoningVal>(str)(NV)

Parameter of the AT^SGPSC "Nmea/DeadReckoning" subcommand. Configures additional NMEA output of Dead Reckoning related information (see Section 16.1, GNSS NMEA Sentences).
Parameter is global for all interfaces, non-volatile and will not be reset by AT&F.
The setting can only be changed when the GNSS engine is off (see parameter <EngineVal>).

"off"(D)	No output of Dead Reckoning related data.
"on"	The additional NMEA sentences for Dead Reckoning will be output.

<DRSyncVal>(str)(NV)

Parameter of the AT^SGPSC "Nmea/DRSync" subcommand. Enables or disables a 1PPS (pulse per second) signal which can be used as an accurate clock signal.

When enabled 1 pulse per second coming from the GNSS receiver's own signal clock is generated on the DR_SYNC line which is available as an alternative function of GPIO1. The accuracy is +/-5 ms, pulse length is 1 ms. The 1PPS signal is provided as long as synchronized with the satellite clock, and continues after GNSS signal loss.
The 1PPS signal will be accurate only if the GNSS engine is active. Therefore, when using the 1PPS signal, the <FreqVal> interval should not exceed 5 sec to avoid that the GNSS engine enters IDLE state. Also,S <OutVal> shall be set to "on" or "buffered".
This parameter can only be changed when the GNSS engine is off (see parameter <EngineVal>). Changed settings take effect only after next UE restart, but are already reserved before UE restart. Therefore, enabling the DR_SYNC line, instantly disables all other functions that can be assigned to GPIO1 (see AT^SCFG subcommands related to GPIOs and AT^SCPIN). The different functions are mutually exclusive.

"off"(D)	1PPS signal on DR_SYNC line is disabled.
"on"	1PPS signal on DR_SYNC line is enabled.

<OutVal>(str)

Parameter of the AT^SGPSC "Nmea/Output" subcommand. Configures the output of NMEA sentences (see Section 16.1, GNSS NMEA Sentences).

"off"	No output, no buffering of NMEA sentences. Previously buffered NMEA sentences will be discarded. The "^SGPSE" URC for buffer notification is deactivated.
"on"(P)	NMEA sentences will be output on the dedicated NMEA port at the frequency set with <FreqVal>. (For NMEA port settings see AT^SSRVSET). Buffering is deactivated. Previously buffered NMEA sentences will be output (thereby freeing the buffer) before printing new NMEA sentences. If there is no previously buffered data, printing new NMEA sentences starts instantly. The "^SGPSE" URC for buffer notification is deactivated.
"buffered"	No NMEA output on dedicated NMEA port. NMEA sentences will be buffered. The "^SGPSE" URC for buffer notification is activated to notify the TE when the buffer becomes full. If buffering is activated then the TE has to enable NMEA output again in order to get the buffered data and to empty the buffer. This shall be done by selecting <OutVal>= "on". The "^SGPSE" URC for buffer notification may be used to trigger the TE to start

	reading the buffer. The first URC "^SGPSE: 0,0, x" will be generated when the buffer reaches 80% capacity. When full, the second URC "^SGPSE: 0,1, x" will be generated. Buffer size: The buffer will hold NMEA data for at least one minute (assuming a max. NMEA sentence length of 640 byte, max. 8 sentences per update and an update interval of one second). The TE may extend the buffering time by increasing the frequency with <FreqVal>. When the buffer is full and not emptied the most recent NMEA sentences will be discarded. Benefit of buffering: The mechanism of switching back and forth between NMEA output and NMEA buffering can be used, for example, to save power for NMEA output or to store the buffered NMEA data to a log file for position tracking.
“last“	This option can be used to query any time the NMEA sentence set most recently received by the GNSS engine and stored in an internal buffer. The benefit is that the NMEA data is instantly returned on the AT command instance where command was executed, eliminating the need to poll the dedicated NMEA instance. The response comes as one NMEA sentence set containing the sentences defined in Section 16.1, GNSS NMEA Sentences. It is provided in ASCII format (incl. "$" character).
“gpsdataurc“	This option enables the output of NMEA sentences as "^SGPSE" URC type 3 ("NMEA sentence)". As a result, all NMEA sentences selected with AT^SGPSC "Nmea/Data" parameter <NmeaDataUrcMask> will be printed to the URC destination instance specified with AT^SCFG, parameter <urcDestIfc>. This eliminates the need of the dedicated NMEA instance. For each single NMEA sentence, there will be a single URC. At the frequency specified with <FreqVal>, the UE will send a set of URCs for each set of NMEA sentences.

<NmeaDataUrcMask>(num)(NV)

Parameter of the AT^SGPSC "Nmea/Data" subcommand. Determines the type of NMEA sentences presented via "^SGPSE" URC type 3 ("NMEA sentence") if <OutVal> is set to "gpsdataurc".
Precondition for showing the URCs is that the output of the corresponding satellite system is also enabled via <GlonassVal>, <GalileoVal>, <GpsVal>.
To select the NMEA sentence types, you can set one of the single values listed below, or the sum of any values (except 255). By default, all types are enabled with value 255.

0	No presentation of NMEA data by URC.
1	All NMEA sentences with Talker ID $GP are enabled.
2	All NMEA sentences with Talker ID $GL are enabled.
4	All NMEA sentences with Talker ID $GA are enabled.
255(D)	All available NMEA sentences are enabled.

<FixUrcVal>(str)

Parameter of the AT^SGPSC "NMEA/URC" subcommand. Enables / disables the "^SGPSE" URC type "Position fix notification" that reports changes of the positioning fix state. For details see "^SGPSE" parameter <PositionStatus>. The advantage is that the information on the positioning state is displayed on an AT command instance (not on the NMEA instance). By default, the URC is emitted on the "APP" instance (see AT^SCFG, parameter <urcDestIfc>).

“off“(P)	Disable URC.
“on“	Enable URC.

<AntVal>(str)

Parameter of the AT^SGPSC "Power/Antenna" subcommand. Configures the GNSS antenna power supply.

“off“	Antenna power off.
“on“	Antenna power supply always on (3.05 V).
“auto“(P)	Antenna power will be automatically switched on or off depending on GNSS engine activity. This mechanism takes effect either if the GNSS engine is activated with <EngineVal> or if an E-911 emergency call is established by Control Plane.

<Degree>(str)(NV)

Minimum GNSS Elevation Angle

Parameter of the AT^SGPSC "Sens/MinElevAngle" subcommand. Configures the Minimum GNSS Elevation Angle. The value can only be changed when the GNSS engine is off (see parameter <EngineVal>). Restart the UE for the change to take effect.

5(D)...45	Minimum GNSS Elevation Angle.

16.5 Examples of How to Configure and Use GNSS

Below you can find selective examples of how to configure and use the PLS8-US-R4's integrated GNSS engine.

16.5.1 Loading Xtra.Bin File and Activating A-GNSS Start Mode

To take advantage of A-GNSS ensure that valid GpsOneXTRA assistance data (in short XTRA file) is available. To do so, first download a new GpsOneXTRA binary file via HTTP from one of the gpsOneXtra assistance web-servers. Save the received xtra*.bin file to your local memory and check the exact file size.
- http://xtra1.gpsonextra.net/xtra2.bin
- http://xtra2.gpsonextra.net/xtra2.bin
- http://xtra3.gpsonextra.net/xtra2.bin

Next, use AT+CCLK to set the RTC. Then, use AT^SBNW to store the GpsOneXTRA assistance data on the FFS. If AT^SBNW returns the responses "AGPS END OK" and "OK" the XTRA file will be injected to the GNSS engine. Finally, use AT^SGPSC to switch on the GNSS engine.

AT+CCLK="12/01/20,13:15:57" OK	Set PLS8-US-R4 RTC to Greenwich Mean Time (instead of local time).
AT^SGPSC="Engine","0" ^SGPSC: "Engine","0" OK	Deactivate the GNSS engine.
AT^SBNW=agps,-1 CONNECT AGPS READY: RESET GPS ENGINE AND DELETE XTRA FILE ... AGPS: END OK OK	Optional: Remove existing xtra.bin file from GNSS receiver and FFS.
AT^SBNW="agps",59734 CONNECT	Write new XTRA file to FFS. File size is 59734 bytes.
AGPS READY: SEND FILE ... AGPS: END OK OK	New XTRA file is successfully stored to the FFS and injected into the GNSS engine.
AT^SGPSC="Power/Antenna","on" ^SGPSC: "Power/Antenna","on" OK	For active antenna only: Switch on antenna power supply.
AT^SGPSC="Engine","2" ^SGPSC: "Engine","1" OK	Switch on GNSS engine by using the injected XTRA file. The response confirms that the GNSS engine is active.
AT^SGPSC="NMEA/Output","on" ^SGPSC: "Nmea/Output","on" OK	NMEA output is enabled by power-up default, therefore setting this command is necessary only if NMEA output was deactivated before.

NMEA output will instantly start on the dedicated NMEA port. The example shows a position fix.

```
....
$GPGGA,123521.0,5232.017893,N,01316.443884,E,1,05,3.7,198.0,M,43.0,M,,*5C
$GPVTG,,T,0.0,M,0.0,N,0.0,K,A*0D
$GPRMC,123521.0,A,5232.017893,N,01316.443884,E,0.0,,270711,,,A*44
$GPGSA,A,3,09,14,25,27,29,,,,,,,,6.4,3.7,5.2*36
$GPGSV,3,1,12,01,,,29,02,19,122,19,09,50,142,26,14,38,288,26*46
$GPGSV,3,2,12,25,43,265,38,27,38,140,36,29,09,205,31,04,24,075,*78
$GPGSV,3,3,12,12,82,293,,17,11,043,,32,03,347,,30,,,*4B
$GPGGA,123522.0,5232.017872,N,01316.443885,E,1,06,1.9,198.0,M,43.0,M,,*5E
....
```

16.5.2 Trying to Load Invalid XTRA File

AT^SBNW=agps,-1	Optional: Remove existing xtra.bin file from FFS.
CONNECT AGPS READY: RESET GPS ENGINE AND DELETE FILE ... AGPS END OK OK	
AT^SBNW="agps",47616	Write new XTRA file to FFS. Specified number of bytes is greater than actual XTRA file size.
CONNECT AGPS READY: SEND FILE ... BAD CRC ERROR	Wrong check sum. File not saved.

16.5.3 Starting GNSS without Aiding

AT^SGPSC="Power/Antenna","on" ^SGPSC: "Power/Antenna","on" OK	For active antenna only: Switch on antenna power supply.
AT^SGPSC="Engine","1" ^SGPSC: "Engine","1" OK	Switch on GNSS engine.
AT^SGPSC="NMEA/Output","on" ^SGPSC: "Nmea/Output","on" OK	NMEA output is active by power-up default, therefore setting this command is necessary only if NMEA output was deactivated before.

NMEA output will instantly start on the dedicated NMEA port. The example shows a position fix.

```
....
$GPGGA,123521.0,5232.017893,N,01316.443884,E,1,05,3.7,198.0,M,43.0,M,,*5C
$GPVTG,,T,0.0,M,0.0,N,0.0,K,A*0D
$GPRMC,123521.0,A,5232.017893,N,01316.443884,E,0.0,,270711,,,A*44
$GPGSA,A,3,09,14,25,27,29,,,,,,,,6.4,3.7,5.2*36
$GPGSV,3,1,12,01,,,29,02,19,122,19,09,50,142,26,14,38,288,26*46
$GPGSV,3,2,12,25,43,265,38,27,38,140,36,29,09,205,31,04,24,075,*78
$GPGSV,3,3,12,12,82,293,,17,11,043,,32,03,347,,30,,,*4B
$GPGGA,123522.0,5232.017872,N,01316.443885,E,1,06,1.9,198.0,M,43.0,M,,*5E
....
```

16.5.4 Cold Start

To trigger a cold start first clear current GNSS data inside GNSS receiver. Do not shut down or restart the UE afterwards. Simply switch on the GNSS engine.
This example uses AT^SGPSC defaults, such as <OutVal>="on", <FreqVal>=1 (1 second frequency interval), <AntVal>="auto" for antenna power.

AT^SBNW=agps,-1	Clear current GNSS data inside GNSS receiver.
CONNECT AGPS READY: RESET GPS ENGINE AND DELETE FILE ... AGPS END OK OK	
AT^SGPSC="Engine","1" ^SGPSC: "Engine","1" OK	Switch on GNSS engine.

NMEA output will instantly start on the dedicated NMEA port. The example shows a position fix.

```
....
$GPGGA,,,,,,0,,,,,,,,*66
$GPRMC,,V,,,,,,,,,,N*53
$GPGSV,3,1,11,02,19,045,35,04,45,295,33,05,16,071,40,09,,,33*44
$GPGSV,3,2,11,12,10,116,25,23,08,317,24,26,30,295,33,29,80,064,36*7C
$GPGSV,3,3,11,33,,,37,06,01,033,,14,,,*4F
$GPVTG,,T,,M,,N,,K,N*2C
$GPGSA,A,1,,,,,,,,,,,,,,*1E
$GPGGA,,,,,,0,,,,,,,,*66
$GPRMC,,V,,,,,,,,,,N*53
$GPGSV,3,1,11,02,19,045,36,04,45,295,34,05,16,071,41,09,,,34*46
$GPGSV,3,2,11,12,10,116,25,23,08,317,27,26,30,295,33,29,80,064,36*7F
$GPGSV,3,3,11,33,,,37,06,01,033,,14,,,*4F
$GPGGA,175612.0,5232.068356,N,01316.494305,E,1,03,6.5,43.8,M,43.0,M,,*60
$GPVTG,,T,0.0,M,0.0,N,0.0,K,A*0D
$GPRMC,175612.0,A,5232.068356,N,01316.494305,E,0.0,,120416,,,A*44
$GPGSA,A,3,02,26,29,,,,,,,,,8.9,6.5,6.1*3A
$GPGSV,3,1,11,02,19,045,36,04,45,295,34,05,16,071,41,09,,,34*46
$GPGSV,3,2,11,12,10,116,25,23,08,317,26,26,30,295,33,29,80,064,37*7F
$GPGSV,3,3,11,33,,,37,06,01,033,,14,,,*4F
$GPGGA,175613.0,5232.067004,N,01316.494489,E,1,03,2.1,41.6,M,43.0,M,,*65
$GPVTG,,T,0.0,M,0.0,N,0.0,K,A*0D
$GPRMC,175613.0,A,5232.067004,N,01316.494489,E,0.0,,120416,,,A*4D
$GPGSA,A,2,02,26,29,,,,,,,,,2.3,2.1,1.0*3D
$GPGSV,4,1,15,02,19,045,35,04,45,295,34,05,16,071,41,09,,,32*40
$GPGSV,4,2,15,12,10,116,24,23,08,317,24,26,30,295,33,29,80,064,37*7F
$GPGSV,4,3,15,33,,,38,06,01,033,,16,10,295,,20,08,122,*45
$GPGSV,4,4,15,21,16,192,,25,48,120,,31,51,233,*4F
....
```

16.5.5 Using the GNSS Buffering Mechanism

AT^SGPSC="Power/Antenna","on" ^SGPSC: "Power/Antenna","on" OK	For active antenna only: Switch on antenna power supply.
AT^SGPSC="Engine","1" ^SGPSC: "Engine","1" OK	Switch on GNSS engine and start buffering.
AT^SGPSC="NMEA/Output","buffered" ^SGPSC: "Nmea/Output","buffered" OK	This setting activates NMEA buffering and enables the presentation of the "^SGPSE" URC. NMEA sentences will be buffered without additional power consumption for data output.
^SGPSE: 0,0,308736	The first URC shows up indicating that the buffer is filled to 80%.
^SGPSE: 0,1,523740	The second URC shows up indicating that the buffer is full.
AT^SGPSC="NMEA/Output","on" ^SGPSC: "Nmea/Output","on" OK	TE disables buffering and activates NMEA output on the dedicated NMEA port.

Buffered NMEA sentences will be instantly flushed to the dedicated NMEA port, followed by new NMEA sentences:

```
....
$GPGGA,155041.0,5232.043142,N,01316.468218,E,1,04,3.0,87.6,M,43.0,M,,*63
$GPVTG,9.6,T,9.6,M,0.0,N,0.0,K,A*23
$GPRMC,155041.0,A,5232.043142,N,01316.468218,E,0.0,9.6,020312,,,A*65
$GPGSA,A,3,05,08,10,28,,,,,,,,,4.1,3.0,2.8*38
$GPGSV,4,1,14,03,06,028,18,05,57,239,29,08,79,077,20,10,23,168,31*72
$GPGSV,4,2,14,26,47,288,22,27,,,34,28,32,157,34,06,03,015,*43
$GPGSV,4,3,14,07,40,061,,13,08,104,,15,07,288,,19,06,060,*79
$GPGSV,4,4,14,21,07,333,,24,,,*4D
$GPGGA,155042.0,5232.043142,N,01316.468216,E,1,04,3.0,87.6,M,43.0,M,,*6E
$GPVTG,9.6,T,9.6,M,0.0,N,0.0,K,A*23
$GPRMC,155042.0,A,5232.043142,N,01316.468216,E,0.0,9.6,020312,,,A*68
$GPGSA,A,3,05,08,10,28,,,,,,,,,4.1,3.0,2.8*38
$GPGSV,4,1,14,03,06,028,18,05,57,239,29,08,79,077,20,10,23,168,31*72
$GPGSV,4,2,14,26,47,288,21,27,,,35,28,32,157,35,06,03,015,*40
$GPGSV,4,3,14,07,40,061,,13,08,104,,15,07,288,,19,06,060,*79
$GPGSV,4,4,14,21,07,333,,24,,,*4D
$GPGGA,155043.0,5232.043141,N,01316.468213,E,1,04,3.0,87.6,M,43.0,M,,*69
....
```

Now the buffer mechanism can be activated again:

`AT^SGPSC="NMEA/Output","buffered"`
`^SGPSC: "Nmea/Output","buffered"`
`OK`
	This setting activates NMEA buffering and enables the presentation of the "^SGPSE" URC. NMEA sentences will be buffered without additional power consumption for data output.

17. Audio Commands

The AT Commands described in this chapter are related to the PLS8-US-R4's audio interface.

17.1 AT+CMUT Mute control

The AT+CMUT command mutes the microphone input. The AT+CMUT write command can be used in all audio modes (incl. mode 1), and during a voice call only. See AT^SNFS for more details on the various audio modes. When a voice call is made, or the audio mode is changed with AT^SNFS during an active voice call, mute mode will automatically be switched off (+CMUT: 0). After the voice call has finished +CMUT: 1 will be set again.

Syntax

Test Command

```
AT+CMUT=?
```

Response(s)

```
+CMUT: (list of supported<mute>s)
OK
```

Read Command

```
AT+CMUT?
```

Response(s)

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

Write Command

```
AT+CMUT=<mute>
```

Response(s)

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

PIN	MDM	APP	✈	Last
-	+	+	+	-

Reference(s)

3GPP TS 27.007 [49]

Parameter Description

<mute>(num)	
0	Mute off
1(P)	Mute on

17.2 AT+VTS DTMF and tone generation

AT+VTS is intended to send ASCII character which cause the Mobile Switching Center (MSC) to transmit DTMF tone to a remote subscriber. The command can only be used during active voice calls and offers the following options:

- AT+VTS=<dtmf>[,<duration>] allows to send a single DTMF tone. The duration can be indvidually determined during the call.

Syntax

Test Command

```
AT+VTS=?
```

Response(s)

```
+VTS: (list of supported<dtmf>s), (list of supported<duration>s)
OK
```

Write Command

```
AT+VTS=<dtmf>[, <duration>]
```

Response(s)

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

PIN	MDM	APP	✈	Last
-	+	+	-	-

Reference(s)

3GPP TS 27.007 [49]

Parameter Description

<dtmf>(str)

Single ASCII character in the set 0...9,#,*, A, B, C, D. The string must be enclosed in quotation marks ("...").

<duration>(num)

Tone duration in 1/10 seconds with tolerance. If not specified the default value (300 ms) is used.

The minimum duration of DTMF signals is 300ms. DTMF tones below 300ms cannot be generated.

1...255

17.3 AT^SAIC Audio Interface Configuration

AT^SAIC controls the audio interfaces. The settings of AT^SAIC as well as AT^SNFI and AT^SNFO are individual for each audio mode set with AT^SNFS. For details please see AT^SNFS. Further information regarding audio functionality is available in the "PLS8-US-R4 Hardware Interface Description" [2].

Syntax

Test Command

AT^SAIC=?

Response(s)

^SAIC:(list of supported <io>s), (list of supported<mic>s), (list of supported<ep>s), (list of supported<bclk>s), (list of supported<mode>s), (list of supported<frame_mode>s), (list of supported<clk_mode>s), (list of supported<sample_rate>s)
OK

Read Command

AT^SAIC?

Response(s)

^SAIC: <io>, <mic>, <ep>, <bclk>, <mode>, <frame_mode>, <clk_mode>, <sample_rate>
OK
ERROR
+CME ERROR: <err>

Write Command

AT^SAIC=<io>, <mic>, <ep>, <bclk>, <mode>, <frame_mode>, <clk_mode>[, <sample_rate>]

Response(s)

OK
ERROR
+CME ERROR: <err>

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<io>(num)

Input and output selection

1(P)	Digital input and output (PCM)
3	Digital input and output (I²S)

<mic>(num)

Microphone selection

1(P)	Microphone 1

<ep>(num)

Select differential earpiece amplifier

1(P)	Selects the earpiece amplifier 1

<bclk>(num)

Parameter configures the Bit Clock (BCLK) signal for PCM and I²S.
Parameter is always mandatory, but only effective if <io>=1 (PCM).
On the I²S bus BCLK is always either 256 kHz at 8 kHz sample rate, or 512 kHz at 16 kHz sample rate, regardless of the value selected with <bclk>.

The parameter value is dependent of <sample_rate>.

0	128 kHz Bit Clock if <sample_rate>= 0 256 kHz Bit Clock if <sample_rate>= 1
1	256 kHz Bit Clock if <sample_rate>= 0 512 kHz Bit Clock if <sample_rate>= 1
2	512 kHz Bit Clock if <sample_rate>= 0 1024 kHz Bit Clock if <sample_rate>= 1
3(P)	2048 kHz Bit Clock if <sample_rate>= 0 4096 kHz Bit Clock if <sample_rate>= 1

<mode>(num)

Master or Slave mode for PCM and I²S. Specifies if BCLK and FSC signals are either output (Master) or input (Slave).
Parameter is always mandatory.
I²S is always Master regardless of the value selected with <mode>.

0(P)	Master mode
1	Slave mode (not applicable to I²S)

<frame_mode>(num)

Parameter configures the Frame Synchronization (FSC) signal.
Parameter is always mandatory, but only effective if <io>=1 (PCM).
I²S always uses a 32 bit stereo voice signal (16 bit word length) regardless of the value selected with <frame_mode>.

0(P)	Short frame
1	Long frame

<clk_mode>(num)

Clock mode

If <io>=1 (PCM):
On the PCM interface this parameter configures the mode of the BCLK signal.

0	BCLK signal will be provided permanently when the digital audio path is configured. Please note that if the BCLK signal is permanently provided the UE will no longer enter its power save (SLEEP) state.
1(P)	BCLK signal will be provided only during digital audio activity (non permanent).

If <io>=3 (I²S):
On the I²S bus this parameter configures the mode of the optional Master Clock (MCLK) output signal.
The frequency of MCLK is always either 2048 kHz at 8 kHz sample rate, or 4096 kHz at 16 kHz sample rate.

0	I²S Master Clock is permanently off.
1	I²S Master Clock will be automatically provided only during audio activity (non-pernament).

<sample_rate>(num)	
Sample rate. Parameter is optional.	
[0](P)	8 kHz
1	16 kHz

Notes

- The default values of AT^SAIC after restart of ME are ^SAIC: 1,1,1,3,0,0,1,0 for every audio mode.
- As can be seen from the AT^SAIC write command syntax, only <sample_rate> is an optional parameter. All other parameters are mandatory, even though ignored for the specific audio interface. Therefore, when setting <io> 3 (digital I²S) all PCM related parameters shall be set as well. If the optional <sample_rate> is omitted its default value applies.

17.3.1 Possible AT^SAIC Configuration Combinations for PCM and I2S

Table 17.1: Possible AT^SAIC Configuration Combinations

AT^SAIC settings	Interface configuration
AT^SAIC=1,1,1,1,0,0,x,1	PCM, master, short frame, BCLK=512kHz, sample rate = 16kHz
AT^SAIC=1,1,1,2,0,0,x,1	PCM, master, short frame, BCLK=1024kHz, sample rate = 16kHz
AT^SAIC=1,1,1,3,0,0,x,1	PCM, master, short frame, BCLK=4096kHz, sample rate = 16kHz
AT^SAIC=1,1,1,x,0,0,x,0	PCM, master, short frame, BCLK=256kHz/512kHz/2048kHz, sample rate =8 kHz
AT^SAIC=1,1,1,x,0,1,x,1	PCM, master, long frame, BCLK=512kHz/2048kHz/4096, sample rate = 16kHz
AT^SAIC=1,1,1,x,1,0,x,1	PCM, slave, short frame, BCLK=256kHz, sample rate = 16kHz
AT^SAIC=1,1,1,x,1,1,x,1	PCM, slave, long frame, BCLK=256kHz, sample rate = 16kHz
AT^SAIC=3,1,1,x,0,0,x,0	I²S, master, BCLK=256kHz, sample rate = 8 kHz
AT^SAIC=3,1,1,x,0,0,x,1	I²S, master, BCLK=512kHz, sample rate = 16 kHz

17.4 AT^SNFG Generate Tone

The AT^SNFG write command generates a 'local tone' via the selected audio output device.
Beside the duration up to 2 combinations of frequency can be used to compose a local tone.

Syntax

Test Command

AT^SNFG=?

Response(s)

^SNFG: (list of supported <duration>s), (list of supported <gain>s), (list of supported <frequency>s), (list of supported <frequency>s)
OK

Write Command

AT^SNFG=<duration>, <gain>, <frequency>[, <frequency>]

Response(s)

OK
ERROR
+CME ERROR: <err>

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<duration>(num)	
1...65535	Duration in milliseconds.
0	Mutes the currently played tone immediately.
65535	Activates a tone with infinite duration.

<gain>(num)	
1...43	Gain of the tone generator belonging to a frequency, ranging from -42 dB to 0 dB. 43 gain levels adjustable in steps of 1dB. (1 = -42 dB, 43 = 0dB)

<frequency>(num)	
200...3400	Frequency in 1 Hz steps. Audible bandwidth is limited due to the voice band filters.

Notes

- Response of the command is always "OK" as long as the input parameters are valid.
- Tone priorities
  There is no prioritization of any tone of sound types, such as the Local tones generated with AT^SNFG as well as Ring tones, Supervisory tones, Call Progress tones, tones invoked by SAT, RTC tones and DTMF tones. This means that if any kind of tone our sound is started then it will simply stop other tones or sounds.
- To suspend a local tone from playing use "AT^SNFG=0".
- Local tones started by this AT command trigger the audio related indicators provided by AT interface in the way as these indicators are defined by AT^SIND commands.

- Local tone generation works during and out of a call. If a tone is started after call establishing then speech and this tone will be mixed. If a tone is started before call establishing then the tone might be no longer audible although the internal processing of the tone is still running. The duration of the tone remains valid, i.e. a non-infinite tone will stop after the given duration and an infinite tone keeps playing. The URC "+CIEV: sounder" will indicate this behavior.
- Tones played by AT^SNFG cannot be muted by AT^SCFG="Audio/SvTone".

17.5 AT^SNFI Set microphone path parameters

AT^SNFI controls microphone settings. The AT^SNFI read and write command parameters are related to the active audio mode set with AT^SNFS.

The optional parameters <echoPathDelay>, <rxAvcSens> or <tuneMode> are available when the enhanced audio configuration is set using AT^SCFG="Audio/Ecfg",1.
Like all basic AT^SNFI parameters, the extended parameters are also volatile and vary depending on the selected AT^SNFS mode. Powerup defaults can be gathered from the AT^SNFI read command response, and are not listed below.

Syntax

Test Command

```
AT^SNFI=?
```

Response(s)

```
^SNFI: (list of supported <micAmp>s), (list of supported <adcVol>s), (list of supported <reserved>s)[, (list of supported <echoPathDelay>s), (list of supported <rxAvcSens>s), (list of supported <tuneMode>s)]
OK
```

Read Command

```
AT^SNFI?
```

Response(s)

```
^SNFI: <micAmp>, <adcVol>, <reserved>[, <echoPathDelay>, <rxAvcSens>, <tuneMode>]
OK
ERROR
+CME ERROR: <err>
```

Write Command

```
AT^SNFI=<micAmp>, <adcVol>, <reserved>[, <echoPathDelay>][, <rxAvcSens>][, <tuneMode>]
```

Response(s)

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

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<micAmp>(num)	
0...56(P)...63	Analogue amplifier, adjustable in 64 steps of 0.75 dB from -12 dB to +35.25 dB. (0 = -12 dB, 16 = 0 dB, 63 = +35.25 dB) Parameter is mandatory, but ignored for PCM and I²S.

<adcVol>(num)	
0...192(P)...255	ADC volume, adjustable in 256 steps of 0.375 dB from -71.625 dB to +23.625 dB. (0 = mute, 1= -71.625 dB, 192 = +0 dB, 255 = +23.625 dB) Parameter is mandatory, but ignored for PCM and I²S.

<reserved>(num)	
16384(P)	Reserved value

<echoPathDelay>(num)	
0...1024	In any system with echo, there is an inherent delay between the original sound and the echo sound. If this inherent echo delay is not somehow accounted for, then there is a waste of adaptive filter taps as the EC tries to cancel echo in the non-echo delay period. This parameter is applied to the adaptive filter reference signal in the adaptive filter path that is just smaller than the actual inherent echo delay, where the delay is expressed in samples at 8kHz (0.125us).

<rxAvcSens>(num)	
0...65535	Forward-link AVC variation from nominal sensitivity. This offset is applied to the background noise estimate before comparing against the thresholds. Increasing this parameter makes the AVC more sensitive to background noise. This parameter is defined as a dB Q8 number. The recommended range is -75 dB to +75 dB. Implementation also limits the range to -75 dB to +75 dB. <rxAvcSens>= 256 * (-75 dB .. +75 dB)

The allowed range in detail is 0 to 19200 and 46336 to 65535 (0x0000 to 0x4B00 and 0xB500 to 0xFFFF).

<tuneMode>(num)	
Bit field to enable or disable several voice processing functions.	
0	No setting.
1	Adaptive filter.
2	Dynamic echo suppression.
4	Noise suppression.
8	Comfort noise injection.
16	Nonlinear echo suppression.
32	Reserved.
64	Reserved.
128	Patch change detector.
256	Highpass filter.
4096	AF preprocessing.
8192	Reserved.
16384	Reserved.
32768	Reserved.
65536	Rx-AIG.
131072	Rx-AGC.
262144	Rx-AVC.
524288	Rx-RVE.
1048576	Tx-AGC.

Other values are reserved or for internal use.
Tx-AIG is disabled together with Tx-AGC and enabled only with Tx-AGC if AIG is enabled in the ACDB.
For example, for adaptive filter (1) and dynamic echo suppression (2) please enter the value 3.

17.6 AT^SNFO Set audio output parameter (loudspeaker path)

AT^SNFO controls the audio output path amplification. The AT^SNFO read and write command parameters are related to the active audio mode set with AT^SNFS.

Syntax

Test Command

AT^SNFO=?

Response(s)

^SNFO: (list of supported <cdcRxVol>s) , (list of supported <reserved1>s) , (list of supported <reserved2>s) , (list of supported <rxVolStep>s) , (list of supported <toneVolStep>s)
OK

Read Command

AT^SNFO?

Response(s)

^SNFO: <cdcRxVol>, <reserved1>, <reserved2>, <rxVolStep>, <toneVolStep>
OK
ERROR
+CME ERROR: <err>

Write Command

AT^SNFO=<cdcRxVol>, <reserved1>, <reserved2>[, <rxVolStep>][, <toneVolStep>]

Response(s)

OK
ERROR
+CME ERROR: <err>

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<cdcRxVol>(num)

0...54(P)...63	Analogue gain of the output signal after summation of sidetone. The analogue gain has a valid range from -57 dB to +6 dB, adjustable in 64 steps of 1 dB. (0 = -57 dB, 57 = 0 dB, 63 = +6 dB) Parameter is mandatory, but ignored for PCM and I²S.

<reserved1>(num)

33(P)	Reserved value

<reserved2>(num)

0(P)	Reserved value

<rxVolStep>(num)

<rxVolStep> configures the speaker volume step. Parameter is effective only for PCM and I²S.

0(P)...5	6 volume levels ranging from -15 dB to 0 dB, adjustable in steps of 3 dB. (0 = 0dB, 5 = -15 dB)

<toneVolStep>(num)

<toneVolStep> configures the tone generator volume step for locally generated supervisory tones and SAT tones.

1...43(P)	43 volume levels ranging from -42 dB to 0 dB, adjustable in steps of 1 dB. (1 = -42 dB, 43 = 0 dB)

Note

- Audio parameters configured by AT^SNFO have no effect on the local tones generated by means of the AT^SNFG write command.

17.7 AT^SNFS Select audio hardware set

AT^SNFS specifies the audio mode required for the connected equipment.
The AT^SNFS write command serves to set the audio mode required for the connected equipment.
The AT^SNFS read command indicates the currently selected audio mode.
Further information regarding audio functionality is available in the "PLS8-US-R4 Hardware Interface Description" [2].

Syntax

Test Command

```
AT^SNFS=?
```

Response(s)

```
^SNFS: (list of supported <audMode>s)
OK
```

Read Command

```
AT^SNFS?
```

Response(s)

```
^SNFS: <audMode>
OK
ERROR
+CME ERROR: <err>
```

Write Command

```
AT^SNFS=<audMode>
```

Response(s)

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

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<audMode>(num)	
1(P)	Audio mode 1: Standard mode. Optimized for the reference handset, that can be connected to the audio interface (see "PLS8-US-R4 Hardware Interface Description" for information on this handset). Note: The powerup default parameters are determined for type approval.
2	Audio mode 2: Echo canceller and noise suppressor are preset for router applications.
3	Audio mode 3: Echo canceller and noise suppressor are preset for user handset usage.
4	Audio mode 4: Echo canceller and noise suppressor are preset for mono-headset usage.
5	Audio mode 5: Echo canceller and noise suppressor are preset for speakerphone usage.
6	Audio mode 6: Echo canceller and noise suppressor are preset for transparent applications.

Note

- The write command can be used during a voice call to switch back and forth between different modes. This allows the user, for example, to switch handsfree operation (speakerphone) on and off.

17.8 AT^SNFTTY Signal TTY/CTM audio mode capability

PLS8-US-R4 offers an integrated implementation of CTM modem (Cellular Text Telephone Modems). The benefit of CTM is that text characters typed on a TTY device (Text Telephone Type-writer) can be transformed into special audio burst signals for reliable transmission via the existing speech channels of a cellular phone system. The internal CTM modem supports a baud rate of 45.45bps. An automatic recognition of TTY devices isn't supported.
If CTM mode is activated, the ME will set the necessary bearer capability bit on outgoing (mobile originated) calls, and incoming calls with this bearer capability bit set are accepted. The TE needs to decode the special audio burst signals.
If CTM mode is disabled, the ME will clear the bearer capability bit on mobile originated calls, and incoming calls with the bearer capability bit set are rejected because the PLS8-US-R4 expects that CTM coded speech data cannot be decoded by the TE.
Designed to set the module's speech system into CTM mode, the AT^SNFTTY command allows a TTY device to be connected to the audio interfaces of PLS8-US-R4.
Related documents: Refer to the relevant standards, such as 3GPP TS 26.226 (ETSI TS 126 226) and 3GPP TS 26.231 (ETSI TS 126 231). 3GPP documentation can be retrieved, for example, from http://www.3gpp.org/specs/specs.htm. Application Note 22 "Using TTY/CTM equipment" supplies information needed to connect TTY/CTM equipment to the PLS8-US-R4.

Requirements for using TTY/CTM features:

- TTY/CTM functionality requires an own audio mode with all audio parameters set to their factory default. This will be reached by a specific internal audio mode for TTY/CTM activated with AT^SNFTTY.
  When TTY/CTM mode is activated the audio mode indicated by the AT^SNFS read command is invalid.

Syntax

Test Command

```
AT^SNFTTY=?
```

Response(s)

```
^SNFTTY:  (list of supported <audioState>s)
OK
```

Read Command

```
AT^SNFTTY?
```

Response(s)

```
^SNFTTY: <audioState>
OK
ERROR
+CME ERROR: <err>
```

Write Command

```
AT^SNFTTY=<audioState>
```

Response(s)

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

PIN	MDM	APP	✈	Last
-	+	+	-	-

Reference(s)

Cinterion

Parameter Description

<audioState>(num)	
0(P)	Audio path is in normal speech mode.
1	Audio path is in TTY/CTM mode. The AT^SNFTTY=1 write command has to be set before dialing with ATD.

Notes

- Functionality of TTY mode will be not guaranteed if AT^SNFTTY=1 is set and audio mode will be changed by AT^SNFS write command.
- Functionality of voice call will be not guaranteed if TTY mode will be changed during activated voice call.

17.9 AT^SRTC Ring tone configuration

The AT^SRTC test command returns a list of ranges for parameter <event>, <number> and <volume>.

The AT^SRTC read command returns the currently set ring tone melody <number> and ring tone volume <volume> for the incoming <event> voice call.

The AT^SRTC write command allows to configure the parameters ring tone melody <number> and ring tone volume <volume> for the ring tone event <event> voice call.

The AT^SRTC execution command is intended for testing. It starts to test the settings currently selected for <event>=1 (incoming calls). To stop test playback use AT^SRTC again. To try different settings use the AT^SRTC write command, select another configuration and start the AT^SRTC execution command once again. An incoming or outgoing call stops the test started by using the AT^SRTC execution command.

Syntax

Test Command

```
AT^SRTC=?
```

Response(s)

```
^SRTC:(list of supported <event>s) , (list of supported <number>s) , (list of supported <volume>s)
OK
```

Read Command

```
AT^SRTC?
```

Response(s)

```
^SRTC: 0, <number>, <volume>
^SRTC: 1, <number>, <volume>
^SRTC: 2, <number>, <volume>
OK
ERROR
+CME ERROR: <err>
```

Exec Command

```
AT^SRTC
```

Response(s)

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

Write Command

```
AT^SRTC=<event>, <number>, <volume>
```

Response(s)

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

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<event>(num)

Ring tone melodies for the following events. Melody will be played from the audio output.

0	Ringing alert for incoming voice calls.

1	For testing only.
2	Reserved value.

<number>(num)

Type or number of ring tone melody. You have a choice of ring tone melody or mute. Ring tone melody will be played from the audio output. <number>=0 is only intended for muting.

0(P)	No ringing alert melody.
1	Melody #1 active.
2	Melody #2 active.
3	Melody #3 active.
4	Melody #4 active.
5	Melody #5 active.
6	Melody #6 active.
7	Melody #7 active.
8	Melody #8 active.
9	Melody #9 active.

<volume>(num)

The volume of ring tone melodies varies from 0 dB to mute.

0(P)	Mute.
1	Volume level 1, set to -12dB.
2	Volume level 2, set to -8dB.
3	Volume level 3, set to -4dB.
4	Volume level 4, set to 0dB.

18. Hardware related Commands

All AT commands described in this chapter are related to the hardware interface of the PLS8-US-R4. Further information regarding this interface is available in the "PLS8-US-R4 Hardware Interface Description" [2].

18.1 AT+CALA Alarm Configuration

AT+CALA allows to set an alarm time for the PLS8-US-R4. For further details on the UE's real time clock (RTC) refer to "PLS8-US-R4 Hardware Interface Description, Version 04.001". When the alarm time is reached and alarm is executed the UE presents an Unsolicited Result Code (URC), and the alarm time is reset to "00/01/01,00:00:00".
The alarm can adopt two functions, depending on whether or not you switch the UE off after setting the alarm:

- Reminder message: You can use the alarm function to generate reminder messages. For this purpose, set the alarm as described below and do not switch off or power down the UE. When executed the message comes as "+CALA" URC which optionally may include a user defined <text>.
- Alarm mode: You can use the alarm function to restart the UE when powered down. For this purpose, set the alarm as described below. Then power down the UE via AT^SMSO. When the alarm time is reached the UE will power on. Its functionality level (AT+CFUN=<fun>) depends on setting of AT^SCFG="MEopMode/CFUN", <volaCFUN>:
  - <volaCFUN>=0: Setting of AT+CFUN parameter <fun> is stored persistently. The UE re-establishes its functionality level formerly used before power down. Wake up is notified by "^SYSSTART" or "^SYSSTART AIRPLANE MODE" URC.
  - <volaCFUN>=1 (delivery value): Setting of AT+CFUN parameter <fun> is volatile. The UE always restarts using Normal Functionality level, which is indicated by "^SYSSTART" URC presentation.

  An additional "+CALA" URC with user defined <text> can be configured.

AT+CALA test command returns the supported array index values <n>, the supported alarm types <type> and the maximum length of the text <tlength>.
AT+CALA read command returns the current alarm settings.

Syntax

Test Command

```
AT+CALA=?
```

Response(s)

```
+CALA: (list of supported <n>s), (list of supported <type>s), (supported <tlength>)
OK
ERROR
+CME ERROR: <err>
```

Read Command

```
AT+CALA?
```

Response(s)

```
+CALA: <time>, <n>, <type>, <text>
+CALA: <time>, <n>, <type>, <text>
+CALA: ...
OK
ERROR
+CME ERROR: <err>
```

Write Command

AT+CALA=<time>[, <n>[, <type>[, <text>]]]

Response(s)

OK
ERROR
+CME ERROR: <err>

PIN	MDM	APP	✈	Last
-	+	+	+	-

Reference(s)

3GPP TS 27.007 [49]

Unsolicited Result Codes

URC 1

+CALA: [<text>]

Indicates reminder message.

URC 2

^SYSSTART
+CALA: [<text>]

Indicates UE wake-up at functionality level AT+CFUN=1 (Normal mode).

URC 3

^SYSSTART AIRPLANE MODE
+CALA: [<text>]

Indicates UE wake-up at functionality level AT+CFUN=0 or AT+CFUN=4 (Airplane mode).

Parameter Description

<time>(str)

Format is "yy/MM/dd,hh:mm:ss". For example, 6th of July 2015, 22:10:00 equals to "15/07/06,22:10:00". See also AT+CCLK.
To clear a given alarm before its scheduled time simply enter an empty string "" for parameter <time>. This will also clear a given <text>.

<n>(num)

Integer type value indicating the array index of the alarm.

[0]...4

<type>(num)

Integer type value indicating the type of the alarm.

0	Alarm indication: text message on AT command instance

<text>(str)

String type value indicating the text to be displayed when alarm time is reached; maximum length is <tlength>. By factory default, <text> is undefined.
Note: <text> will be stored to the non-volatile flash memory when the device enters the Power Down mode via AT^SMSO. Once saved, it will be available upon next power-up, until you overwrite it by typing another text. This eliminates the need to enter the full string when setting a fresh alarm.
<text> should not contain characters which are coded differently in ASCII and GSM (e.g. umlauts), see also "Supported character sets" and "GSM alphabet tables".

<tlength>(num)

Integer type value indicating the maximum length of <text>. The maximum length is 16.

Notes

- After the alarm was executed the parameter <time> of AT+CALA will be reset to "00/01/01,00:00:00", but <text> will be preserved as described above.
- If UE is totally disconnected from power supply the most recently saved configuration of +CALA: <time> [,<n> [,<type>[,<text>]]] will be presented when UE is powered up.

Examples

EXAMPLE 1

You may want to configure a reminder message for July 31, 2015, at 9.30h, including the message "Good Morning".

```
AT+CALA="15/07/31,09:30:00",0,0,"Good Morning"
OK
```

Do not switch off the UE.When the alarm occurs the UE returns the following URC:

```
+CALA: Good Morning
```

EXAMPLE 2

To set a fresh alarm using the same message as in Example 1, simply enter date and time. <n>, <type> and <text> can be omitted:

```
AT+CALA="15/07/31,08:50:00"
OK
```

When the alarm is executed the URC comes with the same message:

```
+CALA: Good Morning
```

EXAMPLE 3

To enable the UE to wake up into Alarm mode, e.g. on July 20, 2015, at 8.30h, enter

```
AT+CALA="15/07/20,08:30:00"
OK
```

Next, power down the UE:

```
AT^SMSO
OK
```

When the alarm is executed the UE wakes up to functionality level (AT+CFUN) which was valid before power down and displays a URC. If available, this line is followed by the individual <text> most recently saved.

```
^SYSSTART
+CALA: Good Morning
```

18.2 AT+CCLK Real Time Clock

AT+CCLK controls the real time clock (RTC) of PLS8-US-R4.
If enabled with AT+CTZU=1 and if supported by the network the RTC is constantly updated with the network time. In this case, any changes to the RTC using the command AT+CCLK will be wiped out by the network time. If AT+CTZU=0 or a network does not support time update the RTC can be set using AT+CCLK.
Each time the UE is restarted it may take up to two seconds to reinitialize the RTC and to update the current time. Therefore, it is recommended to delay the usage of AT+CCLK and AT+CALA after restart.
If the clock is set into the past, it is recommended to reset the UE using AT+CFUN to avoid blocked calls because of the autocall restriction.
Changing the RTC influences an active automatic shutdown timer (see AT^SCFG parameter <shutdownRemainingTime> for details).
The current setting of the clock is retained if the UE enters Power Down mode via AT^SMSO or restarts using AT+CFUN. However, it will be reset to its factory default value if the UE is totally disconnected from power.

Syntax

Test Command

```
AT+CCLK=?
```

Response(s)

```
OK
```

Read Command

```
AT+CCLK?
```

Response(s)

```
+CCLK: <time>
OK
```

Write Command

```
AT+CCLK=<time>
```

Response(s)

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

PIN	MDM	APP	✈	Last
-	+	+	+	-

Reference(s)

3GPP TS 27.007 [49]

Parameter Description

<time>(str)(NV)

Real time clock setting

Format is "yy/mm/dd,hh:mm:ss", where the characters yy indicate the two last digits of the year, followed by month (mm), day (dd), hour (hh, 24 hour format), minutes (mm) and seconds (ss).
For the write command the 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.

Note

- If automatic time zone update is enabled and a time zone update occurs additional time zone information will be appended to parameter <time>. Format is changing to "yy/mm/dd,hh:mm:ss+zz" or "yy/mm/dd,hh:mm:ss-zz" where zz is time zone.
  Time zone zz is given as a positive (east) or negative (west) offset from UTC in units of 15 minutes.
  Example for time and time zone UTC+2: "11/07/06,22:10:00+08".
  Please note that time zone is displayed only when enabled with AT+CTZU and provided by the network. See AT+CTZU for more information.

18.3 AT^SAD Antenna Configuration

AT^SAD controls usage of the module's UMTS/LTE (RX) diversity/MIMO antenna.

For RX antenna diversity, the AT^SAD command enables

- verification of receive paths,
- support of CTIA 3.0 diversity tests (relevant for application approval).

RX antenna diversity means usage of two antennas and two receiver paths to provide significant gains in performance. The gains depend on how 'decoupled' the antennas are from each other. Transmitter (TX) signal is always transferred via primary antenna.

Syntax

Test Command

```
AT^SAD=?
```

Response(s)

```
^SAD: (list of supported <sadMode>s)
OK
```

Write Command

```
AT^SAD=<sadMode>
```

Response(s)

```
^SAD: <sadValue>
OK
ERROR
+CME ERROR: <err>
```

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<sadMode>(num)

This parameter controls usage of the RX diversity antenna.

<sadMode> RX antenna diversity related settings 10, 11, 13 are stored in non-volatile memory and will be processed after next UE power-up. An error is returned if write access to non-volatile storage fails.

10	Disable RX diversity functionality. Activate only the first antenna for RX operation, i.e. use the primary antenna for reception. The secondary (diversity) receiver path is switched off. Configuration is stored in non-volatile memory and becomes effective after next restart of UE.
11(D)	Enable RX diversity functionality by activating both antennas for RX operation. This setting is active as factory delivery configuration. It is stored in non-volatile memory and becomes effective after next restart of the UE.
12	Query RX diversity functionality setting. <sadValue> returns the currently stored configuration.
13	Configure UMTS antenna test mode for approval tests. The primary (main) antenna port is used as TX chain. However, the related receiver path is switched off. Only the secondary (diversity) antenna is activated for RX operation. Configuration is stored in non-volatile memory and becomes effective after next restart of the UE.

<sadValue>(num)

The meaning of this parameter depends on given <sadMode>.

For <sadMode>=[10, 11, 13] <sadValue> returns the currently stored configuration of the RX diversity functionality, which will be used after next restart of the UE.
For <sadMode>=12 <sadValue> returns the current non-volatile memory setting (range 10, 11, 13).

18.4 AT^SBV Battery/Supply Voltage

AT^SBV allows to monitor the supply (or battery) voltage of the module. The voltage is periodically measured. The displayed value is averaged.

The measurement is related to the reference points of BATT+ and GND. For details on the reference points please refer to the Hardware Interface Description [2]. If the measured average voltage drops below or rises above the given voltage thresholds the UE will report alert messages by sending the "^SBC" URCs listed in Section 1.8.1, Common URCs.

Syntax

Test Command

```
AT^SBV=?
```

Response(s)

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

Exec Command

```
AT^SBV
```

Response(s)

```
^SBV: <Voltage>
OK
ERROR
+CME ERROR: <err>
```

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

`<Voltage>`(num)

Supply (or battery) voltage in mV

18.5 AT^SCTM Critical Operating Temperature Monitoring

AT^SCTM allows to monitor the operating temperature range of the PLS8-US-R4 device. Refer to "PLS8-US-R4 Hardware Interface Description" [2] for specifications on critical temperature ranges.
The AT^SCTM write command controls the presentation of URCs to report critical operating temperature limits. Use parameter <UrcMode> to enable (1) and disable (0) URC presentation.

Important: Even if setting is <UrcMode>= 1 URC presentation is disabled during a 2 minutes guard period after the module was switched on. After expiry of the 2 minutes guard period, the presentation will be enabled, i.e. URCs with alert levels "1" or "-1" will be generated. During this period PLS8-US-R4 will not switch off, even if the critical temperature limit is exceeded. This allows the user to set up emergency calls before PLS8-US-R4 switches off. For details refer to Section 18.5.1, Deferred shutdown.

URCs indicating levels "2" are always enabled (except during the guard period or if an emergency call is active, but when the guard period is expired or emergency call is finished and temperature is still above/below critical limit, then the URC will be issued), i.e. they will be issued even though the factory setting AT^SCTM=0 was never changed. If level "2" URCs occur PLS8-US-R4 will trigger shutdown within 5 seconds, unless the temperature returns to a valid operating level ("1", "0", "-1"), the guard period has not yet expired, or there is a new emergency call.

URCs indicating alert levels "1" or "-1" are intended to enable the user to take appropriate precautions, such as protect PLS8-US-R4 from exposure to extreme conditions, or save or back up data etc. .

At the lowest temperature threshold PLS8-US-R4 will neither send an URC, nor switch off automatically.
AT^SCTM read command returns:

- The URC presentation mode.
- Information about the current temperature range of the PLS8-US-R4 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	MDM	APP	✈	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-US-R4 device temperature warning.

Parameter Description

`<UrcMode>`(num)	
URC presentation mode. Setting will not be stored during power-down, i.e. after next restart default setting will be restored.	
0(&F)(P)	Disable URC presentation (except for `<UrcCause>` equal to +2).
1	Enable URC presentation.

`<UrcCause>`(num)	
-1	Below low temperature alert limit.
0	Normal operating temperature.
1	Above upper temperature alert limit.
2	Above uppermost temperature limit (causes switch-off after 5 s time).

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

`<temp>`(num)
Board temperature in Celsius. Is comprised between the lowest temperature warning level and the uppermost temperature warning level.

Examples

EXAMPLE 1

URCs issued when the operating temperature is out of range:

`^SCTM_B: 1`	Caution: Module close to overtemperature limit.
`^SCTM_B: 2`	Alert: Module is above overtemperature limit and switches off.
`^SCTM_B: -1`	Caution: Module close to undertemperature limit.

EXAMPLE 2

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

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

18.5.1 Deferred shutdown

In the following cases, automatic shutdown will be deferred if a critical temperature limit is exceeded:

- While an emergency call is in progress.
- During a 2 minutes guard period after powerup. This guard period has been introduced in order to allow for the user to make an emergency call. The start of any one of these calls extends the guard period until the end of the call. Any other network activity may be terminated by shutdown upon expiry of the guard time.

While in a "deferred shutdown" situation, the engine continues to measure the temperature and to deliver alert messages, but deactivates the shutdown functionality. Once the guard period is expired or the call is terminated, full temperature control will be resumed. If the temperature is still out of range, the UE switches off immediately (without another alert message).

CAUTION!
Automatic shutdown is a safety feature intended to prevent damage to the module. Extended usage of the deferred shutdown facilities provided may result in damage to the module, and possibly other severe consequences.

18.6 AT^SLED LED Feature

AT^SLED controls the LED function provided by the PLS8-US-R4's STATUS line, which acts as an output and can be used to control a connected LED. The electrical specifications of the status line and advice on how to connect the LED circuit can be found in [2].
The LED indicates the operating states listed below:

Table 18.1: PLS8-US-R4 Status and Mode Indication via LED

PLS8-US-R4 Status	<mode>=1	<mode>=2 <flash>= default	<mode>=2 <flash>= user defined	<mode>=3
- GSM voice call in progress or established - UMTS voice call in progress or established	Permanently on	10 ms on / 990 ms off	on + off (interval) = 1000 ms (fixed) on = ((<flash> * 1000) / 1000) ms (variable)	
- GSM PS data transfer - UMTS/LTE data transfer	Permanently on	10 ms on / 1990 ms off	on + off (interval) = 2000 ms (fixed) on = ((<flash> * 2000) / 1000) ms (variable)	
UE registered to a network. No call, no data transfer	Permanently on	12 ms on / 3990 ms off	on + off (interval) = 4000 ms (fixed) on = ((<flash> * 4000) / 1000) ms (variable)	
Limited Network Service (e.g. because no SIM/ USIM, no PIN or during network search)	500 ms on / 500 ms off	500 ms on / 500 ms off	on + off (interval) = 1000 ms (fixed) on = 500 ms (fixed)	
- UMTS/LTE operation mode				Permanently on
- GSM operation mode				Permanently off

Syntax

Test Command

AT^SLED=?

Response(s)

^SLED: (list of supported <mode>s), (range of supported <flash>s)
OK

Read Command

AT^SLED?

Response(s)

^SLED: <mode>[, <flash>]
OK

Write Command

AT^SLED=<mode>[, <flash>]

Response(s)

OK
ERROR
+CME ERROR: <err>

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<mode>(num)(&W)

LED operating mode

0(&F)(D)	LED feature is disabled.
1	LED lights steadily when the UE is registered to the network and either awake or in power saving state.
2	LED is flashing when the UE is in Limited Service or registered with a network and either awake or in power saving state. The duration of flashing can be configured using the parameter <flash>.
3	LED line will indicate with status HIGH that the UE is switched to 3G/UMTS or 4G/LTE operation mode. LED line will indicate with status HIGH that the UE is switched to 3G/UMTS operation mode. In all other states of the UE the line will be set to LOW. When changing the state of the LED line it will be ensured that the LED line will always be at LOW state before there is any slotted TX ouput power in 2G/GSM technology.

<flash>(num)(&W)

LED flash period

1...10(D)...50	LED flash period (in milliseconds) if <mode>=2.

Notes

- When using <mode>=3 configure it before entering the PIN with AT command AT+CPIN to recognise all changes on LED line.
  Remember that only the status change (LTE->UMTS->GSM or GSM->UMTS->LTE) will trigger the LED line.
- The lowest value for the user defined flash time using AT^SLED=2,<flash> is 1/1000 from interval length. For example, with 4000 ms interval length the lowest adjustable value is 4 ms.

18.7 AT^SRADC Configure and Read A/D Converter

AT^SRADC controls the Analog-to-Digital Converters (ADC) of the UE. These ADCs can be used to measure the voltage of external devices connected to the ADC inputs.
AT^SRADC write command configures the parameters required for ADC measurement and returns the measurement result(s). The value(s) can be delivered once on request by using the single measurement mode, or periodically by specifying a measurement interval.

Note that the UE uses an unbalanced input with three pins. The pin names are denoted as follows:

- First ADC channel: ADC1_IN.
- Second ADC channel: ADC2_IN.
- Third ADC channel: ADC3_IN.

For details refer to "PLS8-US-R4 Hardware Interface Description, Version 04.001".

Syntax

Test Command

```
AT^SRADC=?
```

Response(s)

```
^SRADC:(list of supported <ch>s), (list of supported <op>s), (list of supported <it>s)
OK
```

Read Command

```
AT^SRADC?
```

Response(s)

```
^SRADC: <ch>, <op>, <it>
[^SRADC: <ch>, <op>, <it>]
[^SRADC: ...]
OK
```

Write Command

Single measurement (with automatic channel open and close):

```
AT^SRADC=<ch>
```

Response(s)

```
^SRADC: <ch>, <count>, <value>
OK
ERROR
+CME ERROR: <err>
```

Write Command

Periodic measurement:

```
AT^SRADC=<ch>, <op>[, <it>]
```

Response(s)

```
[^SRADC: <ch>, <count>, <value>]
OK
ERROR
+CME ERROR: <err>
```

PIN	MDM	APP	✈	Last
-	+	+	+	-

Unsolicited Result Code

ADC measurement URC (only used in periodic measurement mode).

^SRADC: <ch>, <count>, <value>[, <value>[, <value>[, <value>[, <value>[, <value>[, <value>[, <value>[, <value>[, <value>]]]]]]]]]

Parameter Description

<ch>(num)

ADC channel

0	First ADC channel (ADC1_IN)
1	Second ADC channel (ADC2_IN)
2	Third ADC channel (ADC3_IN)

<op>(num)

Operation

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

[0]	Close ADC channel (value of parameter <it> is ignored).
1	Open ADC channel

<it>(num)

Measurement interval

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

Single Measurement Mode:

[0]	Performs a single measurement (incl. close of channel).

Measurement interval in ms for Periodic Measurement Mode:

Measurement interval and URC output:
The URC output interval is miminum 1000 ms. This means if the measurement interval <it> is smaller than 1000 ms, then every second one URC will be output containing several measurement values. If <it> is equal 1000 ms or greater, each URC contains exactly one single measurement value. See examples below.

URC buffer mechanism:
If the interface is not free (e.g., during execution of an AT command) measurement values are buffered. Up to 5 URCs can be buffered, each containing up to 11 measurement values. After freeing the interface, all buffered URCs will be printed out. Loss of measured values, if any, is indicated by an additional 6th URC containing the value "32767". See example below.

Possible values in milliseconds (ms):

100

200

250

500

1000...30000

<value>(num)

Measurement value

Measurement value in mV

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

Examples

EXAMPLE 1

Single measurement

```
AT^SRADC=0                          Open the first ADC channel for single measurement.
^SRADC: 0,1,78
OK
```

EXAMPLE 2

Periodic measurement at low sample rate (5s):

```
AT^SRADC=0,1,5000                   Start periodic measurement mode on the first ADC
^SRADC: 0,1,76                      channel. Samples are taken every 5s. Every 5s the
^SRADC: 0,1,78                      URC "^SRADC" appears to report the measured volt-
^SRADC: 0,1,76                      ages. The second parameter represents the number
                                    of measured samples, in this case only one.
^SRADC: 0,1,76
AT^SRADC=0,0                        Stop the periodic measurement
OK
```

EXAMPLE 3

Periodic measurement at high sample rate (250ms):

```
AT^SRADC=0,1,250                    Start periodic measurement on the first ADC chan-
^SRADC: 0,4,76,76,77,76             nel. Samples are taken every 250ms. Every second
^SRADC: 0,4,76,76,75,76             a URC "^SRADC" appears to report the measured
^SRADC: 0,5,77,77,76,76,76          voltage. The number of samples is 4 or 5.
^SRADC: 0,4,76,76,75,76
AT^SRADC=0,0
OK                                  Stop the periodic measurement
```

EXAMPLE 4

Handling of "^SRADC" URCs and AT command execution on the same interface:

```
AT^SRADC=0,1,250                    Start periodic measurement mode on the first ADC
^SRADC: 0,4,76,76,77,76             channel. Samples are taken every 250ms.
^SRADC: 0,5,77,77,76,76,76
^SRADC: 0,4,76,76,75,76
^SRADC: 0,4,76,76,75,76
AT^SRADC?                           Input of AT command and <CR> takes some sec-
                                    onds.
^SRADC: 0,1,250
^SRADC: 1,0,0
OK
^SRADC:                             Some URCs were buffered during command input
0,11,75,75,75,75,75,75,75,75,75,75  and sent after completion.
^SRADC: 0,8,75,75,75,75,75,75,77
```

```
^SRADC: 0,1,75
^SRADC: 0,4,76,76,75,76                    More URCs are delivered.
^SRADC: 0,4,76,76,75,76
^SRADC: 0,5,77,77,76,76,76
^SRADC: 0,4,76,76,77,76
^SRADC: 0,4,76,76,75,76
AT^SRADC?                                  Input of AT command and <CR> takes 90s.
^SRADC: 0,1,250
^SRADC: 1,0,0
OK
^SRADC:                                    some URCs were buffered during command input
0,11,75,75,75,75,75,75,75,75,75,75         and sent after completion
^SRADC:
0,11,73,74,73,74,73,73,73,74,74,73,73
^SRADC: 0,11,74,73,74,73,73,73,73,73,73,73
^SRADC: 0,11,73,73,74,74,73,73,74,73,73,74,74
^SRADC: 0,11,73,73,73,73,73,73,73,74,74,73,73
^SRADC: 0,8,73,73,74,73,73,73,73,32767     The URC indicates lost measurement results.
^SRADC: 0,4,74,74,73,73                    More URCs are delivered.
^SRADC: 0,4,75,75,75,75
......
```

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

This chapter describes the AT commands used to access and configure the GPIO pins of PLS8-US-R4.

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

19.1 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	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<mode>(num)	
0	Close General purpose I/O driver
1	Open General purpose I/O driver

19.2 AT^SCPIN Pin Configuration

The AT^SCPIN write command serves to configure GPIOs.
Keep in mind that each GPIO can be assigned only one function. This means that if configured for GPIO handling with AT^SCPIN this GPIO is locked for any alternative function, and vice versa. Mutually exclusive functions are:

- Configuring a GPIO with AT^SCPIN.
  - Using a GPIO configured as input with AT^SCPIN to wake up the UE from power saving. Suitable GPIOs (unless otherwise assigned): GPIO1, GPIO3, GPIO4, GPIO5, GPIO9. Reporting of level state changes at the specified GPIO shall be enabled with AT^SCPOL.
- Configuring a GPIO as Remote Wakeup line to wake up the TE (see AT^SCFG, <RemWakeLine>).
- Configuring GPIO1 as DR_SYNC line (see AT^SGPSC, <DRSyncVal>).
- Configuring GPIO2 as antenna switch for a 700 MHz antenna (see AT^SCFG "GPIO/Mode/Antenna", <ant>).
- Configuring a GPIO as Low Current Indicator (see AT^SCFG "MEopMode/PowerMgmt/LCI", <lci> and <gpio>).

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	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<mode>(num)	
0	Close pin
1	Open pin

<pin_id>(num)	
Pin identifier	
0	GPIO1
1	GPIO2
2	GPIO3
3	GPIO4
4	GPIO5
5	GPIO6
6	GPIO7
7	GPIO8

8	GPIO9
9	GPIO10

`<direction>`(num)

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.

19.3 AT^SCPOL GPIO Level Polling Configuration

AT^SCPOL serves to control automatic level polling and reporting for PLS8-US-R4's GPIOs. The GPIO shall already be configured with AT^SCPIN. Level polling is only applicable to input pins.
After polling has been activated for a specified GPIO, its latest level state transition will be reported via "^SCPOL" URC.

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

If PLS8-US-R4 stays in power save (SLEEP) state, a transition at GPIO1, GPIO3, GPIO4, GPIO5 and GPIO9 (<pin_id>=[0,2,3,4,8]) will wake up the UE.
For all other GPIOs the state detection will only be triggered when the UE suspends power saving state for another reason.
Refer to AT^SCFG, "MeOpMode/PwrSave" parameter <PwrSaveMode> and <PwrSaveWakeup> which allow to fine-tune power saving behaviour of the UE.

Syntax

Test Command

```
AT^SCPOL=?
```

Response(s)

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

Write Command

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

Response(s)

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

PIN	MDM	APP	✈	Last
-	+	+	+	-

Unsolicited Result Code

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

Parameter Description

<mode>(num)

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

<ioId>(num)

This can be either an already configured or an already opened <pin_id>.

<value>(num)

Level state transition detected on <ioId>.

0	<pin_id> is in low state.
1	<pin_id> is in high state.

19.4 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	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<io_id>(num)

This is an already configured <pin_id>.

<value>(num)

State read on this <io_id>.

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

19.5 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	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

`<io_id>`(num)

This is an already configured `<pin_id>`.

`<value>`(num)

State to be set for this `<io_id>`.

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

20. Miscellaneous Commands

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

20.1 A/ Repeat Previous Command Line

Repeat previous AT command line.
In general, after beginning a command line with character "a" or "A" a second character "t", "T" or "/" has to follow. "/" acts as line terminating character. In case of using a wrong second character, it is necessary to start again with character "a" or "A".

Syntax

Exec Command
A/
Response(s)

PIN	MDM	APP	✈	Last
-	+	+	+	-

Reference(s)
V.250

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

The +++ character sequence causes the PLS8-US-R4 to pause data mode and return to AT command mode. To prevent the +++ character sequence from being misinterpreted as data, it must be preceded and followed by a pause of 1000 ms. The +++ characters must be entered in quick succession, all within 1000 ms.

+++ is not supported in Packet Switched and PPP connections.

Syntax

Exec Command
+++
Response(s)
OK

PIN	MDM	APP	✈	Last
-	+	+	-	-

Reference(s)
ITU-T V.250 [17]

20.3 AT^SBNR Binary Read

Syntax

Test Command

AT^SBNR=?

Response(s)

OK

Read Command

AT^SBNR?

Response(s)

OK

Write Command

If <type>= "ciphersuites": Gets the accepted values by default for IPoverAT TLS Cipher suites:

AT^SBNR="ciphersuites", "default"

Response(s)

(default CYASSL ciphers string)
OK

Write Command

If <type>= "ciphersuites": Gets the user-accepted values for IPoverAT TLS Cipher suites, or default values if not defined:

AT^SBNR="ciphersuites", "current"

Response(s)

(ciphersuite user file contents)
OK
If no user values defined:
No Cipher Suites file found or loaded
Default Cipher Suites:
(default CYASSL ciphers string)
OK

Write Command

If <type>= "is_cert": Read certificates for secure connection of client IP services

AT^SBNR="is_cert"

Response(s)

^SBNR:<cert_index>, <cert_size>, <issuer>, <serial-number>, <subject>, <signature-algorithm>, <thumbprint-algorithm>, <thumbprint>
[...]
OK
If error is related to ME functionality:
ERROR
+CME ERROR: <err>
If certificate file is corrupted:
<cert_index>, certificate is corrupted

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<type>(str)	
“ciphersuites“	IPoverAT TLS Cipher suites
“is_cert“	Read certificate details

<cert_index>(num)	
Certificate index	
0...10	Index 0 is handled as client certificate (only 1 allowed). Indexes from 1 to 10 are handled as server certificates.

<cert_size>(str)

Size of certificate file in bytes

<issuer>(str)

Certificate issuer

<serial-number>(str)

Serial number of certificate

<subject>(str)

Subject of certificate

<signature-algorithm>(str)

Signature algorithm of certificate

<thumbprint-algorithm>(str)

Thumbprint algorithm of certificate

<thumbprint>(str)

Thumbprint of certificate

20.4 AT^SBNW Binary Write

AT^SBNW allows for writing binary or hexadecimal data to the non-volatile memory or to the Flash File System (FFS). The handling of the AT^SBNW write command varies depending on the type of data.

Syntax

Test Command

AT^SBNW=?

Response(s)

^SBNW: (list of supported <type>s), (list of supported <subtype>s)
OK

Write Command

Cipher suites user file modification:

AT^SBNW="ciphersuites", <ciphersuites_length>

Response(s)

CONNECT

CIPHERSUITES: SEND FILE ...
Indicates that UE has entered binary data mode. Data can be transferred.
When Ciphersuites file data are transferred and updated, or error occurs the UE returns one of following answers:
CIPHERSUITES: LENGTH ERROR
CIPHERSUITES: FILE WRITE ERROR
CIPHERSUITES: SUITE NOT FOUND
CIPHERSUITES: UNDEFINED ERROR
CIPHERSUITES: INTERNAL ERROR
CIPHERSUITES: I/O ERROR
OK

Write Command

Cipher suites user file removal:

AT^SBNW="ciphersuites", 0

Response(s)

CIPHERSUITES: DELETE CIPHERSUITES FILE...
CIPHERSUITES: DONE
OK
+CME ERROR: <err>

Write Command

Save the xtra.bin file to local memory (if <agps_size> is used to specify file size):

AT^SBNW="agps", <agps_size>

Response(s)

CONNECT

AGPS READY: SEND FILE ...
(Indicates that UE has entered binary data mode. Data can be transferred.)

After data transfer the UE returns one of the following result codes:
AGPS: END OK
AGPS: TIME INFO ERROR
AGPS: BAD CRC
AGPS: SERVICE TIMEOUT ERROR
AGPS: I/O ERROR

Write Command (Continued)

Save the xtra.bin file to local memory (if <agps_size> is used to specify file size):

AT^SBNW="agps", <agps_size>

Response(s)

```
AGPS: FILE WRITE ERROR
AGPS: INTERNAL ERROR
AGPS: UNDEFINED ERROR
OK
ERROR
```

Write Command

Delete existing xtra.bin file (if <agps_size>= -1):

AT^SBNW="agps", <agps_size>

Response(s)

```
CONNECT

AGPS READY: RESET GPS ENGINE AND DELETE XTRA FILE...
```
(Indicates that UE tries to reset all current GPS data and to delete a saved xtra.bin file)
After that the UE returns one of the following result codes:
```
AGPS: END OK
AGPS: TEMPORARY NOT ALLOWED ERROR
AGPS: GENERAL FAILURE
AGPS: UNSUPPORTED
AGPS: INVALID PARAMETER
AGPS: ENGINE BUSY
AGPS: PHONE OFFLINE
AGPS: TIMEOUT
AGPS: CONFIG NOT SUPPORTED
AGPS: INSUFFICIENT MEMORY
OK
```

Write Command

Certificate management for secure connection of client IP services

AT^SBNW="is_cert", <subtype>

Response(s)

```
CONNECT

SECURE CMD READY: SEND COMMAND ...
```
(Indicates that UE has entered binary data mode. Secure command data can be transferred.)
When secure command data is processed the UE will send one of following answers:
```
SECURE CMD LENGTH ERROR
SECURE CMD PUBLIC CERTIFICATE IS CORRUPTED
SECURE CMD PRIVATE KEY WAS REMOVED
SECURE CMD SERVICE TIMEOUT ERROR
SECURE CMD TO MANY DATA ERROR
SECURE CMD ERROR
SECURE CMD END OK
```

Write Command

Command to write and read root certificates for OMA DM services:

AT^SBNW="omadm", <subtype>

Response(s)

```
CONNECT
OMADM SECURE CMD READY: SEND COMMAND ...
```
(Indicates that UE has entered binary data mode. Command can be sent.)

Write Command (Continued)

Command to write and read root certificates for OMA DM services:

AT^SBNW="omadm", <subtype>

Response(s)

After command sending the UE returns one of the following result codes:

```
OMADM SECURE CMD SERVICE TIMEOUT ERROR
OMADM SECURE CMD LENGTH ERROR
OMADM SECURE CMD TO MANY DATA ERROR
OMADM SECURE CMD CERTIFIACATE WRITE ERROR
OMADM SECURE CMD CERTIFIACATE NOT FOUND
OMADM SECURE CMD ERROR
OMADM SECURE CMD END OK
```

PIN	MDM	APP	✈	Last
-	+	+	+	-

Parameter Description

<type>(str)	
“agps“	Activates A-GPS binary data mode.
“ciphersuites“	Command for IPoverAT TLS Cipher Suite file management.
“is_cert“	Secure Command Mode (Manage Certificates). For embedded TCP IP services the certicates shall be created in DER format. The certificate required to create the hash value for the protected mode of AT^SNOMADM shall be created in DER format.
“omadm“	Command for handling root certificates for OMA DM services. These certificates must be created in PEM format.

<subtype>(num)	
1	Start Secure Command Block Transfer mode

<agps_size>(num)	
4097...61440	Size of xtra.bin file (number of bytes).
-1	Delete stored xtra.bin file. Also all currently used GPS data are deleted.

<ciphersuites_length>(num)

Number of characters of ciphersuite names.

Notes

- The AT^SBNW="AGPS" write command can be used to load binary data for A-GNSS (Assisted GNSS) from a local memory to the PLS8-US-R4 Flash File System (FFS). The GNSS receiver integrated in PLS8-US-R4 supports gpsOneXTRA™ assistance data.

  Before transferring A-GNSS data ensure that the following conditions are met:
  - Take care that the RTC of PLS8-US-R4 is correctly set to Greenwich Mean Time (GMT):0 with AT+CCLK and is up to date.
  - Deactivate the GNSS receiver with AT^SGPSC="<EngineVal>",0.
  - Download a new GpsOneXTRA binary file via HTTP from one of the following gpsOneXtra assistance webservers, for example:
    - http://xtra1.gpsonextra.net/xtra2.bin

- http://xtra2.gpsonextra.net/xtra2.bin
- http://xtra3.gpsonextra.net/xtra2.bin

- Save the received XTRA file to your local memory and check the exact file size. This is because the precise data length shall be given when storing the XTRA file to the PLS8-US-R4 FFS. The data length shall be the second parameter <agps_size>.

The UE verifies the XTRA file. If the validation check is successful the UE will send the responses "AGPS END OK" and "OK" and return to command mode. The file will be saved in the FFS and injected into the GNSS engine. If the validation check is not successful the file will also be saved in the FFS, but not injected. The data can be used to achieve faster TTFF (Time to First Fix). For this purpose, set AT^SGPSC="<EngineVal>",2 and activate the GNSS receiver. Assistance data is valid for up to 7 days.

20.5 AT^SFDL Enter Firmware Download Mode

AT^SFDL allows the application manufacturer to download PLS8-US-R4 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
ERROR
+CME ERROR: <err>
```

PIN	MDM	APP	✈	Last
-	+	-	+	+

21. Appendix

21.1 Star-Hash (*#) Network Commands

The following command strings can be sent to the network via ATD and have to be terminated with a semicolon. The command strings are defined with 3GPP TS 22.030 [28].

Table 21.1: Star-Hash (*#) Command Overview

Star-Hash Code	Functionality	Response, also refer to Table 21.3
Phone Security		
*#06#	Query IMEI	<IMEI> OK
**04[2]*oldPin[2]*newPin[2]*new-Pin[2]#	Change SIM pwd	+CME ERROR: <err> / OK
**05[2]*unblKey[2]*newPin[2]*new-Pin[2]#	Change/Unblocking SIM pwd	+CME ERROR: <err> / OK
[*]03[ZZ]*oldPw*newPw*newPw#	Registration of net password	+CME ERROR: <err> / OK
Phone number presentation		
*#30#	Check status of CLIP (Calling Line Identification Presentation)	+CLIP : <n>,<m> OK (see AT+CLIP)
*#31#	Check status of CLIR (Calling Line Identification Restriction)	+CLIR : <n>,<m> OK (see AT+CLIR)
*31#<Phonenumber>[;]	Suppress CLIR	(see AT+CLIR)
#31#<Phonenumber>[;]	Activate CLIR	(see AT+CLIR)
*#76#	Check status of COLP (Connected Line Identification Presentation)	+COLP : 0,<m> OK (where <m> = active or not active)
*#77#	Check status of COLR (Connected Line Identification Restriction)	+COLR : 0,<m> OK (where <m> = active or not active)
Call forwarding		
(choice of *,#,*#,**,##)21*DN*BS#	Act/deact/int/reg/eras CFU	+CCFC : <status>, <class> [,...] (see: AT+CCFC)
(choice of *,#,*#,**,##)67*DN*BS#	Act/deact/int/reg/eras CF busy	see above
(choice of *,#,*#,**,##)61*DN*BS*T#	Act/deact/int/reg/eras CF no reply	see above
(choice of *,#,*#,**,##)62*DN*BS#	Act/deact/int/reg/eras CF no reach	see above
(choice of *,#,*#,**,##)002*DN*BS*T#	Act/deact/int/reg/eras CF all	see above
(choice of *,#,*#,**,##)004*DN*BS*T#	Act/deact/int/reg/eras CF all cond.	see above
Call waiting		
(choice of *,#,*#)43*BS#	Activation/deactivation/int WAIT	+CCWA : <status>, <class> [,...]. (Refer to AT+CCWA)

Star-Hash Code	Functionality	Response, also refer to Table 21.3
Call barring		
(choice of *,#,*#)33*Pw*BS#	Act/deact/int BAOC	+CLCK : <status>, <class> [, ...].(Refer to AT+CLCK)
(choice of *,#,*#)331*Pw*BS#	Act/deact/int BAOIC	see above
(choice of *,#,*#)332*Pw*BS#	Act/deact/int BAOIC exc.home	see above
(choice of *,#,*#)35*Pw*BS#	Act/deact/int. BAIC	see above
(choice of *,#,*#)351*Pw*BS#	Act/deact/int BAIC roaming	see above
#330*Pw*BS#	Deact. All Barring Services	see above
#333*Pw*BS#	Deact. All Outg.Barring Services	see above
#353*Pw*BS#	Deact. All Inc.Barring Services	see above
Call Hold / Multiparty		
C[C] in call	Call hold and multiparty	+CME ERROR: <err> / OK
USSD messages		
[C]...[C]#	Send USSD message	+CME ERROR: <err> / OK
C[C] (excluded 1[C])	Send USSD message	+CME ERROR: <err> / OK

Table 21.2: Abbreviations of Codes and Parameters used in Table 21.1

Abbreviation	Meaning	Value
ZZ	Type of supplementary services: Barring services All services	 330 Not specified
DN	Dialing number	String of digits 0-9
BS	Basic service equivalent to parameter class: Voice Fax (only for compatibility reasons) SMS SMS+Fax (only for compatibility reasons) Data circuit asynchron Data circuit synchron Dedicated PAD access Dedicated Packet access Data circuit asynchron+PAD Data circuit synchron+Packet Data circuit asynchron+synchron+Packet+PAD All Services	 11 13 16 12 25 24 27 26 21 22 20 --
T	Time in seconds	In contrast to AT+CCFC, parameter T has no default value. If T is not specified, an operator defined default or the last known value may be used, depending on the network operator.
PW	Password	--
C	Character of TE character set (e.g. asterisk, hash or digit in case of USSD, or digits in case of held calls or multiparty calls)	--

Table 21.3: Star-Hash Command Response Parameters

Parameter	Meaning
<m>	Mode: 0 = not active, 1 = active
<n>	Unsolicited result code: 0 = presentation disabled, 1 = presentation enabled
<status>	Status: 0 = not active, 1 = active
<class>	Represents BS = basic service, refer to AT+CCFC, AT+CLCK
<fac>	Facility lock, refer to AT+CLCK
<reason>	Call forwarding reason

For exact specification of format and parameters for Star-Hash commands refer to Table 3.2 of 3GPP TS 22.004 [27], and Annex C of of 3GPP TS 22.030 [28].

Table 21.4: Star-Hash Commands for Supplementary Services

Star-Hash Code	Abbreviations in Table 21.1	Functionality
*	act	Activate (except for CLIR, see list above)
**	reg	Register and activate
*#	int	Check status (interrogate)
#	deact	Deactivate (except for CLIR, see list above)
##	eras	Unregister and deactivate

21.2 Available AT Commands and Dependency on SIM PIN

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

Table 21.5: Available AT Commands and Dependency on SIM PIN

AT Command	Exec	Test	Read	Write
Configuration Commands				
AT&F	-	ø	ø	ø
AT&V	-	ø	ø	ø
AT&W	-	ø	ø	ø
ATQ	-	ø	ø	ø
ATV	-	ø	ø	ø
ATX	+	ø	ø	ø
ATZ	+	ø	ø	ø
AT+CMEE	-	-	-	-
AT+CSCS	ø	-	-	-
AT+CFUN	ø	-	-	-
AT+GCAP	+	+	ø	ø
AT^SMSO	-	-	ø	ø
AT^SCFG	ø	-	-	-
AT^SSRVSET	ø	-	-	-
Status Control Commands				
AT+CEER	+	+	ø	+
AT^SIND	ø	-	-	-
AT+CPAS	-	-	ø	ø
AT+WS46	ø	-	-	-
Serial Interface Control Commands				
AT\Q	-	ø	ø	ø
AT&C	+	ø	ø	ø
AT&D	+	ø	ø	ø
AT&S	-	ø	ø	ø
ATE	-	ø	ø	ø
AT+IPR	ø	-	-	-
AT+CMUX	ø	-	-	-
AT^SQPORT	-	-	-	ø
Security Commands				
AT+CPIN	ø	-	-	-
AT+CLCK	ø	+	ø	+

AT Command	Exec	Test	Read	Write
AT+CPWD	ø	+	ø	+
AT^SPIC	-	-	-	-
Identification Commands				
ATI	±	ø	ø	ø
AT+CGMI	-	-	ø	ø
AT+GMI	-	-	ø	ø
AT+CGMM	-	-	ø	ø
AT+GMM	-	-	ø	ø
AT+CGMR	-	-	ø	ø
AT+GMR	-	-	ø	ø
AT+CGSN	-	-	ø	ø
AT+GSN	-	-	ø	ø
AT+CIMI	+	+	ø	ø
AT^SINFO	ø	-	-	-
Call related Commands				
ATA	+	ø	ø	ø
ATD	±	ø	ø	ø
ATD><mem><index>	+	ø	ø	ø
ATD><index>	+	ø	ø	ø
ATD><str>	+	ø	ø	ø
AT+CHUP	-	-	ø	ø
AT^SHUP	ø	+	ø	+
ATS0	ø	ø	-	+
AT+CLCC	-	-	ø	ø
AT^SLCC	-	-	-	-
AT+CR	ø	+	+	+
AT+CRC	+	+	+	+
AT+CVMOD	ø	+	+	+
Network Service Commands				
AT+COPN	+	+	ø	ø
AT+COPS	ø	+	+	+
AT+CPOL	ø	+	+	+
AT+CPLS	ø	+	+	+
AT+CREG	ø	-	-	-
AT+CESQ	+	+	ø	ø
AT+CSQ	+	+	ø	ø
AT+CTZU	ø	-	-	-
AT^SMONI	-	-	ø	-
AT^SMONP	-	-	ø	-

AT Command	Exec	Test	Read	Write
AT^SNMON	ø	-	ø	-
AT^SNOMADM	ø	-	ø	-
AT^SNCSGLS	+	+	ø	ø
AT^SNCSGSC	ø	-	-	-
AT+CAVIMS	ø	-	-	ø
USIM Application Toolkit (USAT) Commands				
AT^SSTA	ø	-	-	-
AT^SSTGI	ø	-	-	-
AT^SSTGI	ø	ø	ø	-
AT^SSTGI	ø	ø	ø	-
AT^SSTGI	ø	ø	ø	-
AT^SSTGI	ø	ø	ø	-
AT^SSTGI	ø	ø	ø	-
AT^SSTGI	ø	ø	ø	-
AT^SSTGI	ø	ø	ø	-
AT^SSTGI	ø	ø	ø	-
AT^SSTGI	ø	ø	ø	-
AT^SSTGI	ø	ø	ø	-
AT^SSTGI	ø	ø	ø	-
AT^SSTGI	ø	ø	ø	-
AT^SSTGI	ø	ø	ø	-
AT^SSTGI	ø	ø	ø	-
AT^SSTGI	ø	ø	ø	-
AT^SSTGI	ø	ø	ø	-
AT^SSTGI	ø	ø	ø	-
AT^SSTGI	ø	ø	ø	-
AT^SSTGI	ø	ø	ø	-
AT^SSTGI	ø	ø	ø	-
AT^SSTR	ø	-	-	-
AT^SSTR	ø	ø	ø	-
AT^SSTR	ø	ø	ø	-
AT^SSTR	ø	ø	ø	-
AT^SSTR	ø	ø	ø	-
AT^SSTR	ø	ø	ø	-
AT^SSTR	ø	ø	ø	-
AT^SSTR	ø	ø	ø	-
AT^SSTR	ø	ø	ø	-
AT^SSTR	ø	ø	ø	-
AT^SSTR	ø	ø	ø	-
AT^SSTR	ø	ø	ø	-
AT^SSTR	ø	ø	ø	-

AT Command	Exec	Test	Read	Write
AT^SSTR	ø	ø	ø	-
AT^SSTR	ø	ø	ø	-
AT^SSTR	ø	ø	ø	-
AT^SSTR	ø	ø	ø	-
AT^SSTR	ø	ø	ø	-
AT^SSTR	ø	ø	ø	-
AT^SSTR	ø	ø	ø	-
AT^SSTR	ø	ø	ø	-
AT^SSTR	ø	ø	ø	-
AT^SSTR	ø	ø	ø	-
AT^SSTR	ø	ø	ø	-
AT^SSTR	ø	ø	ø	-
AT^SSTR	ø	ø	ø	-
AT^SSTR	ø	ø	ø	-
Short Message Service (SMS) Commands				
AT+CMGC	ø	+	ø	+
AT+CMGD	ø	+	ø	+
AT+CMGF	ø	+	+	+
AT+CMGL	+	+	ø	+
AT+CMGR	ø	+	ø	+
AT+CMGS	ø	+	ø	+
AT+CMGW	+	+	ø	+
AT+CMSS	ø	+	ø	+
AT+CNMA	+	+	ø	+
AT+CNMI	ø	+	+	+
AT+CPMS	ø	+	+	+
AT+CPNER	ø	-	-	-
AT+CSCA	ø	+	+	+
AT+CSCB	ø	+	+	+
AT+CSDH	ø	+	+	+
AT+CSMP	ø	+	+	+
AT+CSMS	ø	+	+	+
AT^SMGL	+	+	ø	+
AT^SMGR	ø	+	ø	+
AT^SSDA	ø	-	-	-
Internet Service Commands				
AT^SICA	ø	+	+	+
AT^SICS	ø	-	-	-
AT^SIPS	ø	-	ø	-
AT^SISS	ø	-	-	-

AT Command	Exec	Test	Read	Write
AT^SISI	ø	-	-	-
AT^SISO	ø	-	-	+
AT^SISC	ø	-	ø	+
AT^SISR	ø	-	ø	+
AT^SISW	ø	-	ø	+
AT^SIST	ø	-	-	-
AT^SISH	ø	-	ø	-
AT^SISX	ø	+	ø	+
AT^SISE	ø	-	ø	-
Supplementary Service Commands				
AT+CACM	ø	+	+	+
AT+CAMM	ø	+	+	+
AT+CCFC	ø	+	ø	+
AT+CCWA	ø	+	+	+
AT+CHLD	ø	+	ø	+
AT+CLIR	ø	+	+	+
AT+CSSN	ø	+	+	+
AT+CUSD	ø	+	+	+
AT+CLIP	ø	+	+	+
AT+COLP	ø	+	+	+
Packet Domain Related Commands				
AT+CGDCONT	ø	-	-	-
AT+CGATT	ø	+	+	+
AT+CGACT	ø	+	+	+
AT+CGDATA	ø	+	ø	+
AT+CGPADDR	+	+	ø	+
AT+CGPIAF	ø	+	+	+
AT+CGEREP	ø	+	+	+
AT+CGREG	ø	+	+	+
AT+CEREG	+	+	+	+
AT+CGCONTRDP	+	+	ø	+
AT+CGEQOS	ø	-	-	-
AT+CGEQOSRDP	ø	+	ø	+
AT+CGSMS	ø	+	+	+
AT+CNMPSD	+	+	ø	ø
ATD*99#	+	ø	ø	ø
AT^SGAPN	ø	-	-	-
AT^SGAUTH	ø	-	-	-
AT^SWWAN	ø	+	+	+

AT Command	Exec	Test	Read	Write
USIM related Commands				
AT+CCHC	ø	-	ø	-
AT+CCHO	ø	-	ø	-
AT+CGLA	ø	-	ø	-
AT+CRSM	ø	-	ø	-
AT+CSIM	ø	-	ø	-
AT^SATR	ø	-	ø	-
AT^SCID	-	-	ø	ø
AT^SCKS	ø	-	-	-
AT^SSET	ø	-	-	-
Phonebook Commands				
AT+CPBS	+	+	+	+
AT+CPBR	ø	+	ø	+
AT+CPBW	ø	+	ø	+
AT+CSVM	ø	+	+	+
AT+CNUM	+	+	ø	ø
GNSS Commands				
AT^SGPSC	ø	-	-	-
Audio Commands				
AT+CMUT	ø	-	-	-
AT+VTS	ø	-	ø	-
AT^SAIC	ø	-	-	-
AT^SNFG	ø	-	ø	-
AT^SNFI	ø	-	-	-
AT^SNFO	ø	-	-	-
AT^SNFS	ø	-	-	-
AT^SNFTTY	ø	-	-	-
AT^SRTC	-	-	-	-
Hardware related Commands				
AT+CALA	ø	-	-	-
AT+CCLK	ø	-	-	-
AT^SAD	ø	-	ø	-
AT^SBV	-	-	ø	ø
AT^SCTM	ø	-	-	-
AT^SLED	ø	-	-	-
AT^SRADC	ø	-	-	-

AT Command	Exec	Test	Read	Write
General Purpose I/O (GPIO) Pin related Commands				
AT^SPIO	ø	-	ø	-
AT^SCPIN	ø	-	ø	-
AT^SCPOL	ø	-	ø	-
AT^SGIO	ø	-	ø	-
AT^SSIO	ø	-	ø	-
Miscellaneous Commands				
A/	-	ø	ø	ø
+++	-	ø	ø	ø
AT^SBNR	ø	-	-	-
AT^SBNW	ø	-	ø	-
AT^SFDL	-	-	ø	ø

21.3 Availability of AT Commands Depending on Operating Mode of ME

- ... AT command not supported
+ ... AT command supported
± ... AT command partially supported
See description of AT command for details.

Table 21.6: Availability of AT Commands Depending on Operating Mode of ME

AT Command	Normal Mode	✈
Configuration Commands		
AT&F	+	+
AT&V	+	+
AT&W	+	+
ATQ	+	+
ATV	+	+
ATX	+	+
ATZ	+	+
AT+CMEE	+	+
AT+CSCS	+	+
AT+CFUN	+	+
AT+GCAP	+	+
AT^SMSO	+	+
AT^SCFG	+	+
AT^SSRVSET	+	+
Status Control Commands		
AT+CEER	+	+
AT^SIND	+	+
AT+CPAS	+	+
AT+WS46	+	+
Serial Interface Control Commands		
AT\Q	+	+
AT&C	+	+
AT&D	+	+
AT&S	+	+
ATE	+	+
AT+IPR	+	+
AT+CMUX	+	+
AT^SQPORT	+	+
Security Commands		
AT+CPIN	+	+
AT+CLCK	+	±

AT Command	Normal Mode	✈
AT+CPWD	+	±
AT^SPIC	+	+
Identification Commands		
ATI	+	+
AT+CGMI	+	+
AT+GMI	+	+
AT+CGMM	+	+
AT+GMM	+	+
AT+CGMR	+	+
AT+GMR	+	+
AT+CGSN	+	+
AT+GSN	+	+
AT+CIMI	+	+
AT^SINFO	+	+
Call related Commands		
ATA	+	-
ATD	+	-
ATD><mem><index>	+	-
ATD><index>	+	-
ATD><str>	+	-
AT+CHUP	+	-
AT^SHUP	+	-
ATS0	+	-
AT+CLCC	+	-
AT^SLCC	+	-
AT+CR	+	+
AT+CRC	+	+
AT+CVMOD	+	-
Network Service Commands		
AT+COPN	+	+
AT+COPS	+	-
AT+CPOL	+	+
AT+CPLS	+	-
AT+CREG	+	+
AT+CESQ	+	-
AT+CSQ	+	-
AT+CTZU	+	+
AT^SMONI	+	-
AT^SMONP	+	-

AT Command	Normal Mode	✈
AT^SNMON	+	-
AT^SNOMADM	+	-
AT^SNCSGLS	+	+
AT^SNCSGSC	+	-
AT+CAVIMS	+	+
USIM Application Toolkit (USAT) Commands		
AT^SSTA	+	+
AT^SSTGI	+	+
AT^SSTGI	+	+
AT^SSTGI	+	+
AT^SSTGI	+	+
AT^SSTGI	+	+
AT^SSTGI	+	+
AT^SSTGI	+	+
AT^SSTGI	+	+
AT^SSTGI	+	+
AT^SSTGI	+	+
AT^SSTGI	+	+
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AT^SSTGI	+	+
AT^SSTGI	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+

AT Command	Normal Mode	✈
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
AT^SSTR	+	+
Short Message Service (SMS) Commands		
AT+CMGC	+	-
AT+CMGD	+	+
AT+CMGF	+	+
AT+CMGL	+	+
AT+CMGR	+	+
AT+CMGS	+	-
AT+CMGW	+	+
AT+CMSS	+	-
AT+CNMA	+	-
AT+CNMI	+	+
AT+CPMS	+	+
AT+CPNER	+	-
AT+CSCA	+	+
AT+CSCB	+	+
AT+CSDH	+	+
AT+CSMP	+	+
AT+CSMS	+	+
AT^SMGL	+	+
AT^SMGR	+	+
AT^SSDA	+	+
Internet Service Commands		
AT^SICA	+	-
AT^SICS	+	+
AT^SIPS	+	+
AT^SISS	+	+

AT Command	Normal Mode	✈
AT^SISI	+	+
AT^SISO	+	-
AT^SISC	+	-
AT^SISR	+	-
AT^SISW	+	-
AT^SIST	+	-
AT^SISH	+	-
AT^SISX	+	-
AT^SISE	+	-
Supplementary Service Commands		
AT+CACM	+	+
AT+CAMM	+	+
AT+CCFC	+	-
AT+CCWA	+	-
AT+CHLD	+	-
AT+CLIR	+	-
AT+CSSN	+	-
AT+CUSD	+	-
AT+CLIP	+	-
AT+COLP	+	-
Packet Domain Related Commands		
AT+CGDCONT	+	+
AT+CGATT	+	-
AT+CGACT	+	-
AT+CGDATA	+	-
AT+CGPADDR	+	+
AT+CGPIAF	+	+
AT+CGEREP	+	+
AT+CGREG	+	+
AT+CEREG	+	+
AT+CGCONTRDP	+	-
AT+CGEQOS	+	+
AT+CGEQOSRDP	+	-
AT+CGSMS	+	+
AT+CNMPSD	+	-
ATD*99#	+	-
AT^SGAPN	+	+
AT^SGAUTH	+	+
AT^SWWAN	+	-

AT Command	Normal Mode	✈
USIM related Commands		
AT+CCHC	+	+
AT+CCHO	+	+
AT+CGLA	+	+
AT+CRSM	+	+
AT+CSIM	+	+
AT^SATR	+	+
AT^SCID	+	+
AT^SCKS	+	+
AT^SSET	+	+
Phonebook Commands		
AT+CPBS	+	+
AT+CPBR	+	+
AT+CPBW	+	+
AT+CSVM	+	+
AT+CNUM	+	+
GNSS Commands		
AT^SGPSC	+	+
Audio Commands		
AT+CMUT	+	+
AT+VTS	+	-
AT^SAIC	+	+
AT^SNFG	+	+
AT^SNFI	+	+
AT^SNFO	+	+
AT^SNFS	+	+
AT^SNFTTY	+	-
AT^SRTC	+	+
Hardware related Commands		
AT+CALA	+	+
AT+CCLK	+	+
AT^SAD	+	+
AT^SBV	+	+
AT^SCTM	+	+
AT^SLED	+	+
AT^SRADC	+	+

AT Command	Normal Mode	✈
General Purpose I/O (GPIO) Pin related Commands		
AT^SPIO	+	+
AT^SCPIN	+	+
AT^SCPOL	+	+
AT^SGIO	+	+
AT^SSIO	+	+
Miscellaneous Commands		
A/	+	+
+++	+	-
AT^SBNR	+	+
AT^SBNW	+	+
AT^SFDL	+	+

21.4 AT Command Settings storable with AT&W

Table 21.7: Settings Stored to User Profile

AT Command	Stored Parameters
Configuration Commands	
ATQ	<n>
ATV	<value>
ATX	<value>
AT+CMEE	<errMode>
Status Control Commands	
AT^SIND	<dtmfSrc>, <dtmfSilenceTime>, <dtmf-BufferTimeout>, <dtmfMinToneTime>
Serial Interface Control Commands	
AT\Q	<n>
AT&C	<value>
AT&D	<value>
AT&S	<value>
ATE	<value>
Call related Commands	
ATS0	<n>
AT^SLCC	<n>
AT+CR	<mode>
AT+CRC	<mode>
Network Service Commands	
AT+COPS	<format>
AT+CREG	<urcMode>
Short Message Service (SMS) Commands	
AT+CMGF	<mode>
AT+CNMI	<mode>, <mt>, <bm>, <ds>, <bfr>
AT+CSDH	<show>
AT+CSMS	<service>
Supplementary Service Commands	
AT+CLIP	<clipUrcMode>
USIM related Commands	
AT^SCKS	<mode>
AT^SSET	<n>

AT Command	Stored Parameters
Hardware related Commands	
AT^SLED	<mode>, <flash>

21.5 Factory Default Settings Restorable with AT&F

Table 21.8: Factory Default Settings Restorable with AT&F

AT Command	Factory Defaults
Configuration Commands	
ATQ	<n>=0
ATV	<value>=1
ATX	<value>=0
AT+CMEE	<errMode>=2
AT+CSCS	<charSet>="GSM"
Status Control Commands	
AT^SIND	<dtmfSrc>=0, <dtmfSilenceTime>=50, <dtmfBufferTime-out>=0, <dtmfMinToneTime>=0
Serial Interface Control Commands	
AT\Q	<n>=3
AT&C	<value>=1
AT&D	<value>=2
AT&S	<value>=0
ATE	<value>=1
Call related Commands	
ATS0	<n>=000
AT^SLCC	<n>=0
AT+CR	<mode>=0
AT+CRC	<mode>=0
Network Service Commands	
AT+CREG	<urcMode>=0
AT+CTZU	<n>=0
Short Message Service (SMS) Commands	
AT+CMGF	<mode>=0
AT+CNMI	<mode>=0, <mt>=0, <bm>=0, <ds>=0, <bfr>=1
AT+CSCB	<operation>=0, <dcss>=""
AT+CSDH	<show>=0
AT+CSMP	<pid>=0, <dcs>=0
AT+CSMS	<service>=0
AT^SSDA	<da>=1
Supplementary Service Commands	
AT+CLIR	<n>=0
AT+CSSN	<n>=0, <m>=0

AT Command	Factory Defaults
AT+CUSD	<ussdMode>=0
AT+CLIP	<clipUrcMode>=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>="SM"
Hardware related Commands	
AT^SCTM	<UrcMode>=0
AT^SLED	<mode>=0

21.6 Summary of Unsolicited Result Codes (URC)

Table 21.9: Summary of Unsolicited Result Codes (URC)

AT Command	URC
Unsolicited Result Code Presentation	
	^SBC: Undervoltage
	^SBC: Overvoltage Warning
	^SBC: Overvoltage Shutdown
Configuration Commands	
AT+CFUN	^SYSSTART
AT+CFUN	^SYSSTART AIRPLANE MODE
Status Control Commands	
AT^SIND	+CIEV: <indDescr>, <indValue>
AT^SIND	+CIEV: <indDescr>, <indValue>, <SmsMr>
AT^SIND	+CIEV: <indDescr>, <cmdType>, <commandDetails>[, <pathLen>, <fileNum>, <fileList>[, <status>, <statAddInfo>]]
AT^SIND	+CIEV: <indDescr>, <indValue>, <eonsOperator>, <servProvider>, <servProviderType>
AT^SIND	+CIEV: <indDescr>, <nitzUT>, <nitzTZ>[, <nitzDST>]
AT^SIND	+CIEV: <indDescr>
AT^SIND	+CIEV: <indDescr>, <indValue>, <lstaEdvs>, <lstaRssi>
AT^SIND	+CIEV: <indDescr>, <indValue>, <lstaNo>, <lstaMin>, <lstaMax>, <lsta-Mean>, <lstaVar>
AT^SIND	+CIEV: <indDescr>, <ceerRelCauseGroup>, <ceerReport>
AT^SIND	+CIEV: <indDescr>, <indValue>$_{slot\_1}$, <indValue>$_{slot\_2}$
AT^SIND	+CIEV: <indDescr>, <dtmfChar>, <dtmfSrc>, <dtmfToneDuration>[, <dtmf-ToneDuration>...]
AT^SIND	+CIEV: <indDescr>, <srvProfileId>, <issuer>, <serialNumber>, <sub-ject>, <signatureAlgorithm>, <thumbprintAlgorithm>, <thumbprint>
AT^SIND	+CIEV: <indDescr>, <OmaDmAction>[, <OmaDmStatus>]
AT^SIND	+CIEV: <indDescr>, <containerid>, <mccmnc>, <clength>, <container>
AT^SIND	+CIEV: <indDescr>, <simreadEf>
AT^SIND	+CIEV: <indDescr>, <ltebotTimerstat>, <ltebotReason>, <APN>[, <lte-botReasonTxt>]
AT^SIND	+CIEV: <indDescr>, <provMm>, <provCur>

AT Command	URC
Call related Commands	

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

AT+CRC	RING
AT+CRC	+CRING: <type>
Network Service Commands	
AT+CREG	+CREG: <regStatus>
AT+CREG	+CREG: <regStatus>[, <netLac>, <netCellId>[, <AcT>]]
AT+CTZU	+CTZU:<nitzUT>, <nitzTZ>[, <nitzDST>]
USIM Application Toolkit (USAT) Commands	
^SSTN SAT Notification	^SSTN: <cmdType>
^SSTN SAT Notification	^SSTN: <cmdTerminateValue>
^SSTN SAT Notification	^SSTN: 254
^SSTN SAT Notification	^SSTN: 255
Short Message Service (SMS) Commands	
AT+CNMI	+CMTI: <mem3>, <index>
AT+CNMI	+CMT: <length><CR><LF><pdu>
AT+CNMI	+CMT: <oa>, , <scts>[, <tooa>, <fo>, <pid>, <dcs>, <sca>, <tosca>, <length>]<CR><LF><data>
AT+CNMI	+CBM: <length><CR><LF><pdu>
AT+CNMI	+CBM: <sn>, <mid>, <dcs>, <page>, <pages><CR><LF><data>
AT+CNMI	+CDS: <length><CR><LF><pdu>
AT+CNMI	+CDS: <fo>, <mr>[, <ra>][, <tora>], <scts>, <dt>, <st>
AT+CPNER	+CPNERU: <message>, <number>, <warning>
AT+CPNER	^SSNERU: <serviceId>, <serialNr>, <scope>
Internet Service Commands	
AT^SISR	^SISR: <srvProfileId>, <urcCauseId>
AT^SISW	^SISW: <srvProfileId>, <urcCauseId>
Internet Service URC	^SIS: <srvProfileId>, <urcCause>[, [<urcInfoId>][, <urcInfoText>]]

AT Command	URC
Supplementary Service Commands	
AT+CCWA	+CCWA: <calling number>, <type of number>[, <class>][, , <CLI validity>]
AT+CSSN	+CSSI: <code 1>
AT+CSSN	+CSSU: <code 2>
AT+CUSD	+CUSD: <ussdStatus>[, <ussdRsp>[, <ussdDCS>]]
AT+CLIP	+CLIP: <clipNumber>, <clipNumType>, , [, <clipAlpha>][, <CLI validity>]
AT+COLP	+COLP: <number>, <type>[, <sub-number>][, <sub-type>][, <alpha>]
Packet Domain Related Commands	
AT+CGEREP	+CGEV: REJECT <PDP_type>, <PDP_addr>
AT+CGEREP	+CGEV: NW REACT <PDP_type>, <PDP_addr>[, <cid>]
AT+CGEREP	+CGEV: NW DEACT <PDP_type>, <PDP_addr>[, <cid>]
AT+CGEREP	+CGEV: ME DEACT <PDP_type>, <PDP_addr>[, <cid>]
AT+CGEREP	+CGEV: NW DETACH
AT+CGEREP	+CGEV: ME DETACH
AT+CGEREP	+CGEV: NW CLASS <class>
AT+CGEREP	+CGEV: ME CLASS <class>
AT+CGEREP	+CGEV: PDN ACT <cid>
AT+CGEREP	+CGEV: PDN DEACT <cid>
AT+CGEREP	+CGEV: NW MODIFY <cid>,<change-reason>,<event-type>
AT+CGEREP	+CGEV: ME MODIFY <cid>, <change-reason>, <event-type>
AT+CGEREP	+CGEV: ME PDN ACT <cid>[, <reason>]
AT+CGREG	+CGREG: <stat>
AT+CGREG	+CGREG: <stat>[, <lac>][, <ci>][, <AcT>]
AT+CEREG	+CEREG: <stat>
AT+CEREG	+CEREG: <stat>[, <tac>][, <ci>][, <AcT>]
USIM related Commands	
AT^SCKS	^SCKS: <SimStatus>
AT^SSET	^SSIM READY
GNSS Commands	
^SGPSE GNSS Event Notification	^SGPSE: <UrcType>, <BufferStatus>, <BufferCount>
^SGPSE GNSS Event Notification	^SGPSE: <UrcType>, <PositionStatus>
^SGPSE GNSS Event Notification	^SGPSE: <UrcType>, <InfoUrcMinutes>
^SGPSE GNSS Event Notification	^SGPSE: <UrcType>, <NMEA_sentence> [^SGPSE: <UrcType>, <NMEA_sentence>] ...

AT Command	URC
Hardware related Commands	
AT+CALA	+CALA: [<text>]
AT+CALA	^SYSSTART +CALA: [<text>]
AT+CALA	^SYSSTART AIRPLANE MODE +CALA: [<text>]
AT^SCTM	^SCTM_B: <UrcCause>
AT^SRADC	^SRADC: <ch>, <count>, <value>[, <value>[, <value>[, <value>[, <value>[, <value>[, <value>[, <value>[, <value>]]]]]]]]]
General Purpose I/O (GPIO) Pin related Commands	
AT^SCPOL	^SCPOL: <ioId>, <value>

21.7 AT Commands Supported Only on the Modem Interface

Table 21.10: AT Commands Supported Only on the Modem Interface

AT Command
Serial Interface Control Commands
AT&D
AT&S
AT+CMUX
Packet Domain Related Commands
AT+CGDATA
ATD*99#
Miscellaneous Commands
AT^SFDL

21.8 Alphabetical List of AT Commands

Table 21.11: Alphabetical List of AT Commands

AT Command	Description	Section and Page
+++	Escape from Data Mode to AT Command Mode	Section 20.2, page 518
A/	Repeat Previous Command Line	Section 20.1, page 517
AT&C	Set Data Carrier Detect (DCD) line mode	Section 4.2, page 119
AT&D	Set Data Terminal Ready (DTR) line mode	Section 4.3, page 120
AT&F	Reset AT Command Settings to Factory Default Values	Section 2.1, page 31
AT&S	Set Data Set Ready (DSR) line mode	Section 4.4, page 121
AT&V	Display current Configuration	Section 2.2, page 32
AT&W	Store AT Command Settings to User Defined Profile	Section 2.3, page 33
AT+CACM	Accumulated call meter (ACM) reset or query	Section 12.1, page 378
AT+CALA	Alarm Configuration	Section 18.1, page 494
AT+CAMM	Accumulated call meter maximum (ACMmax) set or query	Section 12.2, page 379
AT+CAVIMS	Availability for voice calls with IMS	Section 8.15, page 213
AT+CCFC	Call forwarding number and conditions control	Section 12.3, page 380
AT+CCHC	Close logical channel	Section 14.1, page 434
AT+CCHO	Open logical channel	Section 14.2, page 435
AT+CCLK	Real Time Clock	Section 18.2, page 497
AT+CCWA	Call Waiting	Section 12.4, page 384
AT+CEER	Extended Error Report	Section 3.1, page 84
AT+CEREG	EPS Network Registration Status	Section 13.9, page 417
AT+CESQ	Extended Signal Quality	Section 8.6, page 184
AT+CFUN	PLS8-US-R4 Functionality Level	Section 2.10, page 44
AT+CGACT	PDP Context Activate or Deactivate	Section 13.3, page 404
AT+CGATT	PS Attach or Detach	Section 13.2, page 403
AT+CGCONTRDP	PDP context read dynamic parameters	Section 13.10, page 419
AT+CGDATA	Enter Data State	Section 13.4, page 406
AT+CGDCONT	Define PDP Context	Section 13.1, page 398
AT+CGEQOS	Define EPS Quality of Service	Section 13.11, page 421
AT+CGEQOSRDP	EPS Quality of Service Read Dynamic Parameters	Section 13.12, page 423
AT+CGEREP	Packet Domain Event Reporting	Section 13.7, page 412
AT+CGLA	Generic logical channel access	Section 14.3, page 436
AT+CGMI	Request manufacturer identification	Section 6.2, page 146
AT+CGMM	Request model identification	Section 6.4, page 147
AT+CGMR	Request revision identification of software status	Section 6.6, page 148
AT+CGPADDR	Show PDP Address	Section 13.5, page 408
AT+CGPIAF	Select Printing IP address format	Section 13.6, page 410
AT+CGREG	Packet Domain Network Registration Status	Section 13.8, page 415
AT+CGSMS	Select Service for MO Short Messages	Section 13.13, page 425
AT+CGSN	Request International Mobile Equipment Identity (IMEI)	Section 6.8, page 149
AT+CHLD	Call Hold and Multiparty	Section 12.5, page 387

AT Command	Description	Section and Page
AT+CHUP	Hang up call	Section 7.6, page 161
AT+CIMI	Request International Mobile Subscriber Identity (IMSI)	Section 6.10, page 150
AT+CLCC	List of current calls	Section 7.9, page 165
AT+CLCK	Facility Lock	Section 5.2, page 129
AT+CLIP	Calling Line Identification Presentation	Section 12.9, page 394
AT+CLIR	Calling Line Identification Restriction	Section 12.6, page 389
AT+CMEE	Error Message Format	Section 2.8, page 38
AT+CMGC	Send an SMS command	Section 10.2, page 295
AT+CMGD	Delete short message	Section 10.3, page 296
AT+CMGF	Select SMS message format	Section 10.4, page 297
AT+CMGL	List SMS messages from preferred store	Section 10.5, page 298
AT+CMGR	Read SMS messages	Section 10.6, page 300
AT+CMGS	Send Short Message	Section 10.7, page 301
AT+CMGW	Write Short Messages to Memory	Section 10.8, page 302
AT+CMSS	Send short messages from storage	Section 10.9, page 303
AT+CMUT	Mute control	Section 17.1, page 477
AT+CMUX	Multiplex mode	Section 4.7, page 124
AT+CNMA	New Message Acknowledgement to UE/TE	Section 10.10, page 304
AT+CNMI	SMS Event Reporting Configuration	Section 10.11, page 305
AT+CNMPSD	No more PS data	Section 13.14, page 426
AT+CNUM	Read own numbers	Section 15.5, page 457
AT+COLP	Connected Line Identification Presentation	Section 12.10, page 396
AT+COPN	Read operator names	Section 8.1, page 174
AT+COPS	Operator Selection	Section 8.2, page 175
AT+CPAS	Activity Status	Section 3.3, page 116
AT+CPBR	Read from phonebook	Section 15.2, page 449
AT+CPBS	Select phonebook memory storage	Section 15.1, page 446
AT+CPBW	Write into phonebook	Section 15.3, page 452
AT+CPIN	PIN Authentication	Section 5.1, page 127
AT+CPLS	Select Preferred Operator List	Section 8.4, page 180
AT+CPMS	Preferred SMS message storage	Section 10.12, page 308
AT+CPNER	Notification event reporting	Section 10.13, page 310
AT+CPOL	Preferred Operator List	Section 8.3, page 178
AT+CPWD	Change Password	Section 5.3, page 136
AT+CR	Service reporting control	Section 7.11, page 170
AT+CRC	Set Cellular Result Codes for incoming call indication	Section 7.12, page 171
AT+CREG	Network Registration Status	Section 8.5, page 181
AT+CRSM	Restricted USIM Access	Section 14.4, page 437
AT+CSCA	SMS Service Center Address	Section 10.14, page 312
AT+CSCB	Select Cell Broadcast Message Indication	Section 10.15, page 313
AT+CSCS	Character Set	Section 2.9, page 43
AT+CSDH	Show SMS text mode parameters	Section 10.16, page 315

AT Command	Description	Section and Page
AT+CSIM	Generic USIM Access	Section 14.5, page 439
AT+CSMP	Set SMS Text Mode Parameters	Section 10.17, page 316
AT+CSMS	Select Message Service	Section 10.18, page 318
AT+CSQ	Signal Quality	Section 8.7, page 186
AT+CSSN	Supplementary service notifications	Section 12.7, page 390
AT+CSVM	Set voice mail number	Section 15.4, page 455
AT+CTZU	Automatic Time Zone Update	Section 8.8, page 187
AT+CUSD	Unstructured Supplementary Service Data	Section 12.8, page 392
AT+CVMOD	Voice call mode	Section 7.13, page 173
AT+GCAP	Capabilities List	Section 2.11, page 46
AT+GMI	Request manufacturer identification	Section 6.3, page 146
AT+GMM	Request model identification	Section 6.5, page 147
AT+GMR	Request revision identification of software status	Section 6.7, page 148
AT+GSN	Request International Mobile Equipment Identity (IMEI)	Section 6.9, page 149
AT+IPR	Bit Rate	Section 4.6, page 123
AT+VTS	DTMF and tone generation	Section 17.2, page 478
AT+WS46	Select wireless network	Section 3.4, page 117
AT\Q	Flow Control	Section 4.1, page 118
AT^SAD	Antenna Configuration	Section 18.3, page 499
AT^SAIC	Audio Interface Configuration	Section 17.3, page 479
AT^SATR	Query SIM's Answer to Reset Data	Section 14.6, page 441
AT^SBNR	Binary Read	Section 20.3, page 519
AT^SBNW	Binary Write	Section 20.4, page 521
AT^SBV	Battery/Supply Voltage	Section 18.4, page 501
AT^SCFG	Extended Configuration Settings	Section 2.13, page 48
AT^SCID	USIM Identification Number	Section 14.7, page 442
AT^SCKS	Query USIM and Chip Card Holder Status	Section 14.8, page 443
AT^SCPIN	Pin Configuration	Section 19.2, page 512
AT^SCPOL	GPIO Level Polling Configuration	Section 19.3, page 514
AT^SCTM	Critical Operating Temperature Monitoring	Section 18.5, page 502
AT^SFDL	Enter Firmware Download Mode	Section 20.5, page 525
AT^SGAPN	Configure APN class settings	Section 13.16, page 428
AT^SGAUTH	Set Type of Authentication for PDP-IP Connections	Section 13.17, page 430
AT^SGIO	Get IO state of a specified pin	Section 19.4, page 515
AT^SGPSC	GNSS Configuration	Section 16.4, page 463
AT^SHUP	Hang up call(s) indicating a specific 3GPP TS 24.008 release cause	Section 7.7, page 162
AT^SICA	Internet Connection Activate or Deactivate	Section 11.1, page 327
AT^SICS	Internet Connection Settings	Section 11.2, page 328
AT^SIND	Extended Indicator Control	Section 3.2, page 98
AT^SINFO	Information Output	Section 6.11, page 151
AT^SIPS	Internet Profile Storage	Section 11.3, page 330

AT Command	Description	Section and Page
AT^SISC	Internet Service Close	Section 11.7, page 344
AT^SISE	Internet Service Error Report	Section 11.13, page 357
AT^SISH	Disconnect Remote Client	Section 11.11, page 353
AT^SISI	Internet Service Information	Section 11.5, page 339
AT^SISO	Internet Service Open	Section 11.6, page 341
AT^SISR	Internet Service Read Data	Section 11.8, page 345
AT^SISS	Internet Service Setup Profile	Section 11.4, page 331
AT^SIST	Transparent Mode	Section 11.10, page 351
AT^SISW	Internet Service Write Data	Section 11.9, page 348
AT^SISX	Internet Service Execution	Section 11.12, page 354
AT^SLCC	Extended list of current calls	Section 7.10, page 167
AT^SLED	LED Feature	Section 18.6, page 505
AT^SMGL	List Short Messages from preferred store without setting status to REC READ	Section 10.19, page 320
AT^SMGR	Read short message without setting status to REC READ	Section 10.20, page 321
AT^SMONI	Monitoring Serving Cell	Section 8.9, page 189
AT^SMONP	Monitoring Neighbour Cells	Section 8.10, page 198
AT^SMSO	Switch Off PLS8-US-R4	Section 2.12, page 47
AT^SNCSGLS	Operator CSG lists on USIM	Section 8.13, page 210
AT^SNCSGSC	Closed Subscriber Group Network Scan	Section 8.14, page 211
AT^SNFG	Generate Tone	Section 17.4, page 482
AT^SNFI	Set microphone path parameters	Section 17.5, page 484
AT^SNFO	Set audio output parameter (loudspeaker path)	Section 17.6, page 486
AT^SNFS	Select audio hardware set	Section 17.7, page 488
AT^SNFTTY	Signal TTY/CTM audio mode capability	Section 17.8, page 490
AT^SNMON	Network Monitoring	Section 8.11, page 206
AT^SNOMADM	Configure OMA DM	Section 8.12, page 208
AT^SPIC	Display PIN Counter	Section 5.4, page 139
AT^SPIO	GPIO Driver Open/Close	Section 19.1, page 511
AT^SQPORT	Query Port Type	Section 4.8, page 126
AT^SRADC	Configure and Read A/D Converter	Section 18.7, page 507
AT^SRTC	Ring tone configuration	Section 17.9, page 492
AT^SSDA	Set SMS Display Availability	Section 10.21, page 322
AT^SSET	USIM Data Ready Indication	Section 14.9, page 445
AT^SSIO	Set IO state of a specified pin	Section 19.5, page 516
AT^SSRVSET	Service Interface Configuration	Section 2.14, page 77
AT^SSTA	Remote-SAT Interface Activation	Section 9.4, page 224
AT^SSTGI	SAT Get Information	Section 9.6, page 228
AT^SSTGI	SAT Get Information - Refresh (1)	Section 9.7, page 229
AT^SSTGI	SAT Get Information - Set Up Event List (5)	Section 9.8, page 231
AT^SSTGI	SAT Get Information - Set Up Call (16)	Section 9.9, page 232
AT^SSTGI	SAT Get Information - Send SS (17)	Section 9.10, page 234

AT Command	Description	Section and Page
AT^SSTGI	SAT Get Information - Send USSD (18)	Section 9.11, page 235
AT^SSTGI	SAT Get Information - Send Short Message (19)	Section 9.12, page 236
AT^SSTGI	SAT Get Information - Send DTMF (20)	Section 9.13, page 237
AT^SSTGI	SAT Get Information - Launch Browser (21)	Section 9.14, page 238
AT^SSTGI	SAT Get Information - Play Tone (32)	Section 9.15, page 240
AT^SSTGI	SAT Get Information - Display Text (33)	Section 9.16, page 242
AT^SSTGI	SAT Get Information - Get Inkey (34)	Section 9.17, page 244
AT^SSTGI	SAT Get Information - Get Input (35)	Section 9.18, page 246
AT^SSTGI	SAT Get Information - Select Item (36)	Section 9.19, page 248
AT^SSTGI	SAT Get Information - Set up Menu (37)	Section 9.20, page 250
AT^SSTGI	SAT Get Information - Set up Idle Mode Text (40)	Section 9.21, page 252
AT^SSTGI	SAT Get Information - Language Notification (53)	Section 9.22, page 253
AT^SSTGI	SAT Get Information - Open Channel (64)	Section 9.23, page 254
AT^SSTGI	SAT Get Information - Close Channel (65)	Section 9.24, page 255
AT^SSTGI	SAT Get Information - Receive Data (66)	Section 9.25, page 256
AT^SSTGI	SAT Get Information - Send Data (67)	Section 9.26, page 257
AT^SSTR	SAT Response	Section 9.27, page 258
AT^SSTR	SAT Response - Refresh (1)	Section 9.28, page 260
AT^SSTR	SAT Response - Set Up Event List (5)	Section 9.29, page 261
AT^SSTR	SAT Response - Set Up Call (16)	Section 9.30, page 262
AT^SSTR	SAT Response - Send SS (17)	Section 9.31, page 263
AT^SSTR	SAT Response - Send USSD (18)	Section 9.32, page 264
AT^SSTR	SAT Response - Send Short Message (19)	Section 9.33, page 265
AT^SSTR	SAT Response - Send DTMF (20)	Section 9.34, page 266
AT^SSTR	SAT Response - Launch Browser (21)	Section 9.35, page 267
AT^SSTR	SAT Response - Play Tone (32)	Section 9.36, page 268
AT^SSTR	SAT Response - Display Text (33)	Section 9.37, page 269
AT^SSTR	SAT Response - Get Inkey (34)	Section 9.38, page 270
AT^SSTR	SAT Response - Get Input (35)	Section 9.39, page 272
AT^SSTR	SAT Response - Select Item (36)	Section 9.40, page 274
AT^SSTR	SAT Response - Set Up Menu (37)	Section 9.41, page 275
AT^SSTR	SAT Response - Set Up Idle Mode Text (40)	Section 9.42, page 276
AT^SSTR	SAT Response - Language Notification (53)	Section 9.43, page 277
AT^SSTR	SAT Response - Open Channel (64)	Section 9.44, page 278
AT^SSTR	SAT Response - Close Channel (65)	Section 9.45, page 279
AT^SSTR	SAT Response - Receive Data (66)	Section 9.46, page 280
AT^SSTR	SAT Response - Send Data (67)	Section 9.47, page 281
AT^SSTR	SAT Event - Menu Selection (211)	Section 9.48, page 282
AT^SSTR	SAT Event - User Activity (232)	Section 9.49, page 283
AT^SSTR	SAT Event - Idle Screen Available (233)	Section 9.50, page 284
AT^SSTR	SAT Event - Language Selection (235)	Section 9.51, page 285
AT^SSTR	SAT Event - Browser Termination (236)	Section 9.52, page 286

AT Command	Description	Section and Page
AT^SSTR	SAT Event - Terminate Command (254)	Section 9.53, page 287
AT^SWWAN	PDP Context Activate or Deactivate	Section 13.18, page 432
ATA	Connect to Incoming Call	Section 7.1, page 154
ATD	Mobile originated call to specified number	Section 7.2, page 155
ATD*99#	Request Packet Domain service	Section 13.15, page 427
ATD><index>	Mobile originated call from active memory using index number	Section 7.4, page 159
ATD><mem><index>	Mobile originated call using specific memory and index number	Section 7.3, page 157
ATD><str>	Mobile originated call from memory using corresponding string	Section 7.5, page 160
ATE	AT Command Echo	Section 4.5, page 122
ATI	Display product identification information	Section 6.1, page 144
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About Gemalto

Since 1996, Gemalto has been pioneering groundbreaking M2M and IoT products that keep our customers on the leading edge of innovation.

We work closely with global mobile network operators to ensure that Cinterion® modules evolve in sync with wireless networks, providing a seamless migration path to protect your IoT technology investment.

Cinterion products integrate seamlessly with Gemalto identity modules, security solutions and licensing and monetization solutions, to streamline development timelines and provide cost efficiencies that improve the bottom line.

As an experienced software provider, we help customers manage connectivity, security and quality of service for the long lifecycle of IoT solutions.

For more information please visit
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