WIRELESS

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u-blox Wireless Modules

Data and Voice Modules

AT Commands Manual

Abstract

Description of standard and proprietary AT Commands used with u-blox Wireless Modules.

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Document Information	
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Document status information	
Objective Specification	This document contains target values. Revised and supplementary data will be published later.
Advance Information	This document contains data based on early testing. Revised and supplementary data will be published later.
Preliminary	This document contains data from product verification. Revised and supplementary data may be published later.
Released	This document contains the final product specification.

This document applies to the following products:

Name	Type number	Firmware version	PCN reference
LEON-G100	LEON-G100-04S-00	07.40.01	GSM.G1-SW-10007
	LEON-G100-05S-00	07.50.00	GSM.G1-SW-10008
	LEON-G100-06S-00	07.60.00	GSM.G1-SW-10012
	LEON-G100-06A-00	07.60.00	GSM.G1-SW-10012
LEON-G200	LEON-G200-04S-00	07.40.02	GSM.G1-SW-10007
	LEON-G200-05S-00	07.50.00	GSM.G1-SW-10008
	LEON-G200-06S-00	07.60.00	GSM.G1-SW-10012
LISA-U100	LISA-U100-00S-00	10.72	n.a.
LISA-U110	LISA-U110-00S-00	10.72	n.a.
LISA-U120	LISA-U120-00S-00	10.72	n.a.
LISA-U130	LISA-U130-00S-00	10.72	n.a.

Preface

u-blox Technical Documentation

As part of our commitment to customer support, u-blox maintains an extensive volume of technical documentation for our products. In addition to our product-specific technical data sheets, the following manuals are available to assist u-blox customers in product design and development.

AT Commands Manual: This document provides the description of the supported AT commands by Wireless Modules to verify all implemented functionalities.

System Integration Manual: This Manual provides hardware design instructions and information on how to set up production and final product tests.

How to use this Manual

The u-blox Wireless Modules AT Commands Manual provides the necessary information to successfully design in and configure these u-blox wireless modules. For navigating this document please note the following:

This manual has a modular structure. It is not necessary to read it from the beginning to the end.

The following symbols are used to highlight important information within the manual:

☞ An index finger points out key information pertaining to module integration and performance.

⚠ **A warning symbol indicates actions that could negatively impact or damage the module.**

Questions

If you have any questions about u-blox Wireless Hardware Integration, please:

- Read this manual carefully.
- Contact our information service on our homepage http://www.u-blox.com
- Read the questions and answers on our FAQ database

Technical Support

Worldwide Web

Our website (www.u-blox.com) is a rich pool of information. Product information, technical documents and helpful FAQ can be accessed 24h a day.

By E-mail

If you have technical problems or cannot find the required information in the provided documents, contact the nearest of the Technical Support offices by email. Use our service pool email addresses rather than any personal email address of our staff. This makes sure that your request is processed as soon as possible. You will find the contact details at the end of the document.

Helpful Information when Contacting Technical Support

When contacting Technical Support please have the following information ready:

- Module type (e.g. LEON-G100-00S-01) and firmware version (e.g. 07.30)
- Module configuration
- Clear description of your question or the problem
- A short description of the application
- Your complete contact details

Contents

1 AT command mode at startup

By default, u-blox Wireless Modules start with serial port 0 in AT command mode (configuration possible using software with different functions at the serial port, this is out of the scope of this document).

2 AT command settings

u-blox Wireless Modules provides at least a physical serial interface (UART) compliant to V.24ter which starts in the command mode. For more details on command mode please refer to chapter 2.1.

For module and hyper terminal connection and settings see EVK-G25H Evaluation Kit Getting Started [43] or EVK-U12 EVK-U13 Getting Started [48] or EVK-G20 Evaluation Kit Getting Started [55].

2.1 Definitions

In this document the following naming conventions are used:

- DCE (Data Communications Equipment) or MT (Mobile Terminal): u-blox wireless module
- TE (Terminal Equipment) or DTE (Data Terminal Equipment): terminal that sends the command to the module

The terms DCE and DTE are used in the serial interface context.

u-blox Wireless Modules implement more than one interface between DTE and DCE, either virtual interfaces (MUX channels) or physical interfaces (UART, USB, SPI, etc., when available). Each interface works as specified by the followings definitions. If not differently stated, all the subsequent descriptions are applicable to every interface.

The differences among the interfaces in reference to the AT command interface are presented in the Appendix B.5.

The DCE interface can operate in two different modes:

- **Command mode**: the DCE waits for AT command instructions. Any characters sent to the DCE are interpreted as commands for the DCE to execute. The DCE may send responses back to the DTE indicating the outcome of the command or further information without having received any commands by the DTE (e.g. unsolicited response code - URC). Any communication in command mode (in either direction) is terminated by the command line termination character
- **Data mode**: the DCE transfers data after having sent the "CONNECT" string; any character sent to the DCE is intended to be transmitted to the remote party. Any further characters received over the serial link are deemed to be from the remote party, and any characters sent are transmitted to the remote party. The DCE enters data mode immediately after it makes a CSD or PSD connection
- **Online command mode**: the DCE is communicating with a remote party, but treats signals from the DTE on TxD as command lines and sends responses to the DTE on RxD

It is possible to switch between data and online command mode (when a data connection is established) in the following ways:

- with the escape sequence: for more details please refer to chapter S2
- via a DTR ON to OFF transition: for more details please refer to +++ table

To switch back to data mode from online command mode ATO command is used. For more detasila please refer to O command (chapter 15.19) and &D command (chapter 15.4).

2.1.1 Command description

AT commands configure and enable the wireless module functionalities in accordance to 3GPP normative and u-blox specifications. AT commands are provided to the module via a hyper terminal through a command line and are described in the following chapters. A general description of each command is provided including functionalities, correct syntax to be provided by the TE/DTE, possible responses, and an example. The command description defines each parameter of the command with its scope and parameter type, the supported values and the default value (when available).

The commands that apply to each u-blox wireless module are listed in the chapter B.

☞ The example provided in the command description refers only to the handling provided by the command. It could be applied only to a product not to all products which the document is applied to. The list of allowed values for a specific product is provided in the corresponding Defined Values chapter.

☞ In this document <CR><LF> are intentionally omitted.

☞ If a parameter is omitted, no value will be inserted between the two commas indicating the interested parameter in the command line sent by the DTE.

The following rules are used when describing the command syntax:

- <...>: Name in angle brackets is a parameter. The brackets themselves do not appear in the command line
- [...]: the square brackets represent the optional parameters of a command or an optional part of the TA information response. Brackets themselves do not appear in the command line. When parameter is not given, the value will be set to the default value provided in the command description

2.1.2 Default values

If the command parameters are optional, they can be also left out in the command line. In such cases normal default values are assumed as follows:

- In case of Number type parameters, the default value is 0, except the cases specified for each concerned command
- In case of String type parameters, the default value is an empty string, except the cases specified for each concerned command

2.1.3 Command line

AT commands are typically provided to wireless modules using a command line with the following generic syntax:

“AT”<command_name><string><S3_character>

Where:

- "AT": prefix to be set at the beginning of each command line
- <command_name>: command name string; it can have a “+” character as prefix
- <string>: string consisting of the value parameters following the syntax provided in this manual
- <S3_character>: Command line termination character, the character can be set with ATS3 command; the default value is <CR> (for more details refer to chapter 15.21)

☞ The maximum number characters sent on the same command line is 512. This value depends on the hyper terminal used; in some cases the number of characters is lower.

☞ The command line is not case sensitive except the following case: if autobauding is enabled then the attention mark “AT” must be typed either as “AT” or “at”; other combination (e.g “At”) are not allowed.

When writing or sending an SMS, CtrlZ or ESC terminates the command; <CR> is used between the 2 parts of the SMS (address and text).

More than one AT command can be entered on the same command line. The "AT" prefix must be provided only at the beginning of the command line. Each command must be separated by using a semicolon as delimiter only if the command has a "+" character as prefix.

Example: AT&VE1;+CMGF?;+COPS?<CR>

Not all commands can be entered with other commands on the same command line: +CMGW, +CMGS, +USOWR, +USOST, + UDWNFILE must be used stand-alone.

2.1.4 Information responses and result codes

The response format can be set with ATV command (for more details refer to the command description, section 15.31). The default setting (ATV1) is as follows:

Information responses: <S3_character><S4_character><text><S3_character><S4_character>

Result codes: <S3_character><S4_character><verbose code><S3_character><S4_character>

where

- <S3_character>: Command line termination character, the character can be set with S3 command (for more details refer to chapter 15.21)
- <S4_character> is the linefeed character, with value specified by command S4 (for more details refer to chapter 15.22)

If the command line is performed successfully, the string "OK" is sent.

If the command is not accepted by the MT a message error will be displayed. The format of the message error can be set with AT+CMEE command (see the command description form more details). The default setting adopted in this manual is AT+CMEE=2 and the message error is displayed with the format:

+CMS ERROR: <err>

if it is the response to a SMS related AT command, and with the format:

+CME ERROR: <err>

If it is the response to any other AT command.

where <err> represents the result code using verbose <err> values.

The most typical errors are listed as follows:

- If the command is not supported or unknown, +CME ERROR: unknown is sent
- If the command syntax is wrong, +CME ERROR: operation not supported is sent (it will be +CMS ERROR: operation not supported for SMS related commands)

The list of all allowed errors is available in Appendix A.6 and A.7. For some commands only the message "ERROR" is displayed and is documented in the command description.

A different procedure will be followed for the following operations:

- FTP, HTTP, SMTP, TCP, UDP connection
- PING operation
- Firmware Update over AT command and over the air

More details for retrieving the error type for these operations are provided in the corresponding chapters.

2.2 Profiles

The default settings of some commands are stored in the memory of the wireless module (for a complete list of the command please refer to chapter B.1). While a subset of these commands is stored in the non volatile memory, other default settings of the commands are organized in two personal profiles. The first profile is the default profile and the data contained in him is used during the module power on (for the complete list of the commands and their values please refer to B.1.

For more details related to the loading, storing and updating of the profiles please refer to AT&W (chapter 15.7), AT&V (chapter 15.8) command description.

2.3 S-parameters

The S-parameters, as specified in ITU-T reccomandation V250 [20], constitute a group of commands that begin with the string "ATS". They are generally indicated as S registers and are used to configure the way to operate of the module. Their syntax is:

ATS<parameter_number>?
ATS<parameter_number>=<value>

The number following the "S" is the referenced S parameter.

u-blox Wireless Modules supports the following set of S-parameters (<parameter_number>):

- 0: Automatic answer setting (for more details please refer to chapter 7.17)
- 2: Escape character setting (for more details please refer to chapter 15.19.2)
- 3: Command line termination character setting (for more details please refer to chapter 15.21)
- 4: Response formatting character setting (for more details please refer to chapter 15.22)
- 5: Command line editing character setting (for more details please refer to chapter 15.23)
- 6: Pause before blind dialling setting (for more details please refer to chapter 15.240)
- 7: Connection completion timeout setting (for more details please refer to chapter 15.25)
- 8: Command dial modifier time setting (for more details please refer to chapter 15.26)
- 10: Automatic disconnect delay setting (for more details please refer to chapter 15.27)
- 12: Escape prompt delay setting (for more details please refer to chapter 15.28)

If a <parameter_number> different from the aboves is introduced, the "S" command returns ERROR (+CME ERROR: operation not supported).

3 General operation

3.1 Start up and initialization

A complete start up can take place only with an SIM-card with disabled PIN-check. For a SIM-card with enabled PIN check the most commands are answered with +CME ERROR: SIM-PIN requested. After entering PIN via +CPIN command, which allows a start up completion, a lot of SIM-files will be read; it is possible that some commands are affected for a few seconds.

The serial interface driver does not allow a new command, until the old one is terminated by OK or +CME ERROR: <error>.

If at start up the MT detects inconsistencies related to the NVRAM the following message is displayed: "! NVR DOES NOT FIT TO SW-VERSION. NVR-update is needed !".

3.2 AT Commands mode

3.2.1 Action Command

An Action Command is used to force the DCE to transmit an information or execute a specific action for the command. A typical usage of this command mode is to provide the manufacturer settings proper of the DCE like manufacturer name, firmware version, etc.

3.2.2 Set Command

A Set Command is performed to set the preferred settings for the specific command. The set command is the only way to set the preferred settings in the DCE. For a subset of the commands is possible to store in the profile the current settings and retrieve them in another connection.

3.2.3 Read Command

A Read Command provides the current values of the command parameters. It is used to know the last configuration of the parameters of the command.

3.2.4 Test Command

A Test Command provides the complete list of the values supported by each parameter of the command.

For a specific set of commands the information can be provided directly by the DCE when a specific event happens. This type of command is an unsolicited (or intermediate) result and can be enabled through a set command.

3.2.5 Unsolicited Result Code (URC)

An unsolicited result code is a string message (provided by the DCE) which is not a response to a previous AT command and can be output, when enabled, at any time to inform the DTE of a specific event or status change. The URC can have the same name of the command that enables it (e.g. +CREG) or can be enabled by another command (e.g. unsolicited result code: +CMTI, command that enables it: +CNMI).

3.2.6 Intermediate Result Code (IRC)

An intermediate result code is a string message (provided by the DCE) which informs the DTE of the processing status of the pending AT command.

4 IPC – Inter Processor Communication

4.1 Multiplexing mode +CMUX

4.1.1 Description

Enables the multiplexing protocol control channel as defined in 3GPP 27.010 (for more details please refer to [46]). The command sets parameters for the control channel. If parameters are no specified, the default values are used. The response code is returned using the old interface speed. The parameters become active only after sending OK.

Usage of +CMUX command while multiplexing is not allowed.

The Mux configuration is reported as follows:

- Channel 0: control channel
- Channel 1 – 5: AT commands /data connection
- Channel 6: GPS tunnelling

Type	Syntax	Response	Example
Set	AT+CMUX=<mode>[,<subset>[,<port_speed>[,<N1>[,<T1>[,<N2>[,<T2>[,<T3>[,<k>]]]]]]]	OK	AT+CMUX=0,0,,1500,50,3,90 OK
Read	AT+CMUX?	+CMUX: <mode>,[<subset>],<port_speed>,<N1>,<T1>,<N2>,<T2>,<T3>[,<k>] OK	+CMUX: 0,0,0,1500,253,3,254,0,0 OK
Test	AT+CMUX=?	+CMUX: (list of supported <mode>s),(list of supported <subset>s),(list of supported <port_speed>s), (list of supported <N1>s), (list of supported <T1>s),(list of supported <N2>s),(list of supported <T2>s),(list of supported <T3>s), (list of supported <k>s) OK	+CMUX: (0),(0),,(1-1509),,(0-5),,, OK

4.1.2 Defined Values

Parameter	Type	Description
<mode>	Number	Multiplexer Transparency Mechanism • 0: Basic option (default); • 1-7: currently not supported, in case of read command 0 is returned.
<subset>	Number	Char set • 0: UIH frames used only (Default value); • 1: UI frames used only; value currently not supported; • 2: I frames used only; value currently not supported.
<port_speed>	Number	Transmission rate; this parameter is not supported and the value 0 is always displayed in case of read command.
<N1>	Number	Maximum frame size • 1-1509: Currently only the range 1-1509 is supported; the default value is 31
<T1>	Number	Acknowledgement timer in units of ten milliseconds • 1-255; currently only the value 253 is supported

Parameter	Type	Description
<N2>	Number	Maximum number of re-transmissions • 0-5: 3 is default; currently only the range 0-5 is supported
<T2>	Number	Response timer for the multiplexer control channel in units of ten milliseconds • only the values 0 and 254 are supported • 0 means that the timer is ignored • Default value: 254
<T3>	Number	Wake up response timer; the value is ignored; this parameter is not supported and the value 0 is always displayed in case of read command.
<k>	Number	Window size, for Advanced operation with Error Recovery options; the value is ignored. This parameter is not supported and the value 0 is always displayed in case of read command

If the mux protocol is not started (+CMUX set command has not been issued or returned ERROR) and +CMEE is set to 2, the +CMUX read command returns the following error message: +CME ERROR: operation not allowed.

For a complete compatibility between LEON-G100/G200 and LISA-U1 series, it is advisable to leave blank the unsupported/unused parameters (which are reported by the +CMUX test command as blank).

5 General commands

5.1 Manufacturer identification +CGMI

5.1.1 Description

Text string, determined by the manufacturer, identifying the manufacturer.

Type	Syntax	Response	Example
Action	AT+CGMI	<manufacturer> OK	u-blox OK
Test	AT+CGMI=?	OK	

5.1.2 Defined Values

Parameter	Type	Description
<manufacturer>	String	Manufacturer name

5.2 Request model identification +CGMM

5.2.1 Description

Text string, determined by the manufacturer, identifying the model identification.

Type	Syntax	Response	Example
Action	AT+CGMM	<model> OK	LEON-G200 OK
Test	AT+CGMM=?	OK	

5.2.2 Defined Values

Parameter	Type	Description
<model>	String	Name of model

5.3 Request Firmware version +CGMR

5.3.1 Description

Returns the firmware version of the module.

Type	Syntax	Response	Example
Action	AT+CGMR	<version> OK	07.11.00 OK
Test	AT+CGMR=?	OK	

5.3.2 Defined Values

Parameter	Type	Description
<version>	String	Firmware version

5.4 Request for IMEI +CGSN

5.4.1 Description

Returns the product serial number, IMEI (International Mobile Equipment Identity) of the MT.

Type	Syntax	Response	Example
Action	AT+CGSN	<IMEI> OK	004999010640000 OK
Test	AT+CGSN=?	OK	

5.4.2 Defined Values

Parameter	Type	Description
<version>	String	IMEI

5.5 Set TE character set +CSCS

5.5.1 Description

Selects the TE character set.

Type	Syntax	Response	Example
Set	AT+CSCS=<chset>	OK	AT+CSCS="IRA" OK
Read	AT+CSCS?	+CSCS=<chset> OK	+CSCS="IRA" OK
Test	AT+CSCS=?	+CSCS: (list of supported <chset>'s) OK	+CSCS: ("IRA","GSM","PCCP437","8859-1","UCS2","HEX") OK

5.5.2 Defined Values

Parameter	Type	Description
<chset>	String	• "IRA": International Reference Alphabet (ITU-T T.50) • "GSM": GSM default alphabet (3GPP TS 23.038) • "PCCP437": PC character set Code Page 437 • "8859-1": ISO 8859 Latin 1 character set • "UCS2": 16-bit universal multiple-octet coded character set (USO/IEC10646); UCS2 character strings are converted to hexadecimal numbers from 0000 to FFFF; e.g. "004100620063" equals three 16-bit characters with decimal values 65, 98 and 99 • "HEX": character strings consist only of hexadecimal numbers from 00 to FF; e.g. "032FE6" equals three 8-bit characters with decimal values 3, 47 and 230; no conversions to the original MT character set shall be done

5.6 Request international mobile subscriber identification +CIMI

5.6.1 Description

Request the IMSI (International Mobile Subscriber Identity).

Type	Syntax	Response	Example
Action	AT+CIMI	<IMSI> OK	222107701772423 OK
Test	AT+CIMI=?	OK	

5.6.2 Defined Values

Parameter	Type	Description
<IMSI>	String	

5.7 Card identification +CCID

5.7.1 Description

Returns the ICCID (Integrated Circuit Card ID) of the SIM-card. ICCID is a serial number identifying the SIM.

Type	Syntax	Response	Example
Action	AT+CCID	+CCID: <ICCID> OK	+CCID: 8939107800023416395 OK
Read	AT+CCID?	+CCID: <ICCID> OK	+CCID: 8939107900010087330 OK
Test	AT+CCID=?	OK	

5.7.2 Defined Values

Parameter	Type	Description
<ICCID>	String	ICCID of the SIM card

5.8 Request complete capabilities list +GCAP

5.8.1 Description

This command requests the list of capabilities, containing the corresponding command names. The Complete Capabilities List command indicates the major capability areas of the MT. Each area is presented by the selection command name of the specific capability area or some other predefined response.

The first response text (+FCLASS) informs that some fax or voice capabilities are present while the second supported area presented with +CGSM shows that all GSM commands of the present document are supported.

Type	Syntax	Response	Example
Action	AT+GCAP	+GCAP: <capability_area 1>[, <capability_area 2>[…]] OK	+GCAP: +FCLASS, +CGSM OK
Test	AT+GCAP=?	OK	

5.8.2 Defined Values

Parameter	Type	Description
<capability_area>	String	Command name or predefined response of the specific capability area In the Example: +FCLASS response text informs that some fax or voice capabilities are present, while +CGSM response text shows that all GSM commands of the present document are supported by the MT

5.9 Repeat last command A/

5.9.1 Description

Repeats the previously executed command again. Only the A/ command can not be repeated.

Type	Syntax	Response	Example
Action	A/		

☞ If autobauding is active, the MT is not able to recognize the command and the the command A/ cannot be used.

6 Mobile equipment control and status commands

6.1 Phone activity status +CPAS

6.1.1 Description

Returns the activity status <pas> of the MT.

Type	Syntax	Response	Example
Action	AT+CPAS	+CPAS: <pas> OK	
Test	AT+CPAS=?	+CPAS: (list of supported <pas>s) OK	+CPAS: (0-5) OK

6.1.2 Defined Values

Parameter	Type	Description
<pas>	Number	• 0: ready (MT allows commands from DTE) • 1: unavailable (MT does not allow commands from DTE) • 2: unknown (MT is not guaranteed to respond to instructions) • 3: ringing (MT is ready for commands from DTE, but the ringer is active) • 4: call in progress (MT is ready for commands from DTE, but a call is in progress, e.g. call active, hold, disconnecting) • 5: asleep (ME is unable to process commands from DTE because it is in a low functionality state)

6.2 Switch off MT +CPWROFF

6.2.1 Description

Switches off the MT. During shut-down current settings are saved in module's non-volatile memory.

☞ Using this command can result in following command line being ignored.

Type	Syntax	Response	Example
Action	AT+CPWROFF	OK	
Test	AT+CPWROFF=?	OK	

6.3 Set phone functionality +CFUN

6.3.1 Description

Selects level of functionality <fun> in the MT.

If the syntaxes +CFUN=15 or +CFUN=16 (resets) are used, the rest of the command line, placed after that, will be ignored.

Type	Syntax	Response	Example
Set	AT+CFUN=<fun>[,<rst>]	OK	AT+CFUN=1 OK
Read	AT+CFUN?	+CFUN: <power_mode>,<STK_mode> OK	+CFUN: 1,0 OK
Test	AT+CFUN=?	+CFUN: (list of supported <fun>'s) OK	+CFUN: (0,1,4,6,7,8,15,16) OK

6.3.2 Defined Values

Parameter	Type	Description
<fun>	Number	Selected functionality • 0: sets the MT to minimum functionality (disable both transmit and receive RF circuits) • 1: sets the MT to full functionality, e.g. from airplane mode or minimum functionality (default value) • 4: sets MT to airplane mode (disable both transmit and receive RF circuits) • 6: enables the SIM-toolkit interface and fetching of proactive commands by SIM-APPL from the SIM-card • 7: disables the SIM-toolkit interface and enables fetching of proactive commands by SIM-APPL from the SIM-card • 8: disable fetching of proactive commands by SIM-APPL from the SIM-card • 15: MT silent reset (with detach from network and saving of NVM parameters), without reset of the SIM card) • 16: MT silent reset (with detach from network and saving of NVM parameters), with reset of the SIM card
<rst>	Number	• 0: do not reset the MT before setting it to the selected <fun> (default value) • 1: reset the MT before setting it to the selected <fun>
<power_mode>	Number	• 1: MT is switched on • 2: invalid mode
<STK_mode>	Number	• 0: inactive state • 6: enables the SIM-toolkit interface and fetching of proactive commands by SIM-APPL from the SIM-card • 7: disables the SIM-toolkit interface and enables fetching of proactive commands by SIM-APPL from the SIM-card • 8: disable fetching of proactive commands by SIM-APPL from the SIM-card

On LEON-G100 / LEON-G200 series, the following restrictions must be be considered:

- <fun>=4 is not supported (<cfun>=0 can be used instead)
- <rst> parameter is available from LEON-G100-06x/LEON-G200-06x and subsequent versions
- <rst>=1 can be used only if <fun>=1
- <fun>=15 behaves as <fun>=16: the MT is reset as well as the SIM card

6.4 Battery charge +CBC

6.4.1 Description

Returns battery status <bcs> and battery charge level <bcl> of the MT. The charge level <bcl> will be also used to build and display the indicator "battchg" i.e. battery charge level in the response code +CIND (refer to chapter 6.5) and in the URC +CIEV (refer to chapter 6.6). The following mapping of "battchg" to <bcl> exists:

"battchg"	<bcl>
0	< 17 %
1	< 33 %
2	< 50 %
3	< 67 %
4	< 83 %
5	>= 83 %

Type	Syntax	Response	Example
Action	AT+CBC	+CBC: <bcs>,<bcl> OK	+CBC: 0,69 OK
Test	AT+CBC=?	+CBC: (list of supported <bcs>'s), (list of supported <bcl>'s) OK	+CBC: (0-3),(0-100) OK

6.4.2 Defined Values

Parameter	Type	Description
<bcs>	Number	Battery status • 0: MT is powered by the battery • 1: MT has a battery connected, but is not powered by it • 2: RFU • 3: Recognized power fault, calls inhibited
<bcl>	Number	Battery charge level • 0: battery is exhausted, or MT does not have a battery connected; • 1..100: battery has 1-100 percent remaining.

6.5 Indicator control +CIND

6.5.1 Description

The command provides indication states related to network status, battery information and so on.

In Set mode, the command does not allow setting the values for those indications which are set according to module state (see <descr> parameter).

The list of indication for set and read follows the indexes of reported in <descr> parameter, so that the first <ind> corresponds to "battchg" and so on.

For more details please refer to 3GPP 27.007 Technical Specification [2].

Type	Syntax	Response	Example
Set	AT+CIND=[<ind>[,<ind>[,...]]]	OK	AT+CIND= OK

Type	Syntax	Response	Example
Read	AT+CIND?	+CIND: <ind>[,<ind>[,...]] OK	+CIND: 5,0,0,0,0,0,0,0,0,0,0 OK
Test	AT+CIND=?	+CIND: (list of <descr>s) OK	+CIND: ("battchg",(0-5)),("signal",(0-5)),("service",(0,1)),("sounder",(0,1)),("message",(0,1)),("call",(0,1)),("roam",(0,1)),("smsfull",(0,1)),("gprs",(0-2)),("callsetup",(0-3)),("callheld",(0,1)),("simind",(0-2)) OK

6.5.2 Defined Values

Parameter	Type	Description
<ind>	Number	Range of corresponding <descr> used to identify the service when an unsolicited indication is provided

<descr>	String	Reserved by the norm and their <ind> ranges; it may have the values:
		• "battchg": battery charge level (0-5); see also +CBC (refer to chapter 0) for details
		• "signal": signal quality
		  ○ 0: < -107 dBm
		  ○ 1: < -93 dBm
		  ○ 2: < -71 dBm
		  ○ 3: < -69 dBm
		  ○ 4: < - 57 dBm
		  ○ 5: >= -57 dBm
		• "service": network service availability
		  ○ 0: Not registered to the network
		  ○ 1: Registered to the network
		• "sounder": sounder activity, indicating when the module is generating a sound
		  ○ 0: no sound
		  ○ 1: sound is generated
		• "message": Unread message available in <mem1> storage
		  ○ 0: no messages
		  ○ 1: unread message available
		• "call": call in progress
		  ○ 0: No call in progress
		  ○ 1: Call in progress
		• "roam": Registration on a roaming network
		  ○ 0: Not in roaming
		  ○ 1: Roaming
		• "smsfull": Indication that an SMS has been rejected with the cause of SMS storage full
		  ○ 0: SMS storage not full
		  ○ 1: SMS Storage full
		• "gprs": GPRS indication status:
		  ○ 0: No GPRS available in the network
		  ○ 1: GPRS available in the network but not registered
		  ○ 2: Registered to GPRS
		• "callsetup" : call set-up:
		  ○ 0: no call set-up
		  ○ 1: incoming call not accepted or rejected
		  ○ 2: outgoing call in dialing state
		  ○ 3: outgoing call in remote party alerting state
		• "callheld" : call on hold:
		  ○ 0: no calls on hold
		  ○ 1: at least one call on hold
		• "simind": SIM detection
		  ○ 0: No SIM detected
		  ○ 1: SIM detected
		  ○ 2: not available

☞ If the battery charging is not supported, "battchg" always returns 5 (full charge).

☞ The <descr> values can not be changed with +CIND set.

☞ "simind" is not supported on LEON-G100/G200 series module.

☞ To enable SIM detection status it is needed to opportunely configure the GPIO pin; for more details please refer to +UGPIOC command description, chapter 19.2.

6.6 Mobile termination event reporting +CMER

6.6.1 Description

Enables or disables sending of URCs from MT to DTE for indications. <mode> parameter controls the processing of URCs specified within this command.

The URC is generated each time an indicator which is defined in +CIND command changes status. The code is actually submitted to MT according to the settings of +CMER.

The command +UCIND allows enabling or disabling indicators (for more details refer to chapter 18.30).

Type	Syntax	Response	Example
Set	AT+CMER=[<mode>[,<keyp>[,<disp>[,<ind>[,<bfr>]]]]]	OK	AT+CMER=1,0,0,2,1 OK
Read	AT+CMER?	+CMER: <mode>,<keyp>,<disp>,<ind>,<bfr> OK	+CMER: 1,0,0,0,1 OK
Test	AT+CMER=?	+CMER: (list of supported <mode>'s), (list of supported <keyp>'s), (list of supported <disp>'s), (list of supported <ind>'s), (list of supported <bfr>'s) OK	+CMER: (0-3),(0),(0),(0-2),(0,1) OK
URC		+CIEV: <descr>,<value>	

6.6.2 Defined Values

Parameter	Type	Description
<mode>	Number	• 0: buffer URCs in the MT (default value) • 1: discard URCs when the V.24 interface is reserved for data; otherwise display them on DTE directly • 2: buffer URCs in MT when the V.24 interface is reserved and flush them after reservation; otherwise display them on DTE directly • 3: same as 1
<keyp>	Number	• 0: no keypad event reporting
<disp>	Number	• 0: no display event reporting
<ind>	Number	• 0: no indicator event reporting • 1: indicator event reporting using result code **+CIEV: <descr>,<value>** where <descr> indicates the indicator order number and <value> is the new value indicator. Only the indicator events which are not caused by +CIND shall be indicated by the MT to the DTE. • 2: indicator event reporting using result code **+CIEV: <descr>,<value>**. All indicator events shall be directed from MT to DTE.

Parameter	Type	Description
<bfr>	Number	• 0: MT buffer of URCs defined within this command is cleared when <mode> 1...3 is entered • 1: MT buffer of URCs defined within this command is flushed to the DTE when <mode> 1...3 is entered (OK response shall be given before flushing the codes).

<descr>	Number	• 1 ("battchg"): <value> provides the battery charge level (0-5); see also +CBC (refer to chapter 0) for details
		• 2 ("signal"): <value> provides the signal quality
		  ○ 0: < -107 dBm
		  ○ 1: < -93 dBm
		  ○ 3: < -71 dBm
		  ○ 3: < -69 dBm
		  ○ 4: < - 57 dBm
		  ○ 5: >= -57 dBm
		• 3 ("service"): <value> provides the network service availability
		  ○ 0: Not registered to the network
		  ○ 1: Registered to the network
		• 4 ("sounder"): <value> provides the sounder activity, indicating when the module is generating a sound
		  ○ 0: no sound
		  ○ 1: sound is generated
		• 5 ("message"): <value> provides the unread message available in <mem1> storage
		  ○ 0: no messages
		  ○ 1: unread message available
		• 6 ("call"): <value> provides the call in progress
		  ○ 0: No call in progress
		  ○ 1: Call in progress
		• 7 ("roam"): <value> provides the registration on a roaming network
		  ○ 0: Not in roaming
		  ○ 1: Roaming
		• 8 ("smsfull"): <value> provides the Indication that an SMS has been rejected with the cause of SMS storage full
		  ○ 0: SMS storage not full
		  ○ 1: SMS Storage full
		• 9 ("gprs"): <value> provides the GPRS indication status:
		  ○ 0: No GPRS available in the network
		  ○ 1: GPRS available in the network but not registered
		  ○ 2: Registered to GPRS
		• 10 ("callsetup"): <value> provides the call set-up:
		  ○ 0: no call set-up
		  ○ 1: incoming call not accepted or rejected
		  ○ 2: outgoing call in dialing state
		  ○ 3: outgoing call in remote party alerting state
		• 11 ("callheld") : <value> provides the call on hold:
		  ○ 0: no calls on hold
		  ○ 1: at least one call on hold
		• 12 ("simind"): <value> provides the SIM detection
		  ○ 0: No SIM detected
		  ○ 1: SIM detected

6.7 Clock +CCLK

6.7.1 Description

Sets the real-time clock of the MT.

Type	Syntax	Response	Example
Set	AT+CCLK=<time>	OK	AT+CCLK="02/07/01,14:54:00+01" OK

Type	Syntax	Response	Example
Read	AT+CCLK?	+CCLK: <time> OK	+CCLK: "02/07/01,14:55:00+01" OK
Test	AT+CCLK=?	OK	

6.7.2 Defined Values

Parameter	Type	Description
<time>	String	Format is "yy/MM/dd,hh:mm:ss±TZ". Characters indicate year, month, day, hour, minutes, seconds, time zone.

"TZ:" The Time Zone information is represented by two digits; the display of TZ for query contains always this information but it is updated only if the automatic time zone update is enabled via AT+CTZU command (before the registration on the network) and the network supports the time zone information.

The Time Zone information is expressed in steps of 15 minutes.

6.8 Alarm +CALA

6.8.1 Description

Sets an alarm time in the MT. There can be an array of different types of alarms. If the setting fails, a +CME ERROR: <error> is returned. To set up a recurrent alarm for more days in the week, the <recurr> parameter is used. When an alarm is timed out, the alarm actions are executed:

- Sound alarm (if not silent)
- URC **+CALV: <n>** is displayed on DTE

Type	Syntax	Response	Example
Set	AT+CALA=<time>[,<n>[,<type>[,<text>[,<recurr>[,<silent>]]]]]	OK	AT+CALA="02/07/01,14:56:00+04",1,1,"Alarm" OK
Read	AT+CALA?	[+CALA: <time>,<n1>,<type>,[<text>],[<recurr>],<silent> [+CALA: <time>,<n2>,<type>,[<text>],[<recurr>],<silent> [...]]] OK	+CALA: "02/07/01,14:56:00+04",1,0,"Alarm",0 OK
Test	AT+CALA=?	+CALA: (list of supported <n>s),(list of supported <type>s),<tlength>,<rlength>,(list of supported <silent>'s) OK	+CALA: (1-3),,255,13,(0-1) OK
URC		+CALV: <n>	

6.8.2 Defined Values

Parameter	Type	Description
<time>	String	Format is "yy/MM/dd,hh:mm:ss±TZ". Characters indicate year, month, day, hour,

Parameter	Type	Description
		minutes, seconds, time zone.
<n>, <n1>, <n2>	Number	indicates the index of the alarm, the allowed ranges are 1-3; if not indicated by user, default value 1 is assumed
<type>	Number	Type of the alarm; this parameter is ignored.
<text>	String	Indicates the text to be displayed when alarm time is reached; this parameter is ignored
<tlength>	Number	Indicates the maximum length of <text>; this parameter is ignored
<recurr>	String	Maximum string length is 13, indicates day of week for the alarm in one of the following formats: • <1..7>[,<1..7>[…]]: Sets a recurrent alarm for one or more days in the week. The digits 1 to 7 corresponds to the days in the week, Monday (1), …, Sunday (7). Example: The string "1,2,3,4,5" may be used to set an alarm for some weekdays. • "0": Sets a recurrent alarm for all days in the week and all following weeks
<rlength>	Number	Indicates the maximum length of <recurr>
<silent>	Number	Indicates if the alarm is silent or not • 1: the alarm will be silent and the only result from the alarm is the URC +CALV • 0: the alarm will not be silent

6.8.3 Switching off module after setting the alarm

Alternatively the module can be switched off after setting the alarm, the module switches on as soon as the alarm has expired. The following procedure can be followed:

- Set the RTC clock by AT command: AT+CCLK="06/12/29,11:00:00+00" (you can check the time set by AT+CCLK?)
- Set the RTC alarm by AT command: AT+CALA="06/12/29,11:01:00+00",1,0,"","",0 (you can check the alarm set by AT+CALA?)
- Switch off the MT with AT+CPWROFF

Output: The MT switches on as soon as the minute is expired and answers "+CALV:1". Try to send "AT" on the hyper terminal, the MT replies properly.

☞ If the MT cannot generate an alarm tone, only the text is displayed at alarm time

6.9 Delete alarm +CALD

6.9.1 Description

Deletes an alarm in the MT.

Type	Syntax	Response	Example
Set	AT+CALD=<n>	OK	AT+CALD=1 OK
Test	AT+CALD=?	+CALD: (list of <n>s) OK	+CALD: (1-3) OK

6.9.2 Defined Values

Parameter	Type	Description
<n>	Number	Indicates the index of the alarm; refer to +CALA description for the allowed range of indexes.

6.10 Restricted SIM access +CRSM

6.10.1 Description

Allows easy access to the SIM database. Set command transmits to the MT the SIM <command> and its required parameters. MT handles internally all SIM-MT interface locking and file selection routines. As response to the command, MT sends the actual SIM information parameters and response data. MT error result code +CME ERROR may be returned when the command cannot be passed to the SIM, but the failure in the execution of the command in the SIM is reported in <sw1> and <sw2> parameters.

Type	Syntax	Response	Example
Set	AT+CRSM=<command>[,<fileid>[,<P1>,<P2>,<P3>[,<data> [,<pathid>]]]]	+CRSM: <sw1>,<sw2>[,<response>] OK	AT+CRSM=176,28471,0,0,3 OK
Test	AT+CRSM=?	OK	

6.10.2 Defined Values

Parameter	Type	Description
<command>	Number	• 176: read binary • 178: read record • 192: get response • 214: update binary • 220: update record • 242: status
<fileid>	Number	Identifies elementary datafile on SIM. Mandatory for every command except STATUS (e.g. 28423: meaning IMSI file (6F07))
<P1>, <P2>, <P3>	Number	Defines the request. These parameters are mandatory for every command, except GET RESPONSE and STATUS. The values are described in GSM TS 11.11 [18].
<data>	String	Information which shall be written to the SIM (hexadecimal character format; refer to +CSCS (refer to chapter 5.5) – string containing hexadecimal characters)
<pathid>	String	Contains the path of an elementary file on the SIM/UICC in hexadecimal format as defined in ETSI TS 102 221 [50] (e.g. "7F205F70" in SIM and UICC case). The <pathid> shall only be used in the mode "select by path from MF" as defined in ETSI TS 102 221 [50]
<sw1>, <sw2>	Number	Contains SIM information about the execution of the actual command and can be (more details in GSM TS 11.11 [18]): • 0x90 0x00: normal ending of the command • 0x9F 0xXX: length XX of the response data • 0x92 0x0X: command successful but after using an internal retry routine X times • 0x92 0x40: memory problem • 0x94 0x00: no EF selected • 0x94 0x02: out of range (invalid address) • 0x94 0x04: file ID not found; pattern not found • 0x94 0x08: file is inconsistent with the command • 0x98 0x02: no CHV initialized • 0x98 0x04: access condition not fullfiled / unsucc. CHV verify / authent.failed • 0x98 0x08: in contradiction with CHV status • 0x98 0x10: in contradiction with invalidation status • 0x98 0x40: unsucc. CHV-verif. or UNBLOCK CHV-verif. / CHV blocked /UNBL.blocked • 0x98 0x50: increase can not be performed. Max. value reached • 0x67 0xXX: incorrect parameter P3 • 0x6B 0xXX: incorrect parameter P1 or P2 • 0x6D 0xXX: unknown instruction code given in the command

Parameter	Type	Description
		• 0x6E 0xXX: wrong instruction class given in the command • 0x6F 0xXX: technical problem with no diagnostic given
<response>	String	The response of successful completion of the command previously issued (hexadecimal character format; refer to +CSCS - chapter 5.5). STATUS and GET RESPONSE return data, which gives information about the current elementary datafield. This information includes the type of file and its size (refer to GSM TS 11.11 [18]). After READ BINARY or READ RECORD command the requested data will be returned. <response> is not returned after a successful UPDATE BINARY or UPDATE RECORD command.

6.11 Alert sound mode +CALM

6.11.1 Description

Selects the general alert sound mode.

Type	Syntax	Response	Example
Set	AT+CALM=<mode>	OK	AT+CALM=0 OK
Read	AT+CALM?	+CALM: <mode> OK	+CALM: 0 OK
Test	AT+CALM=?	+CALM: (list of supported <mode>s) OK	+CALM: (0-1) OK

6.11.2 Defined Values

Parameter	Type	Description
<mode>	Number	• 0: normal mode • 1: silent mode (ringtones and SMS tones are muted; +UTGN AT command is not supported)

☞ If an incorrect number of parameters is provided or the parameter value is out of range the message error "operation not supported"will be provided.

6.12 Ringer sound level +CRSL

6.12.1 Description

Selects the incoming ringer sound level.

Type	Syntax	Response	Example
Set	AT+CRSL=<level>	OK	AT+CRSL=2 OK
Read	AT+CRSL?	+CRSL: <level> OK	+CRSL: 2 OK
Test	AT+CRSL=?	+CRSL: (list of supported <level>s) OK	+CRSL: (0-5) OK

6.12.2 Defined Values

Parameter	Type	Description
<level>	Number	range 0-5 (0 means mute)

If an incorrect number of parameters is provided or the parameter value is out of range the message error "operation not supported"will be provided.

6.13 Loudspeaker volume level +CLVL

6.13.1 Description

Selects the speech volume.

Type	Syntax	Response	Example
Set	AT+CLVL=<level>	OK	AT+CLVL=30 OK
Read	AT+CLVL?	+CLVL: <level> OK	+CLVL: 80 OK
Test	AT+CLVL=?	+CLVL: (list of supported <level>s) OK	+CLVL: (0-100) OK

6.13.2 Defined Values

Parameter	Type	Description
<level>	Number	0-100 (0 means minimum)

If an incorrect number of parameters is provided or the parameter value is out of range the message error "operation not supported"will be provided.

6.14 Mute control +CMUT

6.14.1 Description

Enables and disables the uplink voice muting during all the voice calls.

Type	Syntax	Response	Example
Set	AT+CMUT=<n>	OK	AT+CMUT=0 OK
Read	AT+CMUT?	+CMUT=<n> OK	+CMUT: 0 OK
Test	AT+CMUT=?	+CMUT: (list of supported <n>s) OK	+CMUT: (0-1) OK

6.14.2 Defined Values

Parameter	Type	Description
<n>	Number	• 0: mute off (default value) • 1: mute on

If an incorrect number of parameters is provided or the parameter value is out of range the message error "operation not supported"will be provided.

6.15 Call meter maximum event +CCWE

6.15.1 Description

Allows sending a URC +CCWV to DTE, when enabled. The syntax of the URC is: **+CCWV**. The warning is issued when approximately 30 s call time remains. It is also sent when starting a call if less than 30 s call time remains.

Type	Syntax	Response	Example
Set	AT+CCWE=<mode>	OK	AT+CCWE=1 OK
Read	AT+CCWE?	+CCWE: <mode> OK	+CCWE: 0 OK
Test	AT+CCWE=?	+CCWE: (list of supported <mode>s) OK	+CCWE: (0-1) OK
URC		+CCWV	

6.15.2 Defined Values

Parameter	Type	Description
<mode>	Number	• 0: disable the call meter warning event • 1: enable the call meter warning event

6.16 Set greeting text +CSGT

6.16.1 Description

Sets and activates the greeting text. The greeting text is shown in the MT display when the MT is turned on. The command can also deactivate a text.

Type	Syntax	Response	Example
Set	AT+CSGT=<mode>[,<text>]	OK	AT+CSGT=1,"Hello user" OK
Read	AT+CSGT?	+CSGT: <text>,<mode> OK	+CSGT: "Hello",0 OK
Test	AT+CSGT=?	+CSGT: (list of <mode>s),<ltext> OK	+CSGT: (0-1),49 OK

6.16.2 Defined Values

Parameter	Type	Description
<text>	String	Contains the greeting text
<mode>	Number	• 0: turn off greeting text • 1: turn on greeting text
<ltext>	Number	Maximum length of <text>

The greeting message setting is saved in NVM after power off if changed.

6.17 Automatic Time Zone Update +CTZU

6.17.1 Description

Enables and disables automatic time zone update via NITZ.

Time Zone information is provided after network registration (if the network supports the time zone information).

Type	Syntax	Response	Example
Set	AT+CTZU=<onoff>	OK	AT+CTZU=1 OK
Read	AT+CTZU?	+CTZU: <onoff> OK	+CTZU: 0 OK
Test	AT+CTZU=?	+CTZU: (list of supported <onoff>s) OK	+CTZU: (0-1) OK

6.17.2 Defined Values

Parameter	Type	Description
<onoff>	Number	• 0: disable automatic time zone via NITZ (default value) • 1: enable automatic time zone update via NITZ; if the network supports the service, the local time of the module is changed (not only time zone)

6.18 Time Zone Reporting +CTZR

6.18.1 Description

Enables and disables time zone change event reporting. If reporting is enabled, the MT returns the URC:**+CTZV: <tz>** whenever time zone is changed.

Type	Syntax	Response	Example
Set	AT+CTZR=<onoff>	OK	AT+CTZR=1 OK
Read	AT+CTZR?	+CTZR: <onoff> OK	+CTZR: 0 OK
Test	AT+CTZR=?	+CTZR: (list of supported <onoff>s) OK	+CTZR: (0-1) OK
URC		+CTZV: <tz>	

6.18.2 Defined Values

Parameter	Type	Description
<onoff>	Number	• 0: disable time zone change event reporting (default value) • 1: enable time zone change event reporting
<tz>	Number	Indicates the time zone

The Time Zone reporting is not affected by the Automatic Time Zone setting command, +CTZU.

The Time Zone information is expressed in steps of 15 minutes.

6.19 Report mobile termination error +CMEE

6.19.1 Description

Enables or disables the use of result code +CME ERROR: <err> as an indication of an error relating to the functionality of the MT. When enabled, MT related errors cause +CME ERROR: <err> final result code instead of the regular ERROR final result code. ERROR is returned normally when error is related to syntax, invalid parameters or MT functionality.

Type	Syntax	Response	Example
Set	AT+CMEE=[<n>]	OK	AT+CMEE=2 OK
Read	AT+CMEE?	+CMEE: <n> OK	+CMEE: 0 OK
Test	AT+CMEE=?	+CMEE: (list of supported <n>s) OK	+CMEE: (0-2) OK

6.19.2 Defined Values

Parameter	Type	Description
<n>	Number	• 0: disable +CME ERROR: <err> result code and use ERROR instead • 1: enable +CME ERROR: <err> result code and use numeric <err> values • 2: enable +CME ERROR: <err> result code and use verbose <err> values

☞ When +CMEE=2 selected, the following convention is valid:

- If the error code is related to a parameter not covered by the GSM/ETSI or u-blox specification, the value <error>="operation not supported" shall be used
- If the MT is in a state which does not allow performing the entered command, the value <error>="operation not allowed" shall be used

6.20 List all available AT commands +CLAC

6.20.1 Description

Causes the MT to return one or more lines of AT commands that are available for the DTE user. Each line contains one AT command.

Type	Syntax	Response	Example
Action	AT+CLAC	<AT command 1> [<AT command 2> […]] OK	
Test	AT+CLAC=?	OK	

6.20.2 Defined Values

Parameter	Type	Description
<AT command>	String	AT command name

7 Call control commands

7.1 Select type of address +CSTA

7.1.1 Description

Selects the type of number for further dialling commands (D) according to 3GPP specifications.

Since type of address is automatically detected on the dial string of the D command, the +CSTA command has really no affect.

Type	Syntax	Response	Example
Set	AT+CSTA=[<type>]	OK	AT+CSTA=145 OK
Read	AT+CSTA?	+CSTA: <type> OK	+CSTA: 145 OK
Test	AT+CSTA=?	+CSTA: (list if supported <type>s) OK	+CSTA: (129,145) OK

7.1.2 Defined Values

Parameter	Type	Description
<type>	Number	• 145: dialing string includes international access code character "+" • 129: national coded dialing string (default value)

7.2 Dial command D

7.2.1 Description

Lists characters that may be used in a dialling string for making a call (voice, data or fax call) or controlling supplementary services in accordance with [15] and initiates the indicated kind of call. No further commands may follow in the command line in case of data or fax calls.

If the semicolon ";" is given after the phone number, a voice call is originated, regardless of the value set via +FCLASS command; otherwise the kind of call depends on the service class previously selected via +FCLASS command.

Type	Syntax	Response	Example
Action	ATD<number>[<I>][<G>][;]	See 7.2.3 "Responses"	(Voice Call) ATD123456; OK (Data / Fax Call) ATD123456 CONNECT 9600 (Supplementary Services) ATD*#43# +CCWA: 0,1 +CCWA: 0,2 +CCWA: 0,4 OK

7.2.2 Defined Values

Parameter	Type	Description
<number>	Number	Phone number; the allowed phone digits are the V.25ter dialing digits 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, *,#, +, A, B, C. Character D is allowed but ignored). ☞ ",", "T", "P", "!", "W" or "@" are ignored
<I>	String	Set the CLI status; allowed values are: • I (ASCII code 49 Hex): restrict CLI presentation • i: allow CLI presentation ☞ CLIR supplementary service subscription is overridden for this call.
<G>	String	Enable / disable the CUG supplementary service for the specific call • G: activate CUG • g: deactivate CUG The index and the information parameters used dunring the call will be the same previously set with +CCUG command (pelase refer to chapter 12.16).
<data rate>	Number	Refer to command +CBST (refer to paragraph 7.2.3 "Responses") ☞ In case of data/fax call, refer to "Circuit 108/2, +++ behavior for the different &D: summarizing table" (chapter 15.4.4) to return in Command Mode and disconnect the call.

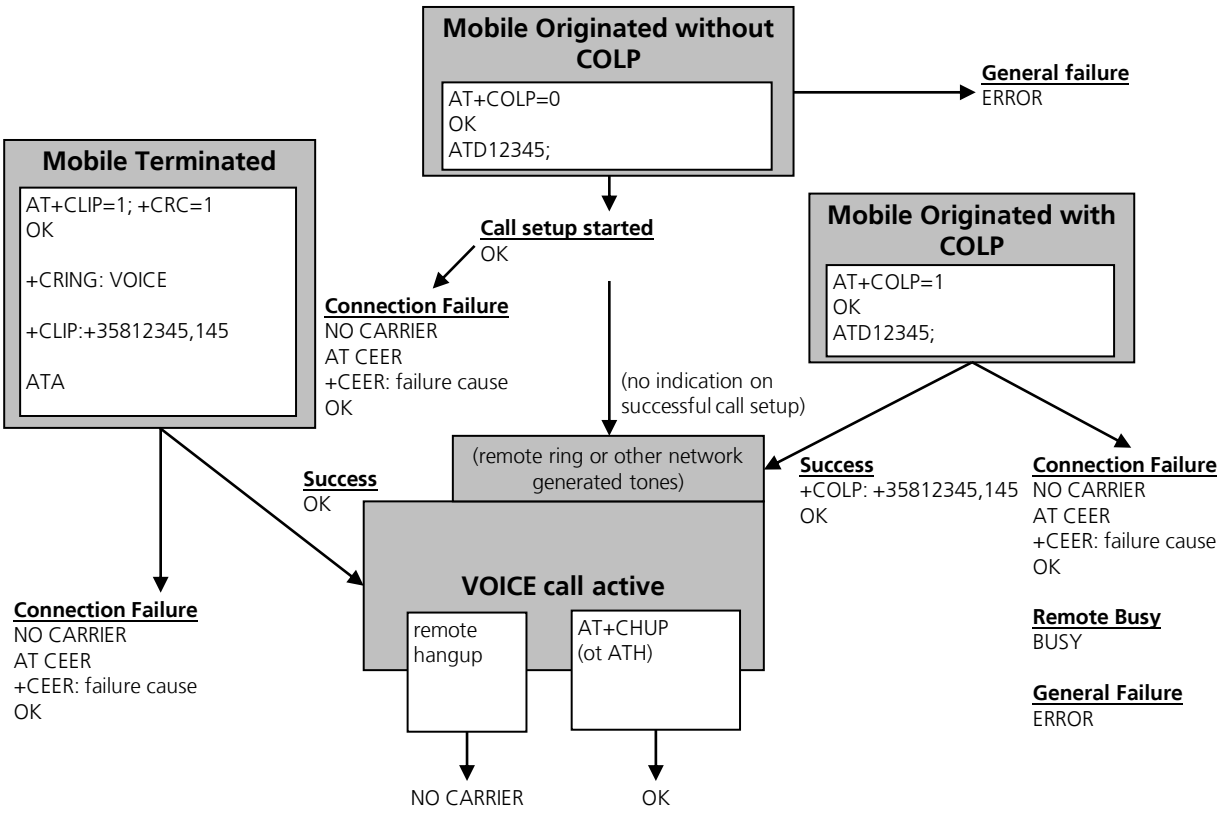
7.2.3 Responses

The following table lists the possible responses to the command. The response is formated using the ATV command (for more details see chapter 15.31).

Verbose	Numeric	Description
OK	0	Acknowledges successful execution of the command; this response is provided only during voice calls
CONNECT	1	A connection has been established
NO CARRIER	3	The connection has been terminated from the remote part or the attempt to establish a connection failed
ERROR	4	General failure
BUSY	7	Engaged signal detected (the called number is busy)
NO ANSWER	8	If no hang up is detected after a fixed network timeout
CONNECT<data rate>	9	Same as CONNECT but includes the data rate (data call)

7.2.4 Voice Call Example

The following diagram illustrates the possible transitions in both Mobile Terminated and Mobile Originated calls. Responses and result codes generated by MT are in italic.



7.3 Direct calling from phonebooks D>

7.3.1 Description

Allows voice, data or fax calls, selecting the phone number from the phonebook.

☞ If the semicolon ";" is given after the phone number, a voice call is originated, regardless of the value set via +FCLASS command; otherwise the kind of call depends on the service class previously selected via +FCLASS command.

Type	Syntax	Response	Example
Action	ATD><str>[I][G][;]	See 7.2.3 "Responses"	ATD>"u-blox"; OK
	ATD><mem><n>[I][G][;]	See 7.2.3 "Responses"	ATD>SM1; OK
	ATD><n>[I][G][;]	See 7.2.3 "Responses"	ATD>1; OK

7.3.2 Defined Values

Parameter	Type	Description
<str>	String	D><str>[I][G][;] originates a call to phone number with corresponding alphanumeric field in the phonebook (set via +CPBS command; more details in chapter 10.1) is <str>.
<mem><n>	String	D><mem><n>[I][G][;] originates a call to phone number in memory (one of the phonebooks) <mem> entry location <n>; refer to +CPBS command (chapter 10.1) for <mem> value. ☞ <mem> value must be inserted without ""
<n>	String	D><n>[I][G][;] originate a call to phone number in entry location <n> of the phonebook (set via +CPBS command; more details in chapter 10.1).
[I][G][;]	String	Refer to paragraph 7.2 "Dial command D"

7.4 Select tone dialling T

7.4.1 Description

Causes subsequent (or previous) D command to assume that DTMF dialling is to be used. Because in GSM DTMF dialling is default, this command has no affect.

Type	Syntax	Response	Example
Action	ATT	OK	

7.5 Select pulse dialling P

7.5.1 Description

Causes subsequent (or previous) D command to assume that pulse dialling is to be used. Because in GSM DTMF dialling is default, this command has no affect.

Type	Syntax	Response	Example
Action	ATP	OK	

7.6 Call answer A

7.6.1 Description

Instructs the DCE to immediately connect to line and start the answer sequence as specified for the underlying DCE. Any additional command that appears after A on the same command line is ignored. The command is abortable. The user is informed that an incoming call is waiting, by the information result code RING or +CRING: <type> (refer to chapter 13.5) displayed on MT.

Type	Syntax	Response	Example
Action	ATA	RING OK	

7.7 Hook control H

7.7.1 Description

Disconnects the remote user. In case of multiple calls, active calls are released, but neither waiting nor held calls.

☞ In case of dual service calls ATH will modify the data part of the call to the voice part, fax is not affected. If the module is GPRS context activated in On-Line Command Mode (OLCM) the ATH command deactivates the context. During the GPRS OLCM an incoming CS call can be accepted with a ATA command (chapter 7.6). Subsequent ATH command releases the current CS call while leaving the GPRS context activated. In this state a second ATH command also deactivates the GPRS context.

☞ On LISA-U1 series a CS data call can't be established during GPRS OLCM (CS voice call only).

Type	Syntax	Response	Example
Action	ATH	OK	

7.8 Monitor speaker loudness L

7.8.1 Description

Controls the volume of the monitor speaker. It has no affect.

Type	Syntax	Response	Example
Action	ATL[<value>]	OK	

7.8.2 Defined Values

Parameter	Type	Description
<value>	Number	0-3

7.9 Monitor speaker mode M

7.9.1 Description

Controls when the monitor speaker is on. The command has no affect.

Type	Syntax	Response	Example
Action	ATM<value>	OK	

7.9.2 Defined Values

Parameter	Type	Description
<value>	Number	0-2

7.10 Call mode +CMOD

7.10.1 Description

Selects the call mode of further dialing commands (D) or for next answering command (A).

Type	Syntax	Response	Example
Set	AT+CMOD=<mode>	OK	AT+CMOD=0 OK
Read	AT+CMOD?	+CMOD: <mode> OK	+CMOD: 0 OK
Test	AT+CMOD=?	+CMOD: (list of supported <mode>s) OK	+CMOD: (0-1) OK

7.10.2 Defined Values

Parameter	Type	Description
<mode>	Number	• 0: single mode • 1: TS61 (voice alternating with fax) ☞ TS means Tele Service.

7.11 Hang up call +CHUP

7.11.1 Description

Causes the MT to hang up the current GSM call.

☞ All active calls will be released but neither waiting nor held calls.

Type	Syntax	Response	Example
Action	AT+CHUP	OK	
Test	AT+CHUP=?	OK	

7.12 Extended error report +CEER

7.12.1 Description

Causes the MT to return one or more lines of information text <report>, determined by the MT manufacturer, which offer an extended report of the reason for:

- The failure in the last unsuccessful call setup or in-call modification
- The last call release
- The last unsuccessful GPRS attach or unsuccessful PDP context activation
- The last GPRS detach or PDP context deactivation

Type	Syntax	Response	Example
Action	AT+CEER	+CEER: <type>[,<cause>, <error_description>][,<SS_cause_error>] [, <tag>, <SS_cause>] OK	+CEER: normal, NO CARRIER OK

Type	Syntax	Response	Example
Test	AT+CEER=?	OK	

7.12.2 Defined Values

Parameter	Type	Description
<report>	String	The total number of characters, including line terminators, in the information text does not exceed 2041. The <report> text is the failure cause from [12].
<type>	String	• CC setup error: <cause> and <error_description> parameters are provided • CC modification error: <cause> and <error_description> parameters are provided • CC release: <cause> and <error_description> parameters are provided • SM attach error: <cause> and <error_description> parameters are provided • SM detach: <cause> and <error_description> parameters are provided • SM activation error: <cause> and <error_description> parameters are provided • SM deactivation: <cause> and <error_description> parameters are provided • SS network GSM cause: <SS_cause_errors> parameters are provided • SS network reject cause: <tag> and <SS_cause> parameters are provided • No report available: no more parameters are provided
<cause>	Number	Code number of the received error; more details in chapter A.8
<error_description>	String	Code description of the received error; more details in chapter A.8
<SS_cause_errors>	Number	Contains the SS network error cause (MN cause)
<SS_cause>	Number	TAG received in the network reject
<tag>	Number	CAUSE received in the network reject

7.13 Single numbering scheme +CSNS

7.13.1 Description

Selects the bearer or teleservice to be used when mobile terminated single numbering scheme call is established. Parameter values set with +CBST command shall be used when <mode> equals to a data service.

The behavior of this command is strictly dependant from the network service.

Test command returns values supported as compound values.

Before setting +CSNS to 4 (data), the bearer capability to be sent to the network must be defined with AT+CBST command (e.g. AT+CBST=0,0,1) (please refer to chapter 13.1).

Type	Syntax	Response	Example
Set	AT+CSNS=<mode>	OK	AT+CSNS=0 OK
Read	AT+CSNS?	+CSNS: <mode> OK	+CSNS: 0 OK
Test	AT+CSNS=?	+CSNS: (list of supported <mode>s) OK	+CSNS: (0,2,4) OK

7.13.2 Defined Values

Parameter	Type	Description
<mode>	Number	• 0: voice • 2: fax (TS 62; TS means Tele Service) • 4: data

<mode>=2 is not supported on LISA-U1 series.

7.14 Tone duration +VTD

7.14.1 Description

Refers to an integer <n> that defines the length of tones emitted as a result of the +VTS command.

The effective maximum DTMF tone duration is network dependent, i.e. the receiver can experience a shorter tone duration than the one specified with +VTD (or with +VTS).

Type	Syntax	Response	Example
Set	AT+VTD=[<n>]	OK	AT+VTD=2 OK
Read	AT+VTD?	+VTD: <n> OK	+VTD: 1 OK
Test	AT+VTD=?	+VTD: (list of supported <n>s) OK	+VTD: (0-255) OK

7.14.2 Defined Values

Parameter	Type	Description
<n>	Number	Range of 0 to 255. A value different than zero causes a tone of duration <n>/10 seconds. The value 1 is default. If the value 0 is selected, the tone duration is set to 1/10 seconds.

7.15 DTMF and tone generation +VTS

7.15.1 Description

Allows transmission of DTMF tones. These tones may be used e.g. when announcing the start of a recording period. The command can only be used during an active voice call. If the optional parameter <duration> is left out or set to 0, the tone duration is given by the setting +VTD (see +VTD description). The command is abortable if a character is sent to DCE during the command execution, and it is not covered by the 3GPP specification.

Type	Syntax	Response	Example
Set	AT+VTS=<DTMF>[,<duration>]	OK	AT+VTS=2 OK or AT+VTS=2A,10 OK

Type	Syntax	Response	Example
Test	AT+VTS=?	+VTS: (list of <DTMF>s),(list of supported <duration>s) OK	+VTS: (0-9,#,*,A-D),(0-255) OK

7.15.2 Defined Values

Parameter	Type	Description
<DTMF>	Character	String of ASCII characters in the set 0-9, #, *, A-D.
<duration>	Number	Range 0-255, expressed in hundredth of seconds. This parameter is optional. The default value is 1/100 of seconds

7.16 Redial last telephone number DL

7.16.1 Description

Redials the last number used in the ATD command. This command can be aborted.

On LEON-G100 / LEON-G200 series, both ATDL and ATDL; commands redial the last called number as voice call, regardless if the number was previously dialled as data or voice call.

On LISA-U1 series, ATDL command redials the last called number as data call, while ATDL; command redials the last called number as voice call, regardless if the number was previously dialled as data or voice call.

Type	Syntax	Response	Example
Action	ATDL[;]	See 7.2.3 "Responses"	ATDL OK

7.17 Automatic answer S0

7.17.1 Description

Controls the automatic answering feature of the DCE. If set to 0, automatic answering is disabled, otherwise it causes the DCE to answer when the incoming call indication (RING) has occurred the number of times indicated by the value.

Type	Syntax	Response	Example
Set	ATS0=<value>	OK	ATS0=2 OK
Read	ATS0?	<value> OK	000 OK

7.17.2 Defined Values

Parameter	Type	Description
<value>	Number	Value in the range 0-255; in the read answer <value> is "xxx" format • 0: disables automatic answer mode (default value) • 1-255: Enables automatic answering after specified number of rings

On LEON-G100/LEON-G200 series <value> value is not mandatory.

8 Network service commands

8.1 Subscriber number +CNUM

8.1.1 Description

Returns the MSISDNs related to this subscriber. If the subscriber has different MSISDN for different services, each MSISDN is returned in a separate line.

MSISDN is read from the SIM.

Type	Syntax	Response	Example
Action	AT+CNUM	+CNUM: [<alpha1>],<number1>,<type1> [+CNUM: [<alpha2>],<number2>,<type2> [...]] OK or OK	+CNUM: "Mario Rossi","+39320821708",145 +CNUM: "ABCD . AAA","123456789012",129 OK
Test	AT+CNUM=?	OK	

8.1.2 Defined Values

Parameter	Type	Description
<alphax>	String	Associated with <numberx>; used character set is selected by setting +CSCS (refer to chapter 5.5)
<numberx>	String	Phone number of format specified by <typex>
<typex>	Number	Type of address, octet in Number format (145 when <numberx> string includes "+", otherwise 129)

8.2 Signal quality +CSQ

8.2.1 Description

Returns signal strength indication <rssi> and channel bit error rate <ber> from the MT. The radio signal strength <rssi> will be also used to build and display the indicator "signal" i.e. signal quality in the response code +CIND (refer to chapter 6.5) and in the URC +CIEV (refer to chapter 6.6).

The following mapping of "signal" to <rssi> exists:

"signal"	<rssi>	
0	< 4 or 99	(<= -106 dBm or unknown)
1	< 10	(<= -96 dBm)
2	< 16	(<= -84 dBm)
3	< 22	(<= -72 dBm)
4	< 28	(<= -60 dBm)
5	>=28	(> -60 dBm)

Type	Syntax	Response	Example
Action	AT+CSQ	+CSQ: <rssi>,<ber> OK	+CSQ: 2,5 OK
Test	AT+CSQ=?	+CSQ: (list of supported <rssi>s), (list of supported <ber>s) OK	+CSQ: (0-31,99),(0-7,99) OK

8.2.2 Defined Values

Parameter	Type	Description
<rssi>	Number	Received Signal Strength Indication - range for GSM: • 0: -113dBm or less • 1: -111 dBm • 2..30: from -109 to -53 dBm • 31: -51 dBm or greater • 99: not known or not detectable
<ber>	Number	Bit Error Rate • 0..7: as RXQUAL values as described in GSM05.08 • 99: not known or not detectable.

8.3 Operator selection +COPS

8.3.1 Description

This command forces an attempt to select and register the GSM/UMTS network operator. Through <mode> parameter the network selection can be performed automatically or forced by this command: the access technology is indicated in <AcT> parameter (where supported).

☞ <format> and <oper> parameters are optional only if the value of <mode> parameter is either 0, 2 or 3.

☞ <AcT> parameter is not available on LEON-G100/G200 series.

Type	Syntax	Response	Example
Set	AT+COPS=[<mode>[,<format>[,<oper>[,<AcT>]]]]	OK	AT+COPS=0,0 OK AT+COPS=5 MCC:222, MNC: 88, LAC:55fa, CI:ffff, BSIC:3f, Arfcn:00104, RxLev:037 MCC:222, MNC: 10, LAC:4e54, CI:ffff, BSIC:32, Arfcn:00080, RxLev:032 ... ... MCC:222, MNC: 88, LAC:55fa, CI:1d39, BSIC:3d, Arfcn:00756, RxLev:005 OK
Read	AT+COPS?	+COPS: <mode>[,<format>,<oper>[,<AcT>]] OK	+COPS: 0,0,"vodafone IT" OK

Type	Syntax	Response	Example
Test	AT+COPS=?	+COPS: [(<stat>, long <oper>, short <oper>, numeric <oper>[,<AcT>])[,(<stat>, long <oper>, short <oper>, numeric <oper>[,<AcT>]),[…]]],(list of supported <mode>s),(list of supported <format>s) OK	+COPS: (2,"vodafone IT","voda IT","22210"),(1,"SI vodafone","vodafone SI","29340"),(1,"I WIND","I WIND","22288"),(1,"I TIM","TIM","22201"),(1,"MOBITEL","MOBITEL","29341"),,(0-4),(0-2) OK

8.3.2 Defined Values

Parameter	Type	Description
<mode>	Number	Is used to select whether the selection is done automatically by the MT or is forced by this command to operator <oper> given in the format <format>: • 0: automatic (<oper> field is ignored) (default value) • 1: manual • 2: deregister from network • 3: set only <format> • 4: manual/automatic • 5: extended network search
<format>	Number	• 0: long alphanumeric <oper> • 1: short format alphanumeric <oper> • 2: numeric <oper>
<oper>	String	Given in format <format>; this field may be up to 16 character long for long alphanumeric format, up to 8 characters for short alphanumeric format and 5 characters long for numeric format (MCC/MNC codes)
<stat>	Number	• 0: unknown • 1: available • 2: current • 3: forbidden
<AcT>	Number	Indicates the radio access technology • 0: GSM • 2: UTRAN

If the antenna is not connected the response to the test command is: +COPS: ,,(0-4),(0-2)

If <mode>= 0 only one parameter will be saved in the profile while the PLMN will be not stored. If the MT is set in normal mode, PLMN information will be stored in the profile.

The application/user should not rely on the Set command response "OK" as a confirmation that the network selection has been performed. To determine the network registration status, rely on the URC +CREG (refer to chapter 8.4).

The command is accessible also without an inserted SIM. In this case the command AT+COPS=0 returns always ERROR because the network registration cannot be performed without the SIM, while the configuration (i.e. automatic registration) is correctly set. The set value can be checked with the command AT+COPS? or checking the active profile with AT&V (parameter <format> is then also visible).

If <mode>=4 the module starts a manual network selection; if the operation is not successful the module will start an automatic network selection and will remain in automatic mode.

If <mode>=5 is set, an extended network search is performed; the BCCH frequencies are reported, except the BCCH frequencies belonging to the BA list of the serving cell (reported in AT+CGED command if <mode> is set to 5 or 6). The command response includes the following data: MCC, MNC, LAC, CI, BSIC, Arfcn, RxLev (refer to +CGED command for the parameter description).

☞ <mode>=5 is not supported on LISA-U1 series.

☞ After having set <mode> to 0 is given, a further set command with <mode>=0 is considered as a user reselection, triggering a search for the HPLMN. This is useful in international roaming in areas where the HPLMN is available.

8.4 Network registration +CREG

8.4.1 Description

Controls the presentation of a URC **+CREG: <stat>** when <n>=1 and there is a change in the MT network registration status, or code **+CREG: <stat>[,<lac>,<ci>]** when <n>=2 and there is a change of the network cell.

☞ On LEON-G100 / LEON-G200 series, if GPRS is enabled and +CREG and +CGREG URCs are both enabled too, once the module is registered and attached then the two URCs are sent out quite at the same time.

Type	Syntax	Response	Example
Set	AT+CREG=[<n>]	OK	AT+CREG=1 OK
Read	AT+CREG?	+CREG: <n>, <stat>[,<lac>,<ci>] OK	+CREG: 0,0 OK
Test	AT+CREG=?	+CREG: (list of the supported <n>s) OK	+CREG: (0-2) OK
URC		+CREG: <stat>[,<lac>,<ci>]	+CREG: 1,"4E54","44A5"

8.4.2 Defined Values

Parameter	Type	Description
<n>	Number	• 0: disable network registration URC (default value) • 1: enable network registration URC **+CREG: <stat>** • 2: enable network registration and location information URC **+CREG: <stat>[,<lac>,<ci>]**
<stat>	Number	• 0: not registered, MT is not currently searching a new operator to register to • 1: registered, home network • 2: not registered, but MT is currently searching a new operator to register to • 3: registration denied • 4: unknown • 5: registered, roaming
<lac>	String	Two bytes location area code in hexadecimal format (e.g. "00C3")
<ci>	String	Two bytes cell ID in hexadecimal format (e.g. "A13F")

8.5 Preferred operator list +CPOL

8.5.1 Description

Edits the user preferred list of networks in the active application on the UICC (GSM) or preferred list of networks in the SIM card. On LISA-U1 series the Access Technology lists are also provided. Set command writes an entry in

the SIM list of preferred operators ($EF_{PLMNsel}$), when the SIM card is present or when the UICC is present with an active GSM application.

If <index> is given but <oper> is left out, the entry is deleted. If only <format> is given, the <oper> format in the read command is changed. On LISA-U1 series, <GSM_AcT>, <GSM_Compact_AcT> and <UTRAN_AcT>, are required when writing user controlled PLMN selector with Access Technology ($EF_{PLMNselwAcT}$).

The read command returns all used entries from the SIM list of preferred PLMNs and on LISA-U1 series with the Access Technologies for each PLMN in the list.

☞ <GSM_AcT>, <GSM_Compact_AcT> and <UTRAN_AcT> parameters are not available on LEON-G100/G200 series.

Type	Syntax	Response	Example
Set	AT+CPOL=[<index>][,<format>[,<oper>[,<GSM_AcT>,<GSM_Compact_AcT>,<UTRAN_AcT>]]]	OK	AT+CPOL=2,0,"I WIND",1,0,1 OK
Read	AT+CPOL?	+CPOL: <index1>,<format>,<oper1>[,<GSM_AcT1>,<GSM_Compact_AcT1>,<UTRAN_AcT1>] [+CPOL: <index2>,<format>,<oper2>[,<GSM_AcT2>,<GSM_Compact_AcT2>,<UTRAN_AcT2>]...] OK	+CPOL: 1,0,"F SFR",1,0,1 +CPOL: 2,0,"TIM I",1,0,1 OK
Test	AT+CPOL=?	+CPOL: (list of supported<index>s), (list of supported <format>s) OK	+CPOL: (1-30),(0-2) OK

8.5.2 Defined Values

Parameter	Type	Description
<index> / <indexn>	Number	Represents the order number of operator in the SIM preferred operator list
<format>	Number	See also +COPS (chapter 8.3) • 0: long format alphanumeric <oper> • 1: short format alphanumeric <oper> • 2: numeric <oper>
<oper> / <opern>	String	Format indicated by <format>
<GSM_AcT>	Number	GSM access technology • 0: access technology not selected • 1: access technology selected
<GSM_Compact_AcT>	Number	GSM compact access technology • 0: access technology not selected • 1: access technology selected
<UTRAN_AcT>	Number	UTRA access technology • 0: access technology not selected • 1: access technology selected

8.6 Read operator names +COPN

8.6.1 Description

Returns the list of operator names from the MT. Each operator code <numeric n> that has an alphanumeric equivalent <alpha n> in the MT memory shall be returned.

Type	Syntax	Response	Example
Action	AT+COPN	+COPN: <numeric 1>,<alpha1> [+COPN: <numeric2>,<alpha2> [...]] OK	+COPN: "21901","T-Mobile HR" +COPN: "21910","HR VIP" +COPN: "22201","I TIM" +COPN: "22210","vodafone IT" OK
Test	AT+COPN=?	OK	OK

8.6.2 Defined Values

Parameter	Type	Description
<numeric n>	String	operator in numeric format (see +COPS (chapter 8.3))
<alpha n>	String	operator in long alphanumeric format (see +COPS (chapter 8.3))

8.7 User to user signalling service 1 +CUUS1

8.7.1 Description

Allows the control of the User-to-User Signalling Supplementary Sevice 1 (UUS1) according to [29]. Parameters <message> and <UUIE> are used to activate/deactivate the implicit request of the User-to-User Signalling Supplementary Service 1. When <message> and <UUIE> are both present the string specified in <UUIE> is included as the value part of the User-to-User Information Element (as defined in 3GPP TS 24.008 [30]) into all subsequent messages of type <message>. If parameter <message> is present but parameter <UUIE> is not present then the User-to-User Information Element shall not be present in subsequent messages of type <message>.

<n> and <m> parameters are used to enable/disable the presentation of incoming User-to-User Information Elements. When <n>=1 and a User-to-User Information is received after a mobile originated call setup or after hanging up a call, IRC +CUUS1I: <message>,<UUIE> is sent to the DTE.

When <m>=1 and a User-toUser Information is received during a mobile terminated call setup or during a remote party call hangup, URC **+CUUS1U: <messageU>,<UUIE>** is sent to the DTE.

Type	Syntax	Response	Example
Set	AT+CUUS1=[<n>[,<m>[,<message>[,<UUIE> [,<message>[,<UUIE>[,...]]]]]]	OK	AT+CUUS1=1,1,1,"7E0005123456" OK
Read	AT+CUUS1?	+CUUS1: <n>,<m>[,<message>,<UUIE> [,<message>,<UUIE>[,...]]] OK	+CUUS1:0,0 OK
Test	AT+CUUS1=?	+CUUS1: (list of supported <n>s), (list of supported <m>s), (list of supported <message>s), (list of supported <messageI>s),(list of supported <messageU>s) OK	+CUUS1: (0,1),(0,1),(0-6),(0-4),(0-3) OK
IRC		+CUUS1I: <message>,<UUIE>	
URC		+CUUS1U: <messageU>,<UUIE>	

8.7.2 Defined Values

Parameter	Type	Description
<n>	Number	Sets/shows the +CUUS1I result code presentation status in the MT • 0: disable • 1: enable
<m>	Number	Sets/shows the +CUUS1U result code presentation status in MT • 0: disable • 1: enable
<message>	Number	Type of message containing the outgoing User-to-User Information Element • 0: ANY • 1: SETUP • 2: ALERT • 3: CONNECT • 4: DISCONNECT • 5: RELEASE • 6: RELEASE_COMPLETE
<messageI>	Number	Type of message containing the intermediate User-to-User Information Element • 0: ANY • 1: ALERT • 2: PROGRESS • 3: CONNECT (sent after +COLP if enabled) • 4: RELEASE
<messageU>	Number	Type of message containing the unsollicited User-to-User Information Element • 0: ANY • 1: SETUP (returned after +CLIP if presented, otherwise after every RING or +CRING (refer to chapter 13.4)) • 2: DISCONNECT • 3: RELEASE_COMPLETE
<UUIE>	Number	The User-user Information Element (as defined in [12]) in hexadecimal character format (for hexadecimal format, refer +CSCS, chapter 13.4).

If the MT does not distinguish the type of message containing the User-to-user Information Element, it can use the value for ANY message.

9 Security commands

9.1 Enter PIN +CPIN

9.1.1 Description

Enter PIN. If no PIN request is pending, the corresponding error code is returned. If wrong PIN is given three times, PUK must be inserted with this syntax: AT+CPIN="SIM PUK","<newpin>"; this second pin, <newpin>, replaces the old pin in the SIM.

Type	Syntax	Response	Example
Set	AT+CPIN=<pin>[,<newpin>]	OK	AT+CPIN="0933" OK
Read	AT+CPIN?	+CPIN: <code> OK	+CPIN: SIM PIN OK
Test	AT+CPIN=?	OK	

9.1.2 Defined Values

Parameter	Type	Description
<pin>, <newpin>	String	
<code>	String	• READY: MT is not pending for any password • SIM PIN: MT is waiting SIM PIN to be given • SIM PUK: MT is waiting SIM PUK to be given • SIM PIN2: MT is waiting SIM PIN2 to be given • SIM PUK2: MT is waiting SIM PUK2 to be given • PH-NET PIN: MT is waiting network personalization password to be given • PH-NETSUB PIN: MT is waiting network subset personalization password to be given • PH-SP PIN: MT is waiting service provider personalization password to be given • PH-CORP PIN: MT is waiting corporate personalization password to be given • PH-SIM PIN: MT is waiting phone to SIM/UICC card password to be given

If PIN is not inserted the following situation can occur:

AT+CMEE=2

OK

AT+COPS=0

+CME ERROR: SIM PIN required

AT+CMEE=0

OK

AT+COPS=0

ERROR

How to change the PIN: to change the PIN the user must use the AT+CPWD="SC",<old_pin>,<new_pin> command (see par.9.3 for details).

Example:

AT+CPWD="SC","1234","4321"

9.2 Facility lock +CLCK

9.2.1 Description

Used to lock, unlock or interrogate an MT or a network facility <fac>. Password is normally needed to do such actions. When querying the status of a network service (<mode>=2) the response line for "not active" case (<status>=0) should be returned only if service is not active for any <class>. The command is abortable if network facilities are set or interrogated.

☞ For <fac> "PN", "PU", "PP", "PC" and "PS" only <mode>=0 and <mode>=2 (unlock and query status) are always supported.

☞ For <fac> "PN", "PU", "PP", "PC" and "PS" <mode>=1 (lock status) is supported only if proper re-activation characteristic is enabled during personalization.

Type	Syntax	Response	Example
Set	AT+CLCK=<fac>,<mode>[,<passwd>[,<class>]]	OK or +CLCK: <status>[,<class1> [+CLCK: <status>[,<class1> […]]	AT+CLCK="SC",1,"0933" OK
Test	AT+CLCK=?	+CLCK: (list of supported <fac>s) OK	+CLCK: ("SC","PN","PU","PP","PC","PS","FD","AO","OI","OX","AI","IR","AB","AG","AC","PS") OK

9.2.2 Defined Values

Parameter	Type	Description
<fac>	String	Facility values • "SC": SIM (lock SIM card) • "PN": Network Personalisation (refer to [31]) • "PU": network sUbset Personalisation (refer to [31]) • "PP": service Provider Personalisation (refer to [31]) • "PC": Corporate Personalisation (refer to [31]) • "PS": SIM/USIM Personalisation (refer to [31]) • "FD": SIM fixed dialling phonebook feature (if PIN2 authentication has not been done during the current session, PIN2 is required as <passwd>) • "AO": BAR (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) • "PS": SIM/USIM Personalisation (refer to [31])
<mode>	Number	• 0: unlock • 1: lock • 2: query status
<status>	Number	• 0: not active • 1: active
<passwd>	String	Shall be the same as password specified for the facility from the MT user interface or with command +CPWD (for more details refer to 9.3)

Parameter	Type	Description
<class x>	Number	Sum of Numbers each representing a class of information (default 7) • 1: voice • 2: data • 4: FAX • 8: short message service • 16: data circuit sync • 32: data circuit async • 64: dedicated packet access • 128: dedicated PAD access

9.3 Change password +CPWD

9.3.1 Description

Sets a new password for the facility lock function defined by command +CLCK. The command is abortable if a character is sent to DCE during the command execution.

Type	Syntax	Response	Example
Set	AT+CPWD=<fac>,<oldpwd>,<newpwd>	OK	AT+CPWD="SC","0933","0934" OK
Test	AT+CPWD=?	+CPWD: list of available (<fac>,<pwdlength>s) OK	+CPWD: ("SC",8),("P2",8),("AO",4),("OI",4),("OX",4),("AI",4),("IR",4),("AB",4),("AG",4),("AC",4) OK

9.3.2 Defined Values

Parameter	Type	Description
<fac>	String	"P2" SIM PIN2; refer to Facility Lock +CLCK (chapter 9.2.2) for other values
<oldpwd>	String	Old password
<newpwd>	String	New password
<pwdlength>	Number	Length of password (digits)

A message error will be provided during the changing of the PIN code if the PIN check is enabled through AT+CLCK.

10 Phonebook commands

10.1 Select phonebook memory storage +CPBS

10.1.1 Description

Selects a phonebook memory storage for further use in phonebook related commands.

☞ The response to the test command depends on SIM dependent parameters (e.g. "EC").

Type	Syntax	Response	Example
Set	AT+CPBS=<storage>[,<password>]	OK	AT+CPBS="SM" OK
Read	AT+CPBS?	+CPBS: <storage>[,<used>,<total>] OK	+CPBS: "SM",25,150 OK
Test	AT+CPBS=?	+CPBS: (list of supported <storages>s) OK	+CPBS: ("SM","FD","LD","SN","EC","ON","BL") OK

10.1.2 Defined Values

Parameter	Type	Description
<storage>	String	Phonebook memory storage; the following values are allowed: • "SM": SIM phonebook • "FD": SIM fixed dialling phonebook (only valid with PIN2) • "LD": SIM last-dialling phonebook • "BN": SIM barred-dialling-number phonebook (only valid with PIN2) • "SN": SIM service-dialling-number phonebook (read only) • "EC": SIM emergency-call-codes phonebook (read only) • "ON": Own number phone-book (read/write); content is also shown by +CNUM • "BL": Blacklist phonebook (delete only): only the position 0 is valid
<password>	String	PIN2-code required when selecting PIN2-code <storage>s above (e.g. "FD"), if PIN2 is applicable
<used>	Number	Indicates the number of used locations in selected memory
<total>	Number	Indicates the total number of locations in selected memory

10.2 Read phonebook entries +CPBR

10.2.1 Description

Returns phonebook entries in location number range <index1> ... <index2> from the current phonebook memory storage selected with +CPBS. If <index2> is left out, only location <index1> is returned. Entry fields returned are:

- location number <indexn>
- phone number stored there <number> of format <type>
- text <text> associated with the number
- <group> indicating a group the entry may belong to (if the selected phonebook supports it)

- <adnumber> an additional number (of format <adtype>) (if the selected phonebook supports it)
- <secondtext> a second text field associated with the number (if the selected phonebook supports it)
- <email> an email field (if the selected phonebook supports it)

If all queried locations are empty (but available), no information text lines may be returned.

☞ The wildcard character (?) in the phone number of FDN is allowed.

☞ <group>, <adnumber>, <adtype>, <secondtext>, <email>, <glength>, <alength>, <slength>, <elength> are not supported on LEON-G100 / LEON-G200 series.

Type	Syntax	Response	Example
Set	AT+CPBR=<index1>[,<index2>]	[+CPBR: <index1>,<number>,<type>,<text>[,<group>[,<adnumber>[,<adtype>[,<secondtext>[,<email>]]]]]] [...] [+CPBR: <index2>,<number>,<type>,<text>[,<group>[,<adnumber>[,<adtype>[,<secondtext>[,<email>]]]]]] OK	If indexes are filled: AT+CPBR=1,3 +CPBR: 1,"040123456",129,"RossiCarlo" +CPBR: 2,"040123457",129,"RossiMario" +CPBR: 3,"040123458",129,"RossiGiuseppe" OK If indexes are not filled: AT+CPBR=5,6 +CPBR=5,6 OK
Test	AT+CPBR=?	+CPBR: (list of supported <index>s),<nlength>,<tlength>[,<glength>[,<alength>[,<slength>[,<elength>]]]] OK	+CPBR: (1-100),20,18 OK

10.2.2 Defined Values

Parameter	Type	Description
<index1>, <index2>, <index>	Number	Range of location numbers of phonebook memory
<number>	String	Phone number of format <type>
<type>	Number	Type of address octet (refer to 3GPP TS 24.008 [30] subclause 10.5.4.7)
<text>	String	Text associated with the phone number of maximum length <tlength>
<group>	String	Group the phonebook entry may belong to, of maximum length <glength>
<adnumber>	String	Additional phone number of format <adtype>
<adtype>	Number	Type of address octet (refer to 3GPP TS 24.008 [30] subclause 10.5.4.7)
<secondtext>	String	Second text associated with the number, of maximum length <slength>
<email>	String	Email of maximum length <elength>
<nlength>	Number	Maximum length of field <number>
<tlength>	Number	Maximum length of field <text>
<glength>	Number	Maximum length of field <group>
<alength>	Number	Maximum length of field <adnumber>
<slength>	Number	Maximum length of field <secondtext>

Parameter	Type	Description
<elength>	Number	Maximum length of field <email>

10.3 Find phonebook entries +CPBF

10.3.1 Description

Returns the phonebook entries from the current phonebook (previously selected by +CPBS), alphanumeric field starts with string <findtext>.

The string <findtext> is case sensitive.

Type	Syntax	Response	Example
Set	AT+CPBF=<findtext>	[+CPBF: <index1>,<number>,<type>,<text>] [...] [+CPBF: <index2>,<number>,<type>,<text>] OK	AT+CPBF="u-blox" OK
Test	AT+CPBF=?	+CPBF: [<nlength>],[<tlength>] OK	+CPBF: 40,18 OK

10.3.2 Defined Values

Parameter	Type	Description
<index1>, <index2>, <index>	Number	Location numbers of phonebook memory
<number>	String	Phone number of format <type>
<type>	Number	Type of address octet
<findtext>,<text>	String	Maximum length <tlength>
<nlength>	Number	Maximum length of field <number>
<tlength>	Number	Maximum length of field <text>

10.4 Write phonebook entry +CPBW

10.4.1 Description

Stores phonebook entry in the current phonebook memory storage (selectable with +CPBS) at the location specified by the <index> field. Other entry fields are:

- the phone number <number> (in the <type> format)
- <text> text associated with the number
- <group> indicating a group the entry may belong to
- <adnumber> an additional number (of format <adtype>)
- <secondtext> a second text field associated with the number
- <email> an email field

If all fields are omitted, except for <index>, the corresponding phonebook entry is deleted. If the <index> field is left out, but the <number> is given, the entry is written in the first free location in the current phonebook memory storage.

If no phonebook entries are available the response to the test command will be +CPBW: 0 <CR><LF>OK

<group>, <adnumber>, <adtype>, <secondtext>, <email> parameters are not supported on LEON-G100 / LEON-G200 series.

<group>, <adnumber>, <adtype>, <secondtext>, <email> parameters are not supported on 2G SIM; but they could be supported by USIM. Not all fields are always supported on the used USIM: to verify which fields are supported refer to the test command.

In case of previously selected BL blacklist phonebook, no parameters are needed; <index>=0 is also accepted.

Set command +CPBW is not applicable for the storages "SN", "EC" (read only storages), while it is applicable to "LD" storage only to delete an item.

Type	Syntax	Response	Example
Set	AT+CPBW=[<index>][,<number>[,<type>[,<text>[,<group>[,<adnumber>[,<adtype>[,<secondtext>[,<email>]]]]]]]]	OK	AT+CPBW=5,"091137880",,"u-blox" OK
Test	AT+CPBW=?	+CPBW: (list of supported <index>s),<nlength>,(list of supported <type>s),<tlength>[,<glength>[,<alength>[,<slength>[,<elength>]]]]]] OK or +CPBW: 0 OK	+CPBW: (1-250),40,(129,145),18 OK

10.4.2 Defined Values

Parameter	Type	Description
<index>	Number	Location numbers of phonebook memory
<number>	String	Phone number of format <type>
<type>	Number	Type of address octet; default 145 when dialling string includes "+", otherwise 129
<text>	String	Maximum length <tlength>
<group>	String	Group the phonebook entry may belong to, of maximum length <glength>
<adnumber>	String	Additional phone number of format <adtype>
<adtype>	Number	Type of address octet; default 145 when dialling string includes "+", otherwise 129
<secondtext>	String	Second text associated with the number, of maximum length <slength>
<email>	String	Email of maximum length <elength>
<nlength>	Number	Maximum length of field <number>
<tlength>	Number	Maximum length of field <text>
<glength>	Number	Maximum length of field <group>
<alength>	Number	Maximum length of field <adnumber>
<slength>	Number	Maximum length of field <secondtext>
<elength>	Number	Maximum length of field <email>

11 Short Messages Service commands

11.1 Introduction

In case of errors all SMS related AT commands return the result codes defined in chapter A.7 instead of the usual error codes listed in chapter A.6.

The <index> parameter in all SMS related AT commands has the following sub-ranges and meaning:

- 0 Index of SMS Class 0 stored in RAM (the last one received)
- 1 - 300 Index of SMS or CB stored in FFS
- 301- (301 + (n-1)) Index of SMS stored in the SIM (n depends on the SIM Card used)

The following limitations apply related to SMS usage:

Single SMS

- 160 characters if <dcs> = "GSM 7 bit default alphabet data"
- 140 octets if <dcs> = "8-bit data"
- 70 UCS2 characters (2 bytes for each one) if <dcs>="16-bit uncompressed UCS2 data"

Concatenated SMS (where supported) - "8-bit reference number" type

- 153 characters if <dcs> = "GSM 7 bit default alphabet data"
- 134 octets if <dcs> = "8-bit data"
- 67 UCS2 characters (2 bytes for each one) if <dcs>="16-bit uncompressed UCS2 data"

Concatenated SMS (where supported) - "16-bit reference number" type

- The limits are the same of "8-bit reference number" type but are decreased of 1 unit

A concatenated SMS can have as many as 255 parts.
For a complete overview on on SMS please refer to 3GPP TS 23.040 [8].

11.2 Select message service +CSMS

11.2.1 Description

Selects message service <service>. It returns the types of messages supported by the MT.

Type	Syntax	Response	Example
Set	AT+CSMS=<service>	+CSMS: <mt>,<mo>,<bm> OK	AT+CSMS=1 +CSMS: 1,1,1 OK
Read	AT+CSMS?	+CSMS: <service>,<mt>,<mo>,<bm> OK	+CSMS: 0,1,1,1 OK
Test	AT+CSMS=?	+CSMS: (list of supported <service>s) OK	+CSMS: (0-1) OK

11.2.2 Defined Values

Parameter	Type	Description
<service>	Number	• 0: Refer to [8] and [9]; syntax of AT commands is compatible with [16]; phase 2+ features may be supported if no new command syntax is required • 1: Refer to [8] and [9]; syntax of AT commands is compatible with [16]
<mt>	Number	Mobile terminated messages • 0: not supported • 1: supported
<mo>	Number	Mobile originated messages • 0: not supported • 1: supported
<bm>	Number	Broadcast messages • 0: not supported • 1: supported

11.3 Preferred message storage +CPMS

11.3.1 Description

Selects memory storages <mem1>, <mem2> and <mem3>. If the chosen storage is supported by the MT but not suitable, the final result code +CMS ERROR: <err> should be returned.

☞ "BM" is available only for <mem1>.

Type	Syntax	Response	Example
Set	AT+CPMS=<mem1>[,<mem2>[,<mem3>]]	AT+CPMS: <used1>,<total1>,<used2>,<total2>,<used3>,<total3> OK	AT+CPMS="BM","SM","SM" OK
Read	AT+CPMS?	+CPMS: <mem1>,<used1>,<total1>,<mem2>,<used2>,<total2>,<mem3>,<used3>,<total3> OK	+CPMS: "MT",4,350,"MT",4,350,"MT",4,350 OK
Test	AT+CPMS=?	+CPMS: (list of supported <mem1>s),(list of supported <mem2>s),(list of supported <mem3>s) OK	+CPMS: ("MT","ME","SM","BM"),("MT","ME","SM"),("MT","ME","SM") OK

11.3.2 Defined Values

Parameter	Type	Description
<mem1>	String	Memory used to read and delete SMS or CB: • "ME" ME message storage • "SM" (U)SIM message storage • "MT" = "ME"+"SM", "ME" preferred • "BM" broadcast message storage
<mem2>	String	Memory used to write and send SMS: • "ME" ME message storage • "SM" (U)SIM message storage • "MT" = "ME"+"SM", "ME" preferred
<mem3>	String	Memory preferred to store the received SMS: • "ME" ME message storage

Parameter	Type	Description
		• "SM" (U)SIM message storage • "MT" = "ME"+"SM", "ME" preferred
<used1>	Number	Number of used message locations in <mem1>
<total1>	Number	Total number of message locations in <mem1>
<used2>	Number	Number of used message locations in <mem2>
<total2>	Number	Total number of message locations in <mem2>
<used3>	Number	Number of used message locations in <mem3>
<total3>	Number	Total number of message locations in <mem3>

11.4 Preferred message format +CMGF

11.4.1 Description

Indicates to MT which input and output format of messages shall be used.

Type	Syntax	Response	Example
Set	AT+CMGF=[<mode>]	OK	AT+CMGF=1 OK
Read	AT+CMGF?	+CMGF: <mode> OK	+CMGF: 1 OK
Test	AT+CMGF=?	+CMGF: (list of supported <mode>s) OK	+CMGF: (0-1) OK

11.4.2 Defined Values

Parameter	Type	Description
<mode>	Number	Indicates the format of messages used with send, list, read and write commands and URCs resulting from receiving SMS's messages: • 0: PDU mode (default) • 1: text mode

11.5 Save settings +CSAS

11.5.1 Description

Saves active message service settings to non-volatile memory (NVRAM). The settings related to +CSCA (the current SMSC address stored in RAM), +CSMP and +CSCB are stored in a profile (only one profile is available).

Type	Syntax	Response	Example
Set	AT+CSAS[=<profile>]	OK	AT+CSAS OK
Test	AT+CSAS=?	+CSAS: (list of supported <profile>s) OK	+CSAS: (0) OK

11.5.2 Defined Values

Parameter	Type	Description
<profile>	Number	• 0: specific profile number where to store the active message settings

11.6 Restore Settings +CRES

11.6.1 Description

Restores message service settings from a non-volatile memory (NVRAM) to active memory (RAM). The settings specified in the commands +CSCA (the SMSC address in the SIM card is also updated), +CSMP and +CSCB are restored (only one profile is available).

Type	Syntax	Response	Example
Set	AT+CRES[=<profile>]	OK	AT+CRES=0 OK
Test	AT+CRES=?	+CRES: (list of supported <profile>s) OK	+CRES: (0) OK

11.6.2 Defined Values

Parameter	Type	Description
<profile>	Number	• 0: indicates the specific profile number where to retrieve the message service settings for restoring

11.7 Show text mode parameters +CSDH

11.7.1 Description

Controls whether detailed header information is shown in text mode result codes.

Type	Syntax	Response	Example
Set	AT+CSDH=[<show>]	OK	AT+CSDH=1 OK
Read	AT+CSDH?	+CSDH: <show> OK	+CSDH: 0 OK
Test	AT+CSDH=?	+CSDH: (list of supported <show>s) OK	+CSDH: (0-1) OK

11.7.2 Defined Values

Parameter	Type	Description
<show>	Number	• 0: do not show detailed header information in text mode result codes • 1: show detailed header information in text mode result codes

11.8 New message indication +CNMI

11.8.1 Description

Selects the procedure to indicate the reception of a new SMS in case of DTR-signal ON. If MT is inactive (DTR-signal OFF), message reception should be done as specified in [7]. All SMS classes are supported accordingly.

The SMS's class 0 (normally displayed via MMI), are indicated on DTE via URC **+CMTI: "SM",0** , wherein 0 represents an SMS without SIM-storage ("SM" indicates only that no other specific setting is needed in order to read the SMS via AT+CMGR=0).

Type	Syntax	Response	Example
Set	AT+CNMI=[<mode>[,<mt>[,<bm>[,<ds>[,<bfr>]]]]]	OK	AT+CNMI=1,1 OK
Read	AT+CNMI?	+CNMI=<mode>,<mt>,<bm>,<ds>,<bfr> OK	+CNMI: 0,0,0,0,0 OK
Test	AT+CNMI=?	+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	+CNMI: (0-2),(0-3),(0-3),(0-2),(0-1) OK
URC		+CMTI: <mem>,<index>	
URC		**(PDU mode)** +CMT: ,<length><CR><LF><pdu> **(text mode)** +CMT <oa>,,<scts><CR><LF><data>	
URC		+CBMI: <mem>,<index>	
URC		**(PDU mode)** +CBM: <length><CR><LF><pdu> **(text mode)** +CBM: <sn>,<mid>,<dcs>,<page>,<pages><CR><LF> <data>	
URC		**(PDU mode)** +CDS: <length><CR><LF><pdu> **(text mode)** +CDS: <fo>,<mr>,[<ra>],[<tora>],<scts>,<dt>,<st>	
URC		+CDSI: <mem>,<index>	

11.8.2 Defined Values

Parameter	Type	Description
<mode>	Number	Controls the processing of URCs specified within this command: • 0: buffer URCs in the MT; if the MT buffer is full, the oldest indication may be discarded and replaced with the new received indications (ring buffer) • 1: discard indication and reject new received message URCs when MT-DTE link is reserved; otherwise forward them directly to the DTE • 2: buffer URCs in the MT when the serial link is busy (e.g. data-transfer); otherwise forward them directly to the DTE
<mt>	Number	Contains the rules for storing received SMS dependent on its <dcs> (SMS Data Coding Scheme (default 0), or Cell Broadcast Data Coding Scheme • 0: No SMS-DELIVER indications are routed to the TE • 1: if SMS-DELIVER is stored in MT, indication of the memory location is routed to the DTE using URC: **+CMTI: <mem>,<index>** • 2: SMS-DELIVER (except class 2 SMS) are routed directly to the DTE (but not saved in the module file system or SIM memory) using the URC: **+CMT: ,<length><CR><LF><pdu>** in PDU mode or **+CMT: <oa>,**

Parameter	Type	Description
		[<alpha>],<scts>[,<tooa>,<fo>,<pid>,<dcs>,<sca>,<tosca>,<length>]<CR><LF><data> in text mode If MT has its own display device then class 0 SMS and SMS in the message waiting indication group (discard message) may be copied to both MT display and to DTE. In this case MT shall send the acknowledgement to the network. Class 2 SMSs and messages in the message waiting indication group (storage message) result in indication as defined in <mt>=1 • 3: Class 3 SMS-DELIVERs are routed directly to DTE using URCs defined in <mt>=2. Messages of other data coding schemes result in indication as defined in <mt>=1 Setting the <mt> parameter to a value different from 0 forces the ring line to notify an SMS arrival switching the ring line from OFF to ON for 1 second.
<bm>	Number	Contains the rules for storing CBMs: • 0: No CBM indications to the DTE • 1 if CBM is stored in RAM/NVRAM by MT, an indication of memory location is routed to DTE URC **+CBMI: <mem>,<index>** • 2: new CBMs are routed directly to the DTE using URC: **+CBM: <length><CR><LF><pdu (when PDU-mode enabled>** or **+CBM: <sn>,<mid>,<dcs>,<page>,<pages><CR><LF><data>** • 3: Class 3 CBMs are routed directly to DTE using URCs defined in <bm>=2. If CBM storage is supported, messages of other classes result in indication as defined in <bm>=1
<ds>	Number	• 0: No SMS-STATUS-REPORTs are routed to the DTE • 1: SMS-STATUS-REPORTs are routed to the DTE using URC: **+CDS: <length><CR><LF><pdu>** if PDU mode enabled or **+CDS: <fo>,<mr>,[<ra>],[<tora>],<scts>,<dt>,<st>** if text mode enabled • 2: if SMS-STATUS-REPORT is stored into MT, indication of the memory location is routed to the DTE using the URC **+CDSI: <mem>,<index>** (<mem> in this case is always "MT")
<bfr>	Number	• 0: MT buffer of URCs defined within this command is flushed to the DTE when <mode> 1...3 is entered (OK response shall be given before flushing the codes). • 1: MT buffer of URCs defined within this command is cleared when <mode> 1...3 is entered
<mem>	String	• "ME" ME message storage • "SM" (U)SIM message storage • "MT" = "ME"+"SM", "ME" preferred • "BM" broadcast message storage
<index>	Number	Storage position
<length>	Number	Two meanings: • in text mode: number of characters • in PDU mode: PDU's length in octets without the Service Center's address. In example:03912143 0100038166F6000004E374F80D : this is a PDU with Service Center's number +1234, that generates the address 03912143 (4 octets). Thus in this case <length> = 13.
<pdu>	String	Protocol data unit: each 8-bit octet is presented as two IRA character long hexadecimal numbers, e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65)
<oa>	String	Originator address
<scts>	String	Service center time stamp in time-string format, refer to <dt>
<data>	String	In the case of SMS: [8] TP-User-Data in text mode responses; format: • if <dcs> indicates that [7] GSM 7 bit default alphabet is used and <fo> indicates that [8] TP-User-Data-Header-Indication is not set: o if TE character set other than "HEX" (refer command Select TE Character Set +CSCS in [2]): ME/TA converts GSM alphabet into current TE character set according to rules of Annex A o if TE character set is "HEX": ME/TA converts each 7-bit character of GSM 7 bit default alphabet into two IRA character long hexadecimal number (e.g. character Π (GSM 7 bit default alphabet 23) is presented as 17 (IRA 49 and 55)) • if <dcs> indicates that 8-bit or UCS2 data coding scheme is used, or <fo> indicates that

Parameter	Type	Description
		[8] TP-User-Data-Header-Indication is set: ME/TA converts each 8-bit octet into two IRA character long hexadecimal number (e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65)) In the case of CBS: [9] CBM Content of Message in text mode responses; format: • if <dcs> indicates that [7] GSM 7 bit default alphabet is used: o if TE character set other than "HEX" (refer command +CSCS in [2]): ME/TA converts GSM alphabet into current TE character set according to rules of Annex A o if TE character set is "HEX": ME/TA converts each 7-bit character of the GSM 7 bit default alphabet into two IRA character long hexadecimal number • if <dcs> indicates that 8-bit or UCS2 data coding scheme is used: ME/TA converts each 8-bit octet into two IRA character long hexadecimal number
<sn>	Number	CBM serial number
<mid>	Number	CBM message identifier
<dcs>	Number	SMS Data Coding Scheme (default 0), or Cell Broadcast Data Coding Scheme
<page>	Number	CBM Page Parameter bits 4-7 in integer format as described in [9]
<pages>	Number	CBM Page Parameter bits 0-3 in integer format as described in [9]
<fo>	Number	First octet of [8] SMS-DELIVER, SMS-SUBMIT (default 17), SMS-STATUS-REPORT, or SMS-COMMAND (default 2)
<mr>	Number	Message reference
<ra>	String	Recipient address field
<tora>	Number	Type of address of <ra> - octet
<dt>	String	Discharge time in format "yy/MM/dd,hh:mm:ss+zz"; the time zone is expressed in steps of 15 minutes
<st>	Number	Status of a SMS STATUS-REPORT

The incoming SMS URC indications will be displayed only on the AT interface where the last +CNMI was set. As general rule, the +CNMI command should be issued by the DTE:

- after start-up
- after using the Z and &F command (which reset the CNMI configuration)
- whenever the incoming SMS URCs indications are requested on a different AT interface

11.9 Read message +CMGR

11.9.1 Description

Returns the message with location value <index> from message storage <mem1> to the DTE.

The parameters <tooa>,<fo>,<pid>,<dcs>,<sca>,<tosca>,<length>,<cdata> shall be displayed only if +CSDH=1 is set.

The syntax AT+CMGR=0 allows to display an SMS class 0 if it is signalized to MT, because no MMI is available in the MT (see also the note from command +CNMI).

If the <index> value is out of range (it depends on AT+CPMS command setting) or it refers to an empty position, then the error "+CMS ERROR: invalid memory index" is returned.

Type	Syntax	Response	Example
Set	**Text mode (+CMGF=1):**	**(SMS-DELIVER)**	
	AT+CMGR=<index>	+CMGR: <stat>,<oa>,[<alpha>],<scts>[,<tooa>,<fo>,<pid>,<dcs>,<sca>,<tosca>,<length>] <data> OK **(SMS-SUBMIT)** +CMGR: <stat>,<da>,[<alpha>][<toda>,<fo>,<pid>,<dcs>,[<vp>],<sca>,<tosca>,<length>] <data> OK **(SMS-STATUS-report)** +CMGR:<stat>,<fo>,<mr>,[<ra>],[<tora>]<scts><dt>,<st> OK **(SMS-COMMAND)** +CMGR: <stat>,<fo>,<ct>[,<pid>,[<mn>],[<da>],[<toda>],<length> [<cdata>]] OK **(CBM storage)** +CMGR: <stat>,<sn>,<mid>,<dcs>,<page>,<pages> <data> OK	AT+CMGR=303 +CMGR:"REC READ","+393488535999",,"07/04/05,18:02:28+08",145,4,0,0,"+393492000466",145,93 You have a missed called. Free information provided by your operator. OK
	PDU mode (+CMGF=0):		
	AT+CMGR=<index>	+CMGR: <stat>,[<alpha>],<length> <pdu> OK	AT+CMGR=1 +CMGR: 1,,40 07919343290020000 40C9193230982661400008070328045218018D4F29CFE06B5CBF379F87C4EBF41E434082E7FDBC3 OK
Test	AT+CMGR=?	OK	

11.9.2 Defined Values

Parameter	Type	Description
<index>	Number	Storage position
<stat>	Number	• 0: in PDU mode or "REC UNREAD" in text mode: received unread SMS • 1: in PDU mode or "REC READ" in text mode: received read SMS • 2: in PDU mode or "STO UNSENT" in text mode: stored unsent SMS • 3: in PDU mode or "STO SENT" in text mode: stored sent SMS • 4: in PDU mode or "ALL" in text mode: all SMS messages
<oa>	String	Originator address
<alpha>	String	Alphanumeric representation of <da> or <a> corresponding to the entry found in the phonebook [12]. The parameter is not managed.
<scts>	String	Service center time stamp in time-string format, refer to <dt>
<tooa>	Number	Type of address of <oa> - octet
<fo>	Number	First octet of [8] SMS-DELIVER, SMS-SUBMIT (default 17), SMS-STATUS-REPORT, or SMS-COMMAND (default 2)
<pid>	Number	TP-Protocol-Identifier (default 0); refer to [8]
<dcs>	Number	SMS Data Coding Scheme (default 0), or Cell Broadcast Data Coding Scheme
<sca>	String	Service center address field
<tosca>	Number	Type of address of <sca> - octet in Number format (for more details please refer to [12]); default 145 when string includes "+", otherwise default 129
<length>	Number	Two meanings: • in text mode: number of characters • in PDU mode: PDU's length in octets without the Service Center's address. In example:03912143 0100038166F6000004E374F80D : this is a PDU with Service Center's number +1234, that generates the address 03912143 (4 octets). Thus in this case <length> = 13.

<data>	String	In the case of SMS: [8] TP-User-Data in text mode responses; format:
		• if <dcs> indicates that [7] GSM 7 bit default alphabet is used and <fo> indicates that [8] TP-User-Data-Header-Indication is not set:
		  ○ if TE character set other than "HEX" (refer command Select TE Character Set +CSCS in [2]): ME/TA converts GSM alphabet into current TE character set according to rules of Annex A
		  ○ if TE character set is "HEX": ME/TA converts each 7-bit character of GSM 7 bit default alphabet into two IRA character long hexadecimal number (e.g. character Π (GSM 7 bit default alphabet 23) is presented as 17 (IRA 49 and 55))
		• if <dcs> indicates that 8-bit or UCS2 data coding scheme is used, or <fo> indicates that [8] TP-User-Data-Header-Indication is set: ME/TA converts each 8-bit octet into two IRA character long hexadecimal number (e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65))
		In the case of CBS: [9] CBM Content of Message in text mode responses; format:
		• if <dcs> indicates that [7] GSM 7 bit default alphabet is used:
		  ○ if TE character set other than "HEX" (refer command +CSCS in [2]): ME/TA converts GSM alphabet into current TE character set according to rules of Annex A
		  ○ if TE character set is "HEX": ME/TA converts each 7-bit character of the GSM 7 bit default alphabet into two IRA character long hexadecimal number
		• if <dcs> indicates that 8-bit or UCS2 data coding scheme is used: ME/TA converts each 8-bit octet into two IRA character long hexadecimal number

<da>	String	Destination address
<toda>	Number	Type of address of <da> - octet
<vp>	Number	Format depending of the <fo> setting:

Parameter	Type	Description
		• Relative format: validity period starting from when the SMS is received by the SMSC, in range 0-255 (default value 167); for more details please refer to [8] <vp> | Validity period value 0 to 143 | (TP-VP + 1) x 5 minutes (i.e. 5 minutes intervals up to 12 hours) 144 to 167 | 12 hours + ((TP-VP -143) x 30 minutes) 168 to 196 | (TP-VP - 166) x 1 day 197 to 255 | (TP-VP - 192) x 1 week • Absolute format: absolute time of the validity period termination in string format ("yy/MM/dd,hh:mm:ss+zz") (please refer to [8]); the time zone is expressed in steps of 15 minutes
<mr>	Number	Message reference
<ra>	String	Recipient address field
<tora>	Number	Type of address of <ra> - octet
<dt>	String	Discharge time in format "yy/MM/dd,hh:mm:ss+zz"; the time zone is expressed in steps of 15 minutes
<st>	Number	Status of an SMS STATUS-REPORT
<ct>	Number	TP-Command-Type (default 0)
<mn>	Number	Refer to 3GPP TS 23.040 [8] TP-Message-Number in integer format
<cdata>	String	TP-Command-Data in text mode responses
<sn>	Number	CBM serial number
<mid>	Number	CBM message identifier
<page>	Number	3GPP TS 23.041 [9] CBM Page Parameter bits 4-7 in integer format
<pages>	Number	3GPP TS 23.041 [9] CBM Page Parameter bits 0-3 in integer format
<pdu>	String	Protocol data unit: each 8-bit octet is presented as two IRA character long hexadecimal numbers, e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65)

11.10 New Message Acknowledgement to MT +CNMA

11.10.1 Description

Confirms the correct reception of a new message (SMS-DELIVER or SMS-REPORT) which is routed directly to the DTE. This acknowledgement command (causing MT to send RP-ACK to the network) shall be used when +CSMS parameter <service> equals 1. MT shall not send another +CMT or +CDS result code to DTE before previous one is acknowledged. If MT does not get the acknowledgement within required time (network timeout), it must send RP-ERROR to the network. Both settings <mt> and <ds> of +CNMI command will be automatically set to zero. If the command +CNMA is received, but no acknowledgement is expected, or some other MT related errors occurs, a corresponding +CMS ERROR: <error> is returned.

Type	Syntax	Response	Example
Set	**Text mode (+CMGF=1):** AT+CNMA	OK	

Type	Syntax	Response	Example
	PDU mode (+CMGF=0): AT+CNMA[=<n>[,<length>[PDU<ctrl-Z/ESC>]]]	OK	
Test	AT+CNMA=?	**Text mode (+CMGF=1):** OK **PDU mode (+CMGF=0):** +CNMA: (list of supported <n>s) OK	

11.10.2 Defined Values

Parameter	Type	Description
<n>	Number	• 0 command operates similarly as defined for the text mode • 1 send RP-ACK (or buffered result code received correctly) • 2 send RP-ERROR (if PDU is not given, ME/TA shall send SMS-DELIVER-REPORT with [8] TP-FCS value set to 'FF' (unspecified error cause))
<length>	Number	PDU's length in octets without the Service Center's address

11.11 List message +CMGL

11.11.1 Description

Returns SMS messages with status value <stat> from message storage <mem1> to the DTE. Some parameter are displayed only when setting +CSDH=1 (see +CSDH, paragraph 11.7). If status of the received message is "received unread", status in the storage changes to "received read".

Type	Syntax	Response	Example
Set	**Text mode (+CMGF=1):** AT+CMGL[=<stat>]	**Command successful and SMS-DELIVERs:** +CMGL: <index>,<stat>,<oa>,[<alpha>],[<scts>][,<tooa>,<length>] <data> [+CMGL: <index>,<stat>,<oa>,[<alpha>],[<scts>][,<tooa>,<length>]<data>[...]] OK	AT+CMGL +CMGL: 303,"REC READ","+393401234999",,"08/08/06,10:01:38+08" You have a missed called. Free information provided by your operator. OK
		Command successful and SMS-SUBMITs: +CMGL: <index>,<stat>,<da>,[<alpha>],[<toda>, <length>] <data> [+CMGL: <index>,<stat>,<da>,[<alpha>],[<toda>, <length>]<data>[...]] OK	

Type	Syntax	Response	Example
		Command successful and SMS-STATUS-REPORTs: +CMGL: <index>,<stat>,<fo>,<mr>,[<ra>],[<tora>],<scts>,<dt>,<st> [+CMGL: <index>,<stat>,<fo>,<mr>,[<ra>],[<tora>],<scts>,<dt>,<st> [...]] OK	
		Command successful and SMS-COMMANDs: +CMGL: <index>,<stat>,<fo>,<ct> [+CMGL: <index>,<stat>,<fo>,<ct>[...]] OK	
		Command successful and CBM storage: +CMGL: <index>,<stat>,<sn>,<mid>,<page>,<pages><data> [+CMGL: <index>,<stat>,<sn>,<mid>,<page>,<pages>,<data>[...]] OK	
	PDU mode (+CMGF=0): AT+CMGL[=<stat>]	**Command successful:** +CMGL: <index>,<stat>,[<alpha>],<length>,<pdu> [+CMGL:<index>,<stat>,[<alpha>],<length><pdu> [...]]	
Test	AT+CMGL=?	+CMGL: (list of supported <stat>s) OK	+CMGL: ("RECUNREAD","REC READ","STO UNSENT","STO SENT","ALL") OK

11.11.2 Defined Values

Parameter	Type	Description
<stat>	Number or String	Number type in PDU mode (default value: 4), or string type in text mode (default value: "ALL"); indicates the status of message in memory • 0: in PDU mode or "REC UNREAD" in text mode: received unread SMS messages • 1: in PDU mode or "REC READ" in text mode: received read SMS messages • 2: in PDU mode or "STO UNSENT" in text mode: stored unsent SMS messages • 3: in PDU mode or "STO SENT" in text mode: stored sent SMS messages • 4: in PDU mode or "ALL" in text mode: all SMS messages
<index>	Number	Storage position
<oa>	String	Originator address
<alpha>	String	Alphanumeric representation of <da> or <a> corresponding to the entry found in the phonebook [12]. The parameter is not managed.

Parameter	Type	Description
<scts>	String	Service center time stamp in time-string format; refer to <dt>
<tooa>	Number	Type of address of <oa> - octet
<length>	Number	Two meanings: • in text mode: number of characters • in PDU mode: PDU's length in octets without the Service Center's address. In example:03912143 0100038166F6000004E374F80D : this is a PDU with Service Center's number +1234, that generates the address 03912143 (4 octets). Thus in this case <length> = 13.
<data>	String	This is the TP-User-Data in text mode; the decoding depends on the DCS (Data Coding Scheme) and the FO (First Octect) of the SMS header [8]; format: • if DCS indicates that [7] GSM 7 bit default alphabet is used and FO indicates that [8] TP-User-Data-Header-Indication is not set: o if TE character set other than "HEX" (refer command Select TE Character Set +CSCS in [2]): ME/TA converts GSM alphabet into current TE character set according to rules of Annex A o if TE character set is "HEX": ME/TA converts each 7-bit character of GSM 7 bit default alphabet into two IRA character long hexadecimal number (e.g. character Π (GSM 7 bit default alphabet 23) is presented as 17 (IRA 49 and 55)) • if DCS indicates that 8-bit or UCS2 data coding scheme is used, or FO indicates that [8] TP-User-Data-Header-Indication is set: ME/TA converts each 8-bit octet into two IRA character long hexadecimal number (e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65)) In the case of CBS: [9] CBM Content of Message in text mode responses; format: • if DCS indicates that [7] GSM 7 bit default alphabet is used: o if TE character set other than "HEX" (refer command +CSCS in [2]): ME/TA converts GSM alphabet into current TE character set according to rules of Annex A o if TE char acter set is "HEX": ME/TA converts each 7-bit character of the GSM 7 bit default alphabet into two IRA character long hexadecimal number if DCS indicates that 8-bit or UCS2 data coding scheme is used: ME/TA converts each 8-bit octet into two IRA character long hexadecimal number
<da>	String	Destination address
<toda>	Number	Type of address of <da> - octet
<fo>	Number	First octet of TS 23.040 SMS-DELIVER, SMS-SUBMIT (default 17), SMS-STATUS-REPORT, or SMS-COMMAND (default 2)
<mr>	Number	Message reference
<ra>	String	Recipient address field
<tora>	Number	Type of address of <ra> - octet
<dt>	String	Discharge time in format "yy/MM/dd,hh:mm:ss+zz"; the time zone is expressed in steps of 15 minutes
<st>	Number	Status of an SMS STATUS-REPORT
<ct>	Number	TP-Command-Type (default 0)
<sn>	Number	CBM serial number
<mid>	Number	CBM message identifier
<page>	Number	3G TS 23.041 [9] CBM Page Parameter bits 4-7 in integer format
<pages>	Number	3G TS 23.041 [9] CBM Page Parameter bits 0-3 in integer format
<pdu>	String	Protocol data unit: each 8-bit octet is presented as two IRA character long hexadecimal numbers, e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65)
<dcs>	Number	SMS Data Coding Scheme (default 0), or Cell Broadcast Data Coding Scheme

11.12 Send message +CMGS

11.12.1 Description

Sends message from a DTE to the network (SMS-SUBMIT). Message reference value <mr> is returned to the DTE on successful message delivery.

Type	Syntax	Response	Example
Set	**Text mode (+CMGF=1):**		
	AT+CMGS=<da>[,<toda>]<CR>	>	AT+CMGS="0171112233"<CR>
			>"This is the text"<Ctrl-Z>
	<text><ctrl-Z/ESC>	+CMGS: <mr>	+CMGS:2
		OK	OK
	PDU mode (+CMGF=0):		
	+CMGS=<length>	+CMGS: <mr>	AT+CMGS=13
	<PDU> <Ctrl-Z/ESC>	OK	039121430100038166F6000004E374F80D<Ctrl-Z >
			+CMGS:2
			OK
Test	AT+CMGS=?	OK	

☞ In Text Mode (+CMGF=1) the entered text is preceded by a '>' (Greater-Than sign) character, and this shows that the interface is in "text enter" mode. The DCD signal shall be in ON state while text is entered.

11.12.2 Defined Values

Parameter	Type	Description
<da>	String	Destination address
<toda>	Number	Type of address of <da> - octet
<text>	String	SMS String
<mr>	Number	Message reference
<length>	Number	Two meanings: • in text mode: number of characters • in PDU mode: PDU's length in octets without the Service Center's address. In example:03912143 0100038166F6000004E374F80D : this is a PDU with Service Center's number +1234, that generates the address 03912143 (4 octets). Thus in this case <length> = 13.
<PDU>	String	Protocol Data Unit: each 8-bit octet of the PDU must be written as two IRA character long hexadecimal numbers, e.g. octet with integer value 42 must be written as two characters 2A (IRA 50 and 65)

11.13 Write message to memory +CMGW

11.13.1 Description

Stores message (SMS-DELIVER or SMS-SUBMIT) to memory storage <mem2>. Memory location <index> of the stored message is returned.<CR> separates the parameter part from the text part of the edited SMS in text mode. <ctrl-Z> indicates that the SMS shall be sent, while <ESC> indicates aborting of the edited SMS.

Type	Syntax	Response	Example
Set	**Text mode (+CMGF=1):**		
	AT+CMGW[=<oa/da>[,<tooa/toda>[,<stat>]]]<CR>	>	AT+CMGW="091137880"<CR> >"This is the text"<Ctrl-Z> +CMGW:303
	<text><Ctrl-Z/ESC>	+CMGW: <index> OK	OK
	PDU mode (+CMGF=0):		
	AT+CMGW=<length>[,<stat>] <PDU><Ctrl-Z/ESC>	+CMGW: <index> OK	AT+CMGW=13, 039121430100038166F6000004E374F80D<Ctrl-Z > +CMGS:2 OK
Test	AT+CMGW=?	OK	

☞ In Text Mode (+CMGF=1) the entered text is preceded by a '>' (Greater-Than sign) character, and this indicates that the interface is in "text enter" mode. The DCD signal shall be in ON state while text is entered.

11.13.2 Defined Values

Parameter	Type	Description
<da>	String	3G TS 23.040 [3] TP-Destination-Address Address-Value field in string format; BCD numbers (or GSM 7 bit default alphabet characters) are converted to characters of the currently selected TE character set (refer command +CSCS in3G TS 27.007 [9]); type of address given by <toda>
<oa>	String	3G TS 23.040 [3] TP-Originating-Address Address-Value field in string format; BCD numbers (or GSM 7 bit default alphabet characters) are converted to characters of the currently selected TE character set (refer command +CSCS in TS 07.07); type of address given by <tooa>
<tooa>	Number	[13] TP-Originating-Address Type-of-Address octet in integer format (default refer <toda>)
<toda>	Number	[13] 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)
<stat>	Number or String	Number type in PDU mode (default value: 4), or string type in text mode (default value: "ALL"); indicates the status of message in memory • 0: in PDU mode or "REC UNREAD" in text mode: received unread SMS messages • 1: in PDU mode or "REC READ" in text mode: received read SMS messages • 2: in PDU mode or "STO UNSENT" in text mode: stored unsent SMS messages • 3: in PDU mode or "STO SENT" in text mode: stored sent SMS messages • 4: in PDU mode or "ALL" in text mode: all SMS messages
<text>	String	SMS String
<index>	Number	Storage position
<length>	Number	Two meanings: • in text mode: number of characters • in PDU mode: PDU's length in octets without the Service Center's address. In example:03912143 0100038166F6000004E374F80D : this is a PDU with Service Center's number +1234, that generates the address 03912143 (4 octets). Thus in this case <length> = 13.

Parameter	Type	Description
<PDU>	String	Protocol Data Unit: each 8-bit octet of the PDU must be written as two IRA character long hexadecimal numbers, e.g. octet with integer value 42 must be written as two characters 2A (IRA 50 and 65)

11.14 Send message from storage +CMSS

11.14.1 Description

Sends message with location value <index> from the preferred message storage <mem2> to the network (SMS-SUBMIT or SMS-COMMAND). If a new recipient address <da> is given for SMS-SUBMIT, it will be used instead of the one stored with the message. Reference value <mr> is returned to the DTE on successful message delivery.

Type	Syntax	Response	Example
Set	**Text mode (+CMGF=1)::**		
	AT+CMSS=<index>[,<da>[,<toda>]]	+CMSS: <mr> OK	AT+CMSS=302 +CMSS: 3 OK
	PDU mode (+CMGF=0):		
	AT+CMSS=<index>	+CMSS: <mr> OK	AT+CMSS=302 +CMSS: 4 OK
Test	AT+CMSS=?	OK	

11.14.2 Defined Values

Parameter	Type	Description
<index>	Number	Storage position
<da>	String	Destination address
<toda>	Number	Type of address of <da> - octet
<mr>	Number	Message reference

11.15 Set text mode parameters +CSMP

11.15.1 Description

Selects values for additional parameters needed when SMS is sent to the network or placed in a storage when text format message mode is selected. For more details please refer to 3GPP TS 23.038 [7] and 3GPP TS 23.040 [8].

Type	Syntax	Response	Example
Set	AT+CSMP=<fo>,<vp>[,<pid>[,<dcs>]]	OK	AT+CSMP=17,167,0,0 OK
Read	AT+CSMP?	+CSMP: <fo>,<vp>,<pid>,<dcs> OK	+CSMP: 17,167,0,0 OK
Test	AT+CSMP=?	OK	

11.15.2 Defined Values

Parameter	Type	Description
<fo>	Number	First octet (byte) of the SMS TPDU structure (for more details please refer to 3GPP TS 23.040 [8]). The meaning of the 8 bits that compose this byte is different according to SMS type (SMS-DELIVER, SMS-DELIVER REPORT, SMS-STATUS-REPORT, SMS-COMMAND, SMS-SUBMIT (default 17), SMS-SUBMIT REPORT) that is coded by the bit 1 and bit 0
<vp>	Number	Format depending on the values of the bit3/bit4 of the <fo> (SMS-SUBMIT case): bit3 bit4 0 0 Validity period not present 0 1 Validity period present, relative format 1 0 Reserved 1 1 Validity period present, absolute format • Relative format: validity period, counted from when the SMS-SUBMIT is received by the SMSC, in range 0-255 (default value 167); for more details please refer to [8] • Absolute format: absolute time of the validity period termination in string format ("yy/MM/dd,hh:mm:ss+zz") (please refer to [8]); the time zone is expressed in steps of 15 minutes
<pid>	Number	TP-Protocol-Identifier (default 0); refer to [8]
<dcs>	Number	SMS Data Coding Scheme (default 0), or Cell Broadcast Data Coding Scheme

<vp>	Validity period value
0 to 143	(TP-VP + 1) x 5 minutes (i.e. 5 minutes intervals up to 12 hours)
144 to 167	12 hours + ((TP-VP -143) x 30 minutes)
168 to 196	(TP-VP - 166) x 1 day
197 to 255	(TP-VP - 192) x 1 week

11.16 Delete SMS +CMGD

11.16.1 Description

Deletes message from preferred message storage <mem1>, if <flag> = 0 or not present, in location <index>. Otherwise the messages are deleted following the rules specified by <flag>.

☞ When deleting a message from an empty location, the modem returns "OK".

Type	Syntax	Response	Example
Set	AT+CMGD=<index>[,<flag>]	OK	AT+CMGD=3 OK
Test	AT+CMGD=?	+CMGD: (list of supported <index>s) OK	+CMGD: (1-350),(0-4) OK

11.16.2 Defined Values

Parameter	Type	Description
<index>	Number	Storage position
<flag>	Number	Deletion flag. If present and different from 0 <index> is ignored: • 0: Default. Delete the message specified in <index> • 1: Delete all read messages from preferred message storage, leaving unread messages and stored mobile originated messages (whether sent or not)

Parameter	Type	Description
		untouched • 2: Delete all read messages from preferred message storage and sent mobile originated messages, leaving unread messages and unsent mobile originated messages untouched • 3: Delete all read messages from preferred message storage, sent and unsent mobile originated messages leaving unread messages untouched. • 4: Delete all messages from preferred message storage including unread messages.

11.17 Service center address +CSCA

11.17.1 Description

Updates the SMSC address, through which mobile originated SMS's are transmitted. In text mode the setting is used by send and write commands. In PDU mode the setting is used by the same commands, but only when the length of SMSC address coded into <pdu> parameter equals zero.

This command sets the service center value both in the RAM (this value is actually the SMSC address used) and in the SIM card. Through the read command the value of current service center stored in the RAM is displayed. At the power on, the MT reads the SMSC address in the SIM card and the same value is set in RAM.

Type	Syntax	Response	Example
Set	AT+CSCA=<sca>[,<tosca>]	OK	AT+CSCA="0170111000",129 OK
Read	AT+CSCA?	+CSCA: <sca>,<tosca> OK	+CSCA: "",129 OK
Test	AT+CSCA=?	OK	

11.17.2 Defined Values

Parameter	Type	Description
<sca>	String	Service center address
<tosca>	String	Type of address of <sca> (for more details refer to [12]); default 145 when string includes "+", otherwise default 129

11.18 Select cell broadcast message types +CSCB

11.18.1 Description

This set command selects which types of CBM's are to be received by the MT.

Type	Syntax	Response	Example
Set	AT+CSCB=[<mode>[,<mids>[,<dcss>]]]	OK	AT+CSCB=0,"1,5,10-11,40","" OK
Read	AT+CSCB?	+CSCB=<mode>,<mids>,<dcss> OK	+CSCB: 0,"","" OK

Type	Syntax	Response	Example
Test	AT+CSCB=?	+CSCB: (list of supported <mode>s) OK	+CSCB: (0-1) OK

11.18.2 Defined Values

Parameter	Type	Description
<mode>	Number	• 0: message types specified in <mids> and <dcss> are accepted • 1: message types specified in <mids> and <dcss> are not accepted
<mids>	String	Contains all possible combinations of CBM message identifiers (<mid>). Refer to 3GPP TS 23.041 [9], chapter 9.4
<dcss>	String	Contains all possible combinations of CBM data coding schemes (<dcs>). Refer to 3GPP TS 23.038 [7], chapter 5

☞ If <mode>=0 and <mids> is an empty string, receiving of CB SMS is stopped.

11.19 Read concatenated message +UCMGR

11.19.1 Description

Returns the message with location value <index> from message storage <mem1> to the DTE and shows additional information when the message is a segment of a concatenated one.

☞ The command is available only on LEON from LEON-G100-06x/LEON-G200-06x and subsequent versions.

☞ For SMS-DELIVER the parameters <tooa>, <fo>, <pid>, <dcs>, <sca>, <tosca>, <length> shall be displayed only if +CSDH=1 is set.

☞ For SMS-SUBMIT the parameters <toda>, <fo>, <pid>, <dcs>, <vp>, <sca>, <tosca>, <length> shall be displayed only if +CSDH=1 is set.

☞ For SMS-COMMAND <pid>, <mn>, <da>, <toda>, <length> <cdata> shall be displayed only if +CSDH=1 is set.

☞ The syntax AT+UCMGR=0 allows to display an SMS class 0 if it is signalized to MT, because no MMI is available in the MT (see also the note from command +CNMI, chapter 11.8).

☞ If status of the received message is "received unread", status in the storage changes to "received read".

☞ The command is supported only for text mode (+CMGF=1).

☞ If the <index> value is out of range (it depends on the preferred message storage, +CPMS command, settings) or it refers to an empty position, then the error "+CMS ERROR: invalid memory index" is returned.

Type	Syntax	Response	Example
Set	AT+UCMGR=<index>	**(SMS-DELIVER)** +UCMGR: <stat>,<oa>,[<alpha>],<scts>[,<tooa>,<fo>,<pid>,<dcs>,<sca>,<tosca>,<length>][,<seq>,<max>,<iei>,<ref>] <data> OK **(SMS-SUBMIT)** +UCMGR: <stat>,<da>,[<alpha>][<toda>,<fo>,<pid>,<dcs>,[<vp>],<sca>,<tosca>,<length>][,<seq>,<max>,<iei>,<ref>] <data> OK **(SMS-STATUS-report)** +UCMGR:<stat>,<fo>,<mr>,[<ra>],[<tora>]<scts><dt>,<st> OK **(SMS-COMMAND)** +UCMGR: <stat>,<fo>,<ct>[,<pid>,[<mn>],[<da>],[<toda>],<length> [<cdata>]] OK **(CBM storage)** +UCMGR: <stat>,<sn>,<mid>,<dcs>,<page>,<pages> <data> OK	AT+UCMGR=303 +UCMGR:"REC READ","+393488535999",,"07/04/05,18:02:28+08",145,4,0,0,"+393492000466",145,152,1,2,8,15 aaaaaaaaaaaaaaaaaaaabbbbbbbbbbbbbbbbbbbbcccccccccccccccccccddddddddddddddddddeeeeeeeeeeeeeeeeeeeffffffffffffffffffgggggggggggggggggggghhhhhhhhhhhh OK
Test	AT+UCMGR=?	OK	

11.19.2 Defined Values

Parameter	Type	Description
<index>	Number	Storage position
<stat>	String	Indicates the status of message in memory: • "REC UNREAD": received unread SMS • "REC READ": received read SMS • "STO UNSENT": stored unsent SMS • "STO SENT": stored sent SMS • "ALL": all SMS messages
<oa>	String	Originator address
<alpha>	String	Alphanumeric representation of <da> or <oa> corresponding to the entry found in the phonebook [12]. The parameter is not managed.
<scts>	String	Service center time stamp in time-string format, refer to <dt>
<tooa>	Number	Type of address of <oa> - octet
<fo>	Number	First octet of [8] SMS-DELIVER, SMS-SUBMIT (default 17), SMS-STATUS-REPORT, or SMS-COMMAND (default 2)
<pid>	Number	TP-Protocol-Identifier (default 0); refer to [8]
<dcs>	Number	SMS Data Coding Scheme (default 0), or Cell Broadcast Data Coding Scheme
<sca>	String	Service center address field

Parameter	Type	Description
<tosca>	Number	Type of address of <sca> - octet in Number format (for more details please refer to [12]); default 145 when string includes "+", otherwise default 129
<length>	Number	Number of characters
<seq>	Number	Sequence number of the current short message (1-255)
<max>	Number	Maximum number of short messages in the concatenated short message (1-255)
<iei>	Number	Information Element Identifier, the possible values are the following: • 0: Concatenated short messages, 8-bit reference number • 8: Concatenated short messages, 16-bit reference number
<ref>	Number	Concatenated short message reference number: • 0-255: Concatenated short messages, 8-bit reference number case • 0-65535: Concatenated short messages, 16-bit reference number case
<data>	String	In the case of SMS: [8] TP-User-Data in text mode responses; format: • if <dcs> indicates that [7] GSM 7 bit default alphabet is used and <fo> indicates that [8] TP-User-Data-Header-Indication is not set: o if TE character set other than "HEX" (refer command Select TE Character Set +CSCS chapter 5.5): ME/TA converts GSM alphabet into current TE character set according to rules of 3GPP27.005 [16] Annex A o if TE character set is "HEX": ME/TA converts each 7-bit character of GSM 7 bit default alphabet into two IRA character long hexadecimal number (e.g. character Π (GSM 7 bit default alphabet 23) is presented as 17 (IRA 49 and 55)) • if <dcs> indicates that 8-bit or UCS2 data coding scheme is used, or <fo> indicates that [8] TP-User-Data-Header-Indication is set: ME/TA converts each 8-bit octet into two IRA character long hexadecimal number (e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65)) In the case of CBS: [9] CBM Content of Message in text mode responses; format: • if <dcs> indicates that [7] GSM 7 bit default alphabet is used: o if TE character set other than "HEX" (refer command +CSCS chapter 26.15): ME/TA converts GSM alphabet into current TE character set according to rules of 3GPP27.005 [16] Annex A o if TE character set is "HEX": ME/TA converts each 7-bit character of the GSM 7 bit default alphabet into two IRA character long hexadecimal number if <dcs> indicates that 8-bit or UCS2 data coding scheme is used: ME/TA converts each 8-bit octet into two IRA character long hexadecimal number
<da>	String	Destination address
<toda>	Number	Type of address of <da> - octet
<vp>	Number	Format depending of the <fo> setting: • Relative format: validity period starting from when the SMS is received by the SMSC, in range 0-255 (default value 167); for more details please refer to [8] **<vp> / Validity period value** 0 to 143 — (TP-VP + 1) x 5 minutes (i.e. 5 minutes intervals up to 12 hours) 144 to 167 — 12 hours + ((TP-VP -143) x 30 minutes) 168 to 196 — (TP-VP - 166) x 1 day 197 to 255 — (TP-VP - 192) x 1 week Absolute format: absolute time of the validity period termination in string format ("yy/MM/dd,hh:mm:ss+zz") (please refer to [8]); the time zone is expressed in steps of 15 minutes
<mr>	Number	Message reference

Parameter	Type	Description
<ra>	String	Recipient address field
<tora>	Number	Type of address of <ra> - octet
<scts>	String	Service center time stamp in time-string format, refer to <dt>
<dt>	String	Discharge time in format "yy/MM/dd,hh:mm:ss+zz"; the time zone is expressed in steps of 15 minutes
<st>	Number	Status of an SMS STATUS-REPORT
<ct>	Number	TP-Command-Type (default 0)
<mn>	Number	3GPP TS 23.040 [8] TP-Message-Number in integer format
<mid>	Number	CBM message identifier
<cdata>	String	TP-Command-Data in text mode responses
<sn>	Number	CBM serial number
<page>	Number	3GPP TS 23.041 [9] CBM Page Parameter bits 4-7 in integer format
<pages>	Number	3GPP TS 23.041 [9] CBM Page Parameter bits 0-3 in integer format

11.20 List concatenated message +UCMGL

11.20.1 Description

Returns SMS messages with status value <stat> from message storage <mem1> to the DTE and shows additional information when the message is a segment of a concatenated one.

- The command is available only on LEON from LEON-G100-06x/LEON-G200-06x and subsequent versions.
- For SMS-DELIVER the parameters <tooa>, <length> shall be displayed only if +CSDH=1 is set.
- For SMS-SUBMIT the parameters <toda>, <length> shall be displayed only if +CSDH=1 is set.
- If status of the received message is "received unread", status in the storage changes to "received read".
- The command is supported only for text mode (+CMGF=1).

Type	Syntax	Response	Example
Set	AT+UCMGL[=<stat>]	**SMS-DELIVERs:** +UCMGL: <index>,<stat>,<oa>,[<alpha>],[<scts>][,<tooa>,<length>][,<seq>,<max>,<iei>,<ref>] <data> [+UCMGL: <index>,<stat>,<oa>,[<alpha>],[<scts>][,<tooa>,<length>][,<seq>,<max>,<iei>,<ref>]<data>[…]] OK	AT+UCMGL +UCMGL: 303,"REC READ","+393401234999",,"08/08/06,10:01:38+08",145,68,2,2,8,15 hhhhhhhhiiiiiiiiiiiiiiiiiiiillllllllllllllllllllmmmmmmmmmmmmmmmmmmmmm OK

Type	Syntax	Response	Example
		SMS-SUBMITs: +UCMGL: <index>,<stat>,<da>,[<alpha>],[<toda>, <length>][,<seq>,<max>,<iei>,<ref>] <data> [+UCMGL: <index>,<stat>,<da>,[<alpha>],[<toda>,<length>][,<seq>,<max>,<iei>,<ref>]<data>[…]] OK	
		SMS-STATUS-REPORTs: +UCMGL: <index>,<stat>,<fo>,<mr>,[<ra>],[<tora>],<scts>,<dt>,<st> [+UCMGL: <index>,<stat>,<fo>,<mr>,[<ra>],[<tora>],<scts>,<dt>,<st> […]] OK	
		SMS-COMMANDs: +UCMGL: <index>,<stat>,<fo>,<ct> [+UCMGL: <index>,<stat>,<fo>,<ct>[…]] OK	
		CBM storage: +UCMGL: <index>,<stat>,<sn>,<mid>,<page>,<pages><data> [+UCMGL: <index>,<stat>,<sn>,<mid>,<page>,<pages>,<data>[…]] OK	
Test	AT+UCMGL=?	+UCMGL: (list of supported <stat>s) OK	+UCMGL: (“RECUNREAD”,”REC READ”,”STO UNSENT”,”STO SENT”,”ALL”) OK

11.20.2 Defined Values

Parameter	Type	Description
<stat>	String	Indicates the status of message in memory: • “REC UNREAD”: received unread SMS messages • “REC READ”: received read SMS messages • “STO UNSENT”: stored unsent SMS messages • “STO SENT”: stored sent SMS messages • “ALL”: all SMS messages (default value)
<index>	Number	Storage position
<oa>	String	Originator address
<alpha>	String	Alphanumeric representation of <da> or <oa> corresponding to the entry found in the phonebook [12]. The parameter is not managed.
<scts>	String	Service center time stamp in time-string format; refer to <dt>
<tooa>	Number	Type of address of <oa> - octet
<length>	Number	Number of characters

Parameter	Type	Description
<seq>	Number	Sequence number of the current short message (1-255)
<max>	Number	Maximum number of short messages in the concatenated short message (1-255)
<iei>	Number	Information Element Identifier, the possible values are the following: • 0: Concatenated short messages, 8-bit reference number • 8: Concatenated short messages, 16-bit reference number
<ref>	Number	Concatenated short message reference number: • 0-255: Concatenated short messages, 8-bit reference number case • 0-65535: Concatenated short messages, 16-bit reference number case
<data>	String	In the case of SMS: [8] TP-User-Data in text mode responses; format: • if <dcs> indicates that [7] GSM 7 bit default alphabet is used and <fo> indicates that [8] TP-User-Data-Header-Indication is not set: o if TE character set other than "HEX" (refer command Select TE Character Set +CSCS chapter 26.15): ME/TA converts GSM alphabet into current TE character set according to rules of 3GPP27.005 Annex A o if TE character set is "HEX": ME/TA converts each 7-bit character of GSM 7 bit default alphabet into two IRA character long hexadecimal number (e.g. character Π (GSM 7 bit default alphabet 23) is presented as 17 (IRA 49 and 55)) • if <dcs> indicates that 8-bit or UCS2 data coding scheme is used, or <fo> indicates that [8] TP-User-Data-Header-Indication is set: ME/TA converts each 8-bit octet into two IRA character long hexadecimal number (e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65)) In the case of CBS: [9] CBM Content of Message in text mode responses; format: • if <dcs> indicates that [7] GSM 7 bit default alphabet is used: o if TE character set other than "HEX" (refer command +CSCS chapter 26.15): ME/TA converts GSM alphabet into current TE character set according to rules of 3GPP27.005 [16]Annex A o if TE character set is "HEX": ME/TA converts each 7-bit character of the GSM 7 bit default alphabet into two IRA character long hexadecimal number if <dcs> indicates that 8-bit or UCS2 data coding scheme is used: ME/TA converts each 8-bit octet into two IRA character long hexadecimal number
<da>	String	Destination address
<toda>	Number	Type of address of <da> - octet
<fo>	Number	First octet of TS 23.040 SMS-DELIVER, SMS-SUBMIT (default 17), SMS-STATUS-REPORT, or SMS-COMMAND (default 2)
<mr>	Number	Message reference
<ra>	String	Recipient address field
<tora>	Number	Type of address of <ra> - octet
<dt>	String	Discharge time in format "yy/MM/dd,hh:mm:ss+zz"; the time zone is expressed in steps of 15 minutes
<st>	Number	Status of an SMS STATUS-REPORT
<ct>	Number	TP-Command-Type (default 0)
<sn>	Number	CBM serial number
<mid>	Number	CBM message identifier
<page>	Number	3GPP TS 23.041 [9] CBM Page Parameter bits 4-7 in integer format
<pages>	Number	3GPP TS 23.041 [9] CBM Page Parameter bits 0-3 in integer format
<dcs>	Number	SMS Data Coding Scheme (default 0), or Cell Broadcast Data Coding Scheme

11.21 Send concatenated message +UCMGS

11.21.1 Description

Sends one segment of a concatenated message from a DTE to the network (SMS-SUBMIT). Message reference value <mr> is returned to the DTE on successful message delivery. <CR> separates the parameter part from the text part of the edited SMS in text mode. <ctrl-Z> indicates that the SMS shall be sent, while <ESC> indicates aborting of the edited SMS.

The command is available only on LEON from LEON-G100-06x/LEON-G200-06x and subsequent versions.

The command is supported only for text mode (+CMGF=1)

Type	Syntax	Response	Example
Set	AT+UCMGS=<da>,[<toda>],<seq>,<max>,<iei>,<ref><CR> <text><Ctrl-Z/ESC>	+UCMGS: <mr> OK	AT+UCMGS="0171112233",,1,2,8,15<CR> aaaaaaaaaaaaaaaaaaaabbbbbbbbbbbbbbbbbbbbbcccccccccccccccccccddddddddddddddddddeeeeeeeeeeeeeeeeeeeffffffffffffffffffgggggggggggggggggggghhhhhhhhhhh <Ctrl-Z> +UCMGS:2 OK
Test	AT+UCMGS=?	OK	

11.21.2 Defined Values

Parameter	Type	Description
<da>	String	Destination address
<toda>	Number	Type of address of <da> - octet
<seq>	Number	Sequence number of the current short message (1-255)
<max>	Number	Maximum number of short messages in the concatenated short message (1-255)
<iei>	Number	Information Element Identifier, the possible values are the following: • 0: Concatenated short messages, 8-bit reference number • 8: Concatenated short messages, 16-bit reference number
<ref>	Number	Concatenated short message reference number: • 0-255: Concatenated short messages, 8-bit reference number case • 0-65535: Concatenated short messages, 16-bit reference number case
<text>	String	SMS String
<mr>	Number	Message reference

11.22 Write concatenated message to memory +UCMGW

11.22.1 Description

Stores one segment of a concatenated message (SMS-DELIVER or SMS-SUBMIT) to memory storage <mem2>. Memory location <index> of the stored message is returned. <CR> separates the parameter part from the text part of the edited SMS in text mode. <ctrl-Z> indicates that the SMS shall be sent, while <ESC> indicates aborting of the edited SMS.

The command is available only on LEON from LEON-G100-06x/LEON-G200-06x and subsequent versions.

The command is supported only for text mode (+CMGF=1)

Type	Syntax	Response	Example
Set	AT+UCMGW=[<oa/da>],[<tooa/toda>],[<stat>],<seq>,<max>,<iei>,<ref><CR> <text><Ctrl-Z/ESC>	+UCMGW: <index> OK	AT+UCMGW="091137880",,,2,2,8,15 <CR> hhhhhhhhiiiiiiiiiiiiiiiiiiiiilllllllllllllllllllllmmmm mmmmmmmmmmmmmmmmm <Ctrl-Z> +UCMGW:303 OK
Test	AT+UCMGW=?	OK	

11.22.2 Defined Values

Parameter	Type	Description
<da>	String	3GPP TS 23.040 [8] TP-Destination-Address Address-Value field in string format; BCD numbers (or GSM 7 bit default alphabet characters) are converted to characters of the currently selected TE character set (refer command +CSCS in 3GPP TS 27.007 [9]); type of address given by <toda>
<oa>	String	3GPP TS 23.040 [8] TP-Originating-Address Address-Value field in string format; BCD numbers (or GSM 7 bit default alphabet characters) are converted to characters of the currently selected TE character set (refer command +CSCS chapter 5.5); type of address given by <tooa>
<tooa>	Number	[13] TP-Originating-Address Type-of-Address octet in integer format (default refer <toda>)
<toda>	Number	[13] 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)
<stat>	String	Indicates the status of message in memory: • "REC UNREAD": received unread SMS messages • "REC READ": received read SMS messages • "STO UNSENT": stored unsent SMS messages • "STO SENT": stored sent SMS messages (default value)
<seq>	Number	Sequence number of the current short message (1-255)
<max>	Number	Maximum number of short messages in the concatenated short message (1-255)
<iei>	Number	Information Element Identifier, the possible values are the following: • 0: Concatenated short messages, 8-bit reference number • 8: Concatenated short messages, 16-bit reference number

Parameter	Type	Description
<ref>	Number	Concatenated short message reference number: • 0-255: Concatenated short messages, 8-bit reference number case • 0-65535: Concatenated short messages, 16-bit reference number case
<text>	String	SMS String
<index>	Number	Storage position

11.23 More Messages to Send +CMMS

11.23.1 Description

Controls the continuity of SMS relay protocol link. When enabled, multiple SMS messages can be sent much faster as link is kept open.

Type	Syntax	Response	Example
Set	AT+CMMS=[<mode>]	OK	AT+CMMS=2 OK
Read	AT+CMMS?	+CMMS: <mode> OK	+CMMS: 2 OK
Test	AT+CMMS=?	+CMMS: (list of supported <mode>s) OK	+CMMS: (0-2) OK

11.23.2 Defined Values

Parameter	Type	Description
<mode>	Number	• 0: disable (default) • 1: keep enabled until the time between the response of the latest message send command (such as +CMGS) and the next send command exceeds 5 seconds, then close the link and switch <mode> automatically back to 0 • 2: keep permanently enabled. The link is closed after each send sequence, but <mode> is not switched back to 0

12 Supplementary services commands

12.1 Call forwarding +CCFC

12.1.1 Description

Controls the call forwarding supplementary service according. Registration, erasure, activation, deactivation and status query are supported. This command can be aborted.

Type	Syntax	Response	Example
Set	AT+CCFC=<reason>,<mode>[,<number>[,<type>[,<class>[,<subaddr>[,<satype>[,<time>]]]]]]	OK or when <mode>=2 +CCFC: <status>,<class1>[,<number>,<type>[,<subaddr>, <satype>[,<time>]]] [+CCFC: <status>,<class2> [,<number>, <type>[,<subaddr>,<satype>[,<time>]]]	**Registration:** AT+CCFC=0,3,"01711234" OK **Query status:** AT+CCFC=2,2 +CCFC: 1,1,"+3945112",145,"",,60 OK
Test	AT+CCFC=?	+CCFC: (list of supported <reason>s) OK	+CCFC: (0-5) OK

12.1.2 Defined Values

Parameter	Type	Description
<reason>	Number	• 0: unconditional • 1: mobile busy • 2: no reply • 3: not reachable • 4: all call forwarding • 5: all conditional call forwarding
<mode>	Number	• 0: disable • 1: enable • 2: query status • 3: registration • 4: erasure
<number>	String	Phone number of forwarding address in <type> format
<type>	Number	Type of address; default 145 when dialling string includes "+", otherwise 129
<subaddr>	String	Subaddress; parameter currently ignored after syntax check
<satype>	Number	Type of subaddress; default 128 (TON/NPI unknown); parameter currently ignored after syntax check
<classx>	Number	Sum of Numbers each representing a class of information (default 7 - voice (1), data (2) and FAX (4) - or interpreted by network if not explicitly entered) • 1: voice • 2: data • 4: FAX • 8: SMS • 16: data circuit sync • 32: data circuit async • 64: dedicated packet access • 128: dedicated PAD access

Parameter	Type	Description
<time>	Number	Time in seconds to wait before call is forwarded (default 20), but only when <reason>=2 (no reply) is enabled; the range goes from 5 to 30 s
<status>	Number	• 0: not active • 1: active

12.2 Call waiting +CCWA

12.2.1 Description

Controls the Call Waiting supplementary service according to [33]. Activation, deactivation and status query are supported. When querying the status of a network service (<mode>=2) the response line for 'not active' case (<status>=0) should be returned only if service is not active for any <class>. Status query is abortable if a character is sent to DCE during the command execution. If enabled by <n> a URC is presented on TE when a call is signalled in following format:

+CCWA: <number>,<type>,<class>,[<alpha>][,<CLI validity>[,<subaddr>,<satype>[,<priority>[,<cause of no cli>]]]]

Type	Syntax	Response	Example
Set	**Set Command** AT+CCWA=[<n>[,<mode>[,<class>]]] **Query Command** AT+CCWA=[<n>[,<mode>]]	+CCWA: <status>,<class1> [+CCWA: <status>,<class2> [...]] OK	+CCWA: 1,1 OK
Read	AT+CCWA?	+CCWA: <n> OK	+CCWA: 0 OK
Test	AT+CCWA=?	+CCWA: (list of supported <n>s) OK	+CCWA: (0-1) OK
URC		+CCWA: <number>,<type>,<class>,[<alpha>][,<CLI validity>[,<subaddr>,<satype>]]	

12.2.2 Defined Values

Parameter	Type	Description
<n>	Number	Enable/disable the presentation of a URC +CCWA • 0: disable • 1: enable
<mode>	Number	If <mode> not given, network is not interrogated • 0: disable • 1: enable • 2: query status
<classx>	Number	Sum of Numbers each representing a class of information (default 1 if <classx> is not set) • 1: voice • 2: data currently not supported • 4: FAX currently not supported • 32: data circuit async; currently not supported ☞ The values 16,64,128 are not supported
<status>	Number	• 0: not active • 1: active

Parameter	Type	Description
<number>	String	phone number of calling address in format specified by <type>
<type>	Number	Type of address
<alpha>	String	Optional string type alphanumeric representation of <number> corresponding to the entry found in phonebook; this parameter is not managed
<CLI validity>	Number	• 0: CLI valid • 1: CLI has been withheld by the originator • 2: CLI is not available
<cause of no cli>	Number	• 0: unavailable • 1: reject by user • 2: interaction with other service • 3: coin line/payphone
<subaddr>	String	Subaddress of format specified by <satype>
<satype>	Number	Subaddress octet (refer to TS 24.008 subclause 10.5.4.8)
<priority>	Number	Optional digit type parameter indicating that the eMLPP priority level of the incoming call. The priority level values are as defined in eMLPP specification 3GPP TS 22.067.

If call waiting is not handled in uniform mode among all networks even if the GSM 02.04 [3] describes all needed 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, the actual implementation of the service on the networks is different.

12.3 Calling line identification restriction +CLIR

12.3.1 Description

Controls calling line identification restriction supplementary service (3GPP 22.081 [34]). This command can be aborted.

Type	Syntax	Response	Example
Set	AT+CLIR=[<n>]	OK	AT+CLIR=2 OK
Read	AT+CLIR?	+CLIR: <n>,<m> OK	+CLIR: 0,2 OK
Test	AT+CLIR=?	+CLIR: (list of supported <n>s) OK	+CLIR: (0-2) OK

12.3.2 Defined Values

Parameter	Type	Description
<n>	Number	Sets the adjustment for outgoing calls • 0: presentation indicator is used according to the subscription of the CLIR service • 1: CLIR invocation • 2: CLIR suppression
<m>	Number	Shows the subscriber CLIR status in the network • 0: CLIR not provisioned • 1: CLIR provisioned in permanent mode • 2: unknown • 3: CLIR temporary mode presentation restricted • 4: CLIR temporary mode presentation allowed

12.4 Calling line identification presentation +CLIP

12.4.1 Description

Controls the calling line identification presentation supplementary service. When CLI (Calling Line Identification) is enabled, +CLIP response is returned after every RING result code. When the presentation of CLI at the TE is enabled, the following URC is displayed after RING: **+CLIP: <number>,<type>[,<subaddr>,<satype>[,[<alpha>][,[<CLI validity>][,<Cause of No Cli>]]]]**

Type	Syntax	Response	Example
Set	AT+CLIP=[<n>]	OK	AT+CLIP=1 OK
Read	AT+CLIP?	+CLIP: <n>,<m> OK	+CLIP: 0,2 OK
Test	AT+CLIP=?	+CLIP: (list of supported <n>s) OK	+CLIP: (0-1) OK

12.4.2 Defined Values

Parameter	Type	Description
<n>	Number	Optional parameter sets/shows the result code presentation in the TA • 0: disable (default value) • 1: enable
<m>	Number	Shows the subscriber CLIP service status in the network • 0: CLIP not provisioned • 1: CLIP provisioned • 2: unknown
<number>	String	Phone number of calling address in format specified by <type>
<type>	Number	Type of address octet
<subaddr>	String	Subaddress of format specified by <satype>
<satype>	Number	Type of subaddress octet
<alpha>	String	Optional string type alphanumeric representation of <number> corresponding to the entry found in phonebook; parameter is not managed
<CLI validity>	Number	• 0: CLI valid • 1: CLI has been withheld by the originator • 2: CLI is not available
<cause of no cli>	Number	• 0: unavailable • 1: reject by user • 2: interaction with other service • 3: coin line/payphone

When CLI is not available (<CLI validity>=2), <number> shall be an empty string ("") and <type> value will not be significant. Nevertheless, TA may return the recommended value 128 for <type> ((TON/NPI unknown). When CLI has been withheld by the originator, (<CLI validity>=1) and the CLIP is provisioned with the "override category" option (refer to [34] and [35]), <number> and <type> is provided. Otherwise, TA shall return the same setting for <number> and <type> as if the CLI was not available.

12.5 Connected line identification presentation +COLP

12.5.1 Description

Controls the connected line identification presentation supplementary service, useful in case of call forwarding of the connected line. When enabled and call allowed the following intermediate result code is sent to TE before any +CR or V.25ter responses:

+COLP: <number>,<type>[,<subaddr>,<satype>[,<alpha>]]

This command can be aborted.

Type	Syntax	Response	Example
Set	AT+COLP=[<n>]	OK	AT+COLP=1 OK
Read	AT+COLP?	+COLP: <n>,<m> OK	+COLP: 0,2 OK
Test	AT+COLP=?	+COLP: (list of supported <n>s) OK	+COLP: (0-1) OK

12.5.2 Defined Values

Parameter	Type	Description
<n>	Number	Optional parameter sets/shows the result code presentation status in the TA • 0: disable (default value) • 1: enable
<m>	Number	Shows the subscriber COLP status in the network • 0: COLP not provisioned • 1: CLIR provisioned in permanent mode • 2: unknown
<number>, <type>, <subaddr>, <satype>, <alpha>		See +CLIP (chapter 12.4)

12.6 Connected line identification restriction +COLR

12.6.1 Description

Enables connected party to prevent presentation of its line identity to the calling party. According to GSM02.81 [34] the activation and deactivation of COLR is only a result of provision / withdrawal. The command +COLR allows only the interrogation of the current state of COLR service in the network. The set syntax is not allowed (+CME ERROR: operation not supported).

Type	Syntax	Response	Example
Read	AT+COLR?	+COLR: <status> OK	+COLR: 2 OK
Test	AT+COLR=?	OK	

12.6.2 Defined Values

Parameter	Type	Description
<status>	Number	Shows the subscriber COLR service status in the network • 0: COLR not provisioned • 1: COLR provisioned • 2: unknown

12.7 Advise of charge +CAOC

12.7.1 Description

Allows the subscriber to get the information about the call costs in home units using the Advise of Charge supplementary service (3GPP TS 22.024 [37] and 3GPP TS 22.086 [36]). If enabled the following URC is sent to TE periodically: **+CAOC: <ccm>**

Type	Syntax	Response	Example
Set	AT+CAOC[=<mode>]	[+CAOC: <ccm>] OK	AT+CAOC=0 OK
Read	AT+CAOC?	+CAOC: <mode> OK	+CAOC: 1 OK
Test	AT+CAOC=?	+CAOC: (list of supported <mode>s) OK	+CAOC: (0-2) OK

12.7.2 Defined Values

Parameter	Type	Description
<mode>	Number	Shows the subscriber COLR service status in the network • 0: query the CCM value • 1: deactivate the unsolicited reporting of CCM value • 2: activate the unsolicited reporting of CCM value
<ccm>	Number	Current call meter indicated as a string in hexadecimal format

12.8 Accumulated call meter +CACM

12.8.1 Description

Resets the Advice of charge related accumulated call meter value in SIM file EF-ACM. ACM contains the total number of home units for both the current and preceding calls. SIM PIN2 is required to reset the value.

Type	Syntax	Response	Example
Set	AT+CACM=[<passwd>]	OK	AT+CACM="0933" OK
Read	AT+CACM?	+CACM: <acm> OK	+CACM: "000000" OK
Test	AT+CACM=?	OK	

12.8.2 Defined Values

Parameter	Type	Description
<passwd>	String	SIM PIN2 as string type
<acm>	String	Accumulated call meter value similarly coded as <ccm> under +CAOC

12.9 Accumulated call meter maximum +CAMM

12.9.1 Description

Sets the Advise of Charge related accumulated call meter maximum value in the SIM file EF-ACMmax. ACMmax contains the maximum number of home units allowed to be consumed by the subscriber. When ACM reaches ACMmax, calls are prohibited. SIM PIN2 is required to set the value.

Type	Syntax	Response	Example
Set	AT+CAMM=[<acmmax>[,<passwd>]]	OK	AT+CAMM="000300","0933" OK
Read	AT+CAMM?	+CAMM: <acmmax> OK	+CAMM:"000300" OK
Test	AT+CAMM=?	OK	

12.9.2 Defined Values

Parameter	Type	Description
<acmmax>	String	Contains the accumulated call meter maximum value similarly coded as <ccm> under +CAOC; value zero disables ACMmax feature
<passwd>	String	Contains SIM PIN2

12.10 Price per unit and currency table +CPUC

12.10.1 Description

Sets the parameters of Advise of Charge related price per unit and currency table in SIM file EF-PUCT. PUCT information can be used to convert the home units into currency units. PIN2 is required to set the parameters.

Type	Syntax	Response	Example
Set	AT+CPUC=<currency>,<ppu>[,<passwd>]	OK	AT+CPUC="USD","0.20","0933" OK
Read	AT+CPUC?	+CPUC: <currency>,<ppu> OK	+CPUC="USD","0.20" OK
Test	AT+CPUC=?	OK	

12.10.2 Defined Values

Parameter	Type	Description
<currency>	String	Contains the three-character currency code (e.g. "GBP","EUR")
<ppu>	String	Contains the price per unit; dot is used as a decimal separator
<passwd>	String	Contains SIM PIN2

12.11 Call related supplementary services +CHLD

12.11.1 Description

Call hold and multiparty conversation (conference call). Calls can be put on hold, recovered, released or added to conversation.

☞ On LEON-G100/G200 series"=" character is not mandatory.

Type	Syntax	Response	Example
Set	AT+CHLD=[<n>]	OK	AT+CHLD=2 OK
Test	AT+CHLD=?	+CHLD: (list of supported <n>s) OK	+CHLD: (0,1,1x,2,2x,3,4,4*,6,7,8) OK

12.11.2 Defined Values

Parameter	Type	Description
<n>	Number	• 0: release all held calls or set User Determined User Busy for a waiting call; if both exists then only the waiting call will be rejected • 1: release all active calls and accepts the other (held or waiting) • 1x: release a specific call (x specific call number as indicated by +CLCC – chapter 12.13) • 2: place all active calls (if exist) on hold and accepts the other call (held or waiting, if exist) • 2x: place all active calls on hold except call x with which communication is supported • 3: adds a held call to the conversation • 4: connects the two calls and disconnects the subscriber from both calls (Explicit Call Transfer) • 4*: call deflection (proprietary feature) • 5: call completion of busy subscriber; this command syntax will be interpreted as an activation request, if the network has previously offered the possibility to activate this function • 6: puts an active call on hold or an held call to active, while another call is waiting • 7: disconnect users in multiparty without accepting incoming call. • 8: release all calls (active and held)

12.12 Call deflection +CTFR

12.12.1 Description

Allows the MT user to respond to an incoming call offered by the network by requesting call deflection, i.e. redirection of this call to another number specified in the response. The call deflection is a supplementary service applicable only to voice calls (teleservice 11).

Type	Syntax	Response	Example
Set	AT+CTFR=<number>	OK	AT+CTFR="09113788" OK
Test	AT+CTFR=?	OK	

12.12.2 Defined Values

Parameter	Type	Description
<number>	String	Phone number

12.13 List current calls +CLCC

12.13.1 Description

Returns the list of current calls of MT. If no calls are available, no information response is sent.

Type	Syntax	Response	Example
Action	AT+CLCC	[+CLCC: <id1>,<dir>,<stat>,<mode>,<mpty>[,<number>,<type>[,alpha>]] [+CLCC: <id2>,<dir>,<stat>,<mode>,<mpty>[,<number>,<type>[,<alpha>]] [...]]] OK or OK (if no calls)	+CLCC: 1,0,0,0,0,"0913137880",129 OK
Test	AT+CLCC=?	OK	

12.13.2 Defined Values

Parameter	Type	Description
<idx>	Number	Indicates the call identification (see +CHLD x)
<dir>	Number	Direction • 0: mobile originated (MO) call • 1: mobile terminated (MT) call
<stat>	Number	State of the call • 0: active • 1: held • 2: dialling (Mobile Originated call) • 3: alerting (Mobile Originated cal) • 4: incoming (Mobile Terminated call) • 5: waiting (Mobile Terminated call)
<mode>	Number	Teleservice • 0: voice • 1: data • 2: FAX • 9: unknown
<mpty>	Number	• 0: call is not one of multiparty (conference) call parties • 1: call is one of multiparty call parties
<number>	String	Indicates the phone number in format specified by <type>
<type>	Number	Type of address octet (phone number)
<alpha>	String	Optional string alphanumeric representation of <number> corresponding to the entry found in phonebook; this parameter is not managed

12.14 Supplementary service notifications +CSSN

12.14.1 Description

Refers to supplementary service related network initiated notifications. When <n>=1 and a supplementary service notification is received after a mobile originated call setup, the IRC **+CSSI: <code1>[,<index>]** is sent before any other Mobile Originated call setup result codes. When <m>=1 and a supplementary service notification is received during a call, the URC **+CSSU: <code2>[,<index>[,<number>,<type>[,<subaddr>,<satype>]]]** is sent.

Type	Syntax	Response	Example
Set	AT+CSSN=[<n>[,<m>]]	OK	AT+CSSN=0,0 OK
Read	AT+CSSN?	+CSSN: <n>,<m> OK	+CSSN: 0,0 OK
Test	AT+CSSN=?	+CSSN: (list of supported <n>s),(list of supported <m>s) OK	+CSSN: (0-1),(0-1) OK
IRC		+CSSI: <code1>[,<index>]	+CSSI: 4,1
URC		+CSSU: <code2>[,<index>[,<number>, <type>[, <subaddr>, <satype>]]]	+CSSU: 0

12.14.2 Defined Values

Parameter	Type	Description
<n>	Number	Sets/shows the +CSSI result code presentation status • 0: disabled (default value) • 1: enabled
<m>	Number	Sets/shows the +CSSU result code presentation status • 0: disabled (default value) • 1: enabled
<code1>	Number	• 0: unconditional call forwarding is active • 1: some of the conditional call forwardings are active • 2: call has been forwarded • 3: call is waiting • 4: this is a CUG call (<index> parameter is provided) • 5: outgoing calls are barred • 6: incoming calls are barred • 7: CLIR suppression rejected • 8: calls has been deflected
<index>	Number	Refer +CCUG (chapter 12.16)
<code2>	Number	• 0: this is a forwarded call (MT call setup) • 1: this is a CUG call (<index> parameter is provided) (MT call setup) • 2: call has been put on hold (during a voice call) • 3: call has been retrieved (during a voice call) • 4: multiparty call entered (during a voice call) • 5: call on hold has been released – this is not an SS notification – (during a voice call) • 6: forward check SS message received (can be received whenever) • 7: call is being connected (alerting) with the remote party in alerting state in explicit call transfer operation (during a voice call) • 8: call has been connected with the other remote party in explicit call transfer operation (during a voice call or MT call setup) • 9: this is a deflected call (MT call setup)

Parameter	Type	Description
		• 10: additional incoming call forwarded
<number>	String	Phone number, format specified by <type>
<type>	Number	Type of address octet
<subaddr>, <satype>	String	Not used

12.15 Unstructured supplementary service data +CUSD

12.15.1 Description

Control of Unstructured Supplementary Service Data (USSD) according to 3GPP TS 22.090 [6]. Both network and mobile initiated operations are supported. Parameter <n> is used to disable/enable the presentation of a URC **+CUSD: <m>[,<str>,<dcs>]**. Value <n>=2 is used to cancel an ongoing USSD session. This command can be aborted. When <str> is given, a mobile initiated USSD-string or a response USSD-string to a network initiated operation is sent to the network. The response USSD-string from the network is returned in the URC +CUSD indicated above.

The command to abort is equivalent to send AT+CUSD=2, that ends the current USSD session.

After having sent a +CUSD request it is not possible to send another one until the URC of the first one is not received.

Don't send any new +CUSD request until the URC for the previous one sent is not received.

Type	Syntax	Response	Example
Set	AT+CUSD=[<n>[,<str>[,<dcs>]]]	[+CUSD: <m>[,<str>,<dcs>]] OK	AT+CUSD=1,"*100#",15 +CUSD: 2,"Residual credit: 7,87 Euro",15 OK
Read	AT+CUSD?	+CUSD: <n> OK	+CUSD: 0 OK
Test	AT+CUSD=?	+CUSD: (list of supported <n>s) OK	+CUSD: (0-2) OK
URC		+CUSD: <m>[,<str>,<dcs>]	

12.15.2 Defined Values

Parameter	Type	Description
<n>	Number	• 0: disable the result code presentation • 1: enable the result code presentation • 2: cancel session (not applicable to read command response)
<str>	String	USSD-string converted in the current character set in use (refer to +CSCS command description 5.5)
<dcs>	Number	Data coding scheme
<m>	Number	• 0: no further user action required • 1: further user action required • 2: USSD termination by network • 4: operation not supported • 5: network time out

12.16 Closed user group +CCUG

12.16.1 Description

Enables subscribers to form closed user groups to and from which access is restricted (refer to 3GPP TS 22.085 [38]). The command can be used to:

- Activate/deactivate the control of the CUG information for all following calls
- Select a CUG index
- Suppress the outgoing access (OA). The OA allows a member of a CUG to place calls outside the CUG
- Suppress the preferential CUG

Type	Syntax	Response	Example
Set	AT+CCUG=[<n>[,<index>[,<info>]]]	OK	AT+CCUG=1,2,1 OK
Read	AT+CCUG?	+CCUG: <n>,<index>,<info> OK	+CCUG: 0,0,0 OK
Test	AT+CCUG=?	+CCUG: (list of supported <n>s),(list of supported <index>s),(list of supported <info>s) OK	+CCUG: (0-1),(0-10),(0-3) OK

12.16.2 Defined Values

Parameter	Type	Description
<n>	Number	• 0: CUG temporary disabled (default value) • 1: CUG temporary enabled
<index>	Number	• 0..9: CUG index, (0 default value) • 10: no index (preferred CUG taken from subscriber data)
<info>	Number	• 0: no information (default value) • 1: suppress OA • 2: suppress preferential CUG • 3: suppress OA and preferential CUG

12.17 Calling name presentation +CNAP

12.17.1 Description

Controls the name identification supplementary service (refer to 3GPP TS 22.096 [39]). When the Calling Name Presentation at the MT is enabled, the following URC is displayed: **+CNAP: <calling_name> [, <CNAP validity>]**. This command can be aborted.

Type	Syntax	Response	Example
Set	AT+CNAP=[<n>]	OK	AT+CNAP=0 OK
Read	AT+CNAP?	+CNAP: <n>, <m> OK	+CNAP: 0,2 OK
Test	AT+CNAP=?	+CNAP: (list of supported <n>s) OK	+CNAP: (0-1) OK

Type	Syntax	Response	Example
URC		+CNAP: <calling_name> [, <CNAP validity>]	+CNAP: "SubscriberName",0

12.17.2 Defined Values

Parameter	Type	Description
<n>	Number	Sets the result code presentation • 0: disabled (default value) • 1: enabled
<m>	Number	Subscriber CNAP service status in the network • 0: CNAP not provisioned • 1: CNAP provisioned • 2: unknown
<calling_name>	String	Calling party name
<CNAP validity>	Number	• 0: name presentation allowed • 1: presentation restricted • 2: name unavailable • 3: name presentation restricted

13 Data commands

13.1 Select bearer service type +CBST

13.1.1 Description

Selects bearer service <name> with data rate <speed> and the connection element <ce> to use for data calls.

Type	Syntax	Response	Example
Set	AT+CBST=[<speed>[,<name>[,<ce>]]]	OK	AT+CBST=5,0,1 OK
Read	AT+CBST?	+CBST: <speed>,<name>,<ce> OK	+CBST: 7,0,1 OK
Test	AT+CBST=?	+CBST: (list of supported <speed>s),(list of supported <name>s),(list of supported <ce>s) OK	+CBST: (0,4-7,12,68,70,71),(0),(0-3) OK

13.1.2 Defined Values

Parameter	Type	Description
<speed>	Number	• 0: autobauding • 4: 2400 b/s (V.22bis) • 5: 2400 b/s (V.26ter) • 6: 4800 b/s (V.32) • 7: 9600 b/s (V.32) (default value) • 12: 9600 b/s (V.34) • 68: 2400 b/s (V110 or X.31 flag stuffing) • 70: 4800 b/s (V110 or X.31 flag stuffing) • 71: 9600 b/s (V110 or X.31 flag stuffing)
<name>	Number	Bearer service name • 0: data circuit asynchronous (UDI or 3.1 kHz modem) (default value)
<ce>	Number	Connection element • 0: transparent • 1: non-transparent (default value) • 2: both, transparent preferred • 3: both, non-transparent preferred

13.2 Service class selection and identification +FCLASS

13.2.1 Description

Puts the MT into a selected mode of operation (voice, data or FAX) for the following CS call.

Type	Syntax	Response	Example
Set	AT+FCLASS=<class>	OK	AT+FCLASS=2.0 OK
Read	AT+FCLASS?	<n> OK	0 OK

Type	Syntax	Response	Example
Test	AT+FCLASS=?	(List of supported <class>s) OK	(0,2.0,8) OK

13.2.2 Defined Values

Parameter	Type	Description
<class>	Number	Operation mode • 0: data (default value) • 2.0: FAX (service class 2) • 8: voice

☞ <class>=2.0 is not supported on LISA-U1 series.

13.3 Service reporting control +CR

13.3.1 Description

Controls if intermediate result code **+CR: <serv>** is returned or not. If enabled, the intermediate result code is transmitted at the point during connect negotiation at which the MT has determined which speed and quality of service will be used, before any error control or data compression reports are transmitted, and before the intermediate result code CONNECT is transmitted.

Type	Syntax	Response	Example
Set	AT+CR=[<mode>]	OK	AT+CR=0 OK
Read	AT+CR?	+CR: <mode> OK	+CR: 0 OK
Test	AT+CR=?	+CR: (list of supported <mode>s) OK	+CR: (0-1) OK

13.3.2 Defined Values

Parameter	Type	Description
<mode>	Number	• 0: disables reporting (default value) • 1: enables reporting
<serv>	Number	Service name • ASYNC - asynchronous transparent • REL ASYNC - asynchronous non-transparent

☞ REL ASYNC applies only for incoming or outgoing data calls.

13.4 Cellular result codes +CRC

13.4.1 Description

Enables detailed ring indication, in case of incoming call. Instead of RING, a URC is displayed.

Type	Syntax	Response	Example
Set	AT+CRC=[<mode>]	OK	AT+CRC=0 OK
Read	AT+CRC?	+CRC: <mode> OK	
Test	AT+CRC=?	+CRC: (list of supported <mode>s) OK	+CRC: (0-1) OK
URC		+CRING: <type>	

13.4.2 Defined Values

Parameter	Type	Description
<mode>	Number	• 0: disables extended format (default) • 1: enables extended format
<type>	Number	Ring indication description • ASYNC - asynchronous transparent • REL ASYNC - asynchronous non-transparent • REL SYNC - synchronous non-transparent • SYNC – synchronous transparent • FAX: facsimile (TS62) • VOICE: normal voice (TS11) • ALT VOICE / FAX: alternating voice/FAX, voice first (TS61) • ALT FAX / VOICE: alternating voice/FAX, FAX first (TS61)

13.5 Radio link protocol +CRLP

13.5.1 Description

Change the radio link protocol (RLP) parameters used when non-transparent data-calls are originated.

Type	Syntax	Response	Example
Set	AT+CRLP=[<iws>[,<mws>[,<T1>[,<N2>]]]]	OK	AT+CRLP=61,61,48,6 OK
Read	AT+CRLP?	+CRLP: <iws>,<mws>,<T1>,<N2> OK	+CRLP: 61,61,48,6 OK
Test	AT+CRLP=?	+CRLP: (lists of supported <iws>),(lists of supported <mws>), lists of supported <T1>),(lists of supported <N2>) OK	+CRLP: (0-61),(0-61),(39-255)(1-255) OK

13.5.2 Defined Values

Parameter	Type	Description
<iws>	Number	IWF (Interworking Function) to MT window size, range 0 - 61 (default 61)
<mws>	Number	MT to IWF (Interworking Function) window size, range 0 - 61 (default 61)
<T1>	Number	Acknowledgement timer T1, expressed in dozen of msec, range 39 – 255 (default 48)
<N2>	Number	Retransmission attempts, range 1 - 255 (default 6)

14 FAX class 2 commands

14.1 Introduction

FAX commands are compliant with ITU_T recommendation V250 and V.25ter.
FAX service is carried out in five separate and consecutive phases:

- Phase A: Call set-up
- Phase B: Pre-message procedure for identifying and selecting the required facilities
- Phase C: Message transmission
- Phase D: Post-message procedure including end-of-message, confirmation and multi-document procedures
- Phase E: Call release

14.2 Adaptive answer +FAA

14.2.1 Description

Allows an adaptive answer of DCE depending on the parameter <value>.

Type	Syntax	Response	Example
Set	AT+FAA=<value>	OK	
Read	AT+FAA?	<value> OK	
Test	AT+FAA=?	(range of <value>s) OK	(0-1) OK

14.2.2 Defined Values

Parameter	Type	Description
<value>	Number	• 0: the DCE shall answer only as a Class 2 facsimile device • 1: the DCE can automatically determine whether to answer as a facsimile DCE (in case of FAX call or alternate speech/fax call is delivered) or as a data modem. If a data modem is detected, the DCE shall operate as described in ITU-T Recommendation T.32 par. 8.3.2.4.

14.3 Address & polling capabilities +FAP

14.3.1 Description

Enables sending and receiving of SUB, SEP, and PWD frames.

Type	Syntax	Response	Example
Set	AT+FAP=<sub>,<sep>, <pwd>	OK	

Type	Syntax	Response	Example
Read	AT+FAP?	<sub>,<sep>,<pwd> OK	
Test	AT+FAP=?	(range of <sub>s),(range of <sep>s),(range of <pwd>s) OK	(0-1),(0-1),(0-1) OK

14.3.2 Defined Values

Parameter	Type	Description
<sub>	Number	subaddressing; default value: 0
<sep>	Number	selective polling; default value: 0
<pwd>	Number	password; default value: 0

14.4 Buffer size +FBS

14.4.1 Description

Allows the DCE to report the size of its data buffers for FAX services.

Type	Syntax	Response	Example
Read	AT+FBS?	<tbs>,<rbs> OK	

14.4.2 Defined Values

Parameter	Type	Description
<tbs>	Number	transmit buffer size, i.e. 2048 bytes
<rbs>	Number	receive buffer size, i.e. 2048 bytes

14.5 Data bit order +FBO

14.5.1 Description

Controls the mapping between PSTN facsimile data and the DTE-DCE link. There are two options:

- Direct order: the first bit of each octet transferred on the DTE-DCE link is the first bit transferred on the GSTN (General Switched Telephone Network) data carrier
- Reversed order: the last bit of each octet transferred on the DTE-DCE link is the first bit transferred on the GSTN data carrier

Type	Syntax	Response	Example
Set	AT+FBO=<value>	OK	
Read	AT+FBO?	<value> OK	
Test	AT+FBO=?	(range of <value>s) OK	(0-3) OK

14.5.2 Defined Values

Parameter	Type	Description
<value>	Number	• 0: direct bit order • 1: reverse bit order for T.4 messages • 2: reverse bit order for HDLC messages • 3: reverse bit order for both T.4 and HDLC messages

14.6 HDLC frame reporting +FBU

14.6.1 Description

Controls the DCE reporting of the contents of phase B and phase D HDLC frames to the DTE via intermediate result codes +FHT and FHR, as they are sent and received, in addition to other responses.

Type	Syntax	Response	Example
Set	AT+FBU=<value>	OK	
Read	AT+FBU?	<value> OK	
Test	AT+FBU=?	(range of <value>s) OK	(0-1) OK

14.6.2 Defined Values

Parameter	Type	Description
<value>	Number	• 0: HDLC reporting disabled • 1: HDLC reporting enabled

14.7 DS capabilities parameters +FCC

14.7.1 Description

Allows the DTE to read and constrain the capabilities of the facsimile DCE based on the choices defined in table 2 of ITU-T Recommendation T.30. When any parameter is modified by the DTE via AT+FCC command, the DCE shall set accordingly the current session parameters (controlled by the AT+FIS command).

All command parameters are optional; if a parameter is left blank, its value remains unchanged.

Type	Syntax	Response	Example
Set	AT+FCC=[[[[[[[[[<vr>],],<wd>],<ln>],<df>],<ec>],<bf>],<st>],<jp>]	OK	
Read	AT+FCC?	<vr>, ,<wd>,<ln>,<df>,<ec>,<bf>,<st>,<jp> OK	
Test	AT+FCC=?	(range of <vr>s),(range of s),(range of <wd>s), (range of <ln>s),(range of <df>s),(range of <ec>s), (range of <bf>s),(range of <st>s),(range of <jp>s) OK	(0-1),(0-3),(0),(0-2),(0),(0),(0),(0-7),(0) OK

14.7.2 Defined Values

Parameter	Type	Description
<vr>	Number	resolution in range 0-1
 	Number	bit rate in range 0-3
<wd>	Number	page width in pixels; only 0 value allowed
<ln>	Number	page length in range 0-2
<df>	Number	data compression format; only 0 value allowed
<ec>	Number	error correction; only 0 value allowed
<bf>	Number	file transfer; only 0 value allowed
<st>	Number	Scan time/line; in range 0-7
<jp>	Number	JPEG for colour and B&W; only 0 value allowed

14.8 Copy quality checking +FCQ

14.8.1 Description

Allows to control copy quality checking and correction by a facsimile DCE.

Type	Syntax	Response	Example
Set	AT+FCQ=<rq>,<tq>	OK	
Read	AT+FCQ?	<rq>,<tq> OK	
Test	AT+FCQ=?	(range of <rq>s),(range of <tq>s) OK	(0),(0) OK

14.8.2 Defined Values

Parameter	Type	Description
<rq>	Number	controls copy quality checking and correction of data received from the remote station and delivered to DTE
<tq>	Number	controls copy quality checking and correction of image data received from the DTE and sent to the remote station

14.9 Capability to receive data +FCR

14.9.1 Description

Sets the capability to receive message data.

Type	Syntax	Response	Example
Set	AT+FCR=<value>	OK	
Read	AT+FCR?	<value> OK	
Test	AT+FCR=?	(supported <value>) OK	(1) OK

14.9.2 Defined Values

Parameter	Type	Description
<value>	Number	only value 1 allowed; DCE can receive message data. Bit 10 in the DIS or DTC frame will be set

14.10 Current session results +FCS

14.10.1 Description

Allows displaying the current session results, either as a response to the read syntax or as an intermediate result code during the execution of +FDT.

Type	Syntax	Response	Example
Read	AT+FCS?	<vr>, ,<wd>,<ln>,<df>,<ec>,<bf>,<st>,<jp> OK	
IRC		+FCS=<vr>, ,<wd>,<ln>,<df>,<ec>,<bf>,<st>,<jp>	
IRC		+FDCS=<vr>, ,<wd>,<ln>,<df>,<ec>,<bf>,<st>,<jp>	

14.10.2 Defined Values

See +FCC.

14.11 DTE phase C response timeout +FCT

14.11.1 Description

Determines how long the DCE will wait for a command after having transmitted all available phase C data.

Type	Syntax	Response	Example
Set	AT+FCT=<value>	OK	
Read	AT+FCT?	<value> OK	
Test	AT+FCT=?	(range of <value>s) OK	(1-FF) OK

14.11.2 Defined Values

Parameter	Type	Description
<value>	Number	Range 0x0-0xFF, in 1 second units. Default value: 0x1E (30) s

14.12 Receive data +FDR

14.12.1 Description

Initiates data reception.

Type	Syntax	Response	Example
Action	AT+FDR	OK	

14.13 Transmit Data +FDT

14.13.1 Description

Prefixes data transmission. It requests the DCE to transmit a phase C page. It is issued at the beginning of each page in phase B or D.

Type	Syntax	Response	Example
Action	AT+FDT	OK	

14.14 Phase C received EOL alignment +FEA

14.14.1 Description

Controls optional octet-alignment of EOL markers in received T.4 data stream. It does not apply to T.6 data, or to any form of data.

Type	Syntax	Response	Example
Set	AT+FEA=<value>	OK	
Read	AT+FEA?	<value> OK	
Test	AT+FEA=?	(supported <value>s) OK	(0) OK

14.14.2 Defined Values

Parameter	Type	Description
<value>	Number	• 0: determines that T.4 EOL patterns are bit aligned (as received) • 1: determines that the last received bits of T.4 EOL patterns are octet aligned by the DCE, with necessary zero fill bits inserted (RFU)

14.15 Format conversion +FFC

14.15.1 Description

Determines the DCE response to mismatches between the phase C data delivered after the +FDT command and the data format parameters negotiated for the facsimile session. Currently no check nor conversion is supported.

Type	Syntax	Response	Example
Set	AT+FFC=<vrc>,<dfv>,<lnc>, <wdc>	OK	
Read	AT+FFC?	<vrc>,<dfv>,<lnc>,<wdc> OK	

Type	Syntax	Response	Example
Test	AT+FFC=?	(list of supported <vrc>s),(list of supported <dfv>s),(list of supported <lnc>s),(list of supported <wdc>s) OK	(0),(0),(0),(0) OK

14.15.2 Defined Values

Parameter	Type	Description
<vrc>	Number	vertical resolution format codes • 0: ignored • 1: enabled (RFU) • 2: enabled for 1-D data (RFU) • 3: enabled for 2-D data (RFU)
<dfc>	Number	data format codes • 0: ignored • 1: checking enabled (RFU) • 2: conversion (RFU)
<lnc>	Number	page length format codes • 0: ignored • 1: checking enabled (RFU) • 2: conversion for 1-D data (RFU) • 3: conversion enabled for 2-D data (RFU)
<wdc>	Number	page with format codes • 0: ignored • 1: checking enabled (RFU) • 2: conversion enabled (RFU)

14.16 Report file transfer diagnostic frame +FFD

14.16.1 Description

This command has no parameters.

Type	Syntax	Response	Example
Action	AT+FFD	OK	

14.17 Call termination status +FHS

14.17.1 Description

indicates the cause of a hang-up; the cause is set by the DCE at the conclusion of a FAX session and reset to 0 at the beginning of phase A.

Type	Syntax	Response	Example
Read	AT+FHS?	<value> OK	

14.17.2 Defined Values

Parameter	Type	Description
<value>	Number	• 0x00: undefined

Parameter	Type	Description
		• 0x02: fax call cleared by the remote modem or the DTE • 0x 11: Fax modem timed out in phase B • 0x20: Unspecified transmitting phase B error • 0x23: Invalid command received in transmitting phase B • 0x40: Unspecified transmitting phase C error • 0x43: Send fax data underflow • 0x70: Unspecified receiving phase B error • 0x50: Unspecified transmitting phase D error • 0xA0: Unspecified receiving phase D error

14.18 Procedure interrupt enable +FIE

14.18.1 Description

Controls the procedure of interrupt handling.

Type	Syntax	Response	Example
Set	AT+FIE=<value>	OK	
Read	AT+FIE?	<value> OK	
Test	AT+FIE=?	(range of <value>s) OK	(0-1) OK
IRC		+FET:<pmc>	

14.18.2 Defined Values

Parameter	Type	Description
<value>	Number	• 0: procedure interrupt requests from the remote station are ignored and not reported to DTE • 1: procedure interrupt requests from the remote station are reported to DTE (allowed only on alternate speech/fax calls) as intermediate result code +FET
<pmc>	Number	Post message command • 0: MultiPage Signal - to indicate the end of a complete page of facsimile information and the return to phase C upon receipt of a confirmation • 1: End Of Message - to indicate the end of a complete page of facsimile information and return to phase B • 2: End Of Procedure - to indicate the end of a complete page of facsimile information and proceeding to phase E upon receipt of a confirmation • 3: same as 0, with return to phase B if operator intervention is accomplished • 4: same as 1, with return to phase B if operator intervention is accomplished • 5: same as 2, with return to phase B if operator intervention is accomplished

14.19 Initialize facsimile parameters +FIP

14.19.1 Description

Causes the DCE to initialize all Service Class Facsimile Parameters to the manufacturer determined default settings. It does not change the +FCLASS setting. It should not be used when FAX connections are active.

Type	Syntax	Response	Example
Set	AT+FIP=[<value>]	OK	
Read	AT+FIP?	0 OK	

Type	Syntax	Response	Example
Test	AT+FIP=?	(list of supported <value>s) OK	(0) OK

14.19.2 Defined Values

Parameter	Type	Description
<value>	Number	indicates the profile; only one profile is possible for <value>=0

14.20 Current session parameters +FIS

14.20.1 Description

Allows the DTE to sense and constrain the capabilities of the current session. An intermediate result code may also be sent to the DTE during fax calls to indicate current negotiated parameters.

Type	Syntax	Response	Example
Set	AT+FIS=[[[[[[[[[<vr>],],<wd>],<ln>],<df>],<ec>],<bf>],<st>],<jp>]	OK	
Read	AT+FIS?	+FIS: <vr>, ,<wd>,<ln>,<df>,<ec>,<bf>,<st>,<jp> OK	
Test	AT+FIS=?	+FIS: (range of <vr>s),(range of s),(range of <wd>s), (range of <ln>s),((range of <df>s),(range of <ec>s), (range of <bf>s),(range of <st>s),(range of <jp>s) OK	+FIS: (0-1),(0-3),(0),(0-2),(0),(0),(0),(0-7),(0) OK
IRC		+FIS=<vr>, ,<wd>,<ln>,<df>,<ec>,<bf>,<st>,<jp>	

14.20.2 Defined Values

Parameter	Type	Description
<vr>	Number	Resolution, range 0-1
 	Number	bit rate, range 0-3
<wd>	Number	page width in pixels; only 0 value allowed
<ln>	Number	page length, range 0-2
<df>	Number	data compression format; only 0 value allowed
<ec>	Number	error correction; only 0 value allowed
<bf>	Number	file transfer; only 0 value allowed
<st>	Number	scan time/line, range 0-7
<jp>	Number	JPEG for colour and B&W; only 0 value allowed

14.21 Inactivity timeout +FIT

14.21.1 Description

Provides an inactivity timer which allows the DCE to break away from an unsuccessful connection attempt at any stage of a facsimile transfer.

Type	Syntax	Response	Example
Set	AT+FIT=[<time>[,<action>]]	OK	
Read	AT+FIT?	<time>,<action> OK	
Test	AT+FIT=?	(range of <time>s),(supported <action>) OK	(0-255),(0) OK

14.21.2 Defined Values

Parameter	Type	Description
<time>	Number	timer duration in seconds, range 0-255
<action>	Number	only value 0 possible, which means: when timer expire, the DCE shall clear the call.

14.22 Session termination +FKS, +FK

14.22.1 Description

Causes the DCE to terminate the session in an orderly manner: if the DCE has an active, not transmitting FAX call, it will send a DCN message and hang up.

Type	Syntax	Response	Example
Set	AT+FK<S>	OK	

14.23 Local ID string +FLI

14.23.1 Description

Determines that DCE sends the ID frame if +FLI is not a zero-string.

Type	Syntax	Response	Example
Set	AT+FLI=<local ID string>	OK	
Read	AT+FLI?	<local ID string> OK	
Test	AT+FLI=?	(range of char values) OK	(20-7E) OK

14.23.2 Defined Values

Parameter	Type	Description
<local ID string>	String	20 digit string; valid codes for characters are in the range 0x20-0x7E

14.24 Set flow control +FLO

14.24.1 Description

Allows setting the flow control for communication via V.24 interface.

Type	Syntax	Response	Example
Set	AT+FLO=<value>	OK	
Read	AT+FLO?	<value> OK	
Test	AT+FLO=?	(range of <value>s) OK	(0-2) OK

14.24.2 Defined Values

Parameter	Type	Description
<value>	Number	indicates the kind of flow control • 0: DTE-DCE flow control is disabled • 1: DTE-DCE flow control is DC1/DC3 (SW flow control) • 2: DTE-DCE flow control is RTC/CTS (HW flow control)

14.25 Indicate document to poll +FLP

14.25.1 Description

Indicates that a document is available for retrieval. By default the DTE has no document to poll.

Type	Syntax	Response	Example
Set	AT+FLP=<value>	OK	
Read	AT+FLP?	<value> OK	
Test	AT+FLP=?	(range of <value>s) OK	(0) OK

14.25.2 Defined Values

Parameter	Type	Description
<value>	Number	only value 0 is allowed

14.26 Request manufacturer Identification +FMI

14.26.1 Description

Text string, determined by the manufacturer, identifying the manufacturer.

Type	Syntax	Response	Example
Action	AT+FMI	<manufacturer> OK	u-blox OK

Type	Syntax	Response	Example
Test	AT+FMI=?	OK	

14.26.2 Defined Values

Parameter	Type	Description
<manufacturer>	String	manufacturer name

14.27 Request model identification +FMM

14.27.1 Description

Text string, determined by the manufacturer, identifying the model identification.

Type	Syntax	Response	Example
Action	AT+FMM	<model> OK	LEON-G200 OK
Test	AT+FMM=?	OK	

14.27.2 Defined Values

Parameter	Type	Description
<model>	String	Name of model

14.28 Request revision identification +FMR

14.28.1 Description

Gives the firmware version of the module.

Type	Syntax	Response	Example
Action	AT+FMR	<version> OK	07.11.00 OK
Test	AT+FMR=?	OK	

14.28.2 Defined Values

Parameter	Type	Description
<version>	String	Firmware version

14.29 Minimum phase C speed +FMS

14.29.1 Description

Limits the lowest negotiable speed for a fax session. If the parameter is left blank, the default value is set.

Type	Syntax	Response	Example
Set	AT+FMS=<value>	OK	

Type	Syntax	Response	Example
Read	AT+FMS?	<value> OK	
Test	AT+FMS=?	(range of <value>s) OK	(0-3) OK

14.29.2 Defined Values

Parameter	Type	Description
<value>	Number	• 0: 2400 b/s (default) • 1: 4800 b/s • 2: 7200 b/s • 3: 9600 b/s

14.30 Negotiation reporting +FNR

14.30.1 Description

Controls the reporting of messages generated during T.30 phase B negotiations.

Type	Syntax	Response	Example
Set	AT+FNR=[<rpr>[,<tpr>[,<idr>[,<nsr>]]]]	OK	
Read	AT+FNR?	<rpr>,<tpr>,<idr>,<nsr> OK	
Test	AT+FNR=?	(range of <rpr>s), (range of <tpr>),(range of <idr>s), (range of <nsr>s) OK	(0-1),(0-1),(0-1),(0-1) OK

14.30.2 Defined Values

Parameter	Type	Description
<rpr>	Number	receiver parameters reporting: 0-1 (no-yes)
<tpr>	Number	transmitter parameters reporting: 0-1 (no-yes)
<idr>	String	ID strings reporting: 0-1 (no-yes)
<nsr>	String	Non-standard frame FIF octet string +FNS

14.31 Non-standard frame FIF octet string +FNS

14.31.1 Description

Allows configuring the corresponding non-standard facilities frame. The command is not currently used.

Type	Syntax	Response	Example
Set	AT+FNS=<string>	OK	
Read	AT+FNS?	<string> OK	
Test	AT+FNS=?	(range of character codes) OK	(20-7E) OK

14.31.2 Defined Values

Parameter	Type	Description
<string>	String	Characters in range 0x20-0x7E

14.32 NSF message data indication +FND

14.32.1 Description

Controls indication of non-standard facilities frames. The command is not currently used.

Type	Syntax	Response	Example
Set	AT+FND=<value>	OK	
Read	AT+FND?	<value> OK	
Test	AT+FND=?	(range of <value>s) OK	(0-1) OK

14.32.2 Defined Values

Parameter	Type	Description
<value>	Number	range 0-1 (enabled/disabled).

14.33 Selective polling address +FPA

14.33.1 Description

Sets the selective polling address. The DCE should send the numeric string contained in the +FPA at the times specified in T.30, if the corresponding parameter is not zero string. The command is not currently used.

Type	Syntax	Response	Example
Set	AT+FPA=<selective polling address string>	OK	AT+FPA=1234 OK
Read	AT+FPA?	<selective polling address string> OK	"1234" OK
Test	AT+FPA=?	(range of character codes) OK	(20-7E) OK

14.33.2 Defined Values.

Parameter	Type	Description
<selective polling address string>	String	20 digit string: values are in range 0x20-0x7E

14.34 Local polling ID string +FPI

14.34.1 Description

Allows the DCE to send the ID frame if +FPI is not a null string. The command is not currently used.

Type	Syntax	Response	Example
Set	AT+FPI=<local polling ID string>	OK	
Read	AT+FPI?	<local polling ID string> OK	"1234" OK
Test	AT+FPI=?	(range of character codes) OK	(20-7E) OK

14.34.2 Defined Values

Parameter	Type	Description
<local polling ID string>	String	only null string "" is allowed

14.35 Packet protocol control +FPP

14.35.1 Description

Allows controlling the packet protocol. The packet protocol is not currently supported.

Type	Syntax	Response	Example
Set	AT+FPP=[<value>]	OK	
Read	AT+FPP?	<value> OK	
Test	AT+FPP=?	(supported <value>) OK	(0) OK

14.35.2 Defined Values

Parameter	Type	Description
<value>	Number	only value 0 allowed

14.36 Page status +FPS

14.36.1 Description

Sets the post page response, in particular end-of-page status, to be sent to the remote part. During fax transmission, post page response of the remote part is indicated to the DTE with an intermediate result code +FPS.

Type	Syntax	Response	Example
Set	AT+FPS=[<value>]	OK	
Read	AT+FPS?	<value> OK	
Test	AT+FPS=?	(range of <value>) OK	(1-5) OK

14.36.2 Defined Values

Parameter	Type	Description
<value>	Number	• 1: MCF, page good (default value) • 2: RTN, page bad; retrain requested • 3: RTP, page good; retrain requested • 4: PIN, page bad; interrupt requested • 5: PIP, page good; interrupt requested

14.37 Password parameter +FPW

14.37.1 Description

Sets the password. The DCE sends the numeric string contained in +FPW at the times specified in T.30, if the corresponding parameter is not a null string.

Type	Syntax	Response	Example
Set	AT+FPW=<password string>	OK	AT+FPW=1234 OK
Read	AT+FPW?	"<password string>" OK	
Test	AT+FPW=?	(range of <value>) OK	"1234" OK

14.37.2 Defined Values

Parameter	Type	Description
<password string>	String	Valid characters: 0-9, *, #, space

14.38 Receive quality thresholds +FRQ

14.38.1 Description

Allows making the "Copy Quality OK" decision using the command parameters. The command is not currently used.

Type	Syntax	Response	Example
Set	AT+FRQ=<pgl>,<cbl>	OK	
Read	AT+FRQ?	<pgl>,<cbl> OK	
Test	AT+FRQ=?	(supported <pgl>),(supported <cbl>) OK	(0),(0) OK

14.38.2 Defined Values

Parameter	Type	Description
<pgl>	Number	Percentage of good lines: only value 0 accepted
<cbl>	Number	Consecutive bad lines: only value 0 accepted

14.39 Error correction mode retry count +FRY

14.39.1 Description

Controls the retry counter in Error Correcting Mode. The command is not currently used.

Type	Syntax	Response	Example
Set	AT+FRY=[<value>]	OK	
Read	AT+FRY?	<count> OK	
Test	AT+FRY=?	(range of <count>) OK	(0-FF) OK

14.39.2 Defined Values

Parameter	Type	Description
<value>	Number	In range 0-0xFF (0 if blank)

14.40 SubAddress parameter +FSA

14.40.1 Description

Sets the subaddress. The DCE sends the numeric string configured via AT+FSA at the times specified in T.30, if the corresponding parameter is not a null string.

Type	Syntax	Response	Example
Set	AT+FSA=<destination SubAddress string>	OK	AT+FSA=1234 OK
Read	AT+FSA?	"<destination SubAddress string >" OK	"1234" OK
Test	AT+FSA=?	(range of character codes) OK	(20-7E) OK

14.40.2 Defined Values

Parameter	Type	Description
<destination SubAddress string>	String	20 digit string; allowed values: 0-9, *, #, space

14.41 Request to poll +FSP

14.41.1 Description

This command indicates whether or not the DTE wants to poll. The command is not currently used.

Type	Syntax	Response	Example
Set	AT+FSP=[<value>]	OK	
Read	AT+FSP?	<value> OK	

Type	Syntax	Response	Example
Test	AT+FSP=?	(supported <value>) OK	(0) OK

14.42 Fax intermediate result codes

14.42.1 Description

According to Recommendation T.32, Tab. 6, the following intermediate result codes are provided to the DTE during fax calls.

IRC	Meaning
+FCO	Indicates connection with a fax terminal
+FVO	Indicates transition to voice
+FHS	Call terminated with status
+FCS	Report the DCS frame information
+FDCS	Report the DCS frame information for speech/fax alternate calls
+FIS	Report the DIS frame information
+FTI	Report the remote (transmitting) ID, from TSI (Transmitting Subscriber Identification) frame
+FTSI	Report the remote (transmitting) ID, from TSI (Transmitting Subscriber Identification) frame for speech/fax alternate calls
+FCI	Report the remote (called) ID, from CSI (Called Subscriber Identification
+FCSI	Report the remote (called) ID, from CSI (Called Subscriber Identification for speech/fax alternate calls
+FET	Report post page message
+FPS	Report received page status
+FPTS	Report received page status for speech/fax alternate calls
+FHT	Report transmitted HDLC frames
+FHR	Debug report received HDLC frames

15 V24 control and V25ter commands

15.1 Reset to default configuration Z

15.1.1 Description

Resets the DCE and the AT commands configuration stored in the profile. Configuration values contained in a user profile will be taken from the corresponding NVRAM-profile, indicated by the <value> parameter.

When the command is issued, any CSD call in progress is released. In case of success, the response is issued using the configuration of the result codes format (Q, V, S3, S4 commands) loaded from the requested NVRAM profile. The other DCE settings are applied after the response issuing.

For more details on the commands stored in the profiles please refer to chapter B.1.

Type	Syntax	Response	Example
Action	ATZ[<value>]	OK	

15.1.2 Defined Values

Parameter	Type	Description
<value>	Number	Optional parameter, it iindicates NVRAM profile; possible values 0-1. If the parameter <value> is omitted, the command behavior is the same of ATZ0

15.2 Set to factory defined configuration &F

15.2.1 Description

Resets the AT commands configuration to factory defined defaults. The reset uses the AT commands configuration stored in the factory default NVRAM-profile. AT commands configuration not belonging to the profile, stored in the NVRAM, is not included in the reset.

In case of success, the response is issued using the configuration of the result codes format (Q, V, S3 and S4 AT commands) loaded from the factory default NVRAM profile. The other DCE settings are applied after the response issuing.

For more details on the commands stored in the profiles please refer to chapter B.1.

Type	Syntax	Response	Example
Action	AT&F[<value>]	OK	

15.2.2 Defined Values

Parameter	Type	Description
<value>	Number	Only 0 allowed

15.3 Circuit 109 behavior &C

15.3.1 Description

Controls the behavior of RS232 circuit 109 - Data Carrier Detect (DCD) - relates to the detection of received line signal from the remote end.

Type	Syntax	Response	Example
Action	AT&C[<value>]	OK	

15.3.2 Defined Values

Parameter	Type	Description
<value>	Number	Indicates the behavior of circuit 109 • 0: DCE always presents ON condition on circuit 109 • 1: circuit 109 changes in accordance with the Carrier detect status; ON if the Carrier is detected, OFF otherwise (default value)

Refer to LEON-G100/G200 System Integration Manual [25] for DCD behavior during the initialization phase of the module.

Refer to LISA-U1 series System Integration Manual [49] for DCD behavior during the initialization phase of the module.

15.4 Circuit 108/2 behavior &D

15.4.1 Description

Controls the behavior of RS232 circuit 108/2 - Data Terminal Ready (DTR) - relates to changes from ON to OFF condition during on-line data state.

Type	Syntax	Response	Example
Action	AT&D[<value>]	OK	

15.4.2 Defined Values

Parameter	Type	Description
<value>	Number	• 0: the DCE ignores circuit 108/2 • 1: upon an ON-to-OFF transition of circuit 108/2, the DCE enters online command state and issues an OK result code (default value) • 2: upon an ON-to-OFF transition of circuit 108/2, the DCE performs an orderly cleardown of the call. Automatic answer is disabled while circuit 108/2 remains OFF

15.4.3 ~+++ behavior in PSD &D

- A special meaning of the &D value is provided for the ~+++ sequence during a PSD data transfer with PPP L2 protocol (this is outside the V25-ter specification scope). The ~+++ causes context deactivation during a PSD data transfer session for the AT&D0 and AT&D2 value[1] (note that the +++ return to on-line command mode is provided for each &D value during a CSD data call [20])
- A different implementation for the ~+++ is done with the &D1 value: PSD data transfer is escaped and system returns in the on-line command state. ATO command is used to resume the PSD data transfer session
- During the on-line command mode different AT commands can be sent but data calls in PSD on-line command mode cannot be granted (activate the AT+CRC=1 mode to identify the kind of call and reject data incoming calls if PSD is in the on-line command mode)

[1] On LEON from LEON-G100-05S/LEON-G200-05S and subsequent versions the setting AT&D0 causes DTR line transitions to be ignored. In

For more details please refer to [20], [21] and [22].

Refer to LEON-G100/G200 System Integration Manual [25] for DTR behavior during the initialization phase of the module.

Refer to LISA-U1 series System Integration Manual [49] for DTR behavior during the initialization phase of the module.

15.4.4 Circuit 108/2, +++ behavior for the different &D: summarizing tables

	CSD data mode	
Event	**DTE sends escape sequence (e.g. +++)**	**DTR On to Off transition**
&D0	DCE enters command mode	No action
&D1	DCE enters command mode	Switch to command mode
&D2	DCE enters command mode	Cleardown call

Table 1: CSD Data Mode

	PSD data mode (PPP L2 protocol case)	
Event	**DTE sends ~+++**	**DTR On to Off transition**
&D0	Context deactivation	No action
&D1	DCE enters command mode	DCE enters command mode
&D2	Context deactivation	Context deactivation

Table 2: PSD Data Mode

The ON/OFF DTR transition in direct link forces the DCE into command mode. In case of AT&D0 the DTR transition is ignored, also in direct link.

The escape sequence for the PSD data mode with a L2 protocol different from the PPP is not ~+++, and it could be not supported. Please refer to the table in 15.19.2 for more information.

15.5 DSR override &S

15.5.1 Description

Selects how the modem will control RS232 circuit 107 - Data Set Ready (DSR).

Type	Syntax	Response	Example
Action	AT&S[<value>]	OK	

15.5.2 Defined Values

Parameter	Type	Description
<value>	Number	• 0: sets the DSR line to ON • 1: sets the DSR line to ON in data mode and to OFF in command mode (default value)

Refer to LEON-G100/G200 System Integration Manual [25] for DSR behavior during the initialization phase of the module.

Refer to LISA-U1 series System Integration Manual [49] for DSR behavior during the initialization phase of the module.

15.6 Flow control &K

15.6.1 Description

Controls the flow control mechanism.

Type	Syntax	Response	Example
Action	AT&K[<value>]	OK	

15.6.2 Defined Values

Parameter	Type	Description
<value>	Number	• 0: disable DTE flow control • 3: enable RTS/CTS DTE flow control (default value) • 4: enable XON/XOFF DTE flow control • 5: enable XON/XOFF DTE flow control • 6: enable XON/XOFF DTE flow control

The setting AT&K0 (flow control disabled) must be used when the RTS and CTS lines are not physically connected.

The command setting provides the message error +CME ERROR: operation not allowed when the AT command interface runs on the USB port or on the SPI interface.

The software flow control (Xon/Xoff) setting is not allowed on the USB port, on the SPI interface and on a MUX channel.

SW flow control (Xon/Xoff) activation is only allowed in case of text transmission: binary data cannot be transmitted because it may contain the special flow control characters (Xon/Xoff).

When software flow control (Xon/Xoff) is used, the DC1 (XON, 0x11) and DC3 (XOFF, 0x13) characters are reserved and therefore filtered (e.g. in SMS text mode these two characters can't be inputted).

On UART interface and if +UPSV=2, only &K0 (no flow control) is allowed.

15.7 Store current configuration &W

15.7.1 Description

Stores into one of the two RAM profile mirrors the AT current configuration of the DCE interface in which the command is issued. The profile is selected according to the AT command parameter value. For more details on the AT command configuration saved in the profiles please refer to chapter B.1.

The NVRAM profile is updated with the RAM mirror only when the module is switched off using the +CPWROFF AT command (more details on the command in the chapter 6.2).

Type	Syntax	Response	Example
Action	AT&W[<value>]	OK	

15.7.2 Defined Values

Parameter	Type	Description
<value>	Number	• 0: selects profile 0 (default value) • 1: selects profile 1

15.8 Display current configuration &V

15.8.1 Description

Reports the current configuration and the stored user profiles.

Not all command parameters are listed with this command. For the complete list of the parameters stored in the profile please refer to Appendix B.1.

AT&V command does not display audio parameters. Audio parameters can be displayed by the corresponding read command (i.e. AT+UMGC?).

Type	Syntax	Response	Example
Action	AT&V	ACTIVE PROFILE: List of commands stored in the active profile with the related values STORED PROFILE 0: List of commands stored in the profile 0 with the related values STORED PROFILE 1: List of commands stored in the profile 1 with the related values OK	ACTIVE PROFILE: &C1, &D1, &S1, &K3, E1, Q0, V1, X4, S00:000, S02:043, S03:013, S04:010, S05:008, S07:060, +CBST:007, 000, 001, +CRLP:061, 061, 048, 006, +CR:000, +CRC:000, +IPR:0, +COPS:0,0,FFFFF, +ICF:3,1, +UPSV: 0, +CMGF:0, +CNMI:1,0,0,0,0, +USTS: 0 STORED PROFILE 0: &C1, &D1, &S1, &K3, E1, Q0, V1, X4, S00:000, S02:043, S03:013, S04:010, S05:008, S07:060, +CBST:007, 000, 001, +CRLP:061, 061, 048, 006, +CR:000, +CRC:000, +IPR:0, +COPS:0,0,FFFFF, +ICF:3,1, +UPSV: 0, +CMGF:0, +CNMI:1,0,0,0,0, +USTS: 0 STORED PROFILE 1: &C1, &D1, &S1, &K3, E1, Q0, V1, X4, S00:000, S02:043, S03:013, S04:010, S05:008, S07:060, +CBST:007, 000, 001, +CRLP:061, 061, 048, 006, +CR:000, +CRC:000, +IPR:0, +COPS:0,0,FFFFF, +ICF:3,1, +UPSV: 0, +CMGF:0, +CNMI:1,0,0,0,0, +USTS: 0 OK

15.9 Designate a default reset profile &Y

15.9.1 Description

Selects which NVRAM-profile will be loaded after a hardware reset. The AT commands configuration from the loaded profile will be separately applied to each attached interface. At run time each interface will own the configuration as described in chapter B.1. An error is returned if <value> is greater then 2, or NVRAM is not installed or is not operational.

For more details on the commands stored in the profiles please refer to chapter B.1.

Type	Syntax	Response	Example
Action	AT&Y[<value>]	OK	

15.9.2 Defined Values

Parameter	Type	Description
<value>	Number	• 0: selects profile 0 (default value) • 1: selects profile 1 • 2: selects the default factory settings

15.10 Request identification information I

15.10.1 Description

Causes the DCE to transmit one or more lines of information text, determined by the manufacturer, followed by a final result code.

Type	Syntax	Response	Example
Action	ATI[<value>]	<string> OK	LISA-U120-00S-00 OK

15.10.2 Defined Values

Parameter	Type	Description
<value>	Number	Range 0-9; for each value a text will be displayed • 0: provide the product type number of the module (default value) • 1-9: reserved

15.11 Request manufacturer Identification +GMI

15.11.1 Description

Text string, determined by the manufacturer, identifying the manufacturer.

Type	Syntax	Response	Example
Action	AT+GMI	<manufacturer> OK	u-blox OK

15.11.2 Defined Values

Parameter	Type	Description
<manufacturer>	String	Manufacturer name

15.12 Request model identification +GMM

15.12.1 Description

Text string, determined by the manufacturer, identifying the model identification.

Type	Syntax	Response	Example
Action	AT+GMM	<model> OK	LISA-U120 OK

15.12.2 Defined Values

Parameter	Type	Description
<model>	String	Name of model

15.13 Request revision identification +GMR

15.13.1 Description

Returns the firmware version of the module.

Type	Syntax	Response	Example
Action	AT+GMR	<version> OK	07.11.00 OK

15.13.2 Defined Values

Parameter	Type	Description
<version>	String	Firmware version

15.14 Request product serial number identification +GSN

15.14.1 Description

Returns the IMEI (International Mobile Equipment Identity) of the MT.

Type	Syntax	Response	Example
Action	AT+GSN	<IMEI> OK	355306040004097 OK
Test	AT+GSN=?	OK	

15.14.2 Defined Values

Parameter	Type	Description
<IMEI>	String	IMEI

15.15 DTE-DCE character framing +ICF

15.15.1 Description

Sets the local serial port start-stop (asynchronous) character framing which is used in information interchange between DCE and DTE. Value 0 corresponds to the auto-detect case (if autobauding is supported).

☞ If autobauding is supported consider the notes as follows:

- Due to hardware characteristics the frame recognition can be present in conjunction with the autobauding recognition only, i.e. the AT+ICF=0 command is effective only if AT+IPR is set to 0. In this case the AT+ICF? returns the 0 value.
- Outside the autobauding conditions the AT+ICF=0 answers OK but it does not switch the system to the automatic frame recognition and it doesn't take actions. In this scenario the AT+ICF? Command will return the current value of the frame format. The AT+IPR=0 command instead forces the AT+ICF to be 0.
- Under the autobauding conditions, the AT+ICF command provided with a value different than 0 will answer ERROR since it is not possible to specify a frame type in those autodetect conditions.
- The stop bit number cannot be automatically recognized i.e. if the system is switched from the 8N2 to the autodetect feature and a 1 stop bit frame is provided at the serial port, unpredictable behavior of the system can occurs.

☞ The following restrictions must be reminded as follows:

- If a data frame format refers to a frame without parity (ex. Format 3), the command is accepted, but the parity value is ignored; it is returned by the AT+ICF? command (and displayed by AT&V) but it has no meaning.
- The settings of the command are ignored when the AT command interface runs on the USB port or on the SPI interface.

Type	Syntax	Response	Example
Set	AT+ICF=[<format>[,<parity>]]	OK	AT+ICF=3,1 OK
Read	AT+ICF?	+ICF: <format>,<parity> OK	+ICF: 3,1 OK
Test	AT+ICF=?	+ICF: (list of supported <format>s),(list of supported <parity>s) OK	+ICF: (0-3,5),(0-1) OK

15.15.2 Defined Values

Parameter	Type	Description
<format>	Number	• 0: auto detect • 1: 8 data 2 stop • 2: 8 data 1 parity 1 stop • 3: 8 data 1 stop • 5: 7 bit, 1 parity, 1 stop
<parity>	Number	• 0: odd • 1: even

<format>=0 is not supported on LISA-U1 series.

On LISA-U1 series the default values are <format> = 3 and <parity> = 1.

On LEON-G100 / LEON-G200 series the default values are <format> = 0 and <parity> = 0.

15.16 DTE-DCE local flow control +IFC

15.16.1 Description

Controls the operation of local flow control between DTE and DCE used when data are sent or received.

The command setting provides the message error +CME ERROR: operation not allowed when the AT command interface runs on the USB port or on the SPI interface.

The software flow control (Xon/Xoff) setting is not allowed on the USB port, on the SPI interface and on a MUX channel.

SW flow control (Xon/Xoff) activation is only allowed in case of text transmission: binary data cannot be transmitted because it may contain the special flow control characters (Xon/Xoff).

When Software flow control (Xon/Xoff) is used, the DC1 (XON, 0x11) and DC3 (XOFF, 0x13) characters are reserved and therefore filtered (e.g. in SMS text mode these two characters can't be inputted).

On UART interface, if +UPSV is set to 2, only +IFC=0,0 (no flow control) is allowed.

Type	Syntax	Response	Example
Set	AT+IFC=[<DCE_by_DTE> [,<DTE_by_DCE>]]	OK	AT+IFC=2,2 OK
Read	AT+IFC?	+IFC: <DCE_by_DTE>, <DTE_by_DCE> OK	+IFC: 2,2 OK
Test	AT+IFC=?	+IFC: (list of supported <DCE_by_DTE>),(list of supported <DTE_by_DCE>s) OK	+IFC: (0-2),(0-2) OK

15.16.2 Defined Values

Parameter	Type	Description
<DCE_by_DTE>	Number	• 0: none • 1: DC1/DC3 on circuit 103 (XON/XOFF) • 2: circuit 105 (RTS) (default value)
<DTE_by_DCE>	Number	• 0: none • 1: DC1/DC3 on circuit 104 (XON/XOFF) • 2: circuit 106 (CTS) (default value)

<DCE_by_DTE> and <DTE_by_DCE> must be provided with same value in pairs (only (0,0), (1,1) and (2,2) are allowed. The other combinations are not allowed and the message error +CME ERROR: operation not allowed is returned).

15.17 Set flow control \Q

15.17.1 Description

Controls the operation of local flow control between DTE and DCE. Used when data are sent or received.

The command setting provides the message error +CME ERROR: operation not allowed when the AT command interface runs on the USB port or on the SPI interface.

The software flow control (Xon/Xoff) setting is not allowed on the USB port, on the SPI interface and on a MUX channel.

SW flow control (Xon/Xoff) activation is only allowed in case of text transmission: binary data cannot be transmitted because it may contain the special flow control characters (Xon/Xoff).

When Software flow control (Xon/Xoff) is used, the DC1 (XON, 0x11) and DC3 (XOFF, 0x13) characters are reserved and therefore filtered (e.g. in SMS text mode these two characters can't be inputted).

On UART interface, if +UPSV is set to 2, only \Q0 (no flow control) is allowed.

Type	Syntax	Response	Example
Set	AT\Q[<value>]	OK	AT\Q3 OK

15.17.2 Defined Values

Parameter	Type	Description
<value>	Number	• 0: no flow control • 1: DC1/DC3 on circuit 103 and 104 (XON/XOFF) • 3: DCE_by_DTE on circuit 105 (RTS) and DTE_by_DCE on circuit 106 (CTS) (default value)

15.18 Fixed DTE rate +IPR

15.18.1 Description

Specifies the data rate at which the DCE will accept commands on UART interface. The full range of data rates depends on HW or other criteria.

Data rate 0 means autobauding, i.e the baud rate is recognized by the DCE in the Offline Command State only when the "at" or "AT" sequence is provided.

On LISA-U1 series <rate>=0 (autobauding) is not supported.

On LISA-U1 series the default value for <rate> is 115200.

On LEON the following notes related to autobauding must be reminded:

- The DCE can start in autobauding (necessary to program the NVM with the baudrate parameter set to 0) or the autobauding can be enabled with the AT+IPR=0 command if the DCE started with a fixed rate
- Autobauding values which can be discovered are the same of the fixing case i.e. 2400, 4800, 9600, 19200, 38400, 57600, 115200 b/s. Although values outside this set will be detected (for ex. 1200 b/s or 230400 b/s), AT commands provided with a baudrate other than values declared, leads to unpredictable results
- If the system starts in autobading (i.e. the +IPR is 0) the first at sequence provided to the module will detect the baudrate. For example the first command sent from the DTE at any rate can be: AT+CPIN="1234"
- Characters different than AT are ignored during the baud rate detection since the hardware detection sequence is triggered on the "at" or "AT" sequence. "At" or "aT" sequences are invalid too, both of the detection chars have to be small or capital
- Power saving is exited at the "A" (or "a") char of the autobauding sequence; power save state is re-entered again when the power saving timeout is elapsed, regardless if the baud detection is complete or not. The "T" (or "t") char doesn't reset the power saving timer; as a result if the detection completion char is sent outside power save condition, it doesn't force to stay out of power saving state for the number of frames of power saving timer
- Autobauding result can be unpredictable with spurious chars if the power saving is entered and the flow control is disabled. If the hardware flow control is present, the DTE can be synchronized with the power saving cycle through the module CTS line i.e. the delivery of the "AT" sequence during the module awake can be granted by the DTE and the power saving can be exited in the proper way. It is recommended to disable the power saving if no hardware flow control is used
- Data rate 0 affects the AT+ICF command too which value is automatically switched to the 0 value. Read carefully the description of the AT+ICF command for further limitations
- The default value for <rate> is 0.

The settings of the command are ignored when the AT command interface runs on the USB port or on the SPI interface. The DCE sends the string"OK" but the command will have not affect.

Type	Syntax	Response	Example
Set	AT+IPR=[<rate>]	OK	AT+IPR=9600 OK
Read	AT+IPR?	+IPR: <rate> OK	+IPR: 9600 OK

Type	Syntax	Response	Example
Test	AT+IPR=?	+IPR: (list of supported autodetectable <rate> values)[,(list of fixed only <rate> values)] OK	+IPR: (0,2400,4800,9600,19200,38400, 57600,115200),() OK

15.18.2 Defined Values

Parameter	Type	Description
<rate>	Number	Baud rate • 0: autobauding • 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 460800

On LEON-G100 / LEON-G200 series <rate>= 1200, <rate>= 230400 and <rate>=460800 cannot be set as fixed rate.

15.19 System can Return to on-line data state O

15.19.1 Description

Causes the DCE to return to online data state and issue a CONNECT or CONNECT <text> (based on ATX command) result code on DTE. It is the complementary command to the escape sequence, or to the other actions (DTR ON to OFF transition, see table in 15.4.4) that cause the DCE to switch from online data state to online command state.

ATO command is used to resume both circuit-switched and packet-switched data call. The resume is only possible if the PPP L2 protocol is used.

Type	Syntax	Response	Example
Action	ATO	<response>	ATO CONNECT

15.19.2 Defined Values

Parameter	Type	Description
<response>	String	• CONNECT • NO CARRIER: the online data state can't be resumed

The command provides a message error (+CME ERROR: operation not allowed if +CMEE=2) in the following cases:

- The DCE is not in online command state
- It is issued on a DCE different from the one in online command state

15.20 Escape character S2

15.20.1 Description

Controls the decimal value of the ASCII character used as the escape character. A value over 127 disables the escape process, i.e. no escape character will be recognized. The escape sequence contains three escape characters e.g. "+++".

Type	Syntax	Response	Example
Set	ATS2=<value>	OK	ATS2=43 OK
Read	ATS2?	<value> OK	043 OK

15.20.2 Defined Values

Parameter	Type	Description
<value>	Number	Range 1 to 255. Answer to Read command is in "xxx" format. Default value: 043 (ASCII '+').

☞ On LEON-G100/LEON-G200 series <value> value is not mandatory.

The following table shows how ATS2 command works for different data call scenarios.

Data call command	L2 protocol	Description	ATS2 behavior
AT+CGDATA="M-HEX",1	HEX	Manufacture	Escape sequence detection is only done for +++ (plus carriage return). ATS2 is not effective. No timing constraints.
AT+CGDATA="M-RAW_IP",1	RAW-IP	PSD call: Transfer IP packet directly	Break detection is not supported
AT+CGDATA="PPP",1	PPP	PSD call: Same of ATD*99***1# (e.g. dial up)	Escape sequence detection is only done for ~+++. ATS2 is not effective. There is not a timing constrain (see S12 command) for ~+++ (+++ is incapsulated in a PPP frame)
ATD1234		CSD call	The command is effective if issued in both command and online command mode
AT+USODL=0		PSD call: Direct Link mode	The command is effective
AT+USOWR=0,32		PSD call:AT socket (not transparent)	Break detection is not supported

15.21 Command line termination character S3

15.21.1 Description

Sets a value representing the decimal IRA5 value of the character recognized by the DCE from the DTE, to terminate the incoming command line. It is also generated by the DCE as part of the header, trailer and terminator for result codes and information text, along with the S4 setting.

Type	Syntax	Response	Example
Set	ATS3=<value>	OK	ATS3=13 OK
Read	ATS3?	<value> OK	013 OK

15.21.2 Defined Values

Parameter	Type	Description
<value>	Number	Range 0 to 127. Answer to Read command is in "xxx" format. Default value: 013 (ASCII carriage return (CR, IRA5 0/13)).

☞ On LEON-G100/LEON-G200 series <value> value is not mandatory.

15.22 Response formatting character S4

15.22.1 Description

Sets a value representing the decimal IRA5 value of the character generated by the DCE as part of the header, trailer and terminator for result codes and information text, along with the S3 setting.

Type	Syntax	Response	Example
Set	ATS4=<value>	OK	ATS4=10 OK
Read	ATS4?	<value> OK	010 OK

15.22.2 Defined Values

Parameter	Type	Description
<value>	Number	Range 0 to 127. Answer to Read command is in "xxx" format. Default is 10 (line feed (LF, IRA5 0/10))

☞ On LEON-G100/LEON-G200 series <value> value is not mandatory.

15.23 Command line editing character S5

15.23.1 Description

Sets a value representing the decimal IRA5 character recognized by the DCE as a request to delete from the command line the immediately preceding character.

Type	Syntax	Response	Example
Set	ATS5=<value>	OK	ATS5=8 OK
Read	ATS5?	<value> OK	008 OK

15.23.2 Defined Values

Parameter	Type	Description
<value>	Number	Range 0 to 127. Answer to Read command is in "xxx" format. Default value: 8 (ASCII backspace (BS, IRA5 0/8))

On LEON-G100/LEON-G200 series <value> value is not mandatory.

15.24 Pause before blind dialling S6

15.24.1 Description

Specifies the time in seconds, that the DCE waits between connecting to the line and dialling, when dial tone is not implemented or enabled. The command is not applicable for signal based mobile phone software.

Type	Syntax	Response	Example
Set	ATS6=<value>	OK	ATS6=2 OK
Read	ATS6?	<value> OK	002 OK

15.24.2 Defined Values

Parameter	Type	Description
<value>	Number	Range 2 - 10. Answer to Read command is in "xxx" format. Default 2 s

On LEON-G100/LEON-G200 series <value> value is not mandatory.

15.25 Connection completion timeout S7

15.25.1 Description

Specifies time in seconds, that the DCE shall allow between either answering a call or completion of dialling and establishment of a connection with a remote site.

Type	Syntax	Response	Example
Set	ATS7=<value>	OK	ATS7=30 OK
Read	ATS7?	<value> OK	060 OK

15.25.2 Defined Values

Parameter	Type	Description
<value>	Number	Range 1 - 255. Answer to Read command is in "xxx" format. Default 60 s

On LEON-G100/LEON-G200 series <value> value is not mandatory.

15.26 Command dial modifier time S8

15.26.1 Description

Specifies time in seconds, that the DCE shall pause, during dialling, when a "," dial modifier is encountered in a dial string, the command has no affect.

Type	Syntax	Response	Example
Set	ATS8=<value>	OK	ATS8=4 OK
Read	ATS8?	<value> OK	002 OK

15.26.2 Defined Values

Parameter	Type	Description
<value>	Number	Range 1 - 255. Answer to Read command is in "xxx" format. Default: 2

On LEON-G100/LEON-G200 series <value> value is not mandatory.

15.27 Automatic disconnect delay S10

15.27.1 Description

Specifies time in tenth of a second, that the DCE will remain connected to the line after the DCE has indicated the absence of received line signal. Not supported for GSM but OK returned.

Type	Syntax	Response	Example
Set	ATS10=<value>	OK	ATS10=30 OK
Read	ATS10?	<value> OK	030 OK

15.27.2 Defined Values

Parameter	Type	Description
<value>	Number	Range 0 - 254

On LEON-G100/LEON-G200 series <value> value is not mandatory.

15.28 Escape prompt delay (EPD) S12

15.28.1 Description

Defines the maximum period, in fiftieths of a second, allowed between the reception of the last character of the sequence of three escape characters from the DTE and the sending of the OK result code to the DTE. If any characters are detected during this time, the OK will not be sent.

Furthermore, the timeout is:

- The minimum period, before the first character reception of the three escape character sequence, during which no other character must be detected to accept it as valid first character
- The maximum period allowed between receipt of first, or second, character of the three escape character sequence and receipt of the next
- The minimum period, after the last character reception of the three escape character sequence, during which no other character must be detected to accept the escape sequence as a valid one

Type	Syntax	Response	Example
Set	ATS12=<value>	OK	ATS12=80 OK
Read	ATS12?	<value> OK	050 OK

15.28.2 Defined Values

Parameter	Type	Description
<value>	Number	Range 0 - 255. Answer to Read command is in "xxx" format. Default: 50 (1 s)

☞ On LEON-G100/LEON-G200 series <value> value is not mandatory.

15.29 Command echo E

15.29.1 Description

Controls whether or not the MT echoes characters received from the DTE during command state.

Type	Syntax	Response	Example
Set	ATE[<value>]	OK	ATE1 OK

15.29.2 Defined Values

Parameter	Type	Description
<value>	Number	• 0: echo off • 1: echo on (default value)

15.30 Result code suppression Q

15.30.1 Description

Determines if DCE transmits result codes to the DTE or not. When result codes are being suppressed, no portion of any intermediate, final or URC is transmitted. Information text transmitted in response to commands is not affected by this setting.

Type	Syntax	Response	Example
Set	ATQ[<value>]	OK	ATQ1 OK

15.30.2 Defined Values

Parameter	Type	Description
<value>	Number	• 0: DCE transmits result codes (default value) • 1: Result codes are suppressed and not transmitted

15.31 DCE response format V

15.31.1 Description

Control the contents of the header and trailer transmitted with result codes and information responses. It also determines whether result codes are transmitted in a numeric form or an alphabetic (or verbose) form. The text portion of information responses is not affected by this setting. The effect of V setting on response formats is described below:

Format for information responce:

- for V0: <text><CR><LF>
- for V1: <CR><LF><text><CR><LF>

Format for result codes:

- for V0: <numeric code><CR>
- for V1: <CR><LF><verbose code><CR><LF>

Type	Syntax	Response	Example
Set	ATV[<value>]	OK	ATV1 OK

15.31.2 Defined Values

Parameter	Type	Description
<value>	Number	• 0: DCE transmits limited headers, trailers and numeric text • 1: DCE transmits full headers, trailers and verbose response text (default)

15.32 Result code selection and call progress monitoring control X

15.32.1 Description

In a CS data call, determines how the DCE transmits to the DTE the CONNECT result code.

Type	Syntax	Response	Example
Set	ATX[<value>]	OK	ATX1 OK

15.32.2 Defined Values

Parameter	Type	Description
<value>	Number	• 0: CONNECT result code is given upon entering online data state; • 1-4: CONNECT <speed> result code is given upon entering online data state; (4 is the default value)
<speed>	Number	Transfer speed for CSD calls configured via the CBST command

16 SIM toolkit

16.1 Introduction

The commands in this section work properly only if the SIM toolkit interface has been activated by the DTE. Otherwiese the SIM-toolkit processing will be blocked.

The activation of the SIM toolkit interface is done by AT+CFUN=6. After the activation of the SIM toolkit interface, the setup menu may be displayed via URC +STKPRO when available from the SIM (immediately or after PIN insertion).

For more details on the command description and parameters please refer to [44].

16.2 SIM-APPL-TK proactive commands +STKPRO

16.2.1 Description

The test command displays the list of the proactive commands that need a response from the user/application via +STKTR command. Only the test command syntax is allowed.

URC **+STKPRO** is provided during STK transactions.

Type	Syntax	Response	Example
Test	AT+STKPRO=?	+STKPRO=(list of supported <proactive_cmd>s) OK	+STKPRO=01,05,16,17,18,19,20,21,32,33,34,35,36,37,38,40,53 OK
URC		+STKPRO: 01,<type>,<number of files>,<files> +STKPRO: 05,<event_list> +STKPRO: 16,<number>,<subaddr>,<type>,<alpha_1>, <icon_id1>,<alpha_2>,<icon_id2> +STKPRO: 17,<ss_data>,<alpha>,<icon_id>, <ref_number> +STKPRO: 18,<dcs>,<hex_string>,<alpha>,<icon_id>, <ref_number> +STKPRO: 19,<alpha>,<icon_id>,<ref_number> +STKPRO. 20,<alpha>,<icon_id>,<dtmf_string> +STKPRO: 21,<URL>,<alpha>,<icon_id> +STKPRO: 32,<tone>,<unit>,<interval>,<alpha>, <icon_id> +STKPRO: 33,<type>,<dcs>,<hex_string>,<icon_id>, <imm_resp> +STKPRO: 34,<type>,<dcs>,<hex_string>,<icon_id>	

Type	Syntax	Response	Example
		+STKPRO: 35,<type>,<dcs>,<hex_string>, <max_rsp_len>,<min_rsp_len>,<default_text>,<icon_id> +STKPRO: 36,<type>,<alpha>,<item_id>,<total_items>, <item_text>,<next_action>,<default_item> +STKPRO: 37,<type>,<alpha>,<item_id>,<total_items>, <item_text>,<next_action> +STKPRO: 38,<type> +STKPRO: 40,<dcs>,<hex_string>,<icon_id> +STKPRO: 53,<language>	

16.2.2 Defined Values

Parameter	Type	Description
<alpha>, <alpha_1>, <alpha_2>	String	Alpha identifier (used in several proactive commands, see [51])
<default_text>	String	Default text for the GET INPUT command (see [51])
<dcs>	Number	Data coding scheme
<default_item>	Number	Indication of the default item (see [51])
<dtmf_string>	String	DTMF tones coded in BCD (same format as the Dialling number string defined for EFADN in GSM TS 11.11 [18])
<event list>	Number	• 00: MT call • 01: Call connected • 02: Call disconnected • 03: Location status • 04: User activity • 05: Idle screen available • 06: Card reader status • 07: Language selection • 08: Browser termination • 09: Data available • 0A: Channel status • 0B: Access Technology Change • 0C: Display parameters changed • 0D: Local connection • 0E: Network Search Mode Change • 0F: Browsing status
<hex_string>	String	Hexadecimal string (the coding is specified in the <dcs> parameter)
<icon_id>, <icon_id1>, <icon_id2>	String	Icon identifier, set to 0 since no graphical interface is provided
<interval>	Number	Time duration in number of units
<imm_resp>	Number	Immediate response
<item_id>	Number	identifier of an item within a list
<item_text>	String	text string of item
<language>	String	2 bytes string indicating the language
<max rsp len>	Number	Maximum response length
<min rsp len>	Number	Minimum response length

Parameter	Type	Description
<next_action>	Number	Used only in menu related proactive commands ("set up menu" and "select item") for each item. It gives the possible actions that will be initiated by the SIM Card in case of selection by the user (see [51])
<number>	String	Called party number
<proactive_cmd>	Number	• 01: refresh • 05: set up event list • 16: set up call • 17: send SS • 18: send USSD • 19: send SMS • 20: send DTMF • 21: launch browser • 32: play tone • 33: display text • 34: get inkey • 35: get input • 36: select item • 37: set up menu • 38: provide local info • 40: set up idle mode text • 52: run AT command • 53: language notification
<ref_number>	Number	Reference number
<subaddr>	String	Called party subaddr
<ss_data>	String	Supplementary services string
<type>	Number	Command qualifier
<tone>	Number	• 01: dial tone • 02: call subscriber busy • 03: congestion • 04: radio path acknowledge • 05: radio path not available • 06: error / special information • 07: call waiting tone • 08: ringing tone • 10: general beep • 11: positive acknowledgement tone • 12: negative acknowledgement or error tone
<total_items>	Number	Total number of the menu items
<unit>	Number	• 0: minutes • 1: seconds • 2: tenth of seconds
<URL>	String	URL to be loaded

☞ <proactive_cmd>=52 is not supported on LEON-G100/G200 wireless module.

16.3 SIM-APPL-TK terminal response +STKTR

16.3.1 Description

Allows entering response to an SIM Toolkit proactive command which has been displayed by the URC +STKPRO.

If no response is entered, after a timeout of duration may range from 180 to 300 s, the modem sends an autonomous terminal response to the SIM in order to complete the STK transaction; the result depends on the pending proactive command and can be "Command performed successfully", "No response from user", "Command type not understood by ME" or "Command data not understood by ME" (see [44]).

AT+STKTR command must be entered always, in order to terminate the pending STK session at the MT-DTE interface, and to be able to enter additional STK commands.

The parameters to be entered depend on the proactive command:

+STKTR:01,<result>,[<add_result>]	refresh
+STKTR:05,<result>	set up event list
+STKTR:16,<result>,[<add_result>]	set up call
+STKTR:17,<result>,<add_result>,[<reference_number>]	send SS
+STKTR:18,<result>,<add_result>,[<reference_number>]	send USSD
+STKTR:19,<result>,<add_result>,[<reference_number>]	send SMS
+STKTR:20,<result>,[<add_result>]	send DTMF
+STKTR:21:<result>	launch browser
+STKTR:32,<result>,<add_result>	play tone
+STKTR:33,<result>,<add_result>	display text
+STKTR:34,<result>,<add_result>,0,<dcs>,<hex_string>	get inkey
+STKTR:35,<result>,<add_result>,0,<dcs>,<hex_string>	get input
+STKTR:36,<result>,<add_result>,0,<dcs>,<hex_string>	select item
+STKTR:37,<result>,<add_result>	set up menu
+STKTR:38,<type>,<language>	provide local info (language setting)
+STKTR:40,<result>,<add_result>	set up idle mode text

*0 stands for the obsolete parameter <last_cmd>

Type	Syntax	Response	Example
Set	AT+STKTR=<proactive_cmd>[,<type>][,<result>,<add_result>[,<reference_number>][,<last_cmd>][,<dcs>][,<hex string>]]	OK	AT+STKTR=1,0 OK
Test	AT+STKTR=?	+STKTR=list of supported <result> values OK	+STKTR=01,05,16,17,18,19,20,21,32,33,34,35,36,37,38,40,53 OK

16.3.2 Defined Values

Parameter	Type	Description
<proactive_cmd>	Number	Decimal code indicates the command (refer +STKPRO command description - paragraph 16.2)
<result>	Number	• 0: command performed successfully • 1: command performed with partial comprehension • 2: command performed with missing information • 3: REFRESH performed with additional EFs read • 4: command performed successfully, but requested icon could not be displayed • 5: command performed but modified by call control by SIM • 6: command performed successfully, limited service • 7: command performed with modification • 16: proactive SIM session terminated by the 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 • 20: USSD or SS transaction terminated by the user • 32: MT currently unable to process command • 33: network currently unable to process command

Parameter	Type	Description
		• 34: user did not accept call set-up request • 35: user cleared down call before connection or network release • 36: action in contradiction to the current timer state • 37: interaction with call control by SIM, temporary problem • 38: launch browser generic error code • 48: command beyond MT's capabilities • 49: command type not understood by MT • 50: command data not understood by MT • 51: command number not known by MT • 52: run AT command • 53: SMS RP-ERROR • 54: error, required values are missing • 55: USSD return error • 56: MultipleCard commands error, if class "a" is supported • 57: interaction with call control by SIM or MO short message control by SIM, permanent problem • 58: bearer independent protocol error (if class "e" is supported)
<add_result>	Number	Additional information, required with specific result codes and/or proactive commands
<reference_number>	Number	Number containing the indicated reference number; this parameter can be used only in case of <proactive_cmd> related to SMS, SS, USSD
<dcs>	Number	Data coding scheme
<hex_string>	String	Default item (see item_id)
<language>	String	pair of alpha-numeric characters, defined in ISO 639, here encoded as a Number, e.g. 25701 = 0x6465 = "de"
<last_cmd>	Number	obsolete parameter, to be set to 0
<type>	Number	Command qualifier (used in case of <proactive_cmd>=38)

16.4 SIM-APPL-TK envelope +STKENV

16.4.1 Description

Allows encoding and sending an STK envelope command to the SIM.

Type	Syntax	Response	Example
Set	AT+STKENV=<envelope_cmd>,<opt_ENV_data1>, <opt_ENV_data2>	OK	AT+STKENV=211,01 OK
Test	AT+STKENV=?	+STKENV: (list of supported <envelope_cmd> OK	+STKENV: 211,214 OK

16.4.2 Defined Values

Parameter	Type	Description
<envelope_cmd>	Number	• code 211 (0xD3): Menu selection (<opt_ENV_data1> shall specify the item identifier of startup menu list) • code 214 (0xD6): Event download (<opt_ENV_data1> shall specify the <event_list>, in which only one event can be included)

<opt_ENV_data1>	Number	Command code related parameters and can have the following values, depending on the chosen envelope command:
		• If <envelope_cmd>=211, "item identifier"
		• If <envelope_cmd>=214 (event list),
		  ○ 4: user activity
		  ○ 5: idle screen available
		  ○ 7: language selection

Parameter	Type	Description
		○ 8: browser termination
<opt_ENV_data2>	Number	Meaning depends on the chosen envelope command: • If <envelope_cmd>=211, "help requested" with the following encoding: ○ 0: help is not requested ○ 1: help is requested • If <envelope_cmd>=214 and <opt_ENV_data1>=7, "currently used language in the DTE" (see AT+STKTR=38) • If <envelope_cmd>=214 and <opt_ENV_data1>=8, "provide the cause" with the following allowed values: ○ 00: User Termination ○ 01: Error Termination

16.5 SIM-APPL-TK terminal profile +STKPROF

16.5.1 Description

Allows reading and changing the terminal profile (list of SIM Application Toolkit facilities supported by the terminal, see [51]) data stored in NVM and used only at SIM initialization. The SIM card may use this information to filter the proactive commands sent to the module. This command does not actually remove/add any functionality from/to the module.

Type	Syntax	Response	Example
Set	AT+STKPROF=<length>, <data>	OK	AT+STKPROF=2,"1F7F" OK
Read	AT+STKPROF?	+STKPROF: <length>,<data> OK	+STKPROF:17,"FFFFFFFF7F0300DF7F000 00000010A0003" OK
Test	AT+STKPROF=?	OK	

16.5.2 Defined Values

Parameter	Type	Description
<length>	Number	Length in bytes of data sent to DTE in <data>
<data>	String	Terminal profile data coded in hex format

☞ <length> set to 0 forces a reset to the default terminal profile stored in the MT.

16.6 SIM-APPL-TK call control commands +STKCC

16.6.1 Description

Control status is displayed using the URC +STKCC.

Type	Syntax	Response	Example
URC		+STKCC: <cc_command>,<res_val>,<alpha>,<param1>[,<sc_addr>,<ton_npi>,<dest_addr>]	+STKCC: 1,0,"Calling","+3913456890"

16.6.2 Defined Values

Parameter	Type	Description
<cc_command>	Number	• 1: set up call • 2: send SS • 3: send USSD • 4: send SM
<res_val>	Number	Call control result value • 00: Allowed, no modification • 01: Not allowed • 02: Allowed with modification
<alpha>	String	
<param1>	String	• called party number if <cc_command>=1 • supplementary service string if <cc_command>=2 • USSD control string if <cc_command>=3 • type of number and numbering plan if <cc_command>=4
<sc_addr>	String	Service centre address
<ton_npi>	Number	Type of number and numbering plan
<dest_addr>	String	Destination address

16.7 SIM-APPL-TK proactive session status +STKCNF

16.7.1 Description

The STK proactive session status is displayed using this URC +STKCNF. The URC comes out after the AT+STKTR or the AT+STKENV command has been issued. Refer to chapter 16.3 and 16.4 for the related command descriptions.

Type	Syntax	Response	Example
URC		+STKCNF: <proactive_cmd>,<result>,<add_result>,<sw1>	+STKCNF: 37,0,255,144

16.7.2 Defined Values

Parameter	Type	Description
<proactive_cmd>	Number	Decimal code indicating the command that was finished (refer to +STKPRO command description 16.2); 129 (0x81) indicates the end of active session.
<result>	Number	Additional result code (refer to 3GPP 51.014 specification [44]]); if no additional information is available 255 (0xFF) is returned
<add_result>	Number	Additional result code; 255 (0xFF) is returned if no additional information is available
<sw1>	Number	Status of the last response • 144 (0x90): command executed successfully • 0: command to SIM was suppressed because of multiple terminal response or wrong client • For other responses see 3GPP TS 51.011

17 GPRS commands

17.1 Parameters definition

17.1.1 <APN>

Access Point Name is a string parameter, which is a logical name, valid in the current PLMN's domain, used to select the GGSN (Gateway GPRS Support Node) or the external packet data network to be connected to. If the value is null or omitted, then the subscription value will be requested. An optional special code placed at the beginning of <APN> indicates the kind of the authentication handling MT/network and may be:

- CHAP: challenge handshake authentication protocol
- PAP: personal authentication protocol
- NONE: authentication protocol not used
- code omitted: authentication protocol not used

An example for the usage of <APN> is:

+CGDCONT=1,"IP","CHAP:internet.t-d1.de",0,0

The maximum length of the parameter is 100.

17.1.2 <cid>

PDP context identifier. A numeric parameter specifying a particular PDP context definition. This parameter is valid only locally on the interface DTE-MT. The maximum number of definable PDP contexts is 3.

17.1.3 <d_comp>

Numeric parameter specifying the PDP data compression, can have the values:

- 0: off (default value if omitted)
- 1: on (manufacturer preferred compression)
- 2 : V.42bis data compression

☞ LEON-G100/LEON-G200 don't support <d_comp>= 2.

17.1.4 <delay>

Numeric parameter which specifies the delay class according to 3GPP 24.008 (QoS) (for the description refer to the command description of "Packet Switched Data" +UPSD, paragraph 22.1).

17.1.5 <h_comp>

Numeric parameter specifying the PDP header compression, can have the values:

- 0: off (default value if omitted)
- 1: on (manufacturer preferred compression, i.e. RFC1144)
- 2: RFC1144
- 3: RFC2507
- 4: RFC3095

☞ LEON-G100/LEON-G200 don't support <h_comp>= 2, 3 and 4.

17.1.6 <L2P>

String parameter indicating the layer 2 protocol to be used between the DTE and MT; these values are supported:

- "PPP" (default value)
- "M-HEX"
- "M-RAW_IP"
- "M-OPT-PPP" (only on LISA-U1 series)
- "PAD" (only on LISA-U1 series)
- "X25" (only on LISA-U1 series)

17.1.7 <mean>

Numeric parameter specifying the mean throughput class (for the description refer to the command description of "Packet Switched Data" +UPSD, paragraph 22.1)

17.1.8 <peak>

Numeric parameter specifying the peak throughput class (for the description refer to the command description of "Packet Switched Data" +UPSD, paragraph 22.1)

17.1.9 <PDP_addr>

String parameter identifying the MT in the IP-address space applicable to the PDP service. If the value is null or omitted, then a value may be provided by the DTE during the PDP startup procedure or, failing that, a dynamic address will be requested. It can be read with the command AT+CGPADDR.

Depending on the IP-version, the <PDP_addr> consists of 4 octetts (IPv4) or 16 octetts (IPv6 RFU):

- IPv4: "ddd.ddd.ddd.ddd"
- IPv6: "ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd"

IPv6 is supported: an IPv6 address could be used in the external contexts.

17.1.10 <PDP_type>

The Packet Data Protocol type is a string parameter which specifies the type of packet data protocol. Only one value is supported:

- "IP" Internet Protocol (IETF STD 5)

17.1.11 <precedence>

Numeric parameter specifying the precedence class (for the description refer to the command description of "Packet Switched Data" +UPSD, paragraph 22.1), can have the values:

- 0: network subscribed
- 1: high priority
- 2: normal priority
- 3: low priority

17.1.12 <reliability>

Numeric parameter specifying the reliability class (refer to the command description of "Packet Switched Data" +UPSD, paragraph 22.1)

17.1.13 <state>

Indicates the state of GPRS attachment

- 0: detached
- 1: attached (default value)

17.1.14 <status>

Indicates the state of PDP context activation

- 0: deactivated
- 1: activated

<h_comp>: the available head-compressions is depending on configuration of the stack (configured via features in the stack)

<L2P>: the application on the remote side must support the selected protocol as well.

17.1.15 <Traffic_class>

Indicates the application type for which the UMTS bearer service is optimized (refer to 3GPP TS 24.008 [30], subclause 10.5.6.5):

- 0: conversational
- 1: streaming
- 2: interactive
- 3: background
- 4: subscribed value

If the Traffic class is specified as conversational (<Traffic_class>=0) or streaming (<Traffic_class>=1), then the Guaranteed and Maximum bit rate parameters shall be also provided.

17.1.16 <Maximum_bitrate_UL>

Indicates the maximum number of kb/s delivered to UMTS (UL) at a SAP (SIM Application Processor) (refer to 3GPP TS 24.008 [30], subclause 10.5.6.5):

- Range 1-63 in steps of 1
- Range 64-568 in steps of 8
- Range 576-8640 in stepss of 64

17.1.17 <Maximum_bitrate_DL>

Indicates the maximum number of kb/s delivered to UMTS (DL) at a SAP (SIM Application Processor) (refer to 3GPP TS 24.008 [30], subclause 10.5.6.5):

- Range 1-63 in steps of 1
- Range 64-568 in steps of 8
- Range 576-8640 in steps of 64
- Range 8700-16000 in steps of 100

17.1.18 <Guaranteed_bitrate_UL>

Indicates the maximum number of kb/s delivered to UMTS (UL) at a SAP (SIM Application Processor) (refer to 3GPP TS 24.008 [30], subclause 10.5.6.5):

- Range 1-63 in steps of 1
- Range 64-568 in steps of 8
- Range 576-8640 in steps of 64

17.1.19 <Guaranteed_bitrate_DL>

Parameter that indicates the maximum number of kb/s delivered to UMTS (DL) at a SAP (SIM Application Processor) (refer to 3GPP TS 24.008 [30], subclause 10.5.6.5):

- Range 1-63 in steps of 1
- Range 64-568 in steps of 8
- Range 576-8640 in steps of 64
- Range 8700-16000 in steps of 100

17.1.20 <Delivery_order>

Indicates whether the UMTS bearer shall provide in-sequence SDU (Service Data Unit) delivery or not (refer to 3GPP TS 24.008 [30], subclause 10.5.6.5):

- 0: no
- 1: yes
- 2: subscribed value

17.1.21 <Maximum_SDU_size>

Indicates the maximum allowed SDU (Service Data Unit) size in octets (refer to 3GPP TS 24.008 [30], subclause 10.5.6.5):

- 0: subscribed value
- Range 10-1500 in steps of 10 octets
- 1502
- 1510
- 1520

17.1.22 <SDU_error_ratio>

Indicates the target value for the fraction of SDUs (Service Data Unit) lost or detected as erroneous. SDU error ratio is defined only for conforming traffic (refer to 3GPP TS 24.008 [30], subclause 10.5.6.5). The value is specified as 'mEe', e.g. a target SDU error ratio of $1*10^{-6}$ would be specified as '1E6'

- "1E6": $1*10^{-6}$
- "1E5": $1*10^{-5}$
- "1E4": $1*10^{-4}$
- "1E3": $1*10^{-3}$
- "7E3": $7*10^{-3}$
- "1E2": $1*10^{-2}$
- "1E1": $1*10^{-1}$
- "0E0": subscribed value

17.1.23 <Residual_bit_error_ratio>

Indicates the target value for the undetected bit error ratio in the delivered SDUs (Service Data Unit). If no error detection is requested, the parameter indicates the bit error ratio in the delivered SDUs (refer to 3GPP TS 24.008 [30], subclause 10.5.6.5). The value is specified as 'mEe', e.g. a target SDU error ratio of $5*10^{-2}$ would be specified as '5E2'

- "6E8": $6*10^{-8}$
- "1E6": $1*10^{-6}$
- "1E5": $1*10^{-5}$
- "1E4": $1*10^{-4}$
- "5E3": $5*10^{-3}$
- "4E3": $4*10^{-3}$
- "1E3": $1*10^{-3}$
- "5E2": $5*10^{-2}$
- "1E2": $1*10^{-2}$
- "0E0": subscribed value

17.1.24 <Delivery_of_erroneous_SDUs>

Indicates whether SDUs (Service Data Unit) detected as erroneous shall be delivered or not (refer to 3GPP TS 24.008 [30], subclause 10.5.6.5):

- 0: no
- 1: yes
- 2: no detect
- 3: subscribed value

17.1.25 <Transfer_delay>

Indicates the targeted time between request to transfer an SDU (Service Data Unit) at one SAP (SIM Application Processor) to its delivery at the other SAP, in milliseconds (refer to 3GPP TS 24.008 [30], subclause 10.5.6.5):

- Range 10-150 in steps of 10
- Range 200-950 in steps of 50
- Range 1000-4000 in steps of 100

17.1.26 <Traffic_handling_priority>

Specifies the relative importance for handling of all SDUs (Service Data Unit) belonging to the UMTS bearer compared to the SDUs of other bearers (refer to 3GPP TS 24.008 [30], subclause 10.5.6.5):

- 0: subscribed
- 1: Priority level 1
- 2: Priority level 2
- 3: Priority level 3

17.1.27 <p_cid>

Identifies the particular PDP context definition, specified using +CGDCONT, to which a secondary PDP context definition will be associated using +CGDSCONT.

This parameter is only locally valid on the interface TE-MT.

17.1.28 <packet_filter_identifier>

Identifies a packet filter:

- Range: 1-8

17.1.29 <evaluation_precedence_index>

Identifies an evaluation precedence index that is unique within all TFTs associated with the PDP contexts that share the same PDP address

- Range: 0-255 (from highest evaluation precedence to lowest evaluation precedence)

17.1.30 <source_address_and_subnet_mask>

Specifies the source address and subnet mask attribute of a valid packet filter. Consists of dot-separated numeric (0-255) parameters on the form:

- "a1.a2.a3.a4.m1.m2.m3.m4" for IPv4
- "a1.a2.a3.a4.a5.a6.a7.a8.a9.a10.a11.a12.a13.a14.a15.a16.m1.m2.m3.m4.m5.m6.m7.m8.m9.m10.m11.m12.m13.m14.m15.m16" for IPv6

17.1.31 <protocol_number_(ipv4)-next_header_(ipv6)>

Specifies the Protocol Number / Next Header attribute of a valid packet filter. It shall contain either an IPv4 Protocol Number or an IPv6 Next Header value.

- Range: 0 -255

17.1.32 <destination_port_range>

Specifies the destination port range attribute of a valid packet filter:

- Range: 0 -65535

17.1.33 <source_port_range>

Specifies the source port range attribute of a valid packet filter:

- Range: 0 -65535

17.1.34 <ipsec_security_parameter_index_(spi)>

Parameter that specifies the IPSec SPI attribute of a valid packet filter which is a 32-bit field.

- Range: 0x00000000 - 0x FFFFFFFF

17.1.35 <type_of_service_(tos)_(ipv4)_and_mask-traffic_class_(ipv6)_and_mask>

Specifies the Type of Service / Traffic Class and Mask attribute of a valid packet filter. It shall contain either an IPv4 TOS octet or an IPv6 Traffic Class octet along with a mask defining which of the 8 bits should be used for matching.

It consists of dot-separated numeric (0-255) parameters on the form 't.m'

17.1.36 <flow_label (ipv6)>

Specifies the Flow Label attribute of a valid packet filter. It shall contain an IPv6 flow label, which is a 20-bit field. It is valid for IPv6 only

- Range: 0x00000 - 0x FFFFF

17.2 Define PDP context +CGDCONT

17.2.1 Description

Define the connection parameters for a PDP context, identified by the local context identification parameter <cid>. If the command is used only with parameter <cid>, the corresponding PDP context becomes undefined. The maximum number of definable PDP contexts is 3.

☞ All parameters are described at the beginning of this chapter.

☞ <PDP_type> is set to its default value if omitted.

☞ PAP and CHAP prefixes of the APN string are not displayed in the response of the read command.

☞ The command is used to set up the PDP context parameters for an external context, i.e. a data connection using the external IP stack (e.g. Windows dial up) and PPP link over the UART.

☞ If not specified the following value are assumed:

- <cid>:1
- <PDP_type>: "IP"
- <APN>: "apn"
- <PDP_addr>: "0.0.0.0"
- <d_comp>: 0
- <h_comp>: 0

Type	Syntax	Response	Example
Set	AT+CGDCONT=[<cid>[,<PDP_type>[,<APN>[,<PDP_addr>[,<d_comp>[,<h_comp>]]]]]]	OK	AT+CGDCONT=1,"IP","APN_name","1.2.3.4",0,0 OK
Read	AT+CGDCONT?	+CGDCONT: <cid>,<PDP_type>,<APN>,<PDP_addr>,<d_comp>, <h_comp> OK	+CGDCONT: 1,"IP","web.omnitel.it","91.80.140.199",0,0 OK
Test	AT+CGDCONT=?	+CGDCONT: (range of <cid>s),<PDP_type>,,,(list of supported <d_comp>s)(list of supported <h_comp>s) OK	+CGDCONT: (1-3),"IP",,,(0),(0,1) OK

Additional examples:

Command sent by DTE	DCE Response	Description
AT+CMEE=2	OK	Use verbose <err> values
AT+CGDCONT=?	+CGDCONT: (1-3),"IP",,,(0),(0,1)	Test command
AT+CGDCONT=4,"IP","internet"	+CME ERROR: operation not allowed	Define out of range PDP contexts
AT+CGDCONT=2,"IP","internet"	OK	Define allowed PDP contexts
AT+CGDCONT=1,"IP","STATREAL"	OK	Define allowed PDP contexts
AT+CGDCONT=3,"IP","PAP: tim.ibox.it"	OK	Define allowed PDP contexts
AT+CGDCONT=253,"IP","internet"	+CME ERROR: operation not allowed	Define out of range PDP contexts
AT+CGDCONT?	+CGDCONT: 2,"IP","internet","0.0.0.0",0,0 +CGDCONT: 1,"IP","STATREAL","0.0.0.0",0,0	Read command

Command sent by DTE	DCE Response	Description
	+CGDCONT: 3,"IP","tim.ibox.it","0.0.0.0",0,0 OK	

17.3 Quality of service profile (requested) +CGQREQ

17.3.1 Description

Allows the DTE to specify the QoS (Quality of Service) profile requested from the Network during the PDP context activation procedure. The set command specifies the QoS profile for the context identified by the <cid> parameter. When set command is used with only <cid> parameter, it sets all requested QoS parameters for the given profile to their default value 0 (subscribed QoS).

PDP-context must be defined before set (AT+CGDCONT was issued).

If not specified the following value are assumed:

- <cid>:1
- <precedence>: 0
- <delay>: 0
- <reliability>: 0
- <peak>: 0
- <mean>: 0

Type	Syntax	Response	Example
Set	AT+CGQREQ=[<cid>[,<precedence>[,<delay>[,reliability>[,<peak>[,<mean>]]]]]]	OK	AT+CGQREQ=1,1,1,1,1,1 OK
Read	AT+CGQREQ?	+CGQREQ: <cid>,<precedence>,<delay>,<reliability>,<peak>,<mean> OK	+CGQREQ: 1,1,1,1,1,1 OK
Test	AT+CGQREQ=?	+CGQREQ: <PDP_type>,(list of supported <precedence>s),(list of supported <delay>s),(list of supported <reliability>s),(list of supported <peak>s),(list of supported <mean>s) OK	+CGQREQ: "IP",(0-3),(0-4),(0-5),(0-9),(0-18,31) OK

17.4 Quality of service profile (minimum acceptable) +CGQMIN

17.4.1 Description

DTE specifies a minimum acceptable QoS (Quality of Service) profile which is checked by the MT against the negotiated QoS profile returned by the network during the PDP context activation procedure.

The set command specifies a QoS profile for the context identified by the <cid> parameter. The QoS profile consists in a set of parameters, each one is configurable. When set command is used with only <cid> parameter, the minimum acceptable QoS profile for the given context is undefined. in this case no check is made against the negotiated QoS profile during PDP context activation.

If not specified the following value are assumed:

- <cid>:1
- <precedence>: 3

- <delay>: 4
- <reliability>: 5
- <peak>: 1
- <mean>: 1

Type	Syntax	Response	Example
Set	AT+CGQMIN=[<cid>[,<precedence>[,<delay>[,reliability>[,<peak>[,<mean>]]]]]]	OK	AT+CGQMIN=1,1,1,1,1,1 OK
Read	AT+CGQMIN?	+CGQMIN: <cid>,<precedence>,<delay>,<reliability>,<peak>,<mean> OK	+CGQMIN: 1,1,1,1,1,1 OK
Test	AT+CGQMIN=?	+CGQMIN: <PDP_type>,(list of supported <precedence>s),(list of supported <delay>s),(list of supported <reliability>s),(list of supported <peak>s),(list of supported <mean>s) OK	+CGQMIN: "IP",(0-3),(0-4),(0-5),(0-9),(0-18,31) OK

17.5 GPRS attach or detach +CGATT

17.5.1 Description

Register (attach) the MT to, or deregister (detach) the MT from the GPRS service. After this command the MT remains in AT command mode. If the MT is already in the requested state (attached or detached), the command is ignored and OK is returned. If the requested state cannot be reached, an ERROR is returned. The command is abortable if a character is sent to DCE during the command execution. Any active PDP context will be automatically deactivated when the GPRS registration state changes to detached.

☞ If MT is configured in class "B" (see command +CGCLASS) and GSM registration has not yet been perfomed, AT+CGATT=1 triggers both GSM and GPRS registration.

Type	Syntax	Response	Example
Set	AT+CGATT=[<state>]	OK	AT+CGATT=1 OK
Read	AT+CGATT?	+CGATT: <state> OK	+CGATT: 1 OK
Test	AT+CGATT=?	+CGATT: (list of supported <state>s) OK	+CGATT: (0,1) OK

17.6 PDP context activate or deactivate +CGACT

17.6.1 Description

Activates or deactivates the specified PDP context. After the command the MT remains in AT command mode. If any context is already in the requested state, the state for the context remains unchanged. If the required action cannot succeed, an error is returned. If the MT is not GPRS attached when the activation of a PDP context is required, the MT first performs a GPRS attach and them attempts to activate the specified context. The command is abortable if a character is sent to DCE during the command execution: in case a PDP context activation on a specific <cid> was requested, PDP context deactivation is performed; in case multiple PDP context activation was requested, it is aborted after the pending PDP context activation has finished.

Type	Syntax	Response	Example
Set	AT+CGACT=[<status>[,<cid>[,...]]]	OK	AT+CGACT=1,1 OK
Read	AT+CGACT?	If no context is defined: OK For any defined context: +CGACT: <cid>,<status> OK	+CGACT: 1,1 OK
Test	AT+CGACT=?	+CGACT: (list of supported <status>s) OK	+CGACT: (0,1) OK

☞ <status> is an optional parameter, default value: 0 (deactivated).

☞ If <cid> not defined, the command activates or deactivates all defined PDP contexts.

Examples of usage of +CGDCONT, +CGACT, +CGPADDR command:

Command sent by DTE	DCE Response	Description
AT+CMEE=2	OK	Use verbose <err> values
AT+COPS=0	OK	
AT+COPS?	+COPS: 0,0,"vodafone IT" OK	
AT+CGDCONT=1,"IP","web.omnitel.it"	OK	Define several PDP contexts
AT+CGDCONT=3,"IP","internet"	OK	
AT+CGDCONT=2,"IP","mms.vodafone.it"	OK	
AT+CGDCONT?	+CGDCONT: 1,"IP","web.omnitel.it","0.0.0.0",0,0 +CGDCONT: 3,"IP","internet","0.0.0.0",0,0 +CGDCONT: 2,"IP","mms.vodafone.it","0.0.0.0",0,0 OK	Read PDP contexts
AT+CGACT=1,1	OK	Activate PDP context 1
AT+CGPADDR=1	+CGPADDR: 1, "91.80.104.82" OK	Show address of PDP context 1
AT+CGPADDR=2	+CGPADDR: 2, "0.0.0.0" OK	Show address of PDP context 2
AT+CGPADDR=3	+CGPADDR: 3, "0.0.0.0" OK	Show address of PDP context 3
AT+CGDCONT?	+CGDCONT: 1,"IP","web.omnitel.it","91.80.104.82",0,0 +CGDCONT: 3,"IP","internet","0.0.0.0",0,0 +CGDCONT: 2,"IP","mms.vodafone.it","0.0.0.0",0,0 OK	
AT+CGACT=0,1	OK	Deactivate PDP context 1
AT+CGDCONT?	+CGDCONT: 1,"IP","web.omnitel.it","0.0.0.0",0,0 +CGDCONT: 3,"IP","internet","0.0.0.0",0,0 +CGDCONT: 2,"IP","mms.vodafone.it","0.0.0.0",0,0 OK	
AT+CGACT=1	OK	Activate all of defined PDP contexts
AT+CGDCONT?	+CGDCONT: 1,"IP","web.omnitel.it","91.80.101.207",0,0 +CGDCONT: 3,"IP","internet","83.225.114.136",0,0 +CGDCONT: 2,"IP","mms.vodafone.it","10.159.135.60",0,0 OK	

Command sent by DTE	DCE Response	Description
AT+CGPADDR=1	+CGPADDR: 1, "91.80.101.207" OK	Show address of PDP context 1
AT+CGPADDR=2	+CGPADDR: 2, "10.159.135.60" OK	Show address of PDP context 2
AT+CGACT=0	OK	Deactivate all of defined PDP contexts
AT+CGPADDR=2	+CGPADDR: 2, "0.0.0.0" OK	Show address of PDP context 2
AT+CGPADDR=3	+CGPADDR: 3, "0.0.0.0" OK	Show address of PDP context 3
AT+CGDCONT?	+CGDCONT: 1,"IP","web.omnitel.it","0.0.0.0",0,0 +CGDCONT: 3,"IP","internet","0.0.0.0",0,0 +CGDCONT: 2,"IP","mms.vodafone.it","0.0.0.0",0,0 OK	
AT+CGACT=1,2	OK	Activate PDP context 2
AT+CGDCONT?	+CGDCONT: 1,"IP","web.omnitel.it","0.0.0.0",0,0 +CGDCONT: 3,"IP","internet","0.0.0.0",0,0 +CGDCONT: 2,"IP","mms.vodafone.it","10.153.123.229", 0,0 OK	
AT+CGACT=1,3	OK	Activate PDP context 3
AT+CGDCONT?	+CGDCONT: 1,"IP","web.omnitel.it","0.0.0.0",0,0 +CGDCONT: 3,"IP","internet","83.225.171.77",0,0 +CGDCONT: 2,"IP","mms.vodafone.it","10.153.123.229",0,0 OK	
AT+CGACT=1,1	OK	Activate PDP context 1
AT+CGDCONT?	+CGDCONT: 1,"IP","web.omnitel.it","91.80.175.163",0,0 +CGDCONT: 3,"IP","internet","83.225.171.77",0,0 +CGDCONT: 2,"IP","mms.vodafone.it","10.153.123.229",0,0 OK	
AT+CGACT=0	OK	Deactivate all of defined PDP contexts
AT+CGDCONT?	+CGDCONT: 1,"IP","web.omnitel.it","0.0.0.0",0,0 +CGDCONT: 3,"IP","internet","0.0.0.0",0,0 +CGDCONT: 2,"IP","mms.vodafone.it","0.0.0.0",0,0 OK	

17.7 Enter data state +CGDATA

17.7.1 Description

Causes the MT to perform the necessary actions to establish communication between the DTE and the PDP network. For L2 manufacturer-specific modes M-HEX and M-RAW_IP, this includes performing a GPRS attach and one or more PDP context activations, if not already done.

If the parameters are accepted (and optionally the PDP context is successfully activated), the MT displays the intermediate result code CONNECT on DTE and enters the online data state; thereafter data transfer may proceed. Other commands following +CGDATA in the command line will be processed. When data transfer is completed, the MT re-enters into command mode and the final result code is displayed on DTE.

In case of error the final result code NO CARRIER or +CME ERROR: <error> is displayed.

The parameters are described in the beginning of this chapter.

If not specified the following value is assumed for <cid>: 1.

LISA starts in PPP silent mode: if the host doesn't starts the PPP configuration, LISA switches to active mode and starts sending PPP configuration data packet. If none response to configuration packet is received, the TIMEOUT expires and the PDP context is dropped.

The session is terminated sending ~+++, which may cause the deactivation, if active, of PDP context depending on DTR line status, i.e on the AT&D setting (see 15.4.3 and 15.4.4). When using "M-HEX" as L2 protocol and AT&D2 is used, the channel is switched back to command mode but the PDP context remains active.

When using "PPP" as L2 protocol, the command triggers a GPRS attach but no any activation of PDP context is performed until the PPP on the DTE side starts communication with the PPP on the MT side.

The L2 protocol "M-HEX" (AT+CGDATA="M-HEX",1) can be used as follows:

Syntax: <int: counter> <int: length[1-1500]> <hex-sequence>[0-9-fA-F]

Examples:

1 200<CR> - send 1 packet with 200 0x2B (fill character)

1000<CR> - send 5 packets with 5 1000 0x2B (fill character)

1 5 31 32 33 34 35<CR> - send 1 packet with the given contents

1 10 31<CR> - send 1 packet with 10 0x31

A packet is sent if the length field is terminated with <CR>, or the length value is equal to # chars of hex-sequence, or the input is terminated with a character not equal to a hex digit or <CR>.

This syntax of the command is mainly used to perform regulatory and conformance testing.

Type	Syntax	Response	Example
Set	AT+CGDATA=[<L2P>,[<cid>]]	CONNECT (data transfer starts)	AT+CGDATA="PPP",1 CONNECT
Test	AT+CGDATA=?	+CGDATA: (list of supported <L2P>s) OK	+CGDATA: ("PPP","M-HEX", "M-RAW_IP") OK

Usage of +CGDATA command:

Command sent by DTE	DCE Response	Description
AT+CMEE=2	OK	Use verbose <err> values
AT&D0	OK	
AT+CGDCONT=1,"IP","web.omnitel.it"	OK	Define two PDP contexts
AT+CGDCONT=2,"IP","internet"	OK	
AT+CGACT=1,2	OK	Activate PDP context 2
AT+CGDATA="M-HEX",1	CONNECT	Activate PDP context 1 and establish mandatory L2 protocol between DTE and MT
1 100	DATA OK	Send one packet of 100 bytes
cid=2	OK	Switch to the already activated context 2
~+++	NO CARRIER	Only the first activated context or the last used is closed

The cid command, which has not to be confused with the <cid> parameter, can be used while in data mode for switching to a PDP Context already active.

The cid command accepts as parameter a <cid> value corresponding to a PDP Context already active and has to be in lower-case.

17.8 Enter IP state/GPRS IP dial D

17.8.1 Description

The V.24ter dial command "D", similar to the command with the syntax AT+CGDATA="PPP",<cid>, causes the MT to perform the necessary actions to establish communication between the DTE and the external PDP network. This includes performing a GPRS attach and, if the PPP sever on the DTE side starts communication, PDP context activation on the specified PDP context indentifier (if not already requested via +CGATT and +CGACT commands).

If the command is accepted and the preliminary GPRS procedures have succeeded, CONNECT is returned, the MT enters the V.25ter online data state and the PPP L2 protocol between the MT and the DTE is started.

User requested returning back to command line mode is possible by entering "+++" or "~+++" (see 15.4.3).

Type	Syntax	Response	Example
Set	ATD<T>*99[[*]<address>][[*[<L2P>]][*[<cid>]]#	CONNECT (data transfer starts)	ATD*99***1# CONNECT

The <address> parameter is ignored.

<L2P> has "PPP" as default value.

The context identifier <cid> maps to 1 if not specified.

The GPRS dial command maps to AT+CGDATA="PPP",<cid>.

17.9 Show PDP address +CGPADDR

17.9.1 Description

Returns a list of PDP addresses for the specified context identifiers. Only defined PDP contexts are displayed.

Type	Syntax	Response	Example
Set	AT+CGPADDR=[<cid>[,<cid> [,...]]]	+CGPADDR: <cid>, <PDP_addr> OK	+CGPADDR: 1,"1.2.3.4" OK
Test	AT+CGPADDR=?	+CGPADDR: [(list of defined <cid>s)] OK	+CGPADDR: 1,3 OK

17.10 GPRS mobile station class +CGCLASS

17.10.1 Description

Sets the MT to operate according to the specified GPRS mobile class.

The read command gives the current operating class, which depends on the MT's capabilities and the MT's current registration state (GSM registered and/or GPRS attached).

Type	Syntax	Response	Example
Set	AT+CGCLASS=[<class>]	OK	AT+CGCLASS="B" OK
Read	AT+CGCLASS?	+CGCLASS: <class> OK	+CGCLASS: "B" OK
Test	AT+CGCLASS=?	+CGCLASS: (list of supported <class>s) OK	+CGCLASS: ("B","CC","CG") OK

17.10.2 Defined Values

Parameter	Type	Description
<class>	String	GPRS mobile class • "A": class-A mode of operation (A/Gb mode), or CS/PS mode of operation (Iu mode) (highest mode of operation) • "B": class B (circuit-switched and packet-switched data alternately supported) (default value) • "CC": class C (one service only) in circuit switched (GSM) mode • "CG": class C (one service only) in GPRS mode

<class>= "A" is supported only on LISA wireless module.

On LEON-G100 / LEON-G200 series, to change the module class it is needed to deregister it from network, change the class type and again register the module on the network.

17.11 GPRS event reporting +CGEREP

17.11.1 Description

Enables or disables sending of URCs **+CGEV: XXX** from MT to the DTE, in case of certain events occurring during GPRS signalling between the MT and the network.

Type	Syntax	Response	Example
Set	AT+CGEREP=[<mode>[, <bfr>]]	OK	AT+CGEREP=1,1 OK
Read	AT+CGEREP?	+CGEREP: <mode>,<bfr> OK	+CGEREP: 0,0 OK
Test	AT+CGEREP=?	+CGEREP: (list of supported <mode>s),(list of supported <bfr>s) OK	+CGEREP: (0-2),(0-1) OK

Type	Syntax	Response	Example
URC		+CGEV: REJECT <PDP_type>,<PDP_addr> +CGEV: NW REACT <PDP_type>,<PDP_addr>,[<cid>] +CGEV: NW DEACT <PDP_type>,<PDP_addr>,[<cid>] +CGEV: ME DEACT <PDP_type>,<PDP_addr>,[<cid>] +CGEV: NW DETACH +CGEV: ME DETACH +CGEV: NW CLASS <class> +CGEV:ME CLASS <class>	+CGEV: NW CLASS CC

Explanation of URCs:

- **+CGEV: REJECT <PDP_type>,<PDP_addr>** means that a network request for PDP context activation occurred when the MT was unable to report it to the DTE with a +CRING URC and was automatically rejected (RFU);
- **+CGEV: NW REACT <PDP_type>,<PDP_addr>,[<cid>]** means that the network has requested a context activation (RFU);
- **+CGEV: NW DEACT <PDP_type>,<PDP_addr>,[<cid>]** means that the network has forced a context deactivation;
- **+CGEV: ME DEACT <PDP_type>,<PDP_addr>,[<cid>]** means that the mobile equipment has forced a context deactivation;
- **+CGEV: NW DETACH** means that the network has forced a GPRS detach;
- **+CGEV: ME DETACH** means that the mobile station has forced a GPRS detach;
- **+CGEV: NW CLASS <class>** means that the network has forced a change of MT class (e.g. due to service detach); the highest available class is reported;
- **+CGEV: ME CLASS <class>** means that the mobile station has forced a change of MT class; the highest available class is reported.

17.11.2 Defined Values

Parameter	Type	Description
<mode>	Number	controls the processing of URCs specified within this command • 0: buffer URCs in the MT; if buffer full the oldest ones will be discarded • 1: discard URCs when V.24 link is reserved (online); otherwise forward them directly to the DTE • 2: buffer URCs in the MT when link reserved (online) and flush them to the DTE when the link becomes available; otherwise forward them directly to the DTE
<bfr>	Number	controls the affect on buffered codes when <mode> 1 or 2 is entered • 0: MT buffer of URCs defined within this command is cleared when <mode> 1 or 2 is entered • 1: MT buffer of URCs defined within this command is flushed to the DTE when <mode> 1 or 2 is entered (OK is given before flushing the codes)
<class>	String	GPRS mobile class • "B": class B (circuit-switched and packet-switched data alternately supported) • "CG": class C (one service only) in GPRS mode • "CC": class C (one service only) in circuit switched (GSM) mode

17.12 GPRS network registration status +CGREG

17.12.1 Description

Controls the presentation of a URC **+CGREG: <stat>** when <n>=1 and there is a change in the GPRS network registration status of the MT, or code **+CGREG: <stat>[,<lac>,<ci>]** when <n>=2 and there is a change in the network cell.

On LEON-G100 / LEON-G200 series, if GPRS is enabled and +CREG and +CGREG URCs are both enabled too, once the module is registered and attached then the two URCs are sent out quite at the same time.

Type	Syntax	Response	Example
Set	AT+CGREG=[<n>]	OK	AT+CGREG=1 OK
Read	AT+CGREG?	+CGREG: <n>,<stat>[,<lac>,<ci>] OK	+CGREG: 0,4 OK
Test	AT+CGREG=?	+CGREG: (list of supported <n>s) OK	+CGREG: (0-2) OK
URC		+CGREG: <stat>[,<lac>,<ci>]	+CGREG: 1,"4E54","44A5"

17.12.2 Defined Values

Parameter	Type	Description
<n>	Number	• 0: disable network registration URC • 1: enable network registration URC +CGREG: <stat> (default value) • 2: enable network registration information URC +CGREG: <stat>[,<lac>,<ci>]
<stat>	Number	• 0: not registered, home network • 1: registered, home network • 2: not registered, but MT is currently searching a new operator to register to • 3: registration denied • 4: unknown • 5: registered, roaming
<lac>	String	two bytes location area in hexadecimal format; it is optional in the unsolicited when <n>=2 and forbidden when <n>=1
<ci>	String	two bytes cell ID in hexadecimal format; it is optional in the unsolicited when <n>=2 and forbidden when <n>=1

17.13 Select service for MO SMS messages +CGSMS

17.13.1 Description

Specifies the service or service preference that the MT will use to send MO SMS messages.

Type	Syntax	Response	Example
Set	AT+CGSMS=[<service>]	OK	AT+CGSMS=1 OK
Read	AT+CGSMS?	+CGSMS: <service> OK	+CGSMS: 1 OK

Type	Syntax	Response	Example
Test	AT+CGSMS=?	+CGSMS: (list of currently available <service>s) OK	+CGSMS: (0-3) OK

17.13.2 Defined Values

Parameter	Type	Description
<service>	Number	service or service preference to be used • 0: GPRS • 1: CSD • 2: GPRS preferred (use circuit switched if GPRS not available • 3: CSD preferred (use GPRS if circuit switched not available)

17.14 Manual deactivation of a PDP context H

17.14.1 Description

This command H (On-hook) deactivates a pending PDP context with PPP L2 protocol in online command mode. The MT responds with OK. See paragraph 7.7 for a detailed description.

☞ In GPRS online command mode the escape sequence "+++" followed by the ATH command is needed to terminate the connection. Alternatively, in data transfer mode, DTE originated DTR toggling or PPP disconnection may be used.

Type	Syntax	Response	Example
Action	ATH	OK	

17.15PDP Context Modify +CGCMOD

17.15.1 Description

This execution command is used to modify the specified PDP context(s) with respect to QoS profiles and TFT's. After the command is complete, the MT returns to the V.25 online data state. If the requested modification for any specified context cannot be achieved, an error response is returned. If no <cid>s are specified, the activation form of the command modifies all active contexts.

☞ Because at the time there is no possibility to interrupt the PPP-protocol (e.g. by +++) and thereafter to return to the data-mode, this command cannot be used.

Type	Syntax	Response	Example
Set	AT+CGCMOD=[<cid>[,<cid>[,,...]]]	OK	AT+CGCMOD=1 OK
Test	AT+CGCMOD=?	+CGCMOD: (list of supported <cid>s) OK	

17.163G Quality of service profile (requested) +CGEQREQ

17.16.1 Description

This command allows the TE to specifiy a Quality of Service Profile that is used when the MT sends an Activate PDP Context Request message to the network. The set command specifies a profile for the context identified by the <cid>. The specified profile will be stored in the MT and sent to the network only at activation or MS-initiated modification of the related context. The command is effectively an extension of the commands +CGDCONT and +CGDSCONT. The QoS profile consists of a number of parameters, each of which may be set to a separate value. The special form +CGEQREQ=<cid> causes the requested profile related to <cid> to become undefined.

If <Maximum_bitrate_UL>, <Maximum bitrate DL>, <Guaranteed_bitrate_UL>, <Guaranteed_bitrate_DL>, <Maximum_SDU_size>, <Transfer_delay> parameters are set with a value greater than the maximum supported a message error will be provided. If the value is lower than the maximum allowed value but different respect to allowed steps, the parameter will be set to the most likely valid one.

Type	Syntax	Response	Example
Set	AT+CGEQREQ=[<cid>[,<Traffic_class>[,<Maximum_bitrate_UL>[,<Maximum_bitrate_DL>[,<Guaranteed_bitrate_UL>[,<Guaranteed_bitrate_DL>[,<Delivery_order>[,<Maximum_SDU_size>[,<SDU_error_ratio>[,<Residual_bit_error_ratio>[,<Delivery_of_erroneous_SDUs>[,<Transfer_delay>[,<Traffic_handling_priority>]]]]]]]]]]]]	OK	AT+CGEQREQ=1,2,5760,5760,0,0,0,1500,"1E4","1E5",0,1000,1 OK
Read	AT+CEGQREQ?	+CGEQREQ: <cid>,<Traffic_class>,<Maximum_bitrate_UL>,<Maximum_bitrate_DL>,<Guaranteed_bitrate_UL>,<Guaranteed_bitrate_DL>,<Delivery_order>,<Maximum_SDU_size>,<SDU_error_ratio>,<Residual_bit_error_ratio>,<Delivery_of_erroneous_SDUs>,<Transfer_delay>,<Traffic_handling_priority> [+CGEQREQ: <cid>,<Traffic_class>,<Maximum_bitrate_UL>,<Maximum_bitrate_DL>,<Guaranteed_bitrate_UL>,<Guaranteed_bitrate_DL>,<Delivery_order>,<Maximum_SDU_size>,<SDU_error_ratio>,<Residual_bit_error_ratio>,<Delivery_of_erroneous_SDUs>,<Transfer_delay>,<Traffic_handling_priority> […]] OK	+CGEQREQ: 1,2,5760,5760,0,0,0,1500,"1E4","1E5",0,1000,1 OK

Type	Syntax	Response	Example
Test	AT+CGEQREQ=?	+CGEQREQ: <PDP_type>,(list of supported <Traffic_class>s),(list of supported <Maximum_bitrate_UL>s),(list of supported <Maximum_bitrate_DL>s),(list of supported <Guaranteed_bitrate_UL>s),(list of supported <Guaranteed_bitrate_DL>s),(list of supported <Delivery_order>s),(list of supported <Maximum_SDU size>s),(list of supported <SDU_error_ratio>s),(list of supported <Residual_bit_error_ratio>s),(list of supported <Delivery_of_erroneous_SDUs>s),(list of supported <Transfer_delay>s),(list of supported <Traffic_handling_priority>s) [+CGEQREQ: <PDP_type>,(list of supported <Traffic_class>s),(list of supported <Maximum_bitrate_UL>s),(list of supported <Maximum_bitrate_DL>s),(list of supported <Guaranteed_bitrate_UL>s),(list of supported <Guaranteed_bitrate_DL>s),(list of supported <Delivery_order>s),(list of supported <Maximum_SDU_size>s),(list of supported <SDU_error_ratio>s),(list of supported <Residual_bit_error_ratio>s),(list of supported <Delivery_of_erroneous_SDUs>s),(list of supported <Transfer_delay>s),(list of supported <Traffic_handling_priority>s) […]] OK	+CGEQREQ: "IP",(0-4),(1-63 in 1 kbps steps, 64-568 in 8 kbps steps, 576-8640 in 64 kbps steps),(1-63 in 1 kbps steps, 64-568 in 8 kbps steps, 576-8640 in 64 kbps steps, 8700-16000 in 100 kbps steps),(1-63 in 1 kbps steps, 64-568 in 8 kbps steps, 576-8640 in 64 kbps steps),(1-63 in 1 kbps steps, 64-568 in 8 kbps steps, 576-8640 in 64 kbps steps, 8700-16000 in 100 kbps steps),(0-1),(10-1500,1502,1510,1520),("1E6","1E5","1E4","1E3","7E3","1E2","1E1"),("6E8","1E6","1E5","1E4","5E3","4E3","1E3","5E2","1E2"),(0-2),(10-150 in 10 ms steps, 200-950 in 50 ms steps, 1000-4000 in 50 ms steps),(0-3) OK

17.173G Quality of service profile (minimum acceptable) +CGEQMIN

17.17.1 Description

This command allows the TE to specifiy a minimum acceptable profile, which is checked by the MT against the negotiated profile returned in the Activate/Modify PDP Context Accept message. The set command specifies a profile for the context identified by the <cid>. The specified profile will be stored in the MT and checked against the negotiated profile only at activation or MS initiated modification of the related context. This command is effectively an extension to the commands +CGDSCONT and +CGEQMIN. The special form of this command +CGEQMIN=<cid> causes the minimum acceptable profile for context number <cid> to become undefined. No check is made against the negotiated profile.

If <Maximum_bitrate_UL>, <Maximum bitrate DL>, <Guaranteed_bitrate_UL>, <Guaranteed_bitrate_DL>, <Maximum_SDU_size>, <Transfer_delay> parameters are set with a value greater than the maximum supported a message error will be provided. If the set value is lower than the maximum allowed value but different respect to allowed steps, the parameter will be set to the most likely valid one.

Type	Syntax	Response	Example
Set	AT+CGDCONT is needed previously AT+CGEQMIN=[<cid>[,<Traffic_class>[,<Maximum_bitrate_UL>[,<Maximum_bitrate_DL>[,<Guaranteed_bitrate_UL>[,<Guaranteed_bitrate_DL>[,<Delivery_order>[,<Maximum_SDU_size>[,<SDU_error_ratio>[,<Residual_bit_error_ratio>[,<Delivery_of_erroneous_SDUs>[,<Transfer_delay>[,<Traffic_handling_priority>]]]]]]]]]]	OK	AT+CGEQMIN=1,2,5760,7168,0,0,0,1480,"1E3","1E5",2,1000,1 OK
Read	AT+CGEQMIN?	+CGEQMIN: <cid>,<Traffic_class>,<Maximum_bitrate_UL>,<Maximum_bitrate_DL>,<Guaranteed_bitrate_UL>,<Guaranteed_bitrate_DL>,<Delivery_order>,<Maximum_SDU_size>,<SDU_error_ratio>,<Residual_bit_error_ratio>,<Delivery_of_erroneous_SDUs>,<Transfer_delay>,<Traffic_handling_priority> [+CGEQMIN: <cid>,<Traffic_class>,<Maximum_bitrate_UL>,<Maximum_bitrate_DL>,<Guaranteed_bitrate_UL>,<Guaranteed_bitrate_DL>,<Delivery_order>,<Maximum_SDU_size>,<SDU_error_ratio>,<Residual_bit_error_ratio>,<Delivery of erroneous SDUs>,<Transfer_delay>,<Traffic_handling_priority> […]] OK	+CGEQMIN: 1,2,5760,7168,0,0,0,1480,"1E3","1E5",2,1000,1,0,0 OK

Type	Syntax	Response	Example
Test	AT+CGEQMIN=?	+CGEQMIN: <PDP_type>,(list of supported <Traffic_class>s),(list of supported <Maximum_bitrate_UL>s),(list of supported <Maximum_bitrate_DL>s),(list of supported <Guaranteed_bitrate_UL>s),(list of supported <Guaranteed_bitrate_DL>s),(list of supported <Delivery_order>s),(list of supported <Maximum_SDU_size>s),(list of supported <SDU_error_ratio>s),(list of supported <Residual_bit_error_ratio>s),(list of supported <Delivery_of_erroneous_SDUs>s),(list of supported <Transfer_delay>s),(list of supported <Traffic_handling_priority>s) [+CGEQMIN: <PDP_type>,(list of supported <Traffic_class>s),(list of supported <Maximum_bitrate_UL>s),(list of supported <Maximum_bitrate_DL>s),(list of supported <Guaranteed_bitrate_UL>s),(list of supported <Guaranteed_bitrate_DL>s),(list of supported <Delivery_order>s),(list of supported <Maximum_SDU_size>s),(list of supported <SDU_error_ratio>s),(list of supported <Residual_bit_error_ratio>s),(list of supported <Delivery_of_erroneous_SDUs>s),(list of supported <Transfer_delay>s),(list of supported <Traffic_handling_priority>s) […]] OK	+CGEQMIN: "IP",(0-3),(1-63 in 1 kbps steps, 64-568 in 8 kbps steps, 576-8640 in 64 kbps steps),(1-63 in 1 kbps steps, 64-568 in 8 kbps steps, 576-8640 in 64 kbps steps, 8700-16000 in 100 kbps steps),(1-63 in 1 kbps steps, 64-568 in 8 kbps steps, 576-8640 in 64 kbps steps),(1-63 in 1 kbps steps, 64-568 in 8 kbps steps, 576-8640 in 64 kbps steps, 8700-16000 in 100 kbps steps),(0-1),(10-1500,1502,1510,1520),("1E6","1E5","1E4","1E3","7E3","1E2","1E1"),("6E8","1E6","1E5","1E4","5E3","4E3","1E3","5E2","1E2"),(0-2),(10-150 in 10 ms steps, 200-950 in 50 ms steps, 1000-4000 in 50 ms steps),(0-3) OK

17.183G Quality of Service Profile (negotiated) +CGEQNEG

17.18.1 Description

This command allows the TE to retrieve the negotiated QoS profiles returned in the Activate PDP Context Accept message. The execution command returns the negotiated QoS profile for the specified <cid>s. The QoS profile consists of a number of parameters, each of which may have a separate value.

Type	Syntax	Response	Example
Set	AT+CGEQNEG=[<cid>[,<cid>[,...]]]	+CGEQNEG: <cid>,<Traffic_class>,<Maximum_bitrate_UL>,<Maximum_bitrate_DL>,<Guaranteed_bitrate_UL>,<Guaranteed_bitrate_DL>,<Delivery_order>,<Maximum_SDU_size>,<SDU_error_ratio>,<Residual_bit_error_ratio>,<Delivery_of_erroneous_SDUs>,<Transfer_delay>,<Traffic_handling_priority> [+CGEQNEG: <cid>,<Traffic_class>,<Maximum_bitrate_UL>,<Maximum_bitrate_DL>,<Guaranteed_bitrate_UL>,<Guaranteed_bitrate_DL>,<Delivery_order>,<Maximum_SDU_size>,<SDU_error_ratio>,<Residual_bit_error_ratio>,<Delivery_of_erroneous_SDUs>,<Transfer_delay>,<Traffic_handling_priority> […]] OK	AT+CGEQNEG=1 +CGEQNEG: 1,2,5760,7168,0,0,0,1480,"1E3","1E5",2,1000,1 OK
Test	AT+CGEQNEG=?	+CGEQNEG: (list of <cid>s associated with active contexts) OK	+CGEQNEG: (1) OK

17.19 Define Secondary PDP context +CGDSCONT

17.19.1 Description

This command specifies particular PDP context parameter values for a secondary PDP context, identified by the local context identification parameter <cid>, associated to a primary PDP context identified by the local context identification parameter <p_cid>.

If the command is used only with one parameter <cid>, it means that the corresponding PDP context becomes undefined.

Type	Syntax	Response	Example
Set	AT+CGDSCONT=[<cid>[,<p_cid>[,<d_comp>[,<h_comp>]]]]	OK	AT+CGDSCONT=2,1 OK
Read	AT+CGDSCONT?	+CGDSCONT: <cid>,<p_cid>,<d_comp>,<h_comp> [+CGDSCONT: <cid>,<p_cid>,<d_comp>,<h_comp> [...]] OK	+CGDSCONT: 2,1,0,0 OK

Type	Syntax	Response	Example
Test	AT+CGDSCONT=?	+CGDSCONT: (range of <cid>s),(list of <cid>s for defined primary contexts),<PDP_type>,,,(list of supported <d_comp>s),(list of supported <h_comp>s) [+CGDSCONT: (range of <cid>s),(list of <cid>s for defined primary contexts),<PDP_type>,,,(list of supported <d_comp>s),(list of supported <h_comp>s), [...]] OK	+CGDSCONT: (1-20),(1),"IP",,,(0-2),(0-4) +CGDSCONT: (1-20),(),"IPV6",,,(0-2),(0-4) OK

17.20Traffic Flow Template +CGTFT

17.20.1 Description

This command allows the TE to specify a Packet Filter - PF for a Traffic Flow Template - TFT that is used in the GGSN for routing of down-link packets onto different QoS flows towards the TE (refer to 3GPP TS 23.060 [10] and 3GPP TS 24.008 [30]). A TFT is identified by a <packet filter identifier> and each packet filter also has an <evaluation precedence index>. The set command specifies a Packet Filters to be added to the TFT stored in the MT and used for the context identified by <cid>. This command is effectively an extension of the commands +CGDCONT and +CGDSCONT.

The syntax +CGTFT=<cid> causes all of the Packet Filters in the TFT for the specified <cid> to become undefined. TFT shall be used for PDP-type IP.

Not all the parameters combinations are allowed in a Packet Filter, some may coexist but others are mutually exclusive. The possible combinations are specified in 3GPP TS 23.060 [10].

Type	Syntax	Response	Example
Set	AT+CGTFT=[<cid>,<packet_filter_identifier>,<evaluation_precedence_index>[,<source_address_and_subnet_mask>[,<protocol_number_(ipv4)-next_header_(ipv6)>[,<destination_port_range>[,<source_port_range>[,<ipsec_security_parameter_index_(spi)>[,<type_of_service_(tos)_(ipv4)_and_mask-traffic_class_(ipv6)_and_mask>[,<flow_label (ipv6)>]]]]]]]]	OK	AT+CGTFT=5,1,1,"109.115.183.216.255.255.0.0" OK

Type	Syntax	Response	Example
Read	AT+CGTFT?	+CGTFT: <cid>, <packet_filter_identifier>, <evaluation_precedence_index>, <source_address_and_subnet_mask>, <protocol_number_(ipv4)-next_header_(ipv6)>, <destination_port_range>, <source_port_range>, <ipsec_security_parameter_index_(spi)>, <type_of_service_(tos)_(ipv4)_and_mask-traffic_class_(ipv6)_and_mask>, <flow_label (ipv6)> [+CGTFT: <cid>, <packet_filter_identifier>, <evaluation_precedence_index>, <source_address_and_subnet_mask>, <protocol_number_(ipv4)-next_header_(ipv6)>, <destination_port_range>, <source_port_range>, <ipsec_security_parameter_index_(spi)>, <type_of_service_(tos)_(ipv4)_and_mask-traffic_class_(ipv6)_and_mask>, <flow_label (ipv6)> […]] OK	+CGTFT: 5, 1, 1, 109.115.183.216[255.255.0.0], 0, 0.0, 0.0, 00000000, 0.0, 00000 OK
Test	AT+CGTFT=?	+CGTFT: <PDP_type>, (list of supported <packet_filter_identifier>s), (list of supported <evaluation_precedence_index>s), (list of supported <source_address_and_subnet_mask>s), (list of supported <protocol_number_(ipv4)-next_header_(ipv6)>s), (list of supported <destination_port_range>s), (list of supported <source_port_range>s), (list of supported <ipsec_security_parameter_index_(spi)>s), (list of supported <type_of_service_(tos)_(ipv4)_and_mask-traffic_class_(ipv6)_and_mask>s), (list of supported <flow_label (ipv6)>s) [+CGTFT: <PDP_type>, (list of supported <packet_filter_identifier>s), (list of supported <evaluation_precedence_index>s), (list of supported <source_address_and_subnet_mask>s), (list of supported <protocol_number_(ipv4)-next_header_(ipv6)>s), (list of supported <destination_port_range>s), (list of supported <source_port_range>s), (list of supported <ipsec_security_parameter_index_(spi)>s), (list of supported <type_of_service_(tos)_(ipv4)_and_mask-traffic_class_(ipv6)_and_mask>s), (list of supported <flow_label (ipv6)>s) […]] OK	+CGTFT: IP, (1 - 8), (0 - 255), (0.0.0.0[0.0.0.0] - 255.255.255.255[255.255.255.255]), (0 - 255), (0.0 - 65535.65535), (0.0 - 65535.65535), (00000000 - ffffffff), (0.0 - 255.255), (00000 - 00000) OK

17.21 Multiple PDP contexts

17.21.1 Description

Two PDP context types are defined:

- "external" PDP context: IP packets are built by the DTE, the MT's IP instance runs the IP relay function only
- "internal" PDP context: the PDP context (relying on the MT's TCP/IP stack) is configured, established and handled via the data connection management packet switched data commands described in chapter 22

Multiple PDP contexts are supported. The DTE can access these PDP contexts either alternatively through the physical serial port, or simultaneously through the virtual serial ports of the multiplexer (multiplexing mode MUX), with the following constraints:

- Using the MT's embedded TCP/IP stack, only 1 internal PDP context is supported. This IP instance supports up to 7 sockets on LISA-U1 series and up to 16 sockets on LEON-G100 / LEON-G200 series
- Using only external PDP contexts, it is possible to have at most 3 IP instances (with 3 different IP addresses) simultaneously. If in addition the internal PDP context is used, at most 2 external PDP contexts can be activated.

Secondary PDP contexts (PDP contexts sharing the IP address of a primary PDP context) are also supported. Traffic Flow Filters for such secondary contexts shall be specified according to 3GPP TS 23.060 [10].

At most 2 secondary PDP contexts can be activated, since the maximum number of PDP contexts, both normal and secondary, is always 3.

18 Specific AT-commands

18.1 FOTA configuration +UFOTA

18.1.1 Description

This command is used to set the FOTA configuration, to enable/disable the feature, define the maximum number of attempts and set a security code to avoid malicious activity.

During update operations, FOTA application prints some indication on the AT serial port using the URC: **+UFOTAIND: <status>, <value>**.

Type	Syntax	Response	Example
Set	AT+UFOTA=<enabled>[,<attempts>[,<configuration>[,<code>]]]	OK	AT+UFOTA=1,1,2,"00000000" OK
Read	AT+UFOTA?	+UFOTA: =<enabled>,<attempts>,<configuration>,<code> OK	+UFOTA: 1,1,2,"00000000" OK
Test	AT+UFOTA=?	+UFOTA: (list of supported <enabled>),(list of supported <attempts>),(list of supported <configuration>s),"alphanumeric <code>" OK	+UFOTA: (0-1),(1-2),(0-15),"CODE" OK
URC		+UFOTAIND: <status>, <value>	

18.1.2 Defined values

Parameter	Type	Description
<enabled>	Number	• 0: FOTA disable (default value) • 1: FOTA enabled
<attempts>	Number	Number of delta FW download attempts in case of a network fail: • 1: one attempt only (default value) • 2: two attempts (a second one if the second fails)
<configuration>	Number	Bitfield to configure FOTA behavior: • 0: Server notification; notify the server about update result (default value) • 1: EEP dynamic reset; Delete EEP dynamic parameters and use new FW default values • 2: Use security code; Enable security code check to validate SMS • 3: Preserve SMS; Do not delete SMS when memory is full • 4 - 15: None; Reserved for future use
<code>	String	Eight alphanumeric characters string used to enable the security check and avoid trigger from unauthorized persons; empty string is the default setting
<status>	Number	• 0: No action pending: update process terminated; <value> is "Update process result"; see A.5 • 1: SMS arrived: a FOTA SMS has arrived • 2: Activate data connection • 3: Delta download begin • 4: Delta downloaded: delta file for upgrade has been downloaded • 5: Code upgrade start; <value> indicate the progress update in percentage • 6: Update terminated; <value> is "Update process result"; see A.5 • 7: Server to be notified; <value> is "Update process result"; see A.5
<value>	String	Please refer to <status> parameter description

18.2 Firmware Update over AT command (FOAT) +UFWUPD

18.2.1 Description

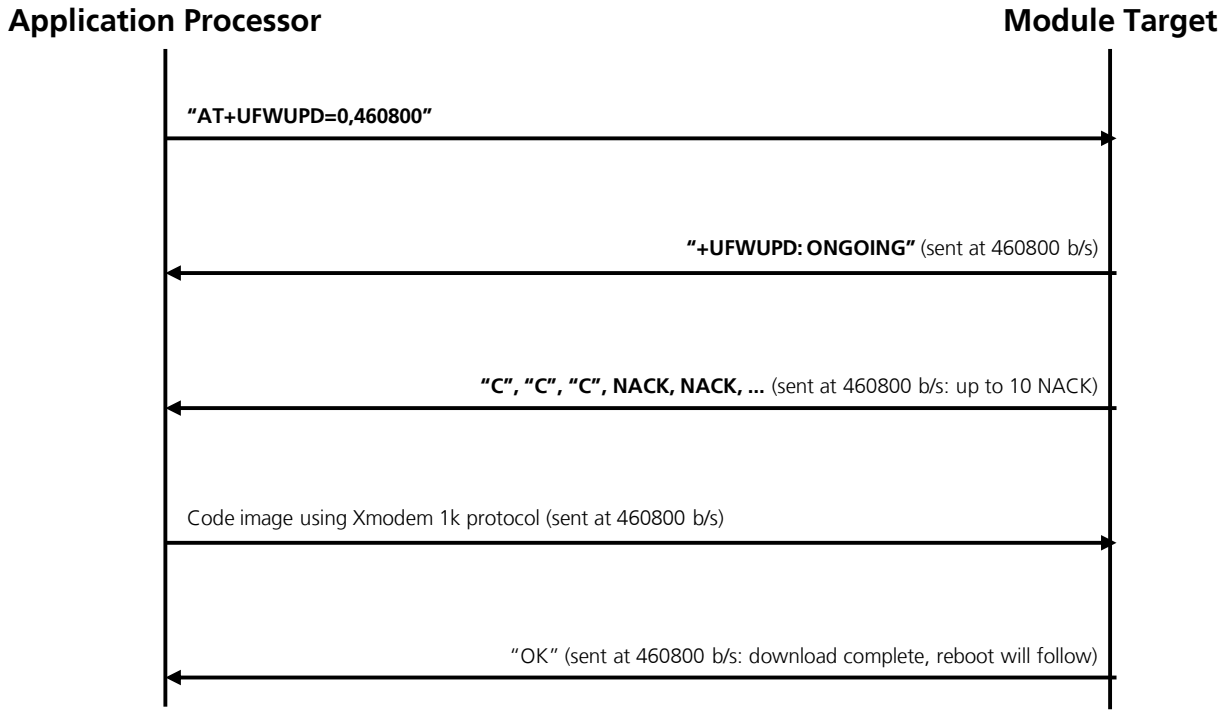
The command triggers the firmware update by means of downloading the Code image (file in fls format) or the Flash File System image (file in dffs format) using the Xmodem-1K protocol.

On AT+UFWUPD reception, the module:

- configures the serial port at the new baud rate (if any)
- resets, restarts and switches to Firmware Update Mode
- sends over the UART the IRC **+UFWUPD: ONGOING** followed up to three "C" (0x43) characters and up to ten "NACK" (0x15)

After this it is possible to download the new code image (e.g. the .fls file) or the new Flash File System image (e.g. the .dffs file) via the Xmodem-1K protocol using a standard terminal program at the selected baud rate without flow control (e.g. in PC environment it could be used HyperTerminal). At the end of the firmware update procedure, the baud rate is set to the baud rate configured with the set command.

Example:



☞ The modem sends a <CAN> packet (0x18) after 8 MB of data instead of waiting for the <EOT> packet (0x04) from the sender. The <CAN> packet can be interpretated as an ABORT from the modem side.

☞ If data are sent while the "C" character is coming, the protocol uses CRC method to detect transmission errors otherwise standard CHECKSUM method.

☞ Both "+UFWUPD: ONGOING" and any further final response are sent at the new baud rate: only a syntax error in the AT+UFWUPD command triggers an error response at the original baud rate.

☞ Errors (data corruption, data loss etc) during the Update phase are internally handled by the Xmodem protocol itself; for more details about the error code please refer to A.4.

☞ In case of power loss during the update, at the next module wake-up a fault is detected and the module remains in Firmware Update Mode expecting that the upload restarts from Xmodem-1k handshake; the FW is corrupted and useless (ERROR2).

☞ If the FW upload ends with an ERROR condition, the module remains in Firmware Update Mode expecting that the upload restarts from Xmodem-1k handshake; the FW is corrupted and useless (ERROR2).

☞ If no data comes to module after AT+UFWUPD command, up to ten NACK are sent and then Firmware Update Mode is dropped out coming back to normal mode; the FW is unchanged and still useable (ERROR1).

☞ It is not possible to update the firmware if the mux is enabled.

Type	Syntax	Response	Example
Set	AT+UFWUPD=<filetype>[,<speed>]	+UFWUPD: ONGOING (Sent at new baud rate, if specified)	AT+UFWUPD=0 +UFWUPD: ONGOING
Test	AT+UFWUPD=?	+UFWUPD: (list of supported <filetype>s),(list of supported <speed>s) OK	+UFWUPD: (0-1),(115200, 230400, 460800, 921600) OK

18.2.2 Defined Values

Parameter	Type	Description
<filetype>	Number	service or service preference to be used • 0: To download CODE image (*.fls file) • 1: To download Flash File System image (*.dffs file)
<speed>	Number	Baud rate in b/s • 115200 (default value) • 230400 • 460800 • 921600

18.3 Antenna Detection +UANTR

18.3.1 Description

Measures the DC component of load of the GSM antenna (the GPS antenna is RFU). The antenna load is expressed in kOhm.

Type	Syntax	Response	Example
Set	AT+UANTR=[<antenna_id>]	+UANTR: <antenna_id>,<antenna_load> OK	AT+UANTR=0 +UANTR: 0,10 OK
Test	AT+UANTR=?	+UANTR: (list of supported <antenna_id>s) OK	+UANTR: (0) OK

18.3.2 Defined Values

Parameter	Type	Description
<antenna_id>	Number	Antenna identifier (optional parameter) • 0: GSM antenna (default value) • 1: GPS antenna (RFU)
<antenna_load>	Number	Measured value in kOhm of the antenna load with a resolution of 1 kOhm. The range goes from -1 to 53 (only integer values can be assumed), where: • -1: open circuit • 0: short circuit • 1: 1 kOhm (minimum limit of the measurement range) … • 53: 53 kOhm (maximum limit of the measurement range)

The load resistor values below the minimum limit of 1 kΩ are identified as short circuit (<antenna_load>=0), while values above the maximum limit of 53 kΩ are identified as open circuit (<antenna_load>=-1).

On LISA-U1 series the reported value could differ from the real resistance value of the diagnostic resistor mounted inside the antenna assembly due to antenna cable length, antenna cable capacity and the measurement method used by LISA. For further details please refer to Antenna detection functionality chapter in LISA-U1 series System Integration Manual [49].

18.4 ADC read command +UADC

18.4.1 Description

Reads the current value of the specified ADC, given in mV. The syntax and the parameters range are shown in the response to the test command if ADC are supported; if no ADC is supported by the modem, an error is returned.

Type	Syntax	Response	Example
Set	AT+UADC=<adc_id>	+UADC: <adc_id>,<adc_val> OK	AT+UADC=0 +UADC: 0,480 OK
Test	AT+UADC=?	+UADC: (range of <adc_id>s) OK	+UADC: (0-1) OK

18.4.2 Defined Values

Parameter	Type	Description
<adc_id>	Number	ADC identifier
<adc_val>	Number	Current ADC value measured on the specified ADC pin, typical range [0-1920 mV]

18.5 Power saving control (Power SaVing) +UPSV

18.5.1 Description

Sets the UART power saving, but has a global effect on module power saving configuration:

- If power saving is enabled (+UPSV= 1) the UART interface is cyclicly enabled and the module enters idle-mode automatically whenever possible

- If power saving is disabled (+UPSV= 0), the UART interface is always enabled and the module cannot enter idle-mode
- If power saving is controlled by the UART **RTS** signal (+UPSV= 2), the module is forced to stay in active-mode (and the UART enabled) as long as the UART **RTS** line is ON

Type	Syntax	Response	Example
Set	AT+UPSV=<mode>[,<Timeout>]	OK	AT+UPSV=1,3000 OK
Read	AT+UPSV?	+UPSV: <mode>[,<Timeout>] OK	+UPSV: 1,3000 OK
Test	AT+UPSV=?	+UPSV: (list of supported <mode>s), (list of supported <Timeout>s) OK	+UPSV: (0-2),(40-65000) OK

18.5.2 Defined Values

Parameter	Type	Description

<mode>	Number	Power saving configuration
		• 0: disabled (default value)
		• 1: enabled:
		  ○ The UART is re-enabled from time to time to give to the DTE a chance for transmission and the module switch from idle to active mode in a cyclic way. If during the active mode any data is received, the UART (and the module) is forced to stay "awake" for a time specified by the <Timeout> parameter. Any subsequent data reception during the "awake" period resets and restarts the "awake" timer
		• 2: power saving is controlled by UART **RTS** signal:
		  ○ If UART **RTS** state is OFF power saving mode is allowed
		  ○ If the **RTS** state is set to ON,the module shall exit power saving mode
		☞ <mode>=2 is allowed only if HW flow control has been previously disabled on UART (e.g. with AT&K0), otherwise the command returns an error response (+CME ERROR: operation not allowed if +CMEE=2).
		☞ In this mode, the DTE can start sending data to the module without risk of data loss after having asserted the UART **RTS** (**RTS** sets to ON).

<Timeout>	Number	If <mode>=1 and active-mode entered, provides the guard period of no reception of characters on the UART interface, expressed in GSM frames (4.615 ms), before entering idle-mode again. • The range goes from 40 to 65000 (approximately from 184 ms to 300 s); the default value is 2000 GSM frames (ca 9.2 s). • This parameter is accepted only when <mode>=1

☞ <mode>= 1 and <mode>= 2 are applicable only in reference to the UART interface, even if the command is accepted by all the serial interfaces (physical and MUX virtual interfaces).
If the command is issued on USB/SPI/MUX channel, all the AT profiles are updated accordingly, but the setting is only applied to the UART interface.

☞ <mode>= 2 requires the disabling of HW flow control on UART interface only. The other serial interfaces can request the <mode> 2 for the UART regardless their flow control configuration.

☞ Since LISA-U1 series are equipped with other serial interfaces besides the UART (USB, SPI), there are some interactions among the power saving mechanisms implemented by the different interfaces. Refer to LISA-U1 series System integration Manual [49] for a description.

☞ On LISA-U1 series, if <mode>=2 the **CTS** line is always set to ON by the module while on LEON-G100/G200 series the **CTS** line follows the module power saving state if **RTS** is set to OFF.

For a detailed explanation of power saving timings, UART lines behaviour and module response to UART events in reference to the +UPSV command setting refer to the LEON-G100/G200 System Integration Manual [25] or LISA-U1 series System integration Manual [49].

18.6 Tone generator (Tone GeNerator) +UTGN

18.6.1 Description

Allows to start a tone on module tone generator. Frequency, duration and volume of the tone must be specified.

The <routing> parameter is available on LEON from LEON-G100-06x/LEON-G200-06x and subsequent versions.

Type	Syntax	Response	Example
Set	AT+UTGN=<freq>,<duration>,<volume>[,<UplinkSending>]	OK	AT+UTGN=1000,1000,100,1 OK
Test	AT+UTGN=?	+UTGN: (range of supported <freq> values in Hz),(range of supported <duration>s in msec),(range of supported <volume> values) ,(range of supported <UplinkSending > values) OK	+UTGN: (300-3400),(10-8000),(1-100),(0-2) OK

18.6.2 Defined Values

Parameter	Type	Description
<freq>	Number	Frequency of the sinus waveform in Hz for the tone generator; the range goes from 300 to 3400 Hz
<duration>	Number	Duration of the tone in msec; the allowed values are: • On LEON-G100 / LEON-G200 series: from 10 to 8000 • On LISA-U1 series: from 10 to 1360
<volume>	Number	Volume for the tone generator. Allowed values are 1-100; volume 1 means muted. Increasing step is 0.25 dB
<UplinkSending>	Number	Enable / disable the connection of the tone generator to uplink and/or downlink path: • 0: the tone is sent only on downlink path (default value) • 1: the tone is sent only on uplink path • 2: the tone is sent both on downlink and uplink path
<error>	Number	If an incorrect number of parameters is provided or the parameter values are out of range the message error "operation not supported" will be provided.

Tone playing can be stopped by set command: AT+UTGN=0,0,0. If no tone is playing an ERROR message (+CME ERROR: operation not supported) is returned.

If Alert Sound Mode "silent mode" (+CALM=1) the +UTGN command returns an ERROR message (+CME ERROR: operation not supported).

18.7 Ringing tone selection command +URNG

18.7.1 Description

Allows the user to select one out of a set of predefined ringers. The test command differs between LEON-G100 / LEON-G200 series and LISA-U1 series.

Type	Syntax	Response	Example
Set	AT+URNG=<rng_id>	OK	AT+URNG=5 OK
Read	AT+URNG?	+URNG: <rng_id> OK	+URNG: 0 OK
Test	AT+URNG=?	LEON-G100 / LEON-G200 series: +URNG: 0 - <rng_name_1> 1 - <rng_name_2> ... rng_max_num - <rng_name_n> OK LISA-U1 / LISA-U1 series: +URNG: (list of supported <rng_id>s) OK	+URNG: 0 - pinkpanther 1 - baroque 2 - caribic 3 - jamesbond 4 - moonstar 5 - ramp_spmidi 6 - mozart_imel 7 - whenever 8 - imperialmarch OK

18.7.2 Defined Values

Parameter	Type	Description
<rng_id>	Number	Ringer identifier currently selected; the default value is 0
<rng_name_x>	Number	Name of the ringer saved in the module
<error>	Number	• If an incorrect number of parameters is provided or the parameter value is out of range the message error "operation not supported" will be provided; • On LEON-G100 / LEON-G200 series, if <rng_id> value is not allowed the message error "Wrong ringer identifier" will be provided

18.8 SMS Alert sound mode (Message Sound Muting) +UMSM

18.8.1 Description

Mutes the signalling sound of SMS on the MT.

Type	Syntax	Response	Example
Set	AT+UMSM=<mode>	OK	AT+UMSM=0 OK
Read	AT+UMSM?	+UMSM: <mode> OK	+UMSM: 0 OK
Test	AT+UMSM=?	+UMSM: (list of supported <mode>s) OK	+UMSM: (0-1) OK

18.8.2 Defined Values

Parameter	Type	Description
<mode>	Number	• 0: normal mode (the signalling sound of SMS on the MT is not muted) (default value) • 1: silent mode (the signalling sound of SMS on the MT is muted)
<error>	Number	If an incorrect number of parameters is provided or the parameter value is out of range the message error "operation not supported" will be provided

18.9 I2S Digital Interface Mode +UI2S

18.9.1 Description

Configures the I²S digital audio interface to be used when audio digital paths are chosen (AT+USPM command,<main_uplink>=I2S RX,<main_downlink>=I2S TX).

The I²S TX and RX data line can be connected to two different access point of the uplink and downlink audio path (Refer to block diagram in the chapter 21.1).

Furthermore syncronization between data, clock and word alignment lines can be configured in different modes: PCM modes (short synchronization signal) and normal I²S modes (long synchronization signal) are available.

For details about I²S techical features in PCM and Normal I²S mode, please refer either to LEON-G100/G200 System Integration Manual [25] or LISA-U1 series System integration Manual [49].

Physical I²S port is composed of 4 pins. Signals are:

- I2S_WA (Word Alignment): Output signal; Syncronize the data word; WA Cycle frequency is 8 kHz for all modes, while WA cycle timing depends on the mode (Refer to chapter 18.9.3, 18.9.4, 18.9.5 and 18.9.6)
- I2S_TXD (Trasmitted Data): Output signal; Sequence of data bits, Most Significative bit transmitted first. Each word 16 bits long, in 2's complement format with 8 kHz sampling frequency
- I2S_CLK (Clock): Output signal; Syncronize the bits composing the data words; CLK frequency and edge syncronization with TXD/RXD signals depends on mode. Refer to chapter 18.9.3, 18.9.5
- I2S_RXD (Received Data): Input signal; Sequence of data bits, Most Significative bit read first. Each word is 16 bits long , in 2's complement format with 8 kHz sampling frequency

☞ For LEON the I²S pins are mapped in the following mode:

- Pin 26: I2S_WA
- Pin 27: I2S_TXD
- Pin 28: I2S_CLK
- Pin 29: I2S_RXD

☞ For LISA-U120/LISA-U130 the I²S pins are mapped in the following mode:

- Pin 41: I2S_WA
- Pin 42: I2S_TXD
- Pin 43: I2S_CLK
- Pin 44: I2S_RXD

Type	Syntax	Response	Example
Set	AT+UI2S=<I2S_mode>,<I2S_port>,<I2S_clk_wa>	OK	AT+UI2S=10,1,1 OK
Read	AT+UI2S?	+UI2S: <I2S_mode>,<I2S_port>,<I2S_clk_wa> OK	+UI2S: 4,1,1 OK

Type	Syntax	Response	Example
Test	AT+UI2S=?	+UI2S: (list of supported <I2S_mode>s),(list of supported <I2S_port>s), (list of supported <I2S_clk_wa>) OK	+UI2S: (0-13),(1-2),(0-1) OK

18.9.2 Defined Values

Parameter	Type	Description
<I2S_mode>	Number	Specifies I^2S configurable modes. Allowed values are (0-13) as described in chapter 18.9.3, 18.9.5 • Default value: 4 • PCM modes (short synchronization signal) and normal I2S modes (long synchronization signal) are available • For modes available on each connection point and for their settings please refer to chapter 18.9.3, 18.9.5. • For the signals timing please refer to the chapter 18.9.4 and 18.9.6 ☞ I2Sx connection point supports only PCM modes, while I2Sy connection point support only Normal I^2S modes.
<I2S_port>	Number	Specifies I2S connection point to be used as audio path when digital path is selected (refer to command AT+USPM, chapter 18.10). To view the I^2S connections points positions please refer to block diagram in chapter 21.1. Allowed values are: • 1: I2S is connected to I2Sx connection point o I2Sx connection point is parallel to the analog audio front end. In this case the digital audio path is comparable with the analog audio paths (refer to +USPM command, chapter 18.10); • 2: I2S is connected to I2Sy connection point o I2Sy connection point is nearer to the codec in the audio path. While using this access point the audio path is not affected by some audio controls as digital filters (+UUBF, +UDBF), digital gains (+UMGC, +USGC), sidetone (+USTN); Furthermore some audio resources as tone generator (+UTGN), info tones (e.g. free tone, connection tone, low battery alarm), players (ringer on incoming call, alarm and tunes generated by +UPAR command) are not available on I2Sy connection point ☞ Volume control (+CLVL) and hands-free algorithm (+UHFP) are active for both connection points. ☞ The analog gains in the +USGC and +UMGC commands are unused for both connection points.
<I2S_clk_wa>	Number	Specifies when I2S_CLK and I2S_WA signal are active. Allowed values are: • 0: Dynamic mode; I2S_CLK and I2S_WA outputs are active and running only when audio path is active (audio samples are read on I2S_RX line and written on I2S_TX line). After audio path is disabled (i.e. a call is hang up) I2S_CLK and I2S_WA are disabled too • 1: Continuous mode; CLK and WA outputs are always active and running, even when module is idle and audio path is disabled (no audio data written on I2S_TX line, no audio data read on I2S_RX line). This implicates the module can not enter power saving mode. This is the default value

☞ <I2S_port>=2 is not supported on LISA-U1 series.

☞ If an incorrect number of parameters is provided or the parameter value is out of range the message error "operation not supported" will be provided:

- o +UI2S command returns ERROR when audio path is in digital mode (+USPM: 2,4,0,0)
- o +UI2S command returns ERROR if I^2S pins are already allocated by another resource
- o +UI2S settings are saved in NVM after power off if changed

☞ Allowed combination of <I2S_mode> and <I2S_port> are described in Table 3 and Table 4.

	PCM modes	Normal I²S modes
I2Sx	(0-1)	Not supported
I2Sy	Not supported	(2-13)

Table 3: LEON-G100 / LEON-G200 series I²S modes

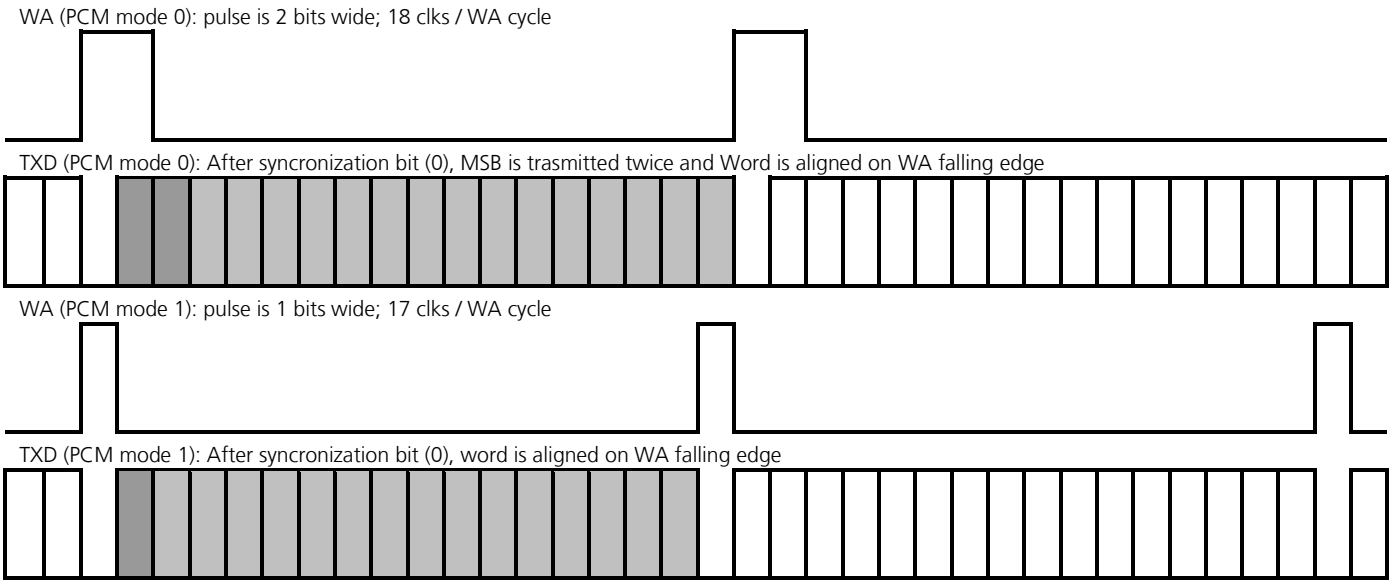
	PCM modes	Normal I²S modes
I2Sx	(0-1)	(2-13)
I2Sy	Not supported	Not supported

Table 4: LISA-U1 series I²S modes

18.9.3 PCM modes (short synchronization signal)

Mode	CLK EDGE for TX	CLK EDGE for RX	WA pulse length	CLK Freq.	WA Freq.
0	RISING	FALLING	2 clks	144 kHz	8 kHz
1	RISING	FALLING	1 clk	136 kHz	8 kHz

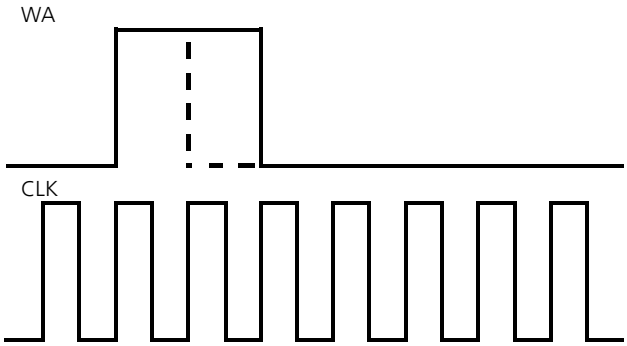
18.9.4 PCM modes timing diagrams



A single Transmitted word is marked in grey. MSB is marked darker.

Since RXD bits are read on the falling edge of CLK signal, the RXD word slot starts half bit delayed respect TXD word slot.

Relation between WA and CLK edge for PCM mode is:

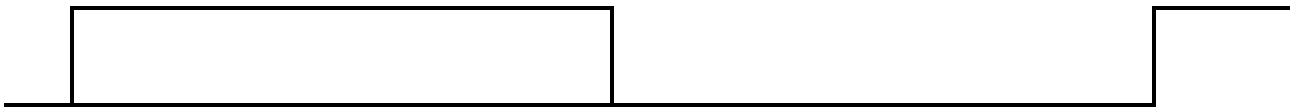


18.9.5 Normal I²S modes (long synchronization signal)

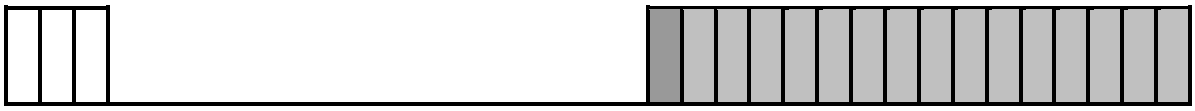
Mode	CLK EDGE for TX	CLK EDGE for RX	MSB DELAY	TX channel	RX channel	CLK Freq.	WA Freq.
2	FALLING	RISING	1 bit	WA LOW	WA LOW	256 kHz	8 kHz
3	RISING	FALLING	1 bit	WA LOW	WA LOW	256 kHz	8 kHz
4	FALLING	RISING	0 bit	WA LOW	WA LOW	256 kHz	8 kHz
5	RISING	FALLING	0 bit	WA LOW	WA LOW	256 kHz	8 kHz
6	FALLING	RISING	1 bit	WA HIGH	WA HIGH	256 kHz	8 kHz
7	RISING	FALLING	1 bit	WA HIGH	WA HIGH	256 kHz	8 kHz
8	FALLING	RISING	0 bit	WA HIGH	WA HIGH	256 kHz	8 kHz
9	RISING	FALLING	0 bit	WA HIGH	WA HIGH	256 kHz	8 kHz
10	FALLING	RISING	1 bit	WA HIGH & LOW	WA HIGH	256 kHz	8 kHz
11	RISING	FALLING	1 bit	WA HIGH & LOW	WA HIGH	256 kHz	8 kHz
12	FALLING	RISING	0 bit	WA HIGH & LOW	WA HIGH	256 kHz	8 kHz
13	RISING	FALLING	0 bit	WA HIGH & LOW	WA HIGH	256 kHz	8 kHz

18.9.6 Normal I²S modes timing diagrams

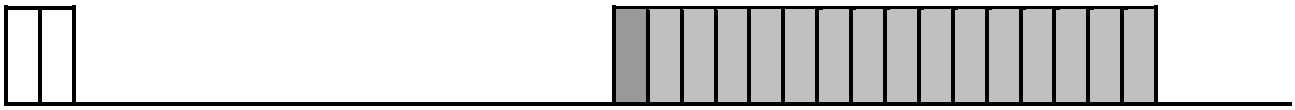
WA (all normal modes)



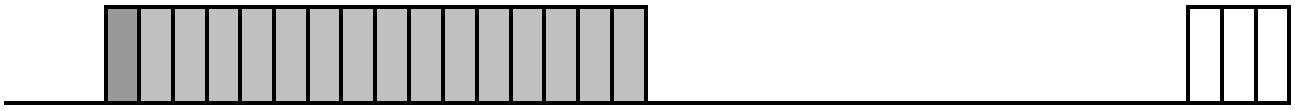
TXD timeslot (Normal modes 2-3): 1 bit delay; channel on WA low



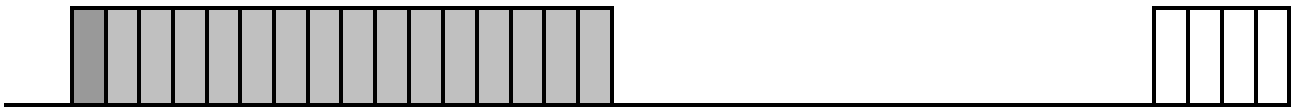
TXD timeslot (Normal modes 4-5): 0 bit delay; channel on WA low



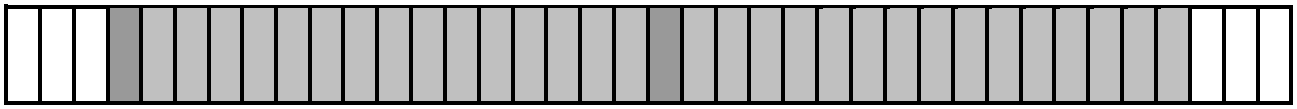
TXD (Normal modes 6-7):1 bit delay; channel on WA high



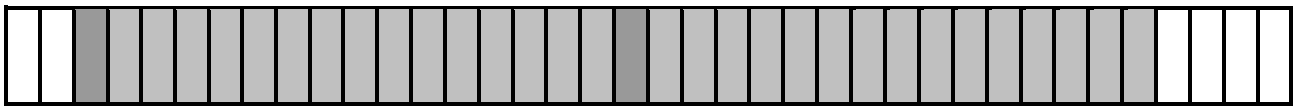
TXD (Normal modes 8-9): 0 bit delay; channel on WA high



TXD (Normal modes 10-11):1 bit delay; channel on WA high and low



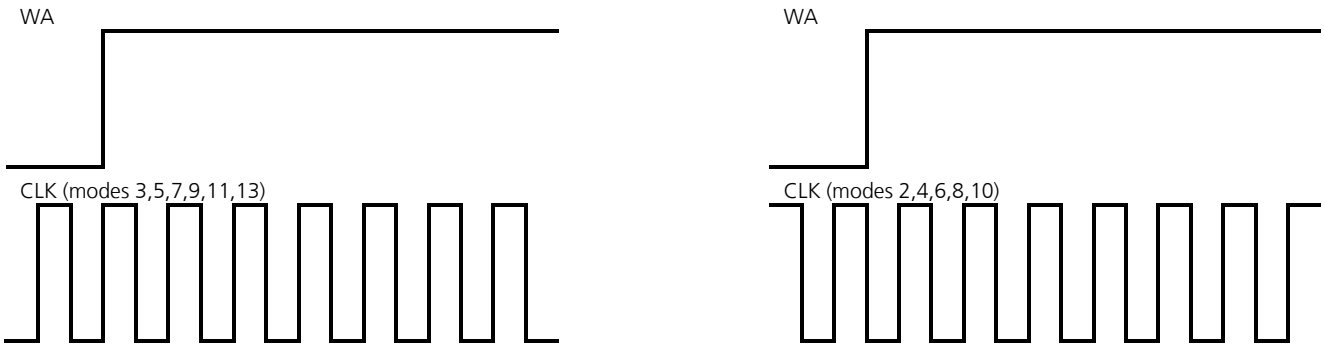
TXD (Normal modes 12-13): 0 bit delay; channel on WA high and low



A single Transmitted word is marked in grey. MSB is marked darker.

Since RXD bits are read on the opposite edge of CLK signal respect TXD bits, the RXD word slot starts half bit delayed respect TXD word slot.

Relation between WA and CLK edge for Normal I²S depends on mode:



18.10 Audio Path mode setting (Set Path Mode) +USPM

18.10.1 Description

Sets the audio Path Mode. The path mode is the way of enabling the different audio paths (audio input and output) of the module for different usecases.

Type	Syntax	Response	Example
Set	AT+USPM=<main_uplink>,<main_downlink>,<alert_sound>,<headset_indication>[,<vmic_ctrl>]	OK	AT+USPM=1,1,0,0 OK
Read	AT+USPM?	+USPM= <main_uplink>, <main_downlink>, <alert_sound>, <headset_indication>,<vmic_ctrl> OK	+USPM: 0,0,0,0,2 OK
Test	AT+USPM=?	+USPM: (list of supported <main_uplink>s),(list of supported <main_downlink>s),(list of supported <alert_sound>s),(list of supported <headset_indication>s) , (list of supported <vmic_ctrl>s) OK	+USPM: (0-2),(0,1,3,4),(0-1),(0-1),(0-2) OK

18.10.2 Defined Values

Parameter	Type	Description
<main_uplink>	Number	Specifies the audio output path used for speech • 0: Handset microphone (LEON pins MIC_BIAS1, MIC_GND1; LISA pins MIC_P, MIC_N) (default value) • 1: Headset microphone (LEON pins: MIC_BIAS2, MIC_GND2; LISA pins MIC_P, MIC_N) • 2: I²S input line (pin I2S_RXD) • 4: hands-free microphone (pins MIC_BIAS1, MIC_GND1)
<main_downlink>	Number	Specifies the audio input path used for speech • 0: Normal earpiece (pins of Board-to-Board connector: LEON: HS_P / GND; LISA: SPK_N / SPK_P) (default value) • 1: Mono headset (pins of Board-to-Board connector: LEON: HS_P / GND; LISA: SPK_N / SPK_P) • 2: Stereo headset • 3: Loudspeaker (pins of Board-to-Board connector: SPK_P and SPK_N)

Parameter	Type	Description
		• 4: I2S output line (pin I2S_TXD). ☞ On LEON all audio outputs are supported; the supported audio inputs are Normal earpiece, mono headset and loudspeaker
<alert_sound>	Number	Specifies if the alert sounds in idle mode are played on the main downlink path (same downlink path as speech; see <main_downlink> parameter) or on the loudspeaker: • 0: Main downlink path • 1: Loudspeaker (default value)
<headset_indication>	Number	Specifies if the speech path is switched on headset or not when the headset is inserted: • 0: Headset indication not considered • 1: Headset indication considered (default value)
<vmic_ctrl>	Number	Specifies the control mode for microphones voltage supply (VMIC). Both microphones bias (MIC_BIAS1, MIC_BIAS2) are supplied by VMIC. • 0: VMIC is switched On /Off synchronously with the microphone amplifier; i.e. while module is idle or is using I^2S input line, microphone amplifiers and VMIC are switched Off (default value) • 1: VMIC is switched always On • 2: VMIC is switched always Off
<error>	String	If an incorrect number of parameters is provided or the parameter values are out of range the message error "operation not supported" will be provided

☞ <main_uplink>=4 is not supported on LEON-G100/G200 series.

☞ <alert_sound>=1 and <headset_indication>=1 are not supported on LISA-U1 series.

☞ <vmic_ctrl>=0 and <vmic_ctrl>=1 are not supported on LISA-U1 series.

☞ On LEON-G100 / LEON-G200 series the following combination of parameters <main_uplink>, <main_downlink>, <alert_sound>, <headset_indication> are allowed:

- 0, 0, 0, 1: Handset microphone, Normal earpiece, Alert on main path, Headset indication considered
- 0, 0, 1, 1: Handset microphone, Normal earpiece, Alert on loudspeaker, Headset indication considered
- 0, 0, 0, 0: Handset microphone, Normal earpiece, Alert on main path, Headset indication not considered
- 0, 0, 1, 0: Handset microphone, Normal earpiece, Alert on loudspeaker, Headset indication not considered
- 0, 3, 0, 0: Handset microphone, Loudspeaker, Alert on main path, Headset indication not considered
- 0, 3, 0, 1: Handset microphone, Loudspeaker, Alert on main path, Headset indication considered
- 0, 1, 0, 0: Handset microphone, Mono headset, Alert on main path, Headset indication not considered
- 1, 1, 0, 0: Headset microphone, Mono headset, Alert on main path, Headset indication not considered
- 1, 0, 0, 0: Headset microphone, Normal earpiece, Alert on main path, Headset indication not considered
- 1, 0, 1, 0: Headset microphone, Normal earpiece, Alert on loudspeaker, Headset indication not considered
- 1, 3, 0, 0: Headset microphone, Loudspeaker, Alert on main path, Headset indication not considered
- 2, 4, 0, 0: I^2S input, I^2S output, Alert on main path, Headset indication not considered

☞ On LISA-U1 series the following combination of parameters <main_uplink>, <main_downlink>, <alert_sound>, <headset_indication> are allowed:

- 0, 0, 0, 0: Handset microphone, Normal earpiece, Alert on main path, Headset indication not considered
- 0, 3, 0, 0: Handset microphone, Loudspeaker, Alert on main path, Headset indication not considered
- 0, 1, 0, 0: Handset microphone, Mono headset, Alert on main path, Headset indication not considered
- 1, 1, 0, 0: Headset microphone, Mono headset, Alert on main path, Headset indication not considered
- 1, 0, 0, 0: Headset microphone, Normal earpiece, Alert on main path, Headset indication not considered
- 1, 3, 0, 0: Headset microphone, Loudspeaker, Alert on main path, Headset indication not considered
- 2, 4, 0, 0: I^2S input, I^2S output, Alert on main path, Headset indication not considered
- 4, 3, 0, 0: Hands-free microphone, Loudspeaker, Alert on main path, Headset indication not considered
- 4, 1, 0, 0: Hands-free microphone, Mono headset, Alert on main path , Headset indication not considered
- 4, 0, 0, 0: Hands-free microphone, Normal earpiece, Alert on main path, Headset indication not considered

18.11 Play audio resource (Play Audio Resource) +UPAR

18.11.1 Description

Starts the playback of the pre-defined tone of the selected audio resource.

Type	Syntax	Response	Example
Set	AT+UPAR=<audio_resource>,<tone_id>,<nof_repeats>	OK	AT+UPAR=0,1,0 OK
Test	AT+UPAR=?	+UPAR: (list of supported <audio_resource>s),(list of supported <tone_id>s),(list of supported <nof_repeats>s) OK	+UPAR: (0-1),(0-66),(0-255) OK

18.11.2 Defined Values

Parameter	Type	Description
<audio_resource>	Number	Specifies the audio resource • 0: tone generator • 1: MIDI player
<tone_id>	Number	Specifies the pre-defined tone id to be played; the supported values depend by <audio_resource> values according to the tables reported below
<nof_repeats>	Number	Specifies the number of repeats • 0: infinite loop • n: n repeats
<error>	Number	If an incorrect number of parameters is provided or the parameter values are out of

Parameter	Type	Description
		range the message error "operation not supported" will be provided.

Possible values for tone generator are:

id	tone	id	tone	id	tone
0	DTMF 0	23	service tone 6	46	melody 0
1	DTMF 1	24	service tone 7	47	melody 1
2	DTMF 2	25	service tone 8	48	melody 2
3	DTMF 3	26	service tone 9	49	melody 3
4	DTMF 4	27	service tone 10	50	melody 4
5	DTMF 5	28	service tone 11	51	melody 5
6	DTMF 6	29	service tone 12	52	melody 6
7	DTMF 7	30	service tone 13	53	melody 7
8	DTMF 8	31	service tone 14	54	melody 8
9	DTMF 9	32	service tone 15	55	melody 9
10	DTMF hash	33	service tone 16	56	melody 10
11	DTMF asterix	34	service tone 17	57	melody 11
12	key tone 1	35	service tone 18	58	melody 12
13	key tone 2	36	service tone 19	59	melody 13
14	key tone 3	37	service tone 20	60	melody 14
15	key tone 4	38	service tone 21	61	melody 15
16	key tone 5	39	service tone 22	62	melody 16
17	service tone 0	40	service tone 23	63	melody 17
18	service tone 1	41	service tone 24	64	melody 18
19	service tone 2	42	service tone 25	65	service tone 29
20	service tone 3	43	service tone 26	66	service tone 30
21	service tone 4	44	service tone 27		
22	service tone 5	45	service tone 28		

Possible values for <audio_resource>= 1 (MIDI player) are:

id	ringing tone	id	ringing tone
0	pinkpanther	5	ramp spmidi
1	baroque	6	mozart imel
2	caribic	7	whenever
3	jamesbond	8	imperialmarch
4	moonstar		

MIDI Melodies are the same selectable as ringer by +URNG command.

<audio_resource>=1 (MIDI player) is not supported on LISA-U1 series.

18.12 Stop audio resource (Stop Audio Resource) +USAR

18.12.1 Description

This command stops the playback of the selected audio resource.

Type	Syntax	Response	Example
Set	AT+USAR=<audio_resource>	OK	AT+USAR=0 OK
Test	AT+USAR=?	+USAR: (list of supported <audio_resource>s) OK	+USAR: (0-1) OK

18.12.2 Defined Values

Parameter	Type	Description
<audio_resource>	Number	Specifies the audio resource • 0: DSP tone generator • 1: MIDI player
<error>	Number	If an incorrect number of parameters is provided or the parameter values are out of range the message error "operation not supported" will be provided.

18.13 Play audio file +UPLAYFILE

18.13.1 Description

Play the specified audio file stored into the file system. For more details about file system description refer to chapter 19 "File System AT commands".

☞ When finish playing the file, a status indication is sent to DTE in a form of +UPLAYFILE.

☞ The command provides a message error if +CRSL is set to 0.

☞ LEON-G100/G200 series modules support AMR audio file. The storage format of AMR encoded audio content must be compliant to RFC3267 [54].

☞ LISA-U1 series modules support PCM audio file. The storage format of PCM audio files must be: 8 kHz sample rate, signed 16 bits, little endian, mono.

Type	Syntax	Response	Example
Set	AT+UPLAYFILE=<filename>	OK	AT+UPLAYFILE="file1.amr" OK
Read	AT+UPLAYFILE?	+UPLAYFILE: <playstatus> OK	+UPLAYFILE: 0 OK

18.13.2 Defined Values

Parameter	Type	Description
<filename>	String	Specifies the audio resource file name to be played
<playstatus>	Number	Play status • 0: no file is playing • 1: the file is playing
<error>	Number	• If an incorrect number of parameters is provided or the parameter values are out of range the message error "operation not supported" will be provided. • If <filename> file is not present in the file system the message error "FILE NOT FOUND" will be provided.

18.14 Stop AMR audio file +USTOPFILE

18.14.1 Description

Stop the AMR audio file reproduction.

Type	Syntax	Response	Example
Action	AT+USTOPFILE	OK	AT+USTOPFILE OK

18.15 Jamming Detection +UCD

18.15.1 Description

The feature consists in detecting, at radio resource level, an anomalous source of interference and signaling it to the client. The jamming condition occurs when simultaneously:

- The MT has lost synchronization with the serving cell and cannot select any other suitable cell
- The band scan reveals at least n carriers with power level equal or higher than threshold
- On all such carriers, no synchronization is possible

The number of minimum disturbing carriers and the power level threshold can be configured by the client through this command.

The jamming condition is cleared when any of the above mentioned statements does not hold.

This command configures the jamming reporting feature. If activated, an unsolicited indication is issued when the jamming condition is entered or released. In particular, the set command controls the presentation of a URC **+UCD:<active>**.

<enable>=2 is available on LEON from LEON-G100-06x/LEON-G200-06x and subsequent versions.

When <enable>=2 in the set command <min_number_of_carriers>,<rxlev_threshold> parameters are not mandatory.

Type	Syntax	Response	Example
Set	AT+UCD=<enable> ,<min_number_of_carriers>,<rxlev_threshold>	[+UCD:<active>] OK	AT+UCD=1,10,20 OK AT+UCD=2 +UCD:1 OK
Read	AT+UCD?	+UCD: <enable>[,<min_number_of_carriers>, <rxlev_threshold>] OK	+UCD: 1,10,20 OK
Test	AT+UCD=?	+UCD: (range of supported <enable>), (range of supported <min_number_of_carriers>), (range of supported <rxlev_threshold>) OK	+UCD: (0-2),(1-255),(3-63) OK
URC		+UCD=<active>	+UCD=1

18.15.2 Defined Values

Parameter	Type	Description
<enable>	Number	• 0: disable congestion URC • 1: enable congestion URC **+UCD:<active>** • 2: return just the value of <active>, if and only if the URC has been enabled previously (the <enable> value doesn't change, which remains the previous stored one)
<min_number_of_carriers>	Number	Number of minimum disturbing carriers Mandatory parameter when <enable>=1 • Range between 1 and 255
<rxlev_threshold>	Number	Power level threshold; please refer to [28] Mandatory parameter when <enable>=1 • Range between 3 to 63
<active>	Number	• <active>=1 when the MT enters in the congestion condition • <active>=0 when the MT exits in the congestion condition

18.16 Select Band +UBANDSEL

18.16.1 Description

Allows switching from automatic band selection to selection of one or more (up to four) bands from the following:

- 2G network
  - 850 MHz
  - 900 MHz
  - 1800 MHz
  - 1900 MHz
- 3G network
  - 800 MHz (Band VI)
  - 850 MHz (Band V)
  - 900 MHz (Band VIII)
  - 1500 MHz (Band XI)
  - 1700 MHz (Band IV)
  - 1800 MHz (Band III)
  - 1900 MHz (Band II)
  - 2100 MHz (Band I)
  - 2600 MHz (Band VII)

On LISA-U1 series the list of supported bands presents exclusively GSM or UMTS bands depending on which RAT the MT is currently registered. If it is not registered, the bands presented depend on +URAT command:

- If in single mode, depends on <AcT>
- If in dual mode, depends on <PreferredAct> (thus the command forces a single mode behaviour)

The MT will camp on a cell, if suitable, belonging to one of the selected band; the OK response is regardless of the result of the camping on the new cell.

To have effective the setting, the module must be deregistered and registered again (using the commands +COPS=2, +COPS=0).

The configuration is saved in NVM for future registration attempts.

Type	Syntax	Response	Example
Set	AT+UBANDSEL=[<band_1>[,<band_2>[,<band_3>[,<band_4>]]]]	OK	AT+UBANDSEL=900 OK
Read	AT+UBANDSEL?	+UBANDSEL: <band_1>[,<band_2>[,<band_3>[,<band_4>]]] OK	+UBANDSEL: 850,900,1800,1900 OK
Test	AT+UBANDSEL=?	+UBANDSEL: (list of supported <band_x>) OK	+UBANDSEL: (0,850,900,1800,1900) OK

18.16.2 Defined Values

Parameter	Type	Description
<band_1> or <band_2> or <band_3> or <band_4>	Number	• 0: restore the default configuration of the module • 800: selection of 800 MHz band • 850: selection of 850 MHz band • 900: selection of 900 MHz band • 1500: selection of 1500 MHz band • 1700: selection of 1700 MHz band • 1800: selection of 1800 MHz band • 1900: selection of 1900 MHz band • 2100: selection of 2100 MHz band • 2600: selection of 2600 MHz band

18.17 Set reporting call status +UCALLSTAT

18.17.1 Description

Allows to enable / disable the reporting voice call status on DTE using the URC **+UCALLSTAT**. This URC is generated each time a call status change occurs. When multiple calls change status at the same time (e.g. when all multiparty calls are terminated) an URC +UCALLSTAT is generated for each of them.

Type	Syntax	Response	Example
Set	AT+UCALLSTAT=<enable>	OK	AT+UCALLSTAT=1 OK
Read	AT+UCALLSTAT?	+UCALLSTAT: <enable> OK	+UCALLSTAT: 1 OK
Test	AT+UCALLSTAT=?	+UCALLSTAT: (list of supported <enable>'s) OK	+UCALLSTAT: (0-1) OK
URC		+UCALLSTAT: <call_id>,<stat>	+UCALLSTAT: 1,2

18.17.2 Defined Values

Parameter	Type	Description
<enable>	Number	• 0: reporting disabled • 1: reporting enabled

Parameter	Type	Description
<call_id>	Number	Indicates the call identification (refer to [15])
<stat>	Number	Indicates the voice call status • 0: active • 1: hold • 2: dialling (Mobile Originated call) • 3: alerting (Mobile Originated call; ringing for the remote party) • 4: ringing (Mobile Terminated call) • 5: waiting (Mobile Terminated call) • 6: disconnected • 7: connected (indicates the completion of a call setup first time for MT and MO calls – this is reported in addition to state active)

18.18 Display operator name +UDOPN

18.18.1 Description

The command displays the name of the network of the requested <type>. In case the requested information is not available, the command displays the network name which is most similar to the requested <type>. In case the requested name is the Service Provider Name (<type>= 7), a null string is displayed if not available.

In case EONS names are not available, NITZ names are displayed, if any. In case no NITZ name is available, CPHS names are used. In case no CPHS name is available, ROM PLMN names are displayed.

In case no ROM PLN name matches to the current network, its numeric format (i.e. <type> 0) is returned.

Type	Syntax	Response	Example
Set	AT+UDOPN=<type>	+UDOPN: <type>[,<name>[,<display_condition>]] OK	AT+UDOPN=4 +UDOPN: 4,"Main Network" OK AT+UDOPN=7 +UDOPN: 7,"SERVICE-PROVIDER",1 OK AT+UDOPN=7 +UDOPN: 7,"" OK
Test	AT+UDOPN=?	+UDOPN: (list of supported <type>s) OK	+UDOPN: (0-9) OK

18.18.2 Defined values

Parameter	Type	Description
<type>	Number	• 0: numeric format of network MCC/MNC (three BCD digit country code and two/three BCD digit network • code) • 1: Short Name in ROM • 2: Long Name in ROM • 3: Short Network Operator Name (CPHS) • 4: Long Network Operator Name (CPHS) • 5: Short NITZ Name • 6: Full NITZ Name • 7: Service Provider Name • 8: EONS short operator name

Parameter	Type	Description
		• 9: EONS long operator name • 11: Short Network Operator Name • 12: Long Network Operator Name
<display_condition>	Number	Display condition as stored on SIM for the service provider name in respect to the registered PLMN (see GSM TS 11.11 [18] for more details).
<name>	String	• "network name": for <type> = 1, 2, 3, 4, 5 or 6 • "additional Unicode network name": for <type> = 1 or 2 • "service provider name": followed by <display_condition> for <type> 7 • "MCC:MNC": for <type> = 0

☞ EONS means Enhanced Operator Name from SIM-files EF-OPL and EF-PNN.

☞ The coding of <name> is according to the +CSCS setting.

☞ <type>=11 and <type>=12 are supported only on LISA-U1 series.

☞ In LISA-U1 series, if the requested <type> in the set command is not available (e.g. no SIM-files EF-OPL and EF-PNN), then the name of the network of another <type> available is displayed (the <type> displayed is displayed before the <name>).

18.19 Change data connection settings +UDCONF

18.19.1 Description

This command allows changing advanced data configuration settings.

It sets the PPP-LCP silent mode: this means that it is possible to configure whether the module must wait for the first LCP frame or the module must send the first LCP frame while establishing a PPP connection.

☞ <param_tag>=1 is available only on LEON from LEON-G100-06x/LEON-G200-06x and subsequent versions.

Type	Syntax	Response	Example
Set	AT+UDCONF=<param_tag>,<param1>	OK	AT+UDCONF=0,0 OK
Get	AT+UDCONF=<param_tag>	+UDCONF: <param_tag>,<param1> OK	AT+UDCONF=0 +UDCONF: 0,0 OK

18.19.2 Defined values

Parameter	Type	Description

<param_tag>	Number	• 0: PPP-LCP silent mode; <param1> may be:
		  ○ 0 : silent mode disabled, the module will send the first LCP frame
		  ○ 1 : silent mode enabled (default), the module will wait for the other end to start first
		• 1: Enable/Disable HEX mode for +USOWR, +USOST, +USORD and +USORF commands; <param1> may be:
		  ○ 0: HEX mode disabled (default)
		  ○ 1: HEX mode enabled
		• (2-n): RFU

18.20 Display EONS names +UEONS

18.20.1 Description

This command displays the list of available networks adding EONS names if available. The list of available networks with details like long operator name, short operator name, MCC/MNC, Long EONS name, Short EONS name for each PLMN is reported. This command is an extension of AT+COPS=? command and it provides additionally EONS names for the available PLMN's.

Type	Syntax	Response	Example
Action	AT+UEONS	+UEONS: [list of supported (<stat>,long alphanumeric <oper>,short alphanumeric <oper>,numeric <oper>,[EONS long operator name],[EONS short operator name])s] OK	+UEONS: (2,"T-Mobile D","T-Mobile D","26201","T-Mob D"," T-Mobile De"), (3, "Vodafone.de", "Vodafone.de", "26202", "test network EONS", "test EONS"), (3,"E-Plus","E-Plus","26203"), (3,"o2 - de","o2 - de","26207") OK
Test	AT+UEONS=?	OK	

18.20.2 Defined values

Please refer to the description of +COPS parameters (more details in chapter 8.3).

18.21 PS Operator selection +UCGOPS

18.21.1 Description

Forces an attempt to select and register on the PS (Packet Switched) network operator either automatically selected by the MT, or manually specified by the user.

The read command returns the network on which the MT is PS attached to, if any.

The test command returns a list of the available networks, specifying if they are forbidden and if PS is supported.

The command in the execution syntax is abortable if a character is sent to DCE during the command execution. The <format> and <oper> parameter must be omitted if the value of <mode> parameter is 0.

☞ <AcT> parameter is not available on LEON-G100/G200 series.

Type	Syntax	Response	Example
Set	AT+UCGOPS=[<mode>[,<format>[,<oper>[,<AcT>]]]]	OK	AT+UCGOPS=0 OK AT+UCGOPS=1,2,"22201" OK
Read	AT+UCGOPS?	+UCGOPS: <status>[,<format>,<oper>,<AcT>] OK	+UCGOPS: 1,2,"22210",0 OK

Type	Syntax	Response	Example
Test	AT+UCGOPS=?	+UCGOPS: [(<stat>,long alphanumeric <oper>, short alphanumeric <oper>, numeric <oper>,[<AcT>,]<ps_availability>)] [,,(list of supported <mode>s),(list of supported <format>s)] OK	+UCGOPS:(1,"vodafone IT","voda IT","22210",1),(3,"I TIM","TIM","22201",1),(3,"I WIND","I WIND","22288",1),,(0-1),(0-2) OK

18.21.2 Defined Values

Parameter	Type	Description
<mode>	Number	Specified whether the operator selection is done automatically by the MT or is manually bound to a specific network • 0: automatic (<oper> field is ignored) • 1: manual
<format>	Number	Mandatory parameter if <mode> value is 1, it specifies the format of the network operator name • 0: long alphanumeric <oper> (default value) • 1: short format alphanumeric <oper> • 2: numeric <oper>
<oper>	String	String type given in format <format>; this field may be up to 16 character long for long alphanumeric format, up to 8 characters for short alphanumeric format and 5 characters long for numeric format (MCC/MNC codes); this parameter is mandatory if <mode> value is 1
<stat>	Number	PLMN status attribute with respect to the MT • 0: unknown • 1: available • 2: current • 3: forbidden
<ps_availability>	Number	GPRS availability • 0: not supported • 1: supported
<AcT>	Number	Indicates the radio access technology and may be: • 0: GSM • 2: UTRAN (UMTS)
<status>	Number	Current GPRS registration status and PLMN selection mode of the MT • 0: attached, automatic PLMN selection mode • 1: attached, manual PLMN selection mode • 2: detached

18.22 Cell environment description +CGED

18.22.1 Description

Provides the cell environment information that can be periodic (with a period of 5 s) or performed only one time. The response syntax for the set command depends whether the UMTS is supported and if it is, by the supported RAT (GSM, UMTS).

When <mode> parameter is set to 1 the neighbor cell content may be repeated up to 6 times.

When <mode> parameter is set to 3 or 4:

- The serving cell information includes the following data: MCC, MNC, LAC, CI, BSIC, Arfcn, Arfcn_ded
- The values are not supported on LISA-U1 series

When <mode> parameter is set to 5 or 6:

- Serving cell information includes only the following data: MCC, MNC, LAC, CI, BSIC, Arfcn, RxLev, Arfcn_ded, RxLevSub, t_adv
- Neighbor cell information includes the following data: MCC, MNC, LAC, CI, BSIC, Arfcn, RxLev
- Information on neighbour cells contained in radio resource BA List is reported. The neighbour cell content may be repeated up to 32 times in idle-mode, up to 6 in dedicated-mode; in packet transfer mode (PDP context active) no reporting is possible on AT UART as it is used for data transfer (MUX can be used to create two virtual serial ports, one for data transfer, one for AT commands)
- The values are supported from LEON-G100-06x/LEON-G200-06x and subsequent versions
- The values are not supported on LISA-U1 series

In case of UMTS radio access technology:

- The maximum number of displayable cells is 30 (24 reserved for UMTS cells and 6 for GSM/GPRS cells)
- The syntax for cell information differs in the channel type

In case of GSM/GPRS radio access technology the total number of GSM/GPRS cells can be at most 6.

An Equivalent PLMN (Public Land Mobile Network) is a PLMN equivalent to the RPLMN (Registered PLMN). The MT has a list of EPLMN's that is updated (deleted, changed…) at the end of each location update procedure, routing area update procedure and GPRS attach procedure.

Type	Syntax	Response	Example
Set	AT+CGED=[<mode>]	**Response syntax in case UMTS is not supported** +CGED: **Service-Cell:** MCC: <MCC>, MNC: <MNC>, LAC: <LAC>, CI: <CI>, BSIC: <BSIC> **[Equivalent PLMNs :** MCC : <MCC>, MNC : <MNC>] Arfcn: <arfcn>, [RxLevServ:: <RxLevServ>,] [RfChannels: <RfChannels>,]Arfcn_ded: <Arfcn_ded>, [RxLevFull: <RxLevFull>,] [RxLevSub: <RxLevSub>,] [RxQualFull: <RxQualFull>, RxQualSub: <RxQualSub>, Ciphering: <ciphering> ms_txpwr: <ms_txpwr>, rx_acc_min: <rx_acc_min>, cbq: <cbq>, cba: <cba>, c2_valid: <c2_valid>, cr_offset: <cr_offset>, tmp_offset: <tmp_offset>, penalty_t: <penalty_t>, c1: <c1>, c2: <c2>, ch_type: <ch_type>, ch_mode: <ch_mode>, txpwr: <txpwr>, dtx_used: <dtx_used>, t3212: <t3212>, acc: <acc>,][t_adv: <t_adv>,] [bs_pa_mfrms: <bs_pa_mfrms>, dsc: <dsc>, rll: <rll>] **Neighbour Cell <n>:** MCC: <MCC>, MNC: <MNC>, LAC: <LAC>, CI: <CI>, BSIC: <BSIC>, Arfcn: <arfcn>, [RxLev: <RxLev>] [C1_nc: <C1_nc>, C2_nc: <C2_nc>] **[GPRS-Parameters:**	**UMTS not supported:** AT+CGED=0 +CGED: **Service Cell:** MCC : 1, MNC : 1, LAC :0001, CI :0000, BSIC :0d **Equivalent PLMNs :** MCC : 1, MNC : 1 Arfcn :00020, RxLevServ :025, RfChannels :000, Arfcn_ded :INVALID_ARFCN, RxLevFull :255, RxLevSub :255, RxQualFull :255, RxQualSub :255, Ciphering :OFF, ms_txpwr :000, rx_acc_min :000, cbq :00, cba :00, c2_valid :True, cr_offset :000, tmp_offset:000, penalty_t:1f, c1: 19, c2: 19, ch_type:ff, ch_mode:ff, txpwr:255, dtx_used:True, t3212:00000, acc:0000, t_adv:000, bs_pa_mfrms:002, dsc:000, rll:255 **Neighbour Cell 1:** MCC:65535, MNC:255, LAC:0000, CI:0000, BSIC:ff, Arfcn:00025, RxLev:000, C1_nc: -1, C2_nc:-32000, **Neighbour Cell 2:** MCC:65535, MNC:255, LAC:0000, CI:0000, BSIC:ff, Arfcn:00070,

Type	Syntax	Response	Example
		GPRS_sup: <GPRS_sup>, RAC: <RAC>, SplitPg: <SplitPg>, NCO: <NCO>, NOM: <NOM>, T3192: <T3192>, Acc_Burst_type: <Acc_Burst_type>, DRX_Timer_Max: <DRX_Timer_Max>, PBCCH: <PBCCH>, Ext_Measure_Order: <Ext_Measure_Order>, PSI1_r_per: <PSI1_r_per>, Count_LR: <Count_LR>, Count_HR: <Count_HR>, C_R_Hyst: <C_R_Hyst>, C31: <C31>, C32: <C32>, Prior_Acc_Thr: <Prior_Acc_Thr>] OK	RxLev:000, C1_nc: -1, C2_nc:-32000, **GPRS-Parameters:** GPRS_sup:True, RAC:01, SplitPg:False, NCO:00000, NOM:001, T3192:01f4, Acc_Burst_type:00015, DRX_Timer_Max:00, PBCCH:False, Ext_Measure_Order:00000, PSI1_r_per:00, Count_LR:00, Count_HR:01, C_R_Hyst:00, C31: -1, C32: 19, Prior_Acc_Thr:06 OK
		Response syntax in case of UMTS radio access technology (RAT): +CGED: RAT:<rat>, URR:<rrc_state>, DC:<urrcdc_state>, BP:<urrcbp_state>, M:<urrcm_state>, ERR:<as_error_code>, RC:<release_cause>, OOS:<out_of_service>, BLER:<meas_bler>,TSIR:<target_sir>,MSIR:<meas_sir>, HSC:<hierarchical_cell_structure>,	+CGED: RAT:"UMTS", URR:"ID" DC:002, BP:0005, M:003, ERR: 0, RC: 0, OOS:0, BLER:-,TSIR:-,MSIR:- HCS:0, HMD:0, LM:0, Cell-ID:016578c, DLF:10813, ULF: 9863, SC:138, RSCP LEV: 12, ECN0 LEV: 23, C:0, D:0, PSM: 0 Cell:U, SC:6, RSCP LEV:13, ECN0 LEV:28, DLF:10813, RV:65523, Cell:NU, SC:81, RSCP LEV:7, ECN0 LEV:16, DLF:10813, RS:6, Cell:NU, SC:133, RSCP LEV:8, ECN0 LEV:12, DLF:10813, RS:6, Cell:NU, SC:98, RSCP LEV:7, ECN0 LEV:11, DLF:10813, RS:6, Cell:NU, SC:127, RSCP LEV:0, ECN0 LEV:0, DLF:10813, RS:6, Cell:NG, B:, Arfcn:53, RXLEV:0, Bsic:48, RS:1 Cell:NG, B:, Arfcn:69, RXLEV:0, Bsic:51, RS:1 Cell:NG, B:, Arfcn:70, RXLEV:0, Bsic:55, RS:1 Cell:NG, B:, Arfcn:70, RXLEV:0, Bsic:49, RS:1 Cell-ID:016578c, DLF:10813, ULF: 9863, SC:138, RSCP LEV: 12, ECN0 LEV: 23,

Type	Syntax	Response	Example
		HMD:<high_mobility_detected>, LM:<limited_service>, Cell-ID:<cell_identity>, DLF:<dl_frequency>, ULF:<ul_frequency>, SC:<scrambling_code>, RSCP LEV:<rscp lev>, ECN0 LEV:<ecn0_lev>, C:<ciphering>, D:<ps_data_transfered>, PSM:< power_saving_mode>, [Cell:<cell_type>=AS, SC:<scrambling_code>, RSCP LEV:<rscp_lev>, ECN0 LEV:<ecn0_lev>] [Cell:<cell_type>=VAS, SC:<scrambling_code>, RSCP LEV:<rscp_lev>, ECN0 LEV:<ecn0_lev>, DLF:<dl_frequency>] [Cell:<cell_type>=M, SC:<scrambling_code>, RSCP LEV:<rscp_lev>, ECN0 LEV:<ecn0_lev>] [Cell:<cell_type>=D, SC:<scrambling_code>, RSCP LEV:<rscp_lev>, ECN0 LEV:<ecn0_lev>] [Cell:<cell_type>=G, B:<gsm_band>,Arfcn:<arfcn>, RXLEV:<RxLev>, Bsic:<BSIC>, RV:<ranking_value>] [Cell:<cell_type>=U, SC:<scrambling_code>, RSCP LEV:<rscp_lev>, ECN0 LEV:<ecn0_lev>, DLF:<dl_frequency>, RV:<ranking_value>] [Cell:<cell_type>=NU, SC:<scrambling_code>, RSCP LEV:<rscp_lev>, ECN0 LEV:<ecn0_lev>, DLF:<dl_frequency>, RS:<ranking_status>] [Cell:<cell_type>=NG B:<gsm band>, Arfcn:<arfcn>, RXLEV:< RxLev>, Bsic:<BSIC>, RS:<ranking_status>] RR measurement evaluation: MeasId:<meas_id>, EventId:<event_id>, <par 3>, <par 4>, <par 5>, <par 6>,..., <par N>, MeasId:<meas_id>, EventId:, <par 3>, <par 4>, <par 5>, <par 6>,..., <par M>, etc... MM: Process:CO, MMs:<mm_state>, MMSs:<mm_service_state>, MSC:<ms_class>, T:<active_timer_bitmap> Process:CS, MMs:<mm_state>, MMSs:<mm_service_state>, LUS: mm_update_status >, T:<active_timer_bitmap>, L:<limited_service> Process:PS, MMs:<mm_state>, MMSs:<mm_service_state>, LUS: mm_update_status >, T:<active_timer_bitmap>,	C:0, D:0, PSM: 0 Cell:U, SC:6, RSCP LEV:13, ECN0 LEV:28, DLF:10813, RV:65523, Cell:NU, SC:81, RSCP LEV:7, ECN0 LEV:16, DLF:10813, RS:6, Cell:NU, SC:133, RSCP LEV:8, ECN0 LEV:12, DLF:10813, RS:6, Cell:NU, SC:98, RSCP LEV:7, ECN0 LEV:11, DLF:10813, RS:6, Cell:NU, SC:127, RSCP LEV:0, ECN0 LEV:0, DLF:10813, RS:6, Cell:NG, B:, Arfcn:53, RXLEV:0, Bsic:48, RS:1 Cell:NG, B:, Arfcn:69, RXLEV:0, Bsic:51, RS:1 Cell:NG, B:, Arfcn:70, RXLEV:0, Bsic:55, RS:1 Cell:NG, B:, Arfcn:70, RXLEV:0, Bsic:49, RS:1 RR measurement evaluation: MeasId: 0, EventId: 0A, 0, 0, 0, 0, 0, 0 MeasId: 0, EventId: 0A, 0, 0, 0, 0, 0, 0 MeasId: 0, EventId: 0A, 0, 0, 0, 0, 0, 0 MM: Process:CO, MMs: 4, MMSs:16, MSC:A, T: 0 Process:CS, MMs: 5, MMSs: 5, LUS:1, T:0004, L:0 Process:PS, MMs: 9, MMSs: 5, LUS:1, T:0008, L:0, GS: d, R:0 Cell change counters: CRT: 0, IRCR: 0 AIRCR: 0, IRHO: 0, AIRHO: 0 Equivalent PLMNs: MCC:222, MNC: 10 Serving PLMN: MCC:222, MNC: 10, LAC:25071, RAC: 20 OK

Type	Syntax	Response	Example
		L:<limited_service>, GS:<gprs_supported>, R:<ready_state> Cell change counters: CRT:<cell_reselecetion_total>, IRCR:<ir_cell_reselecetion>, AIRCR:<attempted_ir_cell_reselecetion> ,IRHO:<ir_handover>, AIRHO:<attempted_ir_handover> Equivalent PLMNs: MCC:<mobile_country_code>, MNC:<mobile_network_code> Serving PLMN: MCC:<mobile_country_code>, MNC:<mobile_network_code>, LAC:<location_area_code>, RAC:<routing_area_code> OK	
		Response syntax in case of GSM/GPRS radio access technology (RAT): +CGED: RAT: <rat>, RR:<grr_state> SFRLC:<signal_failure/radio_link_counter>, RSR:<reselection_reason>, RC:<release_cause>, LM:<limited_service> B:<gsm_band>, Arfcn:<arfcn>, RXLEV:<RxLev>, C1:<C1>, C2:<C2>, Bsic:<BSIC>, MA:<nr_of_rf_in_ma>,MADed:<dedicated_arfcn>, GSM: Ci:<CI>, B:<gsm_band>, Arfcn:<arfcn>,RXLEV:<RxLev>, C1:<C1>, Bsic:<BSIC> UMTS: SC:<scrambling_code>, RSCP LEV:<rscp_lev>, ECN0 LEV:<ecn0_lev>, DLF:<dl_frequency> MM: Process:CO, MMs:<mm_state>, MMSs:<mm_service_state>, MSC:<ms_class>, T:<active_timer_bitmap> Process:CS, MMs:<mm_state>, MMSs:<mm_service_state>, LUS:<location_update_status>, T:<active_timer_bitmap>, L:<limited_service> Process:PS, MMs:<mm_state>, MMSs:<mm_service_state>, LUS:<location_update_status>, T:<active_timer_bitmap>, L:<limited_service>, GS:<gprs_supported>, R:<ready_state> Cell change counters: CRT:<cell_reselecetion_total>, IRCR:<ir_cell_reselection_counter>,	**GSM/GPRS radio access technology supported** +CGED: RAT:"GSM", RR:11 SFRLC: 0, RSR:10, RC: 0, LM:0 B:"G", Arfcn: 989, RXLEV: 60, C1:54, C2:60, Bsic:0d, MA:0, MADed:65535 GSM: Ci:5265, B:"G", Arfcn: 9, RXLEV: 6, C1: 4, Bsic:11 GSM: Ci:ffff, B:"G", Arfcn: 3, RXLEV: 0, C1: 0, Bsic:ff GSM: Ci:ffff, B:"G", Arfcn: 25, RXLEV: 0, C1: 0, Bsic:ff GSM: Ci:ffff, B:"G", Arfcn: 41 RXLEV: 0, C1: 0, Bsic:ff MM: Process:CO, MMs: 4, MMSs: 0, MSC:G, T:0000 Process:CS, MMs: 5, MMSs: 5, LUS:1, T:0000, L:0 Process:PS, MMs: 9, MMSs: 5, LUS:1, T:0010, L:0, GS:1, R:1 Cell change counters: CRT: 0, IRCR: 0 AIRCR: 0, IRHO: 0, AIRHO: 0 Coding Scheme: dl_sc:NB_CS_1, ul_sc: Equivalent PLMNs: MCC: 1, MNC: 1 Serving PLMN: MCC: 1, MNC: 1, LAC: 1, RAC: 1, AcT:1

Type	Syntax	Response	Example
		AIRCR:<attempted_ir_cell_reselection>, IRHO:<ir_handover>, AIRHO:<attempted_ir_handover> Coding Scheme: dl_sc:<dl_sc>,ul_sc:<ul_sc> Equivalent PLMNs: MCC:<MCC>, MNC:<MNC> Serving PLMN: MCC:<MCC>, MNC:<MNC>, LAC:<LAC>, RAC:<RAC>, AcT:<AcT> GPRS-Parameters: SplitPg:<SplitPg>,NCO:<NCO>,NOM:<NOM>, T3192:<T3192>, Acc_Burst_type:<Acc_Burst_type>, DRX_Timer_Max:<DRX_Timer_Max>, PBCCH:<PBCCH>, Ext_Measure_Order:<Ext_Measure_Order> PSI1_r_per:<PSI1_r_per>, si13_location: <si13_location> packet_psi_status:< packet_psi_status> packet_si_status:< packet_si_status> ext_upl_tbf_supported: ext_upl_tbf_supported> ccn_active:< ccn_active> pfc_feat_supported: pfc_feat_supported> Count_LR:<Count_LR>, Count_HR:<Count_HR>, C_R_Hyst:<C_R_Hyst>, C31:<C31>, C32:<C32>, Prior_Acc_Thr:<Prior_Acc_Thr> OK	GPRS-Parameters: SplitPg:False, NCO:00000, NOM:001, T3192:01f4, Acc_Burst_type:00015, DRX_Timer_Max:00, PBCCH:False, Ext_Measure_Order:00000, PSI1_r_per:00 si13_location:"BCCH_NORM" packet_psi_status:False, packet_si_status:False, ext_upl_tbf_supported:False, ccn_active:False, pfc_feat_supported:False Count_LR:00, Count_HR:01, C_R_Hyst:06, C31:-0001, C32:00054, Prior_Acc_Thr:06 OK
Read	AT+CGED?	+CGED: <mode> OK	+CGED: 0 OK
Test	AT+CGED=?	+CGED: (list of supported <mode>s) OK	+CGED: (0-6) OK

18.22.2 Defined Values

Parameter	Type	Description
<mode>	Number	• 0: one shot dump (default value) • 1: periodic refreshed dump: the neighbor cell content may be repeated up to 6 times • 2: stop periodic dump • 3: one shot serving cell dump • 4: periodic serving cell refreshed dump

Parameter	Type	Description
		• 5: one shot serving cell and neighbor cells dump • 6: periodic serving cell and neighbor cells refreshed dump
<MCC>	Number	Mobile country code, range 0-999 (3 digits)
<MNC>	Number	Mobile network code, range 0-999 (2 or 3 digits)
<LAC>	Number	Location area code, range 0h-FFFFh (2 octets)
<CI>	Number	Cell Identity, range 0h-FFFFh (2 octets)
<BSIC>	Number	Base Station Identify Code, range 0h-3Fh (6 bits)
<arfcn>	Number	Absolute radio frequency channel number, range 0-1023
<RxLevServ>	Number	Received signal level on the cell, range 0-63; please refer to [28]
<RfChannels>	Number	Number of frequencies in Mobile Allocation: 0x01 if single RF and 0 if n.a.; please refer to [40]
<Arfcn_ded>	Number	Single ARFCN of dedicated channel; it's the first ARFCN of Mobile Allocation
<RxLevFull>	Number	Received signal strength on serving cell, measured on all slots; range 0h-3Fh; please refer to [40]
<RxLevSub>	Number	Received signal strength on serving cell, measured on a subset of slots; range 0h-3Fh; please refer to [40]
<RxQualFull>	Number	Received signal quality on serving cell, measured on all slots; range 0-7; please refer to [40]
<RxQualSub>	Number	Received signal quality on serving cell, measured on a subset of slots, range 0-7; please refer to [40]
<ciphering>	Number	GSM Ciphering; the supported values are • ON • OFF
<ms_txpwr>	Number	Maximum TX power level an MT may use when accessing the system until otherwise commanded, range 0-31; please refer to [40]
<rx_acc_min>	Number	RXLEV-ACCESS-MIN, range 0-63; please refer to [40]
<cbq>	Number	CELL_BAR_QUALIFY, range 0-1; please refer to [28]
<cba>	Number	CELL_BAR_ACCESS, range 0-1; please refer to [28]
<c2_valid>	Number	True if all parameter for calculation of c2 are available; range 0-1
<cr_offset>	Number	CELL_RESELECT_OFFSET, range 0-63 (6 bit) ; please refer to [40]
<tmp_offset>	Number	TEMPORARY_OFFSET, range 0-7; please refer to [40]
<penalty_t>	Number	Penalty time, range 0-31; please refer to [40]
<c1>, <C1_nc>	Number	Value of c1; please refer to [28]
<c2>, <C2_nc>	Number	Value of c2; please refer to [28]
<ch_type>	Number	Channel type of the current connection (please refer to [40]): • 0: invalid channel type • 1: TCH/F • 2: TCH/H • 3: SDCCH/4 • 4: SDCCH/8
<ch_mode>	Number	Channel mode of current connection (please refer to [40]): • 0: signaling only • 1: speech full rate • 2: speech half rate • 3: data full rate, 12.0 kb/s radio interface rate • 4: data full rate, 6.0 kb/s radio interface rate • 5: data half rate, 6.0 kb/s radio interface rate

Parameter	Type	Description
		• 6: data full rate, 3.6 kb/s radio interface rate • 7: data half rate, 3.6 kb/s radio interface rate • 8: speech full rate version 2 • 9: speech full rate version 3 • 10: speech half rate version 2 • 11: speech half rate version 3
<txpwr>	Number	Transmit power level of the current connection, range 0-31 or 255 if the module is not connected; please refer to [40]
<dtx_used>	Number	DTX used, range 0-1; please refer to [40]
<t3212>	Number	T3212. The T3212 timeout value field is coded as the binary representation of the timeout value for periodic updating in decihours; range 0-255 (8 bits); please refer to [40]
<acc>	Number	Access control class (RACH Control Parameters); please refer to [40]
<t_adv>	Number	Timing Advance, it is valid during a connection and it will updated during the next connection; please refer to [40]
<bs_pa_mfrms>	Number	BS_PA_MFRMS (multiframes period for transmission of PAGING REQUEST), range 0-7 mapped to 2-9; please refer to [42]
<dsc>	Number	Downlink Signaling Counter
<rll>	Number	Radio Link Loss Counter

GPRS-Parameters:

Parameter	Type	Description
<GPRS_sup>	Number	GPRS supported (in serving cell); range 0-1; please refer to [40]
<RAC>	Number	Routing Area Code, range 0h-FFh (1 octet); please refer to [40]
<SplitPg>	Number	SPGC_CCCH_SUP split pg_cycle on ccch by network, range 0-1 (2 bits); please refer to [40]
<NCO>	Number	NETWORK_CONTROL_ORDER (GPRS_Cell_Options), range 0-3 (2 bits); please refer to [40]
<NOM>	Number	NETWORK OPERATION MODE (GPRS_Cell_Options), range 0-3 (2 bits); please refer to [40]
<T3192>	Number	T3192 (Wait for Release of the TBF after reception of the final block), range 0-7 mapped to 0-1500 msec (3 bits); please refer to [41]: • 0: 500 ms • 1: 1000 ms • 2: 1500 ms • 3: 0 ms • 4: 80 ms • 5: 120 ms • 6: 160 ms • 7: 200 ms
<Acc_Burst_type>	Number	ACCESS_BURST_TYPE, range 0-1 (mapped to 8-bit format,11-bit format); please refer to [41]
<DRX_Timer_Max>	Number	DRX_TIMER_MAX, range 0-7 (3 bits); please refer to [41]
<PBCCH>	Number	PBCCH present, range 0-1
<Ext_Measure_Order>	Number	EXT_MEASUREMENT_ORDER, range 0-3 (2 bits); please refer to [41]
<PSI1_r_per>	Number	PSI1_REPEAT_PERIOD, range 0-15 mapped to 1-16 (4 bits); please refer to [41]
<Count_LR>	Number	PSI_COUNT_LR, range 0-63 (6 bits); please refer to [41]
<Count_HR>	Number	PSI_COUNT_HR, range 0-15 mapped to 1-16 (4 bits); please refer to [41]
<C_R_Hyst>	Number	CELL_RESELECT_HYSTERESIS, range 0-7 (3 bits); please refer to [41]

Parameter	Type	Description
<C31>	Number	Value of c31, Number; please refer to [28]
<C32>	Number	Value of c32, Number; please refer to [28]
<Prior_Acc_Thr>	Number	PRIORITY_ACCESS_THR, range 0-7 (3 bits); please refer to [40]

UMTS-Parameters:

Parameter	Type	Description
<rrc_state>	String	• "CD": CELL_DCH (0) • "CF": CELL_FACH(1) • "CP": CELL_PCH(2) • "UP": URA_PCH(3) • "ID": IDLE(4) • "ST": START(5)
<urrcdc_state>	Number	Consists of three hex digits (octet 1, 2: event, 3: state). For debug purposes only
<urrcbp_state>	Number	Consists of four hex digits (octet 1, 2: event, 3, 4: state). For debug purposes only
<urrcm_state>	Number	Consists of three hex digits (octet1, 2: event, 3: state). For debug purposes only.
<as_error_code>	Number	indicates if an AS error occurred; possible values: • 0: no error • 81: UMAC, no TFCI (Transport Format Code identifier) found • 82: UMAC, RLC timing error
<release_cause>	Number	MM RR release cause. For debug purposes only
<out_of_service>	Number	Service state: • 0: Service present • 1: Out of service
<meas_bler>	Number	Measured BLER (Block error Rate). Possible values: • range: 0.000001 to 0.99 • if out of range : -
<target_sir>	Number	Targeted SIR (Signal to Interference Ratio). Possible values: • range: -10 to 20 • if out of range : -
<meas_sir>	Number	Measured SIR (Signal to Interference Ratio). Possible values: • range: -10 to 20 • if out of range : -
<hierarchical_cell_structure>	Number	HCS (Hierarchical Cell Structure) • 0: not used • 1: used
<high_mobility_detect>	Number	High mobility: • 0: not detected • 1: detected
<cell_identity>	Number	Cell identity (eight hex digits)
<dl_frequency>	Number	Downlink frequency. Range 0-16383
<ul_frequency>	Number	Uplink frequency. Range 0-16383
<ciphering>	String	Ciphering: • 1: enabled • 2: disabled
<ps_data_transfered>	Number	PS data: • 0: transferred • 1: not transferred

Parameter	Type	Description
<power_saving_mode>	Number	Power saving: • 0: disabled • 1: enabled
<cell_type>	String	Cell type: • "AS": Active Set • "VAS": Virtual Active Set • "M": Monitored Cells • "D": Detected Cells • "G": GSM cells • "U": UMTS cells • "NU": Non Ranked UMTS cells • "NG": Non Ranked GSM cells
<scrambling_code>	Number	Scrambling code; range 0-511
<rscp_lev>	Number	Received Signal Code Power expressed in dBm levels. Range from 0 to 91. 0 | RSCP < -115 | dBm 1 | -115 ≤ RSCP < -114 | dBm … | … | … 90 | -26 ≤ RSCP < -25 | dBm 91 | RSCP ≥ -25 | dBm
<ecn0_lev>	Number	Energy per Chip/Noise ratio expressed in dB levels. Range from 0 to 49. 0 | ECN0 < -24 | dB 1 | -24 ≤ ECN0 < -23.5 | dB … | … 48 | -0.5 ≤ E□N0 □ 0 | □B 49 | ECN0 ≥ 0 | □
<gsm_band>	String	GSM band: • "D": 1800 MHz • "P": 1900 MHz • "G": 900 MHz
<ranking_value>	Number	Cell's ranking value
<ranking_status>	Number	Ranking status for Non Ranked UMTS cells. Possible values: • 0: EM_CELL_SUITABLE • 1: EM_NOT_MEASURED • 2: EM_CELL_BARRED • 3: EM_WRONG_PLMN • 4: EM_HCS_CRITERIA_PRIO • 5: EM_HCS_H_VALUE • 6: EM_S_VALUE
<meas_id>	Number	RR measurement ID (one hex digit). For debug purpose only
<event_id>	Number	Event ID (two hex digits). For debug purpose only
<par 3,4,5..,M,..,N>	Number	Integer, range 0-99
<signal_failure/radio_link_counter>	Number	Integer, range 0-99. For debug purpose only
<reselection_reason>	Number	Indicates the reason for cell reselection. Possible values: • 0: RESEL_PLMN_CHANGE • 1: RESEL_SERV_CELL_NOT_SUITABLE

Parameter	Type	Description
		• 2: RESEL_BETTER_C2_C32 • 3: RESEL_DOWNLINK_FAIL • 4: RESEL_RA_FAILURE • 5: RESEL_SI_RECEIPT_FAILURE • 6: RESEL_C1_LESS_NULL • 7: RESEL_CALL_REEST_TIMEOUT • 8: RESEL_ABNORMAL_RESEL • 9: RESEL_CELL_CHANGE_ORDER • 10: RESEL_NOT_OCCURRED
<dl_sc>/<ul_sc>	Number	Current burst configuration and Coding Scheme of downlink (<dl_sc>) or uplink (<ul_sc>) TBF may be: • "NB_CS_1" • "NB_CS_2" • "NB_CS_3" • "NB_CS_4" • "NB_MCS_1" • "NB_MCS_2" • "NB_MCS_3" • "NB_MCS_4" • "NB_MCS_5" • "NB_MCS_6" • "NB_MCS_7" • "NB_MCS_8" • "NB_MCS_9" • "NB_MCS_5_7" • "NB_MCS_6_9" • "AB_8" • "AB_11" • "AB_11_E" • if none of the previous ""

UMTS/GSM MM parameters:

Parameter	Type	Description
<mm_state>	Number	MM state. For debug purpose only. Range 1-16
<mm_service_state>	Number	MM service state. For debug purpose only. Range1-10.
<mm_update_status>	Number	location update status. For debug purpose only. Possible values: • 1: updated (MMST_U1_UPDATED) • 2: not updated (MMST_U2_NOT_UPDATED) • 3: roaming not allowed (MMST_U3_ROAMING_NOT_ALLOWED)
<ms_class>	String	MS GPRS-class. Possible values: • 0: class A • 1: class B • 2: class C • 3: class CG: class C in GPRS only mode • 4: class CC: class C in circuit switched only mode (lowest class)
<limited_service>	Number	Limited Service information. Possible values: • 0: no Limited service • 1: Limited Service
<ready_state>	Number	MM READY state. Possible values: • 0: not in ready state • 1: in ready state
<active_timer_bitmap>	Number	Bitmap of the active MM timers: T3302, T3310, T3311, T3312, T3314, T3321, T3330. T3302 is the least significant bit and T3330 the most significant bit The bitmap values are presented in hexadecimal format (the range goes from 0x0000 to 0x007F)

Parameter	Type	Description
<cell_reselection_total>	Number	Total number of cell reselections. Range 0 – 65535.
<ir_cell_reselection_counter>	Number	Number of inter-rat cell reselections. Range 0 – 65535.
<attempted_ir_cell_reselction>	Number	Number of attempts of inter-rat cell reselections. Range 0 – 65535.
<ir_handover>	Number	Number of inter-rat handovers. Range 0 – 65535.
<attempted_ir_handover>	Number	Number of attempts of inter-rat handovers. Range 0 – 65535.

18.23 Device class setting +UCLASS

18.23.1 Description

This command is used to change the module's GPRS multislot class. The new configuration cannot be set if the module is registered on the network for the GPRS service: in this case, before changing the multislot class, the user must first trigger a GPRS detach (e.g. via +COPS=2 or +CGATT=0); the new multislot class will be used starting from the successive GPRS attach. The new GPRS multislot class will be also stored to NVM and used at next power on.

A message error will be provided if the module is registered on the network at the moment of the new configuration setting.

The <ms_class_EGPRS> is not available on LEON-G100/G200 series.

Type	Syntax	Response	Example
Set	AT+UCLASS=<ms_class_GPRS>[,<ms_class_EGPRS>]	OK	AT+UCLASS=10 OK
Read	AT+UCLASS?	+UCLASS: <ms_class_GPRS>[,<ms_class_EGPRS>] OK	+UCLASS: 12,12 OK
Test	AT+UCLASS=?	+UCLASS=(list of supported <ms_class_GPRS> values),(list of supported <ms_class_EGPRS> values) OK	+UCLASS: (0-12),(0-12) OK

18.23.2 Defined values

Parameter	Type	Description
<ms_class_GPRS>	Number	GPRS multislot class defined according to 3GPP TS 05.02: • Values from 0 to 12 are allowed • On LEON value 0 corresponds to the default multislot class 10 • On LISA value 0 corresponds to the default multislot class 12
<ms_class_EGPRS>	Number	EGPRS multislot class defined according to 3GPP TS 05.02: • Values from 0 to 12 are allowed • Value 0 corresponds to the default multislot class 12 • Default Value: 12

On LEON <ms_class_GPRS>=7, <ms_class_GPRS>=11 and <ms_class_GPRS>=12 is not allowed.

18.24 Read counters of sent or received GPRS data +UGCNTRD

18.24.1 Description

The command AT+UGCNTRD allows to read the counters for total sent / received bytes for each defined context and indicates these to the DTE using the result code(s)

+UGCNTRD: <cid>,<sent_sess_bytes>,<received_sess_bytes>,<sent_total_bytes>,<received_total_bytes>.

For each active <cid> one result code line is provided by the DCE.

Only if the specific PDP context parameter values for a PDP context are set.

Type	Syntax	Response	Example
Action	AT+UGCNTRD	+UGCNTRD: <cid>,<sent_sess_bytes>,<received_sess_bytes>,<sent_total_bytes>,<received_total_bytes> [… +UGCNTRD: <cid>,<sent_sess_bytes>,<received_sess_bytes>,<sent_total_bytes>,<received_total_bytes>] OK	AT+UGCNTRD +UGCNTRD: 1, 100, 0, 100, 0 OK
Test	AT+UGCNTRD=?	OK	

18.24.2 Defined Values

Parameter	Type	Description
<cid>	Number	Number containing the local PDP context identifier in range of 0-3
<sent_sess_bytes>	Number	long Number containing the number of sent GPRS session
<received_sess_bytes>	Number	long Number containing the number of received GPRS session bytes
<sent_total_bytes>	Number	long Number containing the total number of sent bytes
<received_total_bytes>	Number	long Number containing the number of total received bytes

18.25 Set/reset counter of sent or received GPRS data +UGCNTSET

18.25.1 Description

The command AT+UGCNTSET allows to set the counter for total sent/received bytes for each defined context to zero or any other offset value.

Whenever the total counter for a <cid> is set (to zero or a certain value), the session counter for this <cid> will be set to zero.

If the <cid> equals zero than the total counter for every defined context is set to zero.

Given offset parameters are ignored in this case.

Type	Syntax	Response	Example
Set	AT+UGCNTSET=<cid>,[<total_bytes_sent_offset>,<total_bytes_received_offset>]	OK	AT+UGCNTSET=0,20,20 OK

Type	Syntax	Response	Example
Test	AT+UGCNTSET=?	+UGCNTSET: (range of <cid>s),(range of <total_bytes_sent_offset>),(range of <total_bytes_received_offset>) OK	+UGCNTSET: (0-3),(0-2147483646),(0-2147483646) OK

18.25.2 Defined Values

Parameter	Type	Description
<cid>	Number	Number containing the local PDP context identifier in range of 0-3
<total_bytes_sent_offset>	Number	long Number containing the offset of total sent bytes used for counting in range 0-0x7FFFFFFE
<total_bytes_received_offset>	Number	long Number containing the offset of total received bytes used for counting in range 0-0x7FFFFFFE.

18.26 Read remaining SIM PIN attempts +UPINCNT

18.26.1 Description

Reads the remaining attempts for SIM PIN, SIM PIN2, SIM PUK and SIM PUK2.

Type	Syntax	Response	Example
Action	AT+UPINCNT	+UPINCNT: <PIN attempts>, <PIN2 attempts>, <PUK attempts>, <PUK2 attempts> OK	+UPINCNT: 3,3,10,10 OK
Test	AT+UPINCNT=?	OK	OK

18.26.2 Defined Values

Parameter	Type	Description
<PIN attempts>	Number	number of remaining attempts to enter PIN (default 3)
<PIN2 attempts>	Number	number of remaining attempts to enter PIN2 (default 3)
<PUK attempts>	Number	number of remaining attempts to enter PUK (default 10)
<PUK2 attempts>	Number	number of remaining attempts to enter PUK2 (default 10)

18.27 Help displaying all commands &H

18.27.1 Description

This command allows to list all possible commands.

Type	Syntax	Response	Example
Action	AT&H	<AT command 1>[: <AT command 1 title>][, <CR><LF> <AT command 2>[: <AT command 2 title>] […]] OK	D, DL, D>, &A, &B, &C, &D, &E, &F, &H, &I, &K, &M, &R, &S, &V, …. +USTOPFILE, +UTEST, +UTGN, +UUBF OK

18.27.2 Defined Values

Parameter	Type	Description
<AT command n>	String	AT command name
< AT command n title>	String	AT command title

<AT command n title> is not supported on LEON-G100/LEON-G200 series.

18.28 Proprietary extended error report +UCEER

18.28.1 Description

This command causes the MT to return one or more lines of information text (<report>,<cause>) determined by the MT manufacturer providing an extended report of the reason for:

- the failure in the last unsuccessful call setup or in-call modification
- the last call release
- the last unsuccessful GPRS attach or unsuccessful PDP context activation
- the last GPRS detach or PDP context deactivation

Type	Syntax	Response	Example
Action	AT+UCEER	+UCEER: <report>,<cause> OK	+UCEER: 1,1 OK
Test	AT+UCEER=?	OK	

18.28.2 Defined Values

Parameter	Type	Description
<report>	Number	Numeric error code
<cause>	Number	Indicates the error code as previously displayed with the response CME ERROR on DTE corresponding to the <report>

18.29 Provide Cell information +UCELLINFO

18.29.1 Description

This command provides periodic reporting of the serving and neighbor cells.

Type	Syntax	Response	Example
Set	AT+UCELLINFO=<mode>	OK	AT+UCELLINFO=1 OK

Type	Syntax	Response	Example
Read	AT+UCELLINFO?	**Response syntax in case of GSM/GPRS radio access technology (RAT):** +UCELLINFO: <mode>,<type>,<MCC>,<MNC>,<LAC>,<CI>,[RxLev],[t_advance] OK **Response syntax in case of UMTS radio access technology (RAT):** +UCELLINFO: <mode>,<type>,<MCC>,<MNC>,<LAC>,<CI>,[<scrambling_code>],[<dl_frequency>],<rscp_lev>,[<ecn0_lev>] OK	
Test	AT+UCELLINFO=?	+UCELLINFO: (range of <mode>s) OK	+UCELLINFO: (0-2) OK

18.29.2 Defined Values

Parameter	Type	Description
<mode>	Number	• 0: disable the periodic reporting • 1: enable the reporting • 2: reserved
<type>	Number	**For GSM/GPRS radio access technology (RAT):** • 0: GSM serving cell • 1: neighbour GSM cell **For UMTS radio access technology (RAT):** • 2: UMTS serving cell or cell belonging to the Active Set • 3: cell belonging to the Virtual Active Set • 4: detected cell
<MCC>	Number	See +CGED; 0xFFFF for UMTS cells of type 3 and 4
<MNC>	Number	See +CGED; 0xFFFF for UMTS cells of type 3 and 4
<LAC>	Number	See +CGED; 0xFFFF for UMTS cells of type 3 and 4
<CI>	Number	See +CGED; 0xFFFF for UMTS cells of type 3 and 4
<RxLev>	Number	Signal strength, see +CGED
<t_advance>	Number	Only valid for the GSM serving cell
<scrambling_code>	Number	See +CGED; only valid for UMTS cells of type 3 and 4
<dl_frequency>	Number	See +CGED; only valid for UMTS cells of type 3 and 4
<rscp_lev>	Number	See +CGED
<ecn0_lev>	Number	See +CGED; only valid for UMTS cells of type 3 and 4

18.30 Configuration of Indicator control +UCIND

18.30.1 Description

The command allows configuration of unsolicited results for indications with +CIEV.

Type	Syntax	Response	Example
Set	AT+UCIND=[<conf>]	OK	AT+UCIND=7 OK
Read	AT+UCIND?	+UCIND: <conf> OK	+UCIND: 7 OK
Test	AT+UCIND=?	OK	

18.30.2 Defined Values

Parameter	Type	Description
<conf>	Number	The unsigned integer is a bit array where each bit indicates if an indication is active for unsolicited indications. The least significant bit is used for the indication with index 1. The bit corresponding to unused indexes (greater than 13) must be set to 0 (setting a <conf> greater than 4095 causes an error). The default value is 4095 (all indications are enabled).

18.31 Customer service profile +UCSP

18.31.1 Description

This command reads the customer service profile (CSP) from the SIM. The CSP indicates the services that are user accessible.

The syntax +UCSP displays all service groups.

If CSP information isn't available on the SIM, the message error +CME ERROR: SIM FAILURE is returned when trying to interrogate all or one of the service groups.

Type	Syntax	Response	Example
Action	AT+UCSP	+UCSP: <service_group>,<services> ..... +UCSP: <service_group>,<services> OK	+UCSP: 06,10000000 OK
Set	AT+UCSP[=<service group>]	+UCSP: <service_group>,<services> OK +UCSP: <service_group>,<services> ..... +UCSP: <service_group>,<services> OK	+UCSP= 06,10000000 OK
Test	AT+UCSP=?	+UCSP: (list of supported <service group>s) OK	+UCSP: (1-9,c0,d5) OK

18.31.2 Defined Values

Parameter	Type	Description
<service_group>	Number	Service group (1-9, c0, d5)

Parameter	Type	Description
<services>	Number	Services of one service group in bit-format beginning with the most significant bit of the service byte

18.32 User setting for proactive DTMF tone generation +UDTMF

18.32.1 Description

On a request from SIM Toolkit of proactive DTMF tone generation (SEND DTMF), <mode> parameter controls wheter the request of DTMF tone generation is performed or it is not. The selected setting is stored in NVRAM and remains valid after the mobile device is switched off.

Type	Syntax	Response	Example
Set	AT+UDTMF=<mode>	OK	AT+UDTMF=1 OK
Read	AT+UDTMF?	+UDTMF: <mode> OK	+UDTMF: 1 OK
Test	AT+UDTMF=?	+UDTMF: (list of supported <mode>s) OK	+UDTMF: (0-1) OK

18.32.2 Defined Values

Parameter	Type	Description
<mode>	Number	Indicates the working mode in relation to DTMF tone generation via SIM-TK • 0: disable DTMF tone generation (The terminal response is "Proactive SIM session terminated by user") • 1: enable DTMF tone generation (The terminal response is encoded according to the result)

18.33 Lock to current serving cell +USCELLLOCK

18.33.1 Description

This command is used to lock the MT to the currently camped cell in 3G. The command works only if the mobile is in IDLE or FACH state.

Type	Syntax	Response	Example
Set	AT+USCELLLOCK=<mode>	OK	AT+USCELLLOCK=1 OK
Read	AT+USCELLLOCK?	+USCELLLOCK: <mode> OK	+USCELLLOCK: 1 OK
Test	AT+USCELLLOCK=?	+USCELLLOCK: (list of supported <mode>s) OK	+USCELLLOCK: (0-1) OK

18.33.2 Defined Values

Parameter	Type	Description
<mode>	Number	• 0: Unlock/-ed • 1: Lock/-ed to current serving cell

18.34 Changing the startup MS class +UCGCLASS

18.34.1 Description

This command sets the default value of the MS class used at startup.

Type	Syntax	Response	Example
Set	AT+UCGCLASS=<class>	OK	AT+UCGCLASS="CC" OK
Read	AT+UCGCLASS?	+UCGCLASS: <class> OK	
Test	AT+UCGCLASS=?	+UCGCLASS: (list of supported <mode>s) OK	

18.34.2 Defined Values

Parameter	Type	Description
<class>	String	• "B": class B (circuit-switched and traffic-switched data alternately supported) • "CC": class C (one service only) in circuit switched mode

18.35 Generic SIM access +CSIM

18.35.1 Description

Allows direct control of the SIM by a distant application on the TE. This command transparently transmits the <command> to the SIM via the MT. The <response> is returned in the same manner to the TE.

☞ It is recommended to wait some seconds after boot (or reset) before using AT+CSIM command.

Type	Syntax	Response	Example
Set	AT+CSIM=<length>,<command>	+CSIM: <length>,<response> OK	AT+CSIM=4,"4330" +CSIM: 4,"6F00" OK
Test	AT+CSIM=?	OK	

18.35.2 Defined Values

Parameter	Type	Description
<length>	Number	Length of of the characters that are sent to TE in <command> or <response
<command>	String	Command passed on by MT to SIM in hex format; refer to 3GPP TS 51.011 [18]

Parameter	Type	Description
<response>	String	Response to the command passed on by the SIM to the MT (3GPP TS 51.011 [18])

18.36 Selection of preferred PLMN list +CPLS

18.36.1 Description

This command selects one PLMN selector with Access Technology list in the SIM card or active application in the UICC (GSM or USIM), that is used by +CPOL command.

The set command selects a list in the SIM/USIM. The read command returns the selected PLMN selector list from the SIM/USIM

The test command returns the whole index range supported lists by the SIM/USIM.

Type	Syntax	Response	Example
Set	AT+CPLS=[<list>]	OK	
Read	AT+CPLS?	+CPLS: <list> OK	+CPLS: 1 OK
Test	AT+CPLS=?	+CPLS: (list of supported <list>s) OK	+CPLS: (0-2) OK

18.36.2 Defined Values

Parameter	Type	Description
<list>	Number	• 0: User controlled PLMN selector with Access Technology EFPLMNwAcT, if not found in the SIM/UICC then PLMN preferred list EFPLMNsel (this file is only available in SIM card or GSM application selected in UICC) • 1: Operator controlled PLMN selector with Access Technology EFOPLMNwAcT • 2: HPLMN selector with Access Technology EFHPLMNwAcT

18.37 Read the SIM language +CLAN

18.37.1 Description

This command reads the language from the SIM.

☞ The read syntax will display the most preferred language from the preferred language list in EF_ELP(2F05) file. If the EF_ELP file does not exist, the preferred language is read from EF_LP (6F05) file. This file content is decoded according to the CB (cell broadcast) data coding scheme (dcs), and the according language is displayed in the response string. If this byte does not result in a valid language according to the CB dcs, then it is printed in the response string in hexadecimal representation.

Type	Syntax	Response	Example
Read	AT+CLAN?	+CLAN: <code> OK	
Test	AT+CLAN=?	OK	

18.37.2 Defined Values

Parameter	Type	Description
<code>	String	It is a two-letter abbreviation of the language. The language codes, as defined in ISO 639, consists of two characters, e.g. "en", "it" etc

18.38 Check for UICC card +UUICC

18.38.1 Description

The command is used to determine if the current SIM is a 2G or 3G SIM.

Type	Syntax	Response	Example
Read	AT+UUICC?	+UUICC: <state> OK	

18.38.2 Defined Values

Parameter	Type	Description
<state>	Number	• 0: 2G SIM • 1: 3G SIM

18.39 Home zone reporting +UHOMEZR

18.39.1 Description

The set command enables and disables home zone change event reporting. If reporting is enabled, the MT returns URC **+UHOMEZR: <label>** whenever the home zone is changed.

Type	Syntax	Response	Example
Set	AT+UHOMEZR=<onoff>	OK	AT+UHOMEZR=1 OK
Read	AT+UHOMEZR?	+UHOMEZR: <onoff> OK	
Test	AT+UHOMEZR=?	+UHOMEZR: (list of supported <onoff>s) OK	+UHOMEZR: (0-1) OK
URC		+UHOMEZR: <label>	

18.39.2 Defined Values

Parameter	Type	Description
<onoff>	Number	• 0: disable home zone change event reporting (default) • 1: enable home zone change event reporting
<label>	String	Zone label indication • "HOME": also possible as "home", dependent from network indication • "CITY": zone label

18.40 Configure the mode of HSDPA/HSUPA +UHSDUPA

18.40.1 Description

Enables / Disables HSDPA and HSUPA also configuring the related data rate.The system has to be rebooted to activate the mode-change.

Type	Syntax	Response	Example
Set	AT+UHSDUPA=<HSDPA-mode>, <HS-DSCH_category>,<HSUPA-mode>[,<E-DCH category>]	OK	AT+UHSDUPA=1,8,1,6 OK
Read	AT+UHSDUPA?	+UHSDUPA: <HSDPA-mode>,<HS-DSCH_category>,<HSUPA-mode>,<E-DCH category> OK	+UHSDUPA: 1,8,1,6 OK
Test	AT+UHSDUPA=?	+UHSDUPA: (<list of supported <HSDPA-mode>s),(<list of supported <HS-DSCH_category>s>),(<list of supported <HSUPA-mode>s),(<list of supported >,<E-DCH category>s) OK	+UHSDUPA: (0-1),(6,8),(0-1),(1,2,4,6) OK

18.40.2 Defined Values

Parameter	Type	Description
<HSDPA-mode>	Number	• 0: HSDPA OFF • 1: HSDPA ON (default value)
<HS-DSCH_category>	Number	HS-DSCH category defined in 3GPP TS 25.306 [53] • 6: category 6 • 8: category 8 (default value)
<HSUPA-mode>	Number	• 0: HSUPA OFF • 1: HSUPA ON (default value)
<E-DCH category>	Number	E-DCH category defined in 3GPP TS 25.306 [53] • 1: category 1 • 2: category 2 • 4: category 4 • 6: category 6 (default value)

18.41 Information to in-band-tones availability +UPROGRESS

18.41.1 Description

This command enables or disables the display of URC **+UPROGRESS: <cin>,<status>** on the DTE while a call is in progress.

Type	Syntax	Response	Example
Set	AT+UPROGRESS=<mode>	OK	AT+UPROGRESS=1 OK

Type	Syntax	Response	Example
Read	AT+UPROGRESS?	+UPROGRESS: <mode> OK	+UPROGRESS: 1 OK
Test	AT+UPROGRESS=?	+UPROGRESS: (list of the supported <mode>s) OK	+UPROGRESS: (0,1) OK
URC		+UPROGRESS: <cin>,<status>	+UPROGRESS: 1,7

18.41.2 Defined Values

Parameter	Type	Description
<mode>	Number	Enabling the URC +UPROGRESS • 0: disable unsolicited result code +UPROGRESS • 1: enable unsolicited result code +UPROGRESS
<cin>	String	Call number indication
<status>	Number	Indicates the call progress status • 0: no progress • 1: alerting, in-band tones or TCH not yet available • 2: mobile terminated call now accepted, TCH yet available • 3: in-band tones available • 4: in-band tones not available • 5: TCH now available, mobile terminated call accepted • 6: TCH now available, in-band tones available • 7: TCH now available, in-band tones not available • 8: TCH changed from data to speech • 9: TCH changed from speech to data • 10: TCH changed to signaling or data • 11: the last speech call has been terminated and the speech can be disabled. Mute uplink, downlink and disable speech • 12: Fast connection is available • 13: Fast connection is closed • 14: progress information element playing announcement has been received

18.42 Selection of Radio Access technology +URAT

18.42.1 Description

This command forces the selection of the Radio Access Technology (RAT) in the protocol stack. On subsequent network registration (+COPS, +CGATT) this RAT is used. In case GSM / UMTS Dual Mode is additionally selected a preferred RAT can be configured, which is stored in NVRAM and selects which RAT shall be attached first.

Dual Mode means the GSM and UMTS Access Stratum will be active and full InterRAT measurements and handovers are provided.

Type	Syntax	Response	Example
Set	AT+URAT=<AcT>[,<PreferredAct>]	OK	AT+URAT=0,0 OK
Read	AT+URAT?	+URAT: <AcT>[, <PreferredAct>] OK	
Test	AT+URAT=?	+URAT: (list of the supported <AcT>s), (list of the supported <PreferredAct>s) OK	+URAT: (0-2), (0,2) OK

18.42.2 Defined Values

Parameter	Type	Description
<AcT>	Number	Indicates the radio access technology and may be: • 0: GSM Single Mode • 1: GSM / UMTS Dual mode (default value) • 2: UTRAN (UMTS)
<PreferredAct>	Number	This parameter is used for network registration in case of <AcT>=1. NVRAM stored value of the preferred access technology in case of dual mode and may be: • 0: RAT GSM • 2: RAT UMTS (default value)

The command settings are stored in the non volatile memory.

Any change in the RAT selection must be done in detached state!

18.43 Extended Packet Switched network registration status +UREG

18.43.1 Description

Reports the network PS (Packet Switched) radio capabilities of the PLMN where the device is attached to through the read command and the URC. The set command allows to enable / disable the URC **+UREG**.

Type	Syntax	Response	Example
Set	AT+UREG=<n>	OK	AT+UREG=1 OK
Read	AT+UREG?	+UREG: <n>,<state> OK	
Test	AT+UREG=?	+UREG: (list of supported <n>'s) OK	
URC		+UREG: <state>	

18.43.2 Defined Values

Parameter	Type	Description
<n>	Number	• 0: disable network registration attach status URC • 1: enable network registration attach status URC +UREG
<state>	Number	• 0: not registered for PS service • 1: registered for PS service,RAT=GSM, GPRS available • 2: registered for PS service,RAT=GSM, EDGE available • 3: registered for PS service,RAT=UMTS, WCDMA available • 4: registered for PS service,RAT=UMTS, HSDPA available • 5: registered for PS service,RAT=UMTS, HSUPA available • 6: registered for PS service,RAT=UMTS, HSDPA and HSUPA available

18.44 Start and stop tone generation +UVTS

18.44.1 Description

This command starts and stops DTMF tones. In GSM this operates only in voice mode.

Type	Syntax	Response	Example
Set	AT+UVTS=[<DTMF>]	OK	AT+UVTS=2 OK
Test	AT+UVTS=?	OK	

When <DTMF> parameter is omitted the tone is stopped.

18.44.2 Defined Values

Parameter	Type	Description
<DTMF>	Char	Single ASCII character in the set 0-9, #, *, A-D

18.45 PCCA STD-101 [17] select wireless network +WS46

18.45.1 Description

PCCA STD-101 [17] includes a command to select the cellular network (Wireless Data Service; WDS) to operate with the MT. PCCA calls this WDS-Side Stack Selection. This command may be used when the MT is asked to indicate the networks in which it can operate.

Type	Syntax	Response	Example
Set	AT+WS46=[<n>]	OK	AT+WS46=25 OK
Read	AT+WS46?	+WS46: <n> OK	+WS46: 25 OK
Test	AT+WS46=?	+WS46: (list of supported <n>s) OK	+WS46: (12,22,25) OK

18.45.2 Defined Values

Parameter	Type	Description
<n>	Number	WDS-Side Stack Selection indication and may be: • 12: GSM digital cellular (Single mode GSM) • 22: UTRAN only (Single mode UMTS) • 25: 3GPP Systems, both GERAN and UTRAN (Dual Mode Stack)

Any change in the WDS-Side stack selection must be done during detached state.

This functionality is also supported by the proprietary command +URAT, which provides extended functionality to +WS46.

18.46 End User Test +UTEST

18.46.1 Description

Sets the module in non signaling mode (e.g. without the GSM protocol stack running) to trigger one of the following actions:

- generate a GSM burst RF signal on a specified frequency
- detect a RX signal and measure the RF level

To enter in non signaling mode and perform these actions <mode> parameter must be set to 1, otherwise a messager error will be provided (+CME ERROR: operation not allowed if +CMEE is set to 2).

In non signalling mode:

- the module accepts only +UTEST commands
- the other AT commands don't work; if these commands are used the module behaviour is unpredictable

To go back in normal mode, the module needs to be reset or powered off or send AT+UTEST=0.

This command is available only on LEON from LEON-G100-06x/LEON-G200-06x and subsequent versions.

Type	Syntax	Response	Example
Set	AT+UTEST=<mode>[, <par1>[, <par2>[, <par3>[, <par4>[, <par5>]]]]]	+UTEST: [<par1>,<par2>][,<par3>,<par4>,<par5>][,<min>,<avg>,<max>] OK	AT+UTEST=2,124,250 +UTEST: 124,250,-80,-80,-80 OK
Read	AT+UTEST?	+UTEST: <mode> OK	+UTEST: 1 OK
Test	AT+UTEST=?	+UTEST: (list of supported <mode>s) OK	+UTEST: (0-3) OK

18.46.2 Defined Values

Parameter	Type	Description
<mode>	Number	Test mode setting: • 0: reset the module to normal mode • 1: Set the module in non signaling mode • 2: RX test mode • 3: TX test mode (GSM burst)
<par1>..<par5>	Number	Parameters needed for each selected mode as reported in the table below

RX mode setting (<mode>=2)

Par	Description	Range	Default	Notes
<par1>	Channel	0…65535	32	RX channel: for 850, 900, 1800 bands the values corresponds to ARFCN while for 1900 band an offset of 32768 is added • 0-124: 900 MHz • 128-251: 850 MHz • 512-885: 1800 MHz • 975-1023: 900 MHz • 33280-33578: 1900 MHz (corresponding to ARFCN 512-810 range in band 1900) Only the values indicated in the above ranges are valid, otherwise a messager error will be provided (+CME ERROR: operation not supported if +CMEE is set to 2)
<par2>	Time	1 - 600000	1000	Time interval for RX test expressed in ms
<min>	Minimum antenna RF level estimation	-100 - -20		Expressed in dBm
<avg>	Average antenna RF level estimation	-100 - -20		Expressed in dBm
<max>	Maximum antenna RF level estimation	-100 - -20		Expressed in dBm
Example: AT+UTEST=2 +UTEST:32,1000,-89,-55,-50 OK				Module measures antenna RX level at RX channel 32 for 1 s interval. After this time it will output results: In the example -89,-55,-50 are the antenna RF level estimation: numbers are just an example

TX mode setting (<mode>=3)

Par	Description	Range	Default	Notes
<par1>	Tx channel	0…65535	32	TX channel: for 850, 900, 1800 bands the values corresponds to ARFCN while for 1900 band an offset of 32768 is added • 0-124: 900 MHz Power control level range goes from 5 to 19; if <par2> is less than 5 the handling is the same for <par2>=5 • 128-251: 850 MHz Power control level range goes from 5 to 19; if <par2> is less than 5 the handling is the same for <par2>=5 • 512-885: 1800 MHz Power control level range goes from 0 to 15 • 975-1023: 900 MHz Power control level range goes from 5 to 19; if <par2> is less than 5 the handling is the same for <par2>=5 • 33280-33578: 1900 MHz (corresponding to ARFCN 512-810 range in band 1900)] Power control level range goes from 0 to 15 Only the values indicated in the above ranges are valid, otherwise a messager error will be provided (+CME ERROR: operation not supported if +CMEE is set to 2)
<par2>	Power control Level	0-19	0	PCL (power control level) for 2G mode. The allowed values depend on the related <par1> value: lower numbers means higher power level

Par	Description	Range	Default	Notes
<par3>	Training Seq (TSC)	0-7	5	Training sequence to be used (to be changed only in case of link with network simulator, else use default)
<par4>	Modulation Mode	1	1	Modulation mode • 1: GMSK normal modulation including TSC
<par5>	Time	0-600000	1000	Time interval for TX test expressed in ms • 0: burst sequence is continuously transmitted. In this case the command will return immediately. The command line will be available immediately. To stop the burst sequence transmission the command AT+UTEST=1 must be provided
Example: AT+UTEST=3 +UTEST:32,0,5,1,1000 OK				Module will transmit for 1 s interval at TX channel 32 GSM900 at PCL 5 using training sequence 5 and normal modulation

Example:

AT+UTEST=1
OK
AT+UTEST?
+UTEST: 1
OK

AT+UTEST=3,37,5,0,1,20000
+UTEST: 37,5,0,1,20000

OK

AT+UTEST=2,124,250
+UTEST: 124,250,-80,-80,-80

OK

AT+UTEST=2,37,5000
+UTEST: 37,5000,-100,-100,-100

OK
AT+UTEST=0
OK

18.47 Smart temperature Supervisor +USTS

18.47.1 Description

Allows to enable/disable the Smart Temperature Supervisor feature.

When the feature is enabled the internal temperature is measured via the internal temperature sensor.

If the measured value goes over the t_{+1} threshold or below the t_{-1} threshold an URC will be sent to notify a warning: the module is still in a valid and good working condition.

If the measured value goes over the t_{+2} threshold or below the t_{-2} threshold an URC will be sent to notify the dangerous working condition. This status will be notified and the device will start the shutting down procedure to avoid damaging it.

☞ The shutting down procedure is performed only if <mode>=1: an URC is sent to notify this.

☞ For security reasons the shut down is suspended in case of emergency call in progress. In this case the device will switch off at call termination: an URC will be sent to notify this.

☞ If the feature is disabled (<mode> = 0 and <mode> = 2) there's no embedded protection against not allowed temperature working conditions.

☞ For more details on Smart Temperature Supervisor feature please refer to LEON-G100/G200 system Integration Manual [25] or LISA-U1 Series System integration Manual [49].

Type	Syntax	Response	Example
Set	AT+USTS=<mode>	OK	AT+USTS=0 OK
Read	AT+USTS?	+USTS: <mode> OK	+USTS: 0 OK
Test	AT+USTS=?	+USTS: (list of supported modes) OK	+USTS: (0-2) OK
URC		+UUSTS: <mode>,<event>	+UUSTS: 1,1

18.47.2 Defined Values

Parameter	Type	Description
<mode>	Number	Enable / disable the smart temperature mode • 0: feature disabled (default value) • 1: Smart Temperature feature enabled: the indication and shutting down are performed • 2: Smart Temperature Indication enabled
<event>	Number	Provides the event status • -2: temperature below t-2threshold • -1: temperature below t-1 threshold • 0: temperature inside the allowed range – not close to the limits • 1: temperature above t+1 threshold • 2: temperature above the t2threshold • 10: timer expired and no emergency call is in progress, shutdown phase started • 20: emergency call ended, shutdown phase started

18.48 Configure the Data Channel + UDATACHANNEL

18.48.1 Description

This command configures the channel over which CSD or GPRS data shall be routed.

The data is default routed on the channel where the connection is established.

- Set Command configures the channel over which CSD or GPRS data shall be routed.
- Test command returns the list of modes supported.

A message error will be provided if the interested interface is not active.

Type	Syntax	Response	Example
Set	AT+UDATACHANNEL=<mode>,<csd_gprs_flag>,<ctrl-tid-path>,<tidpath>[,<connect_flag>]	OK	AT+UDATACHANNEL=1,1,"/mux/1\","/mux/2",0
Test	AT+UDATACHANNEL=?	+UDATACHANNEL: (list of <mode>s),(list of <csd_gprs_flag>'s), (list of <connect_flag>'s) OK	+UDATACHANNEL: (0-2),(0,1),(0,1) OK

18.48.2 Defined Values

Parameter	Type	Description
<mode>	Number	• 0: disable the routing • 1: enable the routing • 2: query current setting for the channel where the command is executed
<csd_gprs_flag>	Number	• 0 configure the channel for a CSD connection • 1 configure the channel for a GRPS connection
<ctrl-tid-path>	String	• Interface for which the data routing mechanism shall be enabled
<tid-path>	String	Interface to which a data call shall be routed
<connect_flag>	Number	• 0 No Reporting on the data channel (neither CONNECT nor NO CARRIER) • 1 Reporting on the data channel enabled (= CONNECT and NO CARRIER)

18.49 Custom SIM Lock +USIMLCK

18.49.1 Description

Allows locking the SIM to work only with specified scenarios defined by the user (e.g. a subset of networks, with a specified SIM card). According to the 3GPP TS 22.022 [31] there are different kinds of lock as follows:

- Network
- Network Subset
- SIM

SIM is locked according to user needs even if the SIM card is not inserted or the PIN code is not provided. At most 10 personalization can be simultaneously configured.

Type	Syntax	Response	Example
Set	AT+USIMLCK=<facility>,<pers_data>,<pwd>,<status>	OK	AT+USIMLCK="PN","222.01","12345678",1
Test	AT+USIMLCK=?	+USIMLCK (list of supported <facility>s),,,(list of supported <status>	+USIMLCK ("PN"," "),,,(0-1) OK

18.49.2 Defined Values

Parameter	Type	Description
<facility>	String	• "PN" Network personalization <pers_data> is provided by MCC and MNC of the network in the following format: "MCC.MNC"; if more than one network must be provided the syntax is as follows: "MCC1.MNC1:MCC2.MNC2:MCC.MNCn" • "PU" Networks subset personalization <pers_data> is MCC+MNC+ digits 6 and 7 of IMSI; if more than one network subset personalization must be provided the syntax is as follows: "MCC:MNC:DD1:DD2:DD3:DDn" where DDx represent the sixth and seventh digits of IMSI • "PS" SIM/USIM personalization <pers_data> is IMSI; if more than one SIM/USIM personalization must be provided the syntax is as follows: "IMSI1:IMSI2:IMSI3:IMSIn"
<pers_data>	String	Data to personalize the device. The supported string depends on related <facility>
<pwd>	String	Password to enable/disable the personalization. The password length goes from 6 to 16 digits
<status>	Number	• 0: feature set but disabled • 1: feature set and enabled

☞ At the end of command execution, the module is deregistered from network, reset and rebooted.

☞ There's only 5 retrial in case a wrong password is inserted during an unlock operation with +CLCK command; when maximum retrial counter is reached, the possibility to perform further unlock operations are blocked. The ME can still be used with the right SIM.

☞ The following message errors could be provided

- +CME ERROR: invalid characters in text string (error code: 25): an error is present in the <pers_data> format
- +CME ERROR: operation not allowed (error code: 3): the user tries the module personalization with a facility already active. An unlock operation must be performed before
- +CME ERROR: incorrect password(error code: 16): The password format or length is wrong

☞ If the SIM lock is disabled it is possible to enable with AT+CLCK command providing needed parameters (<fac>, <mode>=1 and the password); otherwise the same personalization type can be modified at any time by means of AT+USIMLCK command.

☞ If the SIM lock is enabled the same personalization can be modified only if before it has been disabled through AT+CLCK command.

19 GPIO AT-commands

19.1 Introduction

The chapter provides the description of AT commands used to manage the GPIO pins provided by u-blox wireless modules.

19.1.1 GPIO functions

On u-blox wireless modules, GPIO pins can be opportunely configured as general purpose input or output. Moreover GPIO pins of u-blox wireless modules can be configured to provide custom functions via +UGPIOC AT command. The custom functions availability can vary depending on the u-blox wireless modules series and version: please refer to Table 5 for an overview of the custom functions supported by u-blox wireless modules.

<gpio_mode>	Function	LEON-Gx00-04S LEON-Gx00-05S	LEON-G100-06x LEON-G200-06x	LISA-U1x0-00x
0	Output	Supported	Supported	Supported
1	Input	Supported	Supported	Supported
2	Network status indication	Supported	Supported	Supported
3	GPS supply enable	Supported	Supported	Supported
4	GPS data ready	Not Supported	Supported	Not Supported
5	GPS RTC sharing	Not Supported	Supported	Not Supported
7	SIM Card Detection	Not Supported	Not Supported	Supported
8	Headset Detection	Supported[2]	Supported	Not Supported
9	GSM Tx burst indication	Not Supported	Not Supported	Supported
255	Pad disabled	Not Supported	Supported	Supported

Table 5: GPIO custom functions overview

The configuration of the GPIO pins (i.e. the setting of the parameters of the +UGPIOC AT command) is saved in the NVM and used at the next power-on.

19.1.2 GPIO mapping

The number of available GPIO pins and their mapping can vary depending on the u-blox wireless modules series and version. The GPIOs mapping for different u-blox wireless modules is reported in Table 6, Table 7, Table 8:

LEON-Gx00-04S and LEON-Gx00-05S

<gpio_id>	Pin name	Pin number	Default function	Remarks
20	GPIO1	20	Output	<gpio_out_val>=0
21	GPIO2	21	GPS supply enable	

Table 6: LEON-Gx00-04x and LEON-Gx00-05x GPIO mapping

[2] The HS_DET pin provides headset detection function only: it cannot be configured as GPIO

LEON-G100-06x/LEON-G200-06x

<gpio_id>	Pin name	Pin number	Default function	Remarks
18	HS_DET	18	Headset Detection	Only pin 18 can be configured for headset detection functionality
20	GPIO1	20	Pad disabled	
21	GPIO2	21	GPS supply enable	
23	GPIO3	23	GPS Data Ready	Only pin 23 can be configured for GPS Data Ready functionality
24	GPIO4	24	GPS RTC sharing	Only pin 24 can be configured for GPS RTC sharing functionality

Table 7: LEON-G100-06x/LEON-G200-06x GPIO mapping

LISA-U1x0-00x

<gpio_id>	Pin name	Pin number	Default function	Remarks
20	GPIO1	20	Pad disabled	
21	GPIO2	21	GPS supply enable	
23	GPIO3	23	Pad disabled	
24	GPIO4	24	Pad disabled	
51	GPIO5	51	SIM Card Detection	Only pin 51 can be configured for SIM card detection functionality

Table 8: LISA-U1x0-00x GPIO mapping

☞ The "GPS supply enable", "GPS data ready" and "GPS RTC sharing" custom functions can be handled by the +UGPS and the +UGPRF custom AT commands to manage the u-blox GPS receiver connected to the Wireless Module and the embedded GPS aiding. For more details please refer to chapter 29.1 and 29.3.

☞ When SIM Card Detection functionality is enabled, the status is reported by +CIND AT command (for more details refer to the command description, chapter 6.5).

☞ Refer to LEON-G100/G200 System Integration Manual [25] or LISA-U1 Series System Integration Manual [49] for the complete overview of all allowed configurations.

19.1.3 Network status indication

When a GPIO pin is configured to provide network status indication, its progress depends by the network status:

- No Service: Indicates No network coverage or Not registered (but there can be coverage in limited service)
- Registered Home Network 2G: Indicates registered with home 2G network (full or limited service)
- Registered Home Network 3G: Indicates registered with home 3G network (full or limited service)
- Registered Roaming 2G: Indicates registered with visitor 2G network (roaming, full or limited service)
- Registered Roaming 3G: Indicates registered with visitor 3G network (roaming, full or limited service)
- Data Transmission: Indicates voice or data call enabled either 2G/3G

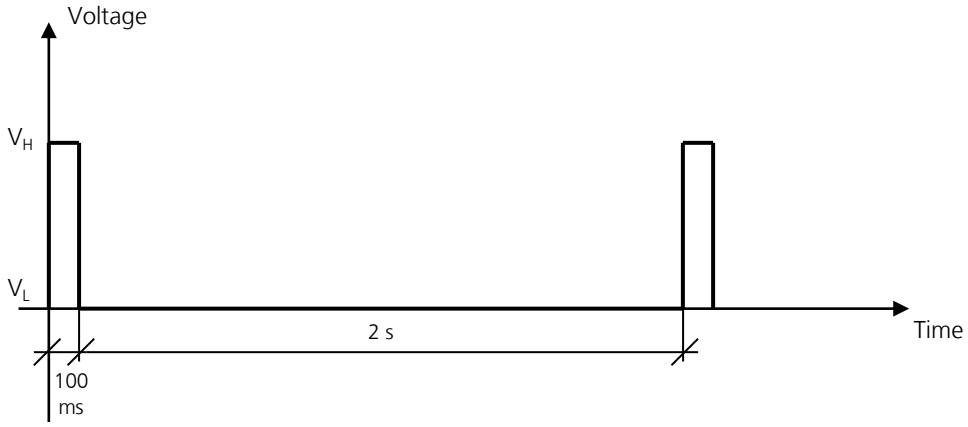
Following figures report the allowed progresses for GPIO pin set as network indication: V_H and V_L values are provided in LEON-G100 / LEON-G200 series Data Sheet [24] and LISA-U1 series Data Sheet [56] in "Generic Digital Interfaces pins" chapter.

No service (no network coverage or not registered)

- Continuous Output / Low

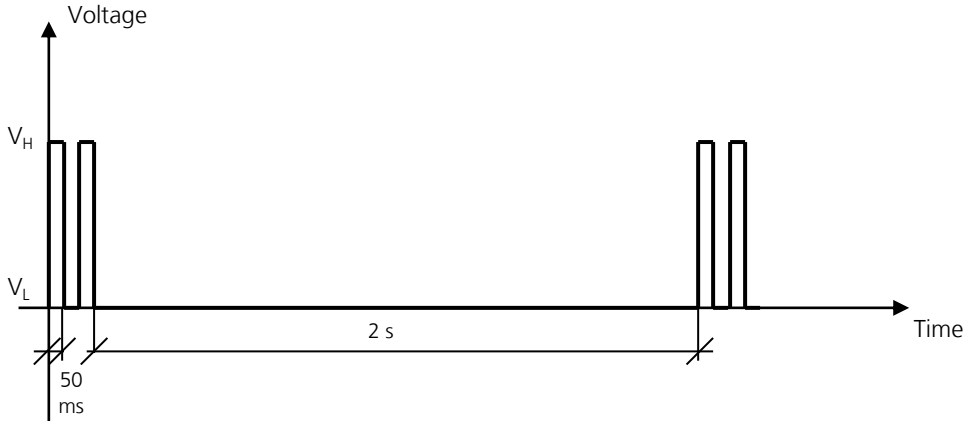
Registered home network 2G

- Cyclic Output / High for 100 ms, Output / Low for 2 s,



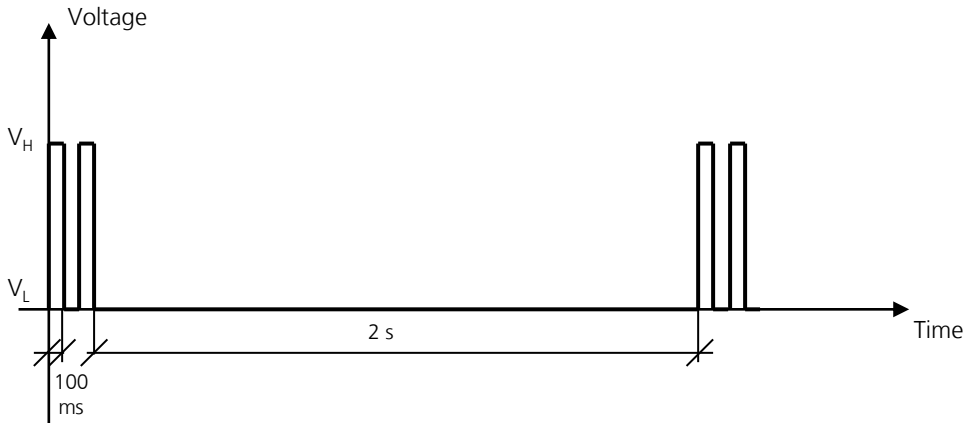
Registered home network 3G

- Cyclic Output / High for 50 ms, Output / Low for 50 ms, Output / High for 50 ms, Output / Low for 2 s



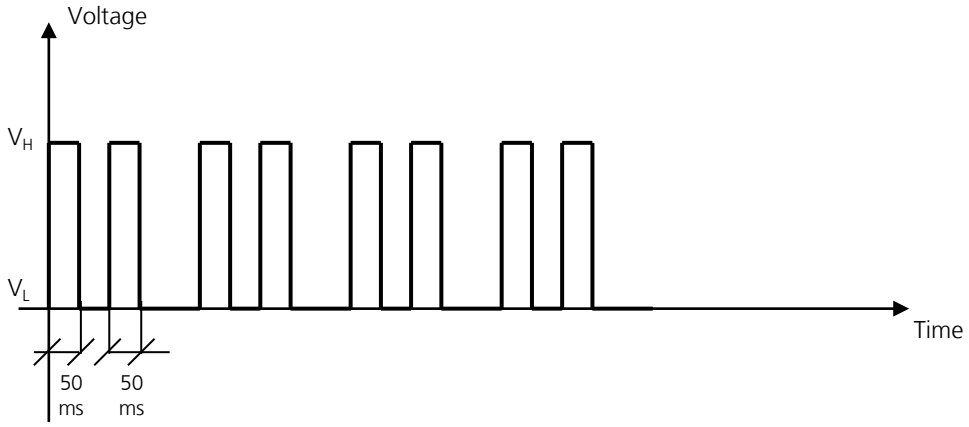
Registered roaming 2G

- Cyclic Output / High for 100 ms, Output / Low for 100 ms, Output / High for 100 ms, Output / Low for 2 s



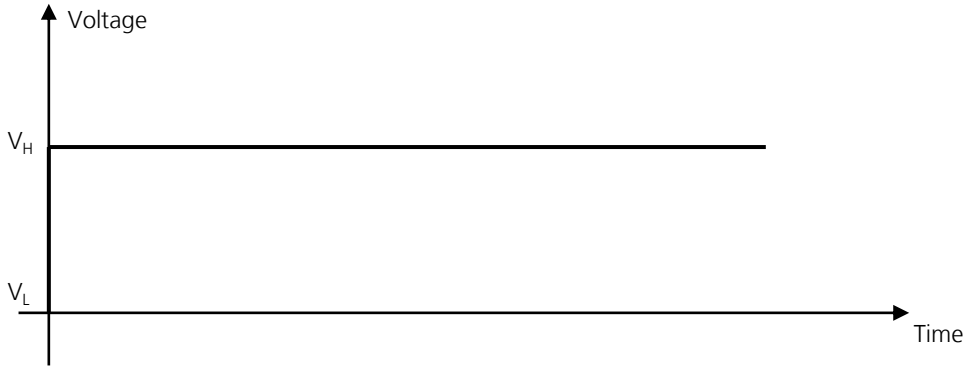
Registered roaming 3G

- Cyclic Output / High for 50 ms, Output / Low for 50 ms, Output / High for 50 ms, Output / Low for 100 ms



Voice or data transmission 2G/3G call enabled

- Continuous Output / High



19.2 GPIO select configuration command +UGPIOC

19.2.1 Description

Allows the user to configure GPIOs pins as input, output or to handle a custom function. When GPIOs pins are configured as output pin, it is possible to set the value.

The test command provides the list of the supported GPIOs, the supported functions and the status of all GPIOs.

☞ The read command is provided only on LISA-U1 series modules.

☞ In the test command the list of the <gpio_id> with the related <gpio_mode> is provided only on LEON-G100/G200 modules.

☞ Not all GPIO functions can be assigned to each GPIO pin. If the configuration is not allowed, a message error will be returned (1502 - +CME ERROR: Select GPIO mode error).

☞ "GPS supply enable", "Network status Indication" and "SIM indication" cannot be simultaneously configured on 2 GPIOs. To make available the GPIO set as "GPS supply enable" mode it is needed to stop supplying GPS with AT+UGPS=0 command.

☞ For more details regarding the custom functions supported by u-blox wireless modules and the default settings please refer to Table 5.

Type	Syntax	Response	Example
Set	AT+UGPIOC=<gpio_id>,<gpio_mode>[,<gpio_out_val >]	OK	AT+UGPIOC=20,0,1 OK
Read	AT+UGPIOC?	+UGPIOC: <gpio_id>, <gpio_mode> [<gpio_id>, <gpio_mode> [….]] OK	+UGPIOC: 20,255 21,3 23,255 24,255 51,7 OK
Test	AT+UGPIOC=?	+UGPIOC: (list of supported GPIOs pins),(list of supported <gpio_mode>), (list of supported <gpio_out_val >) [<gpio_id1>, <gpio_mode> ... <gpio_idN>, <gpio_mode>] OK	+UGPIOC: (20,21,23,24,51),(0-5,7,9,255),(0-1)

19.2.2 Defined Values

Parameter	Type	Description
<gpio_id>	Number	GPIO pin identifier: pin number Refer to Table 6, Table 7 and Table 8 for available GPIO pins and their mapping on different u-blox wireless modules series and version.
<gpio_mode>	Number	Mode identifier: configured function Refer to Table 5 for custom functions supported by different u-blox wireless modules series and version. Possible values: • 0: output • 1: input • 2: network status indication

Parameter	Type	Description
		• 3: GPS supply enable • 4: GPS data ready • 5: GPS RTC sharing • 7: SIM card detection • 8: headset detection • 9: GSM Tx burst indication • 255: pad disabled
<gpio_out_val>	Number	GPIO output value (for output function <gpio_mode>=0 only): • 0: low (default) • 1: high

19.3 GPIO read command +UGPIOR

19.3.1 Description

Reads the current value of the specified GPIO, no matter whether it is configured as input or output (refer to +UGPIOC AT command to define the GPIO function). The syntax and the parameters range is shown in the response to the test command.

Type	Syntax	Response	Example
Set	AT+UGPIOR=<gpio_id>	+UGPIOR: <gpio_id>,<gpio_val> OK	AT+UGPIOR=20 +UGPIOR: 20,0 OK
Test	AT+UGPIOR=?	+UGPIOR: (list of supported <gpio_id>s) OK	+UGPIOR: (20, 21) OK

19.3.2 Defined Values

Parameter	Type	Description
<gpio_id>	Number	GPIO pin identifier: pin number Refer to Table 6, Table 7 and Table 8 for available GPIO pins and their mapping on different u-blox wireless modules series and version.
<gpio_val>	Number	GPIO value (0-1)

The command works only if the parameter <gpio_mode> of the +UGPIOC AT command is set to 0 or 1.

19.4 GPIO set command +UGPIOW

19.4.1 Description

Sets ("writes") the output of the specified GPIO, but only if it is configured in output function (refer to +UGPIOC AT command to set the pin as output).

Type	Syntax	Response	Example
Set	AT+UGPIOW=<gpio_id>,<gpio_out_val>	OK	AT+UGPIOW=20,1 OK

Type	Syntax	Response	Example
Test	AT+UGPIOW=?	+UGPIOW: (list of supported <gpio_id>s),(list of supported <gpio_out_val>) OK	+UGPIOW: (20, 21),(0-1) OK

19.4.2 Defined Values

Parameter	Type	Description
<gpio_id>	Number	GPIO pin identifier: pin number Refer to Table 6, Table 7 and Table 8 for available GPIO pins and their mapping on different u-blox wireless modules series and version.
<gpio_out_val>	Number	GPIO value (0-1)

The command works only if the parameter <gpio_mode> of the +UGPIOC AT command is set to 0.

20 File System AT Commands

20.1 Download file +UDWNFILE

20.1.1 Description

Stores (writes) a file into the file system. The available free memory space is checked before starting the file transfer. If the file exceeds the available space an error is returned.

No interrogation (test) is possible for this command. In case of any error, the return code will always be 100 ("unknown") or 4 ("ERROR"). If an error occurs during the file writing, the transfer is aborted and it is up to the user to delete the file.

☞ If the file already exists the incoming bytes will be appended.

☞ The maximal speed of the serial port is 115200 b/s.

☞ The serial port flow control must be enabled.

☞ The data timeout is 20 s.

☞ The maximum available user space in the file system of LEON-G100/G200 series and LISA-U1 series is 1 MB.

☞ In LISA-U1 series if the module shuts down during a file storing, all available bytes of this file will be stored.

☞ In LEON-G100/G200 series the module shuts down during a file storing, all bytes of this file will be deleted.

Type	Syntax	Response	Example
Set	AT+UDWNFILE=<filename>, <size>	>\ \ Start transfer of file data\ OK	AT+UDWNFILE="filename",36\ >these bytes are the data of the file\ OK

20.1.2 Defined Values

Parameter	Type	Description
<filename>	String	file name (max. 47 characters)
<size>	Number	file size expressed in bytes

☞ The stream of bytes can be entered after the ">" prompt has been provided to the user. The file transfer is terminated exactly when <size> bytes have been sent entered and either OK or an error message is returned. The feed process cannot be interrupted i.e. command mode is re-entered once the user has provided the declared the number of bytes.

20.2 Delete file +UDELFILE

20.2.1 Description

Deletes a stored file from the file system.

☞ If <filename> file is not stored in the file system the following message error will be provided: +CME ERROR: FILE NOT FOUND.

Type	Syntax	Response	Example
Set	AT+UDELFILE=<filename>	OK	AT+UDELFILE="filename" OK

20.2.2 Defined Values

Parameter	Type	Description
<filename>	String	file name (max. 47 characters)

20.3 Read file +URDFILE

20.3.1 Description

Retrieves a file from the file system.

Type	Syntax	Response	Example
Set	AT+URDFILE=<filename>	+URDFILE: <filename>,<size>,<data> OK	AT+URDFILE="filename" +URDFILE: filename,36,"these bytes are the data of the file" OK

20.3.2 Defined Values

Parameter	Type	Description
<filename>	String	file name (max. 47 characters)
<size>	Number	file size, in bytes
<data>	Byte Stream	content of the file read

The returned file data is displayed as an ASCII string of <length> chars in the range [0x00,0xFF]. At the end of the string, <CR><LF> are provided for user convenience and visualization purposes.

20.4 List files information +ULSTFILE

20.4.1 Description

This command retrieves information about the FFS. Depending on the specified <param_id>, it can print:

- List of files stored into the FFS
- Remaining free FFS space expressed in bytes
- Size of the specified file expressed in bytes

In FFS these are the file limits:

- Maximum number of files that can be stored: 135 files
- Maximum length of the file name: 47 characters

Type	Syntax	Response	Example
Set	AT+ULSTFILE=<param_id>[,<filename>]	+ULSTFILE: [<filename1>[,<filename2>[,…[,<filenameN>]]]] OK Or +ULSTFILE: <free_ffs_space> OK Or +ULSTFILE: <file_size> OK	AT+ULSTFILE= +ULSTFILE: "filename" OK AT+ULSTFILE=1 +ULSTFILE: 236800 OK AT+ULSTFILE=2,"filename" +ULSTFILE: 784 OK

20.4.2 Defined Values

Parameter	Type	Description
<param_id>	Integer	Possible values are: • 0: default value, list the files • 1: get free space • 2: get file size, <filename> parameter is required in this case
<free_fss_space>	integer	Available free space on FFS in bytes
<file_size>	integer	Size of the file specified with param <filename> when <param_id> is 2
<filenameX>	String	File name

20.5 Download file +URDBLOCK

20.5.1 Description

Retrieves a file from the file system.

Differently from +URDFILE this command allows the user to read only a portion of the file, indicating the offset and amount of bytes.

This command is available only on LEON from LEON-G100-06x/LEON-G200-06x and subsequent versions.

Type	Syntax	Response	Example
Set	AT+URDBLOCK=<filename>,<offset>,<size>	+URDBLOCK: <filename>,<size>,<data> OK	AT+URDBLOCK ="filename",0,20 +URDBLOCK: "filename",20, "these bytes are the " OK

20.5.2 Defined Values

Parameter	Type	Description
<filename>	String	File name (max. 47 characters)
<offset>	Number	Offset in bytes from the beginning of the file
<size>	Number	file size, in bytes
<data>	Byte Stream	content of the file read

The returned file data is displayed as an ASCII string of <length> chars in the range [0x00,0xFF]. At the end of the string, <CR><LF> are provided for user convenience and visualization purposes.

In case a size larger than the whole file size is required the command returns the file size only, indicating the amount of bytes read.

In case an offset larger than the whole file size is required an ERROR message is triggered.

21 Audio parameters tuning commands

21.1 Introduction

The audio driver switches uplink and downlink audio paths. For example uplink path can be switched from handset microphone to headset microphone and downlink path can be switched from handset earpiece to loudspeaker (see 18.10 for more details). Every path includes a set of parameters that are loaded by the audio driver in the voiceband processing system; for example the uplink path can include the gain of the microphone that can be different for handset or headset microphone path.

For every audio path, the parameters can be changed by the following AT commands:

- AT+UHFP: Hands-Free Parameters
- AT+UMGC: Microphone Gain Control
- AT+USGC: Speaker Gain Control
- AT+USTN: Sidetone
- AT+UUBF: Uplink Biquad Filters
- AT+UDBF: Downlink Biquad Filters

Audio parameters configuration for all the audio paths can be stored in one of the two available user profiles in NVRAM (refer to AT&W command description).

Audio parameters in user profiles in NVRAM are managed by commands AT&W (it saves in profile 0 or profile 1), AT&F (it resets to factory profile), AT&Y (it selects user profile to be used after a hardware reset), ATZ (it reloads user profile).

AT&V command does not display audio parameters. Audio parameters can be displayed by the corresponding read command, for example AT+UMGC?.

Paragraphs below explain each audio parameters tuning command in detail.

To understand the position in the audio paths of parts affected by audio parameters, please refer to Figure 1 and Figure 2.

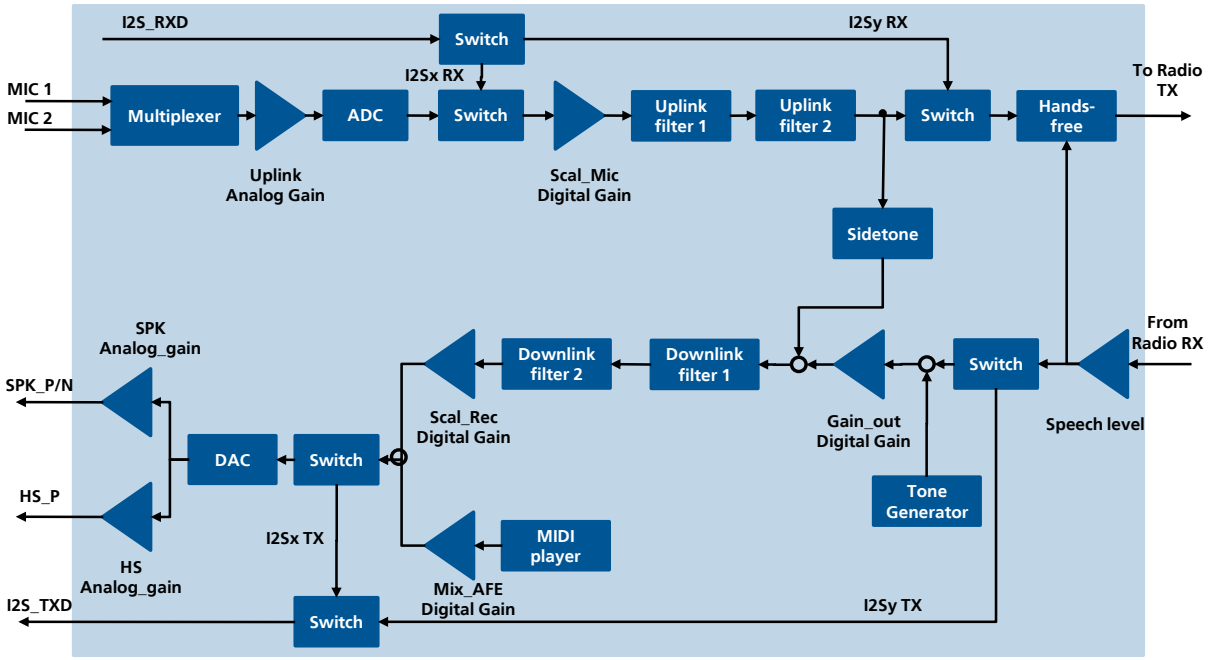


Figure 1: LEON-G100 / LEON-G200 series Audio Paths

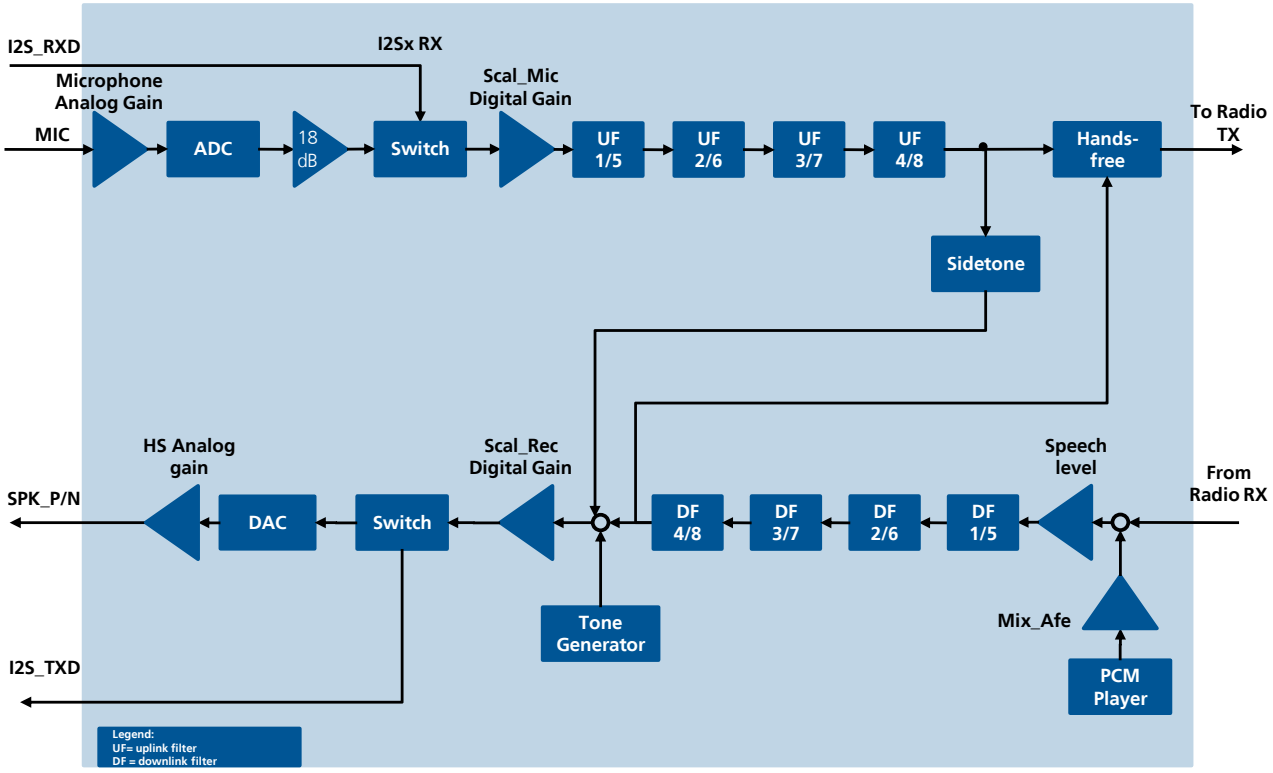


Figure 2: LISA-U120 / LISA-U130 Audio Paths

Audio parameters in the factory profile are stored in static NVRAM and can not be changed by the user.

Some parameter present on LEON-G100 / LEON-G200 are not available on LISA-U1 series but they are still maintained in the command for backward compatibility. In this case the 'NA' string appears in the test command; The NA parameter is not stored in the NVRAM.

Biquad filters indexes are for Narrow/Wide Band (e.g.: UF 1/5 is Uplink Filter 1 in Narrow Band, Uplink Filter 5 in Wide Band).

Speech Level is active on call only (no effect on PCM player if not in call)

E.g.:
AT+USGC?
+USGC:
Path 0:
NA,0,8192,16384,NA

The range of some parameters on LISA is extended respect to LEON-G100 / LEON-G200 series:
E.g: <filter_number> in +UUBF,+UDBF commands.

On LISA-U1 series some commands support new parameters. In this case these parameters are optional, for back compatibility.
E.g.:
<ec_nr_coeff_real> in +UHFP command.

21.2 Microphone Gain (Microphone Gain Control) +UMGC

21.2.1 Description

Changes the uplink path gain. See note 20.7.2 for impact on echo canceller.

Type	Syntax	Response	Example
Set	AT+UMGC=<uplink_path_num>,<analog_gain>, <digital_gain>	OK	AT+UMGC=1,12,16000 OK
Read	AT+UMGC?	+UMGC: Path <uplink_path_num>: <analog_gain >,<digital_gain> […] (for all the supported path) OK	+UMGC: Path 0: 10,9384 Path 1: 12,8192 Path 2: 6,8192 OK
Test	AT+UMGC=?	+UMGC: (list of supported <uplink_path_num>s),(list of supported <analog_gain>s),(list of supported <digital_gain>s) OK	+UMGC: (0-2),(0-14),(0-32767) OK

21.2.2 Defined Values

Parameter	Type	Description
<uplink_path_num>	Number	• 0: handset_mic • 1: headset_mic • 2: I2S_rx • 3. not supported • 4: hands-free microphone
<analog_gain>	Number	Gain for analog audio front end amplifier • range: 0 - 14: (0=0 dB; 14=42 dB; 3 dB/step)
<digital_gain>	Number	Gain for Scal_mic digital amplifier • range: 0 – 32767: (8192 = 0 dB; 32767=12 dB; linear)

<uplink_path_num>=4 is not supported on LEON-G100/G200 series.

Not all paths are supported. Check for allowed uplink_path_num in the test command response.

For the position of amplifiers in the audio path, please refer to the block diagram in the chapter 21.1.

Any change in the gain on uplink or downlink path impacts on the amount of echo fed back from the speaker to the microphone. This means that performance of EC algorithm could change and rxtx_relation parameter could need to be changed to better fit new gain on uplink or downlink path. Refer to +UHFP command.

21.3 Speaker Gain (Speaker Gain Control) +USGC

21.3.1 Description

Changes the downlink path gain. See 20.7.2 note for impact on echo canceller.

Type	Syntax	Response	Example
Set	AT+USGC=<downlink_path_num>[,<SPK_analog_gain>],<HS_analog_gain>,<scal_rec>,<Mix_afe>[,<Gain_out>]	OK	AT+USGC=0,6,6,16000,16000,22000 OK
Read	AT+USGC?	+USGC: Path<downlink_path_num>: <SPK_analog_gain>,<HS_analog_gain>,<scal_rec>, <Mix_afe>,<Gain_Out> […] (for all the supported path) OK	+USGC: Path 0: 6,6,16000,16000,22000 Path 1: 6,0,8192,16384,10240 Path 3: 0,6,8192,16384,8191 Path 4: 6,6,8192,16384,8191 OK
Test	AT+USGC=?	+USGC: (list of supported <downlink_path_num>s),(list of supported <SPK_analog_gain>s),(list of supported <HS_analog_gain>s),(list of supported <scal_rec>s),(list of supported <Mix_afe>s),(list of supported <Gain_out>s) OK	+USGC: (0,1,3,4),(0-6),(0-6),(0-32767),(0-32767),(0-32767) OK

21.3.2 Defined Values

Parameter	Type	Description
<downlinkpath_num>	Number	Specifies the downlink path that should change the gains • 0: normal_earpiece • 1: mono_headset • 3: backspeaker • 4: I2S_TX
<SPK_analog_gain>	Number	gain of analog audio amplifier for SPK_P/SPK_N output • range: 0 – 6: (-3 dB/step; 0=+9 dB to 6= -9 dB)
<HS_analog_gain>	Number	gain of analog audio amplifier for HS_P output • range: 0 – 6: (-3 db/step; 0=0 dB to 6= -18 dB)
<scal_rec>	Number	gain for the digital amplifier Scal_rec (speech and Tone Generator) • range: 0 – 32767: (8192=0 dB; 32767=12 dB; linear)
<Mix_afe>	Number	gains for the digital amplifier Mix_afe (synthesizers) • range: 0 – 32767: (16384=0 dB; 32767=6 dB; linear)
<Gain_out>	Number	gain for the digital amplifier Gain_Out (speech) • range: 0 – 32767: (8192=0 dB; 32767=12 dB; linear)

<SPK_analog_gain>, <Gain_out> are unused and not mandatory on LISA.

Not all paths are supported.

The <HS_analog_gain> parameter is unused on LISA-U1 series.

For the position of amplifiers in the audio path, please refer to the block diagram in the chapter 21.1.

Any change in the gain on uplink or downlink path impacts on the amount of echo fed back from the speaker to the microphone. This means that performance of EC algorithm could change and rxtx_relation parameter could need to be changed to better fit new gain on uplink or downlink path. Refer to +UHFP command (21.7).

21.4 Sidetone (SideToNe) +USTN

21.4.1 Description

Changes the sidetone gain for a specific downlink path. Sidetone is a part of the user's speech on uplink path that should be listened on downlink path by the user himself to have perception the call is on.

Type	Syntax	Response	Example
Set	AT+USTN=<downlink_path_num>,<sidetone_gain>	OK	AT+USTN=1,1000 OK
Read	AT+USTN?	+USTN: Path<downlink_path_num>: <sidetone_gain > […] (all the supported path) OK	+USTN: Path 0: 2249 Path 1: 2249 ……. OK
Test	AT+USTN=?	+USTN: (list of supported <downlink_path_num>s),(list of supported <sidetone_gain>s) OK	+USTN: (0,1,3,4),(0-32767) OK

21.4.2 Defined Values

Parameter	Type	Description
<downlink_path_num>	Number	Specifies the downlink path that should change the sidetone • 0: normal_earpiece • 1: mono_headset • 3: backspeaker • 4: I2S_TX
<sidetone_gain>	Number	gain for Side_Tone digital amplifier • range: 0 – 32767: (16384=0 dB; 32767=6 dB; linear)

Not all paths are supported.

For the position of sidetone gain in the audio path, please refer to the block diagram in the chapter 21.1.

21.5 Uplink Digital Filters (Uplink Biquad Filters) +UUBF

21.5.1 Description

Changes the digital audio filters parameters for a specific uplink path.

Type	Syntax	Response	Example
Set	AT+UUBF=<uplinkpath_num>,<filter_number>,<a1>,<b1>,<a2>,<b2>,<a0>	OK	AT+UUBF=0,1, -13915,2249,4377, -325,23450 OK
Read	AT+UUBF?	+UUBF: Path =<uplinkpath_num>: Filter1: a1:<a1>, b1:<b1>, a2:<a2>, b2:<b2>, a0:<a0> Filter2: a1:<a1>, b1:<b1>, a2:<a2>, b2:<b2>, a0:<a0> Filter3: a1:<a1>, b1:<b1>, a2:<a2>, b2:<b2>, a0:<a0> Filter4: a1:<a1>, b1:<b1>, a2:<a2>, b2:<b2>, a0:<a0> […] (for all the supported paths) OK	On LEON: +UUBF: Path 0: Filter1: a1:-13915, b1:2249, a2:4377, b2:-325, a0:23450 Filter2: a1:21682, b1:-2312, a2:17984, b2:-15517, a0:32767 [repeated for each path]OK On LISA: +UUBF: Path 0: Filter1: a1:0, b1:0, a2:0, b2:0, a0:32767 Filter2: a1:0, b1:0, a2:0, b2:0, a0:32767 Filter3: a1:0, b1:0, a2:0, b2:0, a0:32767 Filter4: a1:0, b1:0, a2:0, b2:0, a0:32767 Filter5: a1:0, b1:0, a2:0, b2:0, a0:32767 Filter6: a1:0, b1:0, a2:0, b2:0, a0:32767 Filter7: a1:0, b1:0, a2:0, b2:0, a0:32767 Filter8: a1:0, b1:0, a2:0, b2:0, a0:32767 [repeated for each path] OK

Type	Syntax	Response	Example
Test	AT+UUBF=?	+UUBF: (list of supported <uplinkpath_num>s),(list of supported <filter_number>s),(list of supported <a1>s),(list of supported <b1>s),(list of supported <a2>s),(list of supported <b2>s),(list of supported <a0>s) OK	On LEON: +UUBF: (0-2),(1-2),(-32768:32767),(-32768:32767),(-32768:32767),(-32768:32767),(-32768:32767) OK On LISA: +UUBF: (0-2,4),(1-8),(-32768:32767),(-32768:32767),(-32768:32767),(-32768:32767),(-32768:32767) OK

21.5.2 Defined Values

Parameter	Type	Description
<uplink_path_num>	Number	• 0: handset_mic • 1: headset_mic • 2: I2S_rx • 3. not supported • 4: hands-free microphone
<filter_number>	Number	LEON-G100 / LEON-G200 series Two digital biquad filters in cascade are available for each uplink path (Filter1, Filter2). refer to Figure 1 for filter position The range goes from 1 to 2 LISA-U1 series Four digital biquad filters in cascade are available for each uplink path (Filter1, Filter2). Refer to Figure 2 for filter position. Filter 1-4 are used for Narrow Band (8 kHz sampling rate speech). Filter 1-5 are used for Wide Band (16 kHz sampling rate speech). The range goes from 1 to 8
<a1>,<b1>,<a2>,<b2>,<a0>	Number	These parameters are the biquad filter coefficient. The range goes from -32768 to 32767

☞ <uplink_path_num>=4 is not supported on LEON-G100/G200 series.

☞ Not all paths are supported.

☞ The biquad filter transfer function is

$$H(z) = \frac{A_0 + 2A_1 z^{-1} + A_2 z^{-2}}{1 + 2B_1 z^{-1} + B_2 z^{-2}}$$

with coefficients A_0, A_1, A_2, B_1, B_2 in the range -1:1

Command parameters are filter coefficents scaled in the range that goes from -32768 to 32767

- <a1>=32767 * A_1
- <b1>=32767 * B_1
- <a2>=32767 * A_2
- <b2>=32767 * B_2
- <a0>=32767 * A_0

Consider in the calculus of coefficients sampling rate that:

On LEON:

- 8 kHz

On LISA:

- 8 kHz for Narrow Band Filters (<filter_number>= (1-4))
- 16 kHz for Wide Band Filters (<filter_number>= (5-8))

Example:

Set both headset microphone filters to all pass:
In this case the biquad filter transfer function is
H(z)=1
Then the coefficients are
A0=1
A1=A2=B1=B2=0
Thus parameters are : <a1>=0 ,<b1> =0 ,<a2>=0 ,<b2>= 0 ,<a0>=32767
Commands are:
AT+UUBF=1,1, 0,0,0,0, 32767
AT+UUBF=1,2, 0,0,0,0, 32767

For the position of the filters in the audio path, please refer to the block diagram in the chapter 21.1.

21.6 Downlink Digital Filters (Downlink Biquad Filters) +UDBF

21.6.1 Description

Change the digital audio filters parameters for a specific downlink path.

Type	Syntax	Response	Example
Set	AT+UDBF=<downlinkpath_num>,<filter_number>,<a1>,<b1>,<a2>,<b2>,<a0>	OK	AT+UDBF=0,1, -13915,2249,4377, -325,23450 OK

Type	Syntax	Response	Example
Read	AT+UDBF?	+UDBF: Path =<downlinkpath_num>: Filter1: a1:<a1>, b1:<b1>, a2:<a2>, b2:<b2>, a0:<a0> Filter2: a1:<a1>, b1:<b1>, a2:<a2>, b2:<b2>, a0:<a0> Filter3: a1:<a1>, b1:<b1>, a2:<a2>, b2:<b2>, a0:<a0> Filter4: a1:<a1>, b1:<b1>, a2:<a2>, b2:<b2>, a0:<a0> […] (for all the supported paths) OK	On LEON: +UDBF: Path 0: Filter1: a1:0, b1:0, a2:0, b2:0, a0:32767 Filter2: a1:0, b1:0, a2:0, b2:0, a0:32767 [repeated for each path] OK On LISA: +UDBF: Path 0: Filter1: a1:0, b1:0, a2:0, b2:0, a0:32767 Filter2: a1:0, b1:0, a2:0, b2:0, a0:32767 Filter3: a1:0, b1:0, a2:0, b2:0, a0:32767 Filter4: a1:0, b1:0, a2:0, b2:0, a0:32767 Filter5: a1:0, b1:0, a2:0, b2:0, a0:32767 Filter6: a1:0, b1:0, a2:0, b2:0, a0:32767 Filter7: a1:0, b1:0, a2:0, b2:0, a0:32767 Filter8: a1:0, b1:0, a2:0, b2:0, a0:32767 [repeated for each path] OK
Test	AT+UDBF=?	+UDBF: (list of supported <downlinkpath_num>s),(list of supported <filter_number>s),(list of supported <a1>s),(list of supported <b1>s),(list of supported <a2>s),(list of supported <b2>s),(list of supported <a0>s) OK	On LEON: +UDBF: (0,1,3,4),(1-2),(-32768:32767),(-32768:32767),(-32768:32767),(-32768:32767),(-32768:32767) OK On LISA: +UDBF: (0,1,3,4),(1-8),(-32768:32767),(-32768:32767),(-32768:32767),(-32768:32767),(-32768:32767) OK

21.6.2 Defined Values

Parameter	Type	Description
<downlinkpath_num>	Number	Specifies the downlink path that should change the sidetone • 0: normal_earpiece • 1: mono_headset • 3: backspeaker • 4: I2S_TX
<filter_number>	Number	LEON-G100 / LEON-G200 series Two digital biquad filters in cascade are available for each uplink path (Filter1, Filter2). refer to Figure 1 for filter position The range goes from 1 to 2 LISA-U1 series Four digital biquad filters in cascade are available for each downlink path (Filter1, Filter2). Refer to Figure 2 for filter position. Filters 1-4 are used for Narrow Band (8 kHz sampling rate speech). Filters 1-5 are used for Wide Band (16 kHz sampling rate speech). The range goes from 1 to 8
<a1>,<b1>,<a2>,<b2>,<a0>	Number	These parameters are the biquad filter coefficient. The range goes from -32768 to 32767

☞ Not all paths are supported.

☞ The biquad filter transfer function is

$$H(z) = \frac{A_0 + 2A_1 z^{-1} + A_2 z^{-2}}{1 + 2B_1 z^{-1} + B_2 z^{-2}}$$

with coefficients A_0, A_1, A_2, B_1, B_2 in the range -1:1
Command parameters are filter coefficents scaled in the range that goes from -32768 to 32767

- <a1>=32767 * A_1
- <b1>=32767 * B_1
- <a2>=32767 * A_2
- <b2>=32767 * B_2
- <a0>=32767 * A_0

Consider in the calculus of coefficients sampling rate that:
On LEON-G100 LEON-G200 series:

- 8 kHz

On LISA-U1 series:

- 8 kHz for Narrow Band Filters (<filter_number>= (1-4))
- 16 kHz for Wide Band Filters (<filter_number>= (5-8))

Example:

Set both loudspeaker filters to all pass:
In this case the biquad filter transfer function is
H(z)=1
Then the coefficients are
A0=1
A1=A2=B1=B2=0
Thus parameters are: <a1>=0 ,<b1> =0 ,<a2>=0 ,<b2>= 0 ,<a0>=32767
Commands are:
AT+UDBF=3,1,0,0,0,0, 32767
AT+UDBF=3,2,0,0,0,0, 32767

☞ For the position of the filters in the audio path, please refer to the block diagram in the chapter 21.1.

21.7 Hands-Free Parameters (Hands-Free Parameters) +UHFP

21.7.1 Description

Changes the parameters that control the Hands-Free audio application for a specific uplink path. Hands-Free application consists distinct operating parts:

- Echo Canceller (EC)
- Automatic Gain Control (AGC)
- Noise Reduction (NR)

The HF algorith tuning has been described in detail in a dedicated application note, “Procedure for HF algorithm tuning”. Description of parameter reported in this document is summarized. A more detailed description is reported in the Application Note [47].

The command syntax differs between LEON-G100 / LEON-G200 series and LISA-U1 series. In chapter 21.7.2 21.7.4 the different descriptions are provided.

21.7.2 Command syntax for LEON-G100/G200 series

Type	Syntax	Response	Example
Set	AT+UHFP=<uplink_path_num>,<hf_algorithm_init>[,<hf_algorithm_restart>[,<step_width>[,<lms_length>[,<lms_offset>[,<block_length>[,<rxtx_relation>]]]]]], <add_atten>,<min_atten>,<max_atten>,<nr_sw_2>,<nr_u_fak_0>,<nr_u_fak>	OK	AT+UHFP=1,0x01FD,0x016E,2200,250,3,5,150,0,0,500,4096,16384,16384 OK
Read	AT+UHFP?	+UHFP: Path <uplink_path_num>: HF_algorithm_init:<hf_algorithm_init>, HF_Algorithm_Restart:<hf_algorithm_restart>, Step_Width:<step_width>, LMS_Length:<lms_length>,LMS_Offset:<lms_offset>, Block_Length:<block_length>, RXTX_Relation:<rxtx_relation>, Add_Atten:<add_atten>, Min_Atten:<min_atten>, Max_Atten:<max_atten>, NR_sw_2:<nr_sw_2>,NR_u_fak_0:<nr_u_fak_0>, NR_u_fak:<nr_u_fak> […] (for all the supported paths) OK	+UHFP: Path 0: HF_algorithm_init:0x01fd, HF_Algorithm_Restart:0x016e, Step_Width:2200, LMS_Length:250, LMS_Offset:3, Block_Length:5, RXTX_Relation:150, Add_Atten:0, Min_Atten:0, Max_Atten:500, NR_sw_2:4096, NR_u_fak_0:16384, NR_u_fak:16384 Path 1: HF_algorithm_init:0x01fd, HF_Algorithm_Restart:0x016e, Step_Width:2200, LMS_Length:250, LMS_Offset:3, Block_Length:5, RXTX_Relation:150, Add_Atten:0, Min_Atten:0, Max_Atten:500, NR_sw_2:4096, NR_u_fak_0:16384, NR_u_fak:16384 Path 2: HF_algorithm_init:0x01fd, HF_Algorithm_Restart:0x016e, Step_Width:2200, LMS_Length:250, LMS_Offset:8, Block_Length:5, RXTX_Relation:150, Add_Atten:0, Min_Atten:0, Max_Atten:500, NR_sw_2:4096, NR_u_fak_0:16384, NR_u_fak:16384 OK

Type	Syntax	Response	Example
Test	AT+UHFP=?	+UHFP: (list of supported <uplink_path_num>s),(list of supported <hf_algorithm_init>s),(list of supported <hf_algorithm_restart>s),(list of supported <step_width>s),(list of supported <lms_length>s),(list of supported <lms_offset>s), (list of supported <block_length>s),(list of supported <rxtx_relation>s),(list of supported <add_atten>s),(list of supported <min_atten>s),(list of supported <max_atten>s),(list of supported <nr_sw_2>s),(list of supported <nr_u_fak_0>s),(list of supported <nr_u_fak>s) OK	+UHFP: (0-2),(0x0000-0x01FF),(0x0000-0x01FF),(0:32767),(2:400),(0:400),(2,4,5,8),(-960:+960),(0:960),(0:960),(0:960),(0:32767),(0:16384),(0:16384) OK

21.7.3 Defined Values for LEON-G100/G200 series

Parameter	Type	Description
<uplink_path_num>	Number	• 0: handset_mic • 1: headset_mic • 2: I2S_rx
<hf_algorithm_init>	Number	The SWITCH parameter controls the activity and initialization of the EC,AGC,NR blocks • Bit #0 set: Echo Canceller (EC) initialization • Bit #1 set: EC restart (without coefficient initialization) • Bit #2 set: EC on • Bit #3 set: EC adaptation on • Bit #4 set: Noise reduction initialization • Bit #5 set: Noise reduction on • Bit #6 set: Noise reduction works with additional AGC • Bit #7 set: Automatic Gain Control (AGC) initialization • Bit #8 set: AGC on Setting the bits is not mutually exclusive; more than one bit can be set at the same time. • Range: 0x0000 to 0x01FF
<hf_algorithm_restart>	Number	This bit mask allows to restart the activity of the EC,AGC,NR blocks without initialization. For bit map refer to <hf_algorithm_init>. Used when the algorithm is restarted automatically by the driver (i.e. after and handover) • Range: 0x0000 to 0x01FF
<step_width>	Number	The higher this value, the faster the echo characteristic gets adapted. Limit: <step_width>*<block_length><=2*32767 Range: 0 to 32767
<lms_length>	Number	Maximum impulsive response of the FIR filter considered by the adaptive LMS algorithm, in samples. (Max time length: 400*Ts=50ms) Limit: 2<= <lms_length>+ <lms_offset><=400 (DSP memory limit) Range: 2 to 400
<lms_offset>	Number	This parameter is used by the LMS adaptation algorithm and indicates the expected delay of the echo after the RX signal, in samples. Range: 0 to 400
<block_length>	Number	LMS coefficent adaptation block length. The higher this number, the slower but more accurate the adaptation converges Allowed values are: 2,4,5,8
<rxtx_relation>	Number	Checks the power relation between Rx (loudspeaker) and Tx (microphone) signals in order to recognize the double talk condition from the echo condition. The system is considered to be in double talk condition when the TX power

Parameter	Type	Description
		(mic signal) is higher that the maximum expected echo power: Tx(dB) > Rx (dB) - RxTx(dB) with RxTx(dB)= <rxtx_relation>*3/32 This is the most critical parameter in hands-free. Values typical for handset are in range 50 to 150. For backspeaker: -100 to -400. When in double talk, adaptation of FIR and AGC are suspended. Range: -960 to 960
<add_atten>	Number	When AGC decides to attenuate, <add_atten> is added to the calculated attenuation. • Attenuation Level(dB)=3/32* <add_atten> • Range: 0 to 960
<min_atten>	Number	Minimal attenuation of the mic signal allowed for the AGC. • Attenuation Level (dB)=3/32* <min_atten> • Range: 0 to 960
<max_atten>	Number	Maximal attenuation of the mic signal allowed for the AGC. • Attenuation Level (dB)=3/32* <max_atten> • Range: 0 to 960
<nr_sw_2>	Number	Max NR attenuation. Linear; 32767 means 1 (0 dB) • Ex. 16384= 0.5 = -6 dB • Range: 0 to 32767
<nr_u_fak_0>	Number	Factor of NR in the band 0 (0 Hz - 250 Hz). • Linear; 16384 means 1 (0 dB) • Range: 0 to 16384
<nr_u_fak>	Number	Factor of NR in the bands 1 to 7 (250 Hz - 3750 Hz). • Linear; 16384 means 1 (0 dB) • A factor lower than 1 causes a better NR but also speech distortion and lowering of SLR. • Range: 0 to 16384

Examples:

1. SWITCH =0x01FD =bin 000111111101 means EC initialized and on, EC adaptation on, Noise reduction initialized and on, Automatic Gain Control initialized and on,used with NR
2. SWITCH =0x016E =bin 000101101110 means EC on, EC adaptation on, EC restart Noise reduction on, Automatic Gain Control on and working with NR.
3. SWITCH =0x0000 means EC ,AGC and NR all off.
4. Calculation of <lms_offset>

Sample period T= 1/8000 s= 125 µs	Loudspeaker to mic distance on a phone: L= 10 cm
Sound velocity V=340 m/s	Delay of echo: D =L/V = 0.1/ 340 = 294 µs
Number of samples=D/T= 2.35 -->	LMS_OFFSET =2

Important note: Any change in the gain on uplink or downlink path impacts on the amount of echo fed back from the speaker to the microphone. This means that performance of EC algorithm could change and rxtx_relation parameter could need to be changed to better fit new gain on uplink or downlink path.

21.7.4 Command syntax for LISA-U1 series

Type	Syntax	Response	Example
Set	AT+UHFP=<uplink_path_num>,<hf_algorithm_init>[,<hf_algorithm_restart>[,<step_width>[,<lms_length>[,<lms_offset>[,<block_length>[,<rxtx_relation>]]]]]], <add_atten>,<min_atten>,<max_atten>,<nr_sw_2>,<nr_u_fak_0>,<nr_u_fak>>[,<ec_block_length>[, <ec_nr_coeff_real> [, <ec_nr_coeff_complex1>[,<ec_nr_coeff_complex2>[,<ec_nr_coeff_complex3>[,<ec_nr_coeff_complex4>[,<ec_nr_coeff_complex5>]]]]]])	OK	AT+UHFP=1,0x01Fd,,,,,,0,50,450,8000,7000,7000,4,220,220,220,100,100,100
Read	AT+UHFP?	+UHFP: Path <uplink_path_num>: HF_algorithm_init:<hf_algorithm_init>, HF_Algorithm_Restart:NA, Step_Width:NA, LMS_Length:NA, LMS_Offset:NA, Block_Length:NA, RXTX_Relation:NA,Add_Atten:<add_atten>, Min_Atten:<min_atten>, Max_Atten:<max_atten>, NR_sw_2:<nr_sw_2>,NR_u_fak_0:<nr_u_fak_0>, NR_u_fak:<nr_u_fak>,<ec_block_length>, ec_nr_coeff_real>, <ec_nr_coeff_complex1>,<ec_nr_coeff_complex2>,<ec_nr_coeff_complex3>,<ec_nr_coeff_complex4>,<ec_nr_coeff_complex5> […] (for all the supported paths) OK	+UHFP: Path 0: HF_algorithm_init:0x01fd, HF_Algorithm_Restart:NA, Step_Width:NA, LMS_Length:NA, LMS_Offset:NA, Block_Length:NA, RXTX_Relation:NA, Add_Atten:0, Min_Atten:0, Max_Atten:500, NR_sw_2:8192, NR_u_fak_0:7500, NR_u_fak:7500, EC_block_length:2, EC_nr_coeff_real:100, EC_nr_coeff_complex1:100, EC_nr_coeff_complex2:100, EC_nr_coeff_complex3:60, EC_nr_coeff_complex4:60, EC_nr_coeff_complex5:60 […] (for all the supported paths) OK
Test	AT+UHFP=?	+UHFP: (list of supported <uplink_path_num>s),(list of supported <hf_algorithm_init>s),(list of supported <hf_algorithm_restart>s),(list of supported <step_width>s),(list of supported <lms_length>s),(list of supported <lms_offset>s), (list of supported <block_length>s),(list of supported <rxtx_relation>s),(list of supported <add_atten>s),(list of supported <min_atten>s),(list of supported <max_atten>s),(list of supported <nr_sw_2>s),(list of supported <nr_u_fak_0>s),(list of supported <nr_u_fak>s),(list of supported <ec_block_length>s), (list of supported<ec_nr_coeff_real>s), (list of supported <ec_nr_coeff_complex1>s), (list of supported <ec_nr_coeff_complex2>s), (list of supported <ec_nr_coeff_complex3>s), (list of supported <ec_nr_coeff_complex4>s), (list of supported <ec_nr_coeff_complex5>s), OK	+UHFP: (0-2,4),(0x0000-0x07FF),(0x0000-0x07FF),(0:32767),(2:400),(0:400),(2,4,5,8),(-960:960),(-960:960),(0:960),(0:960),(0:32767),(0:16384),(0:16384),(1,2,4,5,8),(2:1100),(1:1100),(1:1100),(1:1100),(1:1100),(1:1100) OK

21.7.5 Defined Values

Parameter	Type	Description
<uplink_path_num>	Number	• 0: handset_mic • 1: headset_mic • 2: I2S_rx • 3: not supported • 4: hands-free microphone
<hf_algorithm_init>	Number	The SWITCH parameter controls the activity and initialization of the EC,AGC,NR blocks • Bit #0 set: Echo Canceller (EC) initialization • Bit #1 set: EC restart (without coefficient initialization) • Bit #2 set: EC on • Bit #3 set: Unused • Bit #4 set: Noise reduction initialization • Bit #5 set: Noise reduction on • Bit #6 set: Unused • Bit #7 set: Automatic Gain Control (AGC) initialization • Bit #8 set: AGC on • Bit #9 set: Dynamic Echo Suppression INIT • Bit #10 set: Dynamic Echo Suppression ACTIVE Setting the bits is not mutually exclusive; more than one bit can be set at the same time.
<hf_algorithm_restart>	Number	Not Available. 'NA' appears in the Test command. In the Set command, the range is checked but the value is not used Range: 0x0000 to 0x07FF
<step_width>	Number	Not Available. 'NA' appears in the Test command. • In the Set command, the range is checked but the value is not used. • Range: 0 to 32767
<lms_length>	Number	Not Available. • 'NA' appears in the Test command. • In the Set command, the range is checked but the value is not used. • Range: 2 to 400
<lms_offset>	Number	Not Available. • 'NA' appears in the Test command. • In the Set command, the range is checked but the value is not used. • Range: 0 to 400
<block_length>	Number	Not Available. • 'NA' appears in the Test command. • In the Set command, the range is checked but the value is not used. • Allowed values: 2,4,5,8
<rxtx_relation>	Number	Not Available. • 'NA' appears in the Test command. • In the Set command, the range is checked but the value is not used. • Range : -960 to 960
<add_atten>	Number	When AGC decides to attenuate, <add_atten> is added to the calculated attenuation. • Attenuation Level(dB)=0,05* <add_atten> • Range: -960 to 960
<min_atten>	Number	Minimal attenuation of the mic signal allowed for the AGC. • Attenuation Level(dB)=0,05* <min_atten> • Range: 0 to 960
<max_atten>	Number	Maximal attenuation of the mic signal allowed for the AGC. • Attenuation Level(dB)=0,05* <max_atten> • Range: 0 to 960

Parameter	Type	Description
<nr_sw_2>	Number	Max NR attenuation. Linear; 32767 means 1 (0 dB) • Ex. 16384= 0.5 = -6 dB • Range: 0 to 32767
<nr_u_fak_0>	Number	Factor of NR in the band 0 (0 Hz - 500 Hz). • Linear; 16384 means 1 (0 dB) • Range: 0 to 16384
<nr_u_fak>	Number	Factor of NR in the higher bands (–f > 500 Hz). • Linear; 16384 means 1 (0 dB) • A factor lower than 1 causes a better NR but also speech distortion and lowering of SLR. • Range: 0 to 16384
<ec_block_length>	Number	LMS coefficent adaptation block length. The higher this number, the slower but more accurate the adaptation converges Allowed values are: 1,2,4,5,8
<ec_nr_coeff_real>	Number	Number of coefficients of the filter in the sub-band EC , forreal sub band (in Narrow Band mode: 0-0.8 kHz in Wide Band mode: 0-0.73 kHz) • Range: 2 to 1100 Limit: <ec_nr_coeff_real>+2*(<ec_nr_coeff_complex1>+<ec_nr_coeff_complex2>+<ec_nr_coeff_complex3>+ <ec_nr_coeff_complex4>+ <ec_nr_coeff_complex51>) <2000
<ec_nr_coeff_complex1>	Number	Number of coefficients of the filter in the sub-band EC, for complex sub band 1 (in Narrow Band mode: 0.8-2.4 kHz; in Wide Band mode: 0.73 -2.18 kHz) Range: 1 to 1100
<ec_nr_coeff_complex2>	Number	Number of coefficients of the filter in the sub-band EC, for complex sub band 2 (in Narrow Band mode: 2.4- 4 kHz; in Wide Band mode: 2.18 -3.64 kHz) Range:1 to 1100
<ec_nr_coeff_complex3>	Number	Number of coefficients of the filter in the sub-band EC, forcomplex sub band 3 (in Narrow Band mode: Ignored; in Wide Band mode: 3.64 - 5.09 kHz) Range: 1 to 1100
<ec_nr_coeff_complex4>	Number	Number of coefficients of the filter in the sub-band EC, forcomplex sub band 4 (in Narrow Band mode: Ignored; in Wide Band mode: 5.09 - 6.56 kHz) Range: 1 to 1100
<ec_nr_coeff_complex5>	Number	Number of coefficients of the filter in the sub-band EC, forcomplex sub band 5 (in Narrow Band mode: Ignored; in Wide Band mode: 6.56 - 8 kHz) Range: 1 to 1100

<hf_algorithm_restart>, <step_width>, <lms_length>, <lms_offset>, <block_length> ,<rxtx_relation> parameters are mantained for back compatibility with LEON-G100 / LEON-G200 series; they are not used and optional for LISA-U1 series.

Examples:

SWITCH =0x01FD =bin 000111111101 means EC initialized and on, Noise reduction initialized and on, Automatic Gain Control initialized and on

SWITCH =0x0000 means EC ,AGC and NR all off.

Important note: Any change in the gain on uplink or downlink path impacts on the amount of echo fed back from the speaker to the microphone. This means that performance of Hands-Free algorithm could change and parameters could need to be changed to better fit new gain on uplink or downlink path.

22 Data Connection Setup AT Commands

2G modules provide access to networking services (DNS, TCP/IP, FTP, HTTP, SMTP) by means of several proprietary AT commands which implemement Data Connection Management (DCM) for both packet switched (GPRS) and circuit switched (GSM) data services. Since there is no intrinsic association between bearers (GPRS and CSD) and data channels (TCP/IP sockets, DNS service, FTP, HTTP, SMTP) a great flexibility is ensured: several TCP/IP sockets can be managed independently and simultaneously over the same bearer and it is easy to associate networking services and connections.

The AT commands described in this paragraph define the parameters of PSD and CSD connection, and activate and deactivate PSD and CSD connections. Networking services such as TCP/IP sockets, FTP, HTTP and SMTP clients can be started by the commands detailed in paragraphs "TCP/IP AT Commands", "FTP AT Commands", "HTTP AT Commands" and "SMTP AT Commands".

22.1 Packet Switched Data +UPSD

22.1.1 Description

Sets or gets the value of the specified parameter in a specific GPRS packet switched data (PSD) profile, or reads all parameters of the given GPRS profile, and lists them in separated lines.

☞ The parameter values set with this command are volatile, but the whole profile can be stored in NVM with AT+UPSDA command.

☞ The command should be used to set up the PDP context parameters for an internal context, i.e. a data connection using the internal IP stack and related AT commands for sockets.

Type	Syntax	Response	Example
Set	PSD Set command AT+UPSD=<profile_id>,<param_tag>,<param_val>	OK	AT+UPSD=0,1,"apn.provider.com" OK
	PSD Get command AT+UPSD=<profile_id>, <param_tag>	+UPSD: <profile_id>,<param_tag>, <param_val> OK	AT+UPSD=0,1 +UPSD: 0,1,"apn.provider.com" OK
	PSD Get All command AT+UPSD=<profile_id>	+UPSD: <profile_id>,0,<param_val0> +UPSD: <profile_id>,1,<param_val1>… +UPSD: <profile_id>,x, <param_valx>	AT+UPSD=0 +UPSD: 0,0,0 +UPSD: 0,1,"apn.provider.com" +UPSD: 0,2,"username" +UPSD: 0,4,"0.0.0.0" … +UPSD: 0,19,0 OK

22.1.2 Defined Values

Parameter	Type	Description
<profile_id>	Number	PSD profile identifier, in range 0-6

<param_tag>	Number	• 0: Protocol type (<param_val> is 0)
		  ○ 0: (Ipv4)
		  ○ 1: (Ipv6); this value is currently reserved for future use (RFU)
		• 1: APN - <param_val> is defined by the text string of APN, e.g. "apn.provider.com"; the maximum length is 100

Parameter	Type	Description

		• 2: Username - <param_val> is the user name text string for the authentication phase
		• 3: Password - <param_val> is the password text string for the authentication phase. Note: the AT+UPSD Get command with <param_tag> = 3 is not allowed and the Get all command does not display it
		• 4: DNS1 - <param_val> is the text string of the primary DNS address in dotted decimal notation form (i.e. four numbers in range 0-255 separated by periods, e.g. "xxx.yyy.zzz.www")
		• 5: DNS2 - <param_val> is the text string of the secondary DNS address in dotted decimal notation form (i.e. four numbers in range 0-255 separated by periods, e.g. "xxx.yyy.zzz.www")
		• 6: Authentication - <param_val> selects the authentication type:
		  ○ 0: none
		  ○ 1: PAP
		  ○ 2: CHAP
		• 7: IP address - <param_val> is the text string of the static IP address given by the ISP in dotted decimal notation form (i.e. four numbers in range 0-255 separated by periods, e.g. "xxx.yyy.zzz.www"). Note: IP address set as "0.0.0.0" means dynamic IP address assigned during PDP context activation
		• 8: Data compression - <param_val> enables/disables (1/0) data compression
		• 9: Header compression - <param_val> enables/disables (1/0) header compression
		• 10: QoS precedence - <param_val> selects the precedence class:
		  ○ 0: subscribed
		  ○ 1: high
		  ○ 2: normal
		  ○ 3: low
		• 11: QoS delay - <param_val> selects the delay class:
		  ○ 0: subscribed
		  ○ 1: class 1
		  ○ 2: class 2
		  ○ 3: class 3
		  ○ 4: best effort
		• 12: QoS reliability - <param_val> selects the reliability class:
		  ○ 0: subscribed
		  ○ 1: class 1 (GTP Ack, LLC Ack and Protected, RLC Ack)
		  ○ 2: class 2 (GTP Unack, LLC Ack and Protected, RLC Ack)
		  ○ 3: class 3 (GTP Unack, LLC Unack and Protected, RLC Ack)
		  ○ 4: class 4 (GTP Unack, LLC Unack and Protected, RLC Unack)
		  ○ 5: class 5 (GTP Unack, LLC Unack and Unprotected, RLC Unack)
		• 13: QoS peak rate - <param_val> selects the peak throughput in range 0-9
		• 14: QoS mean rate - <param_val> selects the mean throughput in range 0-18, 31
		• 15: Minimum QoS precedence - <param_val> selects the acceptable value for the precedence class:
		  ○ 0: subscribed
		  ○ 1: high
		  ○ 2: normal
		  ○ 3: low
		• 16: Minimum QoS delay - <param_val> selects the acceptable value for the delay class:
		  ○ 0: subscribed
		  ○ 1: class 1
		  ○ 2: class 2
		  ○ 3: class 3
		  ○ 4: best effort
		• 17: Minimum QoS reliability - <param_val> selects the minimum acceptable value for the reliability class:
		  ○ 0: subscribed
		  ○ 1: class 1 (GTP Ack, LLC Ack and Protected, RLC Ack)
		  ○ 2: class 2 (GTP Unack, LLC Ack and Protected, RLC Ack)
		  ○ 3: class 3 (GTP Unack, LLC Unack and Protected, RLC Ack)
		  ○ 4: class 4 (GTP Unack, LLC Unack and Protected, RLC Unack)
		  ○ 5: class 5 (GTP Unack, LLC Unack and Unprotected, RLC Unack)
		• 18: Minimum QoS peak rate - <param_val> selects the acceptable value for the peak throughput in range 0-9

Parameter	Type	Description

		• 19: Minimum QoS mean rate - <param_val> selects the acceptable value for the mean throughput in range 0-18, 31
		• 20: 3G QoS delivery order - <param_val> selects the acceptable value for the delivery order:
		  ○ 0: subscribed;
		  ○ 1: enable;
		  ○ 2: disable.
		• 21: 3G QoS erroneous SDU delivery - <param_val> selects the acceptable value for the erroneous SDU delivery:
		  ○ 0: subscribed;
		  ○ 1: no detection;
		  ○ 2: enable;
		  ○ 3: disable.
		• 22: 3G QoS extended guaranteed downlink bit rate - <param_val> is the value for the extended guaranteed downlink bit rate in kb/s.
		• 23: 3G QoS extended maximum downlink bit rate - <param_val> is the value for the extended maximum downlink bit rate in kb/s.
		• 24: 3G QoS guaranteed downlink bit rate - <param_val> is the value for the guaranteed downlink bit rate in kb/s.
		• 25: 3G QoS guaranteed uplink bit rate - <param_val> is the value for the guaranteed uplink bit rate in kb/s.
		• 26: 3G QoS maximum downlink bit rate - <param_val> is the value for the maximum downlink bit rate in kb/s.
		• 27: 3G QoS maximum uplink bit rate - <param_val> is the value for the maximum uplink bit rate in kb/s.
		• 28: 3G QoS maximum SDU size - <param_val> is the value for the maximum SDU size in octects
		• 29: 3G QoS residual bit error rate - <param_val> selects the acceptable value for the residual bit error rate:
		  ○ 0: subscribed;
		  ○ 1: 5E2;
		  ○ 2: 1E2;
		  ○ 3: 5E3;
		  ○ 4: 4E3;
		  ○ 5: 1E3;
		  ○ 6: 1E4;
		  ○ 7: 1E5;
		  ○ 8: 1E6;
		  ○ 9: 6E8.
		• 30: 3G QoS SDU error ratio - <param_val> selects the acceptable value for the SDU error ratio:
		  ○ 0: subscribed;
		  ○ 1: 1E2;
		  ○ 2: 7E3;
		  ○ 3: 1E3;
		  ○ 4: 1E4;
		  ○ 5: 1E5;
		  ○ 6: 1E6;
		  ○ 7: 1E1.
		• 31: 3G QoS signaling indicator - <param_val> selects the acceptable value for the signaling indicator:
		  ○ 0: subscribed;
		  ○ 1: signaling indicator 1.
		• 32: 3G QoS source statistics descriptor - <param_val> selects the acceptable value for the source statistics descriptor:
		  ○ 0: subscribed;
		  ○ 1: source statistics descriptor 1.
		• 33: 3G QoS traffic class - <param_val> selects the acceptable value for the traffic class:
		  ○ 0: subscribed;
		  ○ 1: conversational;
		  ○ 2: streaming;
		  ○ 3: interactive;
		  ○ 4: background.
		• 34: 3G QoS traffic priority - <param_val> selects the acceptable value for the traffic priority:

Parameter	Type	Description
		○ 0: subscribed; ○ 1: priority 1; ○ 2: priority 2; ○ 3: priority 3. • 35: 3G QoS transfer delay - <param_val> is the value for the transfer delay in milliseconds. • 36: 3G Minimum QoS delivery order - <param_val> selects the acceptable value for the delivery order: ○ 0: subscribed; ○ 1: enable; ○ 2: disable. • 37: 3G Minimum QoS erroneous SDU delivery - <param_val> selects the acceptable value for the erroneous SDU delivery: ○ 0: subscribed; ○ 1: no detection; ○ 2: enable; ○ 3: disable. • 38: 3G Minimum QoS extended guaranteed downlink bit rate - <param_val> is the value for the extended guaranteed downlink bit rate in kb/s. • 39: 3G Minimum QoS extended maximum downlink bit rate - <param_val> is the value for the extended maximum downlink bit rate in kb/s. • 40: 3G Minimum QoS guaranteed downlink bit rate - <param_val> is the value for the guaranteed downlink bit rate in kb/s. • 41: 3G Minimum QoS guaranteed uplink bit rate - <param_val> is the value for the guaranteed uplink bit rate in kb/s. • 42: 3G Minimum QoS maximum downlink bit rate - <param_val> is the value for the maximum downlink bit rate in kb/s. • 43: 3G Minimum QoS maximum uplink bit rate - <param_val> is the value for the maximum uplink bit rate in kb/s. • 44: 3G Minimum QoS maximum SDU size - <param_val> is the value for the maximum SDU size in octects • 45: 3G Minimum QoS residual bit error rate - <param_val> selects the acceptable value for the residual bit error rate: ○ 0: subscribed; ○ 1: 5E2; ○ 2: 1E2; ○ 3: 5E3; ○ 4: 4E3; ○ 5: 1E3; ○ 6: 1E4; ○ 7: 1E5; ○ 8: 1E6; ○ 9: 6E8. • 46: 3G Minimum QoS SDU error ratio - <param_val> selects the acceptable value for the SDU error ratio: ○ 0: subscribed; ○ 1: 1E2; ○ 2: 7E3; ○ 3: 1E3; ○ 4: 1E4; ○ 5: 1E5; ○ 6: 1E6; ○ 7: 1E1. • 47: 3G Minimum QoS signaling indicator - <param_val> selects the acceptable value for the signaling indicator: ○ 0: subscribed; ○ 1: signaling indicator 1. • 48: 3G Minimum QoS source statistics descriptor - <param_val> selects the acceptable value for the source statistics descriptor: ○ 0: subscribed; ○ 1: source statistics descriptor 1. • 49: 3G Minimum QoS traffic class - <param_val> selects the acceptable value for the traffic class: ○ 0: subscribed; ○ 1: conversational; ○ 2: streaming;

Parameter	Type	Description
		○ 3: interactive; ○ 4: background. • 50: 3G Minimum QoS traffic priority - <param_val> selects the acceptable value for the traffic priority: ○ 0: subscribed; ○ 1: priority 1; ○ 2: priority 2; ○ 3: priority 3. • 51: 3G Minimum QoS transfer delay - <param_val> is the value for the transfer delay in milliseconds.

☞ For the description of the QoS parameters, see 3GPP TS 02.60 and 3GPP TS 03.60.

☞ If <param_tag> = 6, <param_val> can assume the value 2 (CHAP) only on LISA-U1 series.

☞ The maximum length of <param_val> if <param_tag> is equal to 2 or 3 is 30 on LEON series and 64 on LISA-U1 series.

☞ The values of <param_tag> greater than 19 are supported only by LISA-U1 series.

22.2 Packet Switched Data Action +UPSDA

22.2.1 Description

Performs the requested action for the specified GPRS packet switched data profile.

Type	Syntax	Response	Example
Set	AT+UPSDA=<profile_id>, <action>	OK	AT+UPSDA=2,1 OK

22.2.2 Defined Values

Parameter	Type	Description
<profile_id>	Number	GPRS profile identifier, in range 0-6
<action>	Number	• 0: Reset: clears the specified profile resetting all parameters to their default values • 1: Store: saves all parameters in NVM • 2: Load: reads all parameters from NVM • 3: Activate: activates a PDP context with the specified profile, using the current parameters • 4: Deactivate: deactivates the PDP context associated with the specified profile

☞ Only one profile can be activated at the same time. PDP context activation on more than one profile at the same time is not supported.

☞ In case of remote deactivation of the PDP context associated with a GPRS profile, the URC **+UUPSDD: <profile_id>** is sent to the TE to inform the user, otherwise the user should deactivate the PDP context after usage.

☞ In case of remote deactivation of the PDP context associated with a GPRS profile, it's up to the user or the application to close all the sockets created and still opened.

22.3 Packet Switched Network-assigned Data +UPSND

22.3.1 Description

Returns the current (dynamic) network-assigned or network-negotiated value of the specified parameter for the active GPRS PDP context associated with the specified GPRS profile.

Type	Syntax	Response	Example
Set	AT+UPSND=<profile_id>,<param_tag>	+UPSND: <profile_id>,<param_tag>,<dynamic_param_val> OK	AT+UPSND=2,0 +UPSND: 2,0,"151.9.78.170" OK

22.3.2 Defined Values

Parameter	Type	Description
<profile_id>	Number	GPRS profile identifier, in range 0-6
<param_tag>	Number	• 0: IP address: dynamic IP address assigned during PDP context activation; • 1: DNS1: dynamic primary DNS address; • 2: DNS2: dynamic secondary DNS address; • 3: QoS precedence: network assigned precedence class of the QoS; • 4: QoS delay: network assigned delay class of the QoS; • 5: QoS reliability: network assigned reliability class of the QoS; • 6: QoS peak rate: network assigned peak rate value of the QoS; • 7: QoS mean rate: network assigned mean rate value of the QoS • 8: GPRS profile status: if the profile is active the return value is 1, 0 otherwise • 9: 3G QoS delivery order • 10: 3G QoS erroneous SDU delivery • 11: 3G QoS extended guaranteed downlink bit rate • 12: 3G QoS extended maximum downlink bit rate • 13: 3G QoS guaranteed downlink bit rate • 14: 3G QoS guaranteed uplink bit rate • 15: 3G QoS maximum downlink bit rate • 16: 3G QoS maximum uplink bit rate • 17: 3G QoS maximum SDU size • 18: 3G QoS residual bit error rate • 19: 3G QoS SDU error ratio • 20: 3G QoS signaling indicator • 21: 3G QoS source statistics descriptor • 22: 3G QoS traffic class • 23: 3G QoS traffic priority • 24: 3G QoS transfer delay
<dynamic_param_val>	String	Value of the specified <param_tag>

The values of <param_tag> greater than 8 are supported only by LISA-U1 series.

22.4 Circuit Switched Data +UCSD

22.4.1 Description

Sets or gets the value of the specified parameter in a specific GSM circuit switched data (CSD) profile, or reads the current values of all parameters of the given GPRS profile, listing them in separated lines.

The parameter values set with this command are volatile, but the whole profile may be stored in NVM with the AT+UCSDA command.

Type	Syntax	Response	Example
Set	CSD Set command AT+UCSD=<profile_id>,<param_tag>,<param_val>	OK	AT+UCSD=2,1,0 OK
	CSD Get command	+UCSD: <profile_id>, <param_tag>,	AT+UCSD=2,1

Type	Syntax	Response	Example
	AT+UCSD=<profile_id>,<param_tag>	<param_val> OK	+UCSD: 2,1,0 OK
	CSD Get All command AT+UCSD=<profile_id>	+UCSD: <profile_id>,0,<param_val0> …….. OK	

22.4.2 Defined Values

Parameter	Type	Description
<profile_id>	Number	CSD profile identifier, in range 0-6

<param_tag>	Number	• 0: Phone number - <param_val> is defined by a text string, such as "36912345678".
		• 1: Call type - <param_val> may be:
		  ○ 0: Analog;
		  ○ 1: ISDN.
		• 2: Username - <param_val> is the user name text string for the authentication phase.
		• 3: Password - <param_val> is the password text string for the authentication phase. Note: the AT+UCSD Get command with <param_tag> = 3 is not allowed
		• 4: DNS1 - <param_val> is the text string of the primary DNS address in dotted decimal notation form (i.e. four numbers in range 0-255 separated by periods, like "xxx.yyy.zzz.www").
		• 5: DNS2 - <param_val> is the text string of the secondary DNS address in dotted decimal notation form (i.e. four numbers in range 0-255 separated by periods, like "xxx.yyy.zzz.www").
		• 6: Timeout (RFU) - <param_val> represents the linger time: if there is no data transfer for the given time-out, the call is hang-up). Note: currently not implemented. Parameter 6 can be neither set nor retrieved

22.5 Circuit Switched Data Action +UCSDA

22.5.1 Description

Performs the requested action for the specified CSD profile.

Type	Syntax	Response	Example
Set	AT+UCSDA=<profile_id>, <action>	OK	AT+UCSDA=3,0 OK

22.5.2 Defined Values

Parameter	Type	Description
<profile_id>	Number	CSD profile identifier, in range 0-6
<action>	Number	• 0: Reset: clears the specified profile, resetting all parameters to their default values • 1: Store: saves all parameters of the specified profile in NVM for future retrieval • 2: Load: reads all parameters of the specified profile from NVM • 3: Activate: performs end-to-end connection establishment for the specified CSD profile, using its pre-defined parameters (i.e. service provider number) • 4: Deactivate: releases the GSM data call associated with the specified CSD profile

☞ Only one profile at a time can be associated with an active GSM call.

☞ in case of remote disconnection of a GSM call associated to a CSD profile, the URC **+UUCSDD: <profile_id>** is sent to the TE to inform the user, otherwise the user is in charge of connection release after usage

22.6 Circuit Switched Network-assigned Data +UCSND

22.6.1 Description

Returns the current (dynamic) network-assigned value of the specified parameter of the active GSM data call associated with the specified CSD profile.

Type	Syntax	Response	Example
Set	AT+UCSND=<profile_id>, <param_tag>	+UCSND: <profile_id>,<param_tag>, <dynamic_param_val> OK	AT+UCSND=2,0 +UCSND: 2,0,"151.9.78.170" OK

22.6.2 Defined Values

Parameter	Type	Description
<profile_id>	Number	CSD profile identifier, in range 0-6
<param_tag>	Number	• 0: IP address: dynamic IP address assigned during context activation • 1: DNS1: dynamic primary DNS address • 2: DNS2: dynamic secondary DNS address
<dynamic_param_val>	String	value of the specified <param_tag>

23 DNS AT Commands

DNS service requires the user to define and activate a connection profile, either PSD or CSD, using the specific AT commands described in chapter "Data Connection Setup AT Commands".

23.1 Resolve Name / IP Number through DNS +UDNSRN

23.1.1 Description

Translates a domain name to an IP address or an IP address to a domain name by using an available DNS. There are two available DNSs, primary and secondary. They are usually provided by the network after GPRS activation or CSD establishment. They are automatically used in the resolution process if available. The resolutor will use first the primary DNS, if no answer, the second DNS will be involved. User can replace each network provided DNS by setting its own DNS. In this case the command AT+UPSND should be used for a PSD context or the AT+UCSD command for the CSD context. If a DNS value different from "0.0.0.0" is provided, the user DNS will replace the correspondent network-provided one. Pay attention to the DNS setting for the different profiles since the user DNS can be put into action if the corresponding profile is activated (if the user sets a DNS for a profile, and a different profile is activated, the user DNS has no action and the network DNS is used if available).

Usage of the network provided DNSs is recommended.

Type	Syntax	Response	Example
Set	AT+UDNSRN=<resolution_type>,<domain_ip_string>	+UDNSRN: <resolved_ip_address> OK or +UDNSRN: <resolved_domain_name> OK	AT+UDNSRN=0,"www.google.com" +UDNSRN: "216.239.59.147" OK

23.1.2 Defined Values

Parameter	Type	Description
<resolution_type >	Number	Type of resolution operation • 0: domain name to IP address • 1: IP address to domain name (host by name)
<domain_ip_string>	String	Domain name (resolution_type=0) or the IP address in (resolution_type=1) to be resolved
<resolved_ip_address>	String	Resolved IP address corresponding to the specified domain name
<resolved_domain_name>	String	Resolved domain name corresponding to the provided IP address

In case of error the error class and code is provided through +USOER AT command (more details in chapter 24.5.2).

24 TCP/IP UDP/IP AT Commands

24.1 Introduction

Before using TCP/IP services, a connection profile (either PSD or CSD) must be defined and activated, with AT commands described in chapter 22 "Data Connection Setup AT Commands". The sockets can be managed independently and simultaneously over the same bearer (either GPRS or GSM). AT commands for both reading and writing data on sockets are provided and URC notifies the external application of incoming data and transmission result, no need for polling.

Some network operators close dynamic NATs after few minutes if there is no activity on the connection (no data transfer in the period). To solve this problem enable the TCP keep alive options with 1 minute delay (view +USOSO command, paragraph 24.3).

IP dotted notation doesn't support a leading 0 in an IP address (e.g. IP = 010.128.076.034 is not supported, 10.128.76.34 is supported).

When both TCP and UDP socket are used at the same time at the maximum throughput (downlink and uplink at the maximum allowed baud rate) it is possible to lose some incoming UDP packets due to internal buffer limitation. A possible workaround is provided as follows:

- **If it is possible, adopt an application layer UDP acknowledge system**
- **Stop sending TCP packet (and check with the +USOCTL command that the outcoming buffer is empty) when expecting to receive UDP data**

On LEON-G100/G200 series the maximum number of sockets that can be managed are 16.

On LISA-U1 series the maximum number of sockets that can be managed are 7.

24.2 Create Socket +USOCR

24.2.1 Description

Creates a socket and associates it with the specified protocol (TCP or UDP), returns a number identifying the socket. Such command corresponds to the BSD socket routine. Up to 16 sockets on LEON-G100/G200 series and 7 sockets on LISA-U1 series can be created. It is possible to specify the local port to bind within the socket **(UDP only)** in order to send data from a specific port.

Type	Syntax	Response	Example
Set	AT+USOCR=<protocol>[,<local_port>]	+USOCR: <socket> OK	AT+USOCR=17 +USOCR: 2 OK

24.2.2 Defined Values

Parameter	Type	Description
<protocol>	Number	• 6: TCP • 17: UDP
<socket>	Number	Socket identifier to be used for any future operation on that socket • On LEON-G100/G200 series the range goes from 0 to 15 • On LISA-U1 series the range goes from 0 to 6
<local_port>	Number	Local port to be used while sending data (for UDP sockets only). If <local_port> is specified creating a TCP socket an error will be raised. The range goes from 1 to 65535.

☞ In case of error the error code is provided through +USOER AT command (more details in chapter 24.5.2).

☞ On LISA-U1 series the socket creation operation can be performed only after PDP context activation on one of the defined profiles

24.3 Set Socket Option +USOSO

24.3.1 Description

Sets the specified standard option (type of service, local address re-use, linger time, time-to-live, etc) for the specified socket, like the BSD setsockopt routine.

☞ Parameters must be set one by one.

Type	Syntax	Response	Example
Set	AT+USOSO=<socket>,<level>,<opt_name>,<opt_val> [, <opt_val2>]	OK	AT+USOSO=2,6,1,1 OK

24.3.2 Defined Values

Parameter	Type	Description
<socket>	Number	Socket identifier • On LEON-G100/G200 series the range goes from 0 to 15 • On LISA-U1 series the range goes from 0 to 6

<level>	Number	• 0: IP Protocol
		<opt_name> for IP Protocol level may be:
		  • 1: Type of service
		<opt_val>: 8 bit mask that represent the flags of IP TOS. For more information refer to RFC 791 [27]Range 0-255. Default value is 0
		  • 2: Time-to-live
		<opt_val>: unsigned 8 bit value representing the TTL. Range 0-255 (default 255)
		• 6: TCP Protocol
		<opt_name> for TCP protocol level may be:
		  • 1: No delay option: don't delay send to coalesce packets; <opt_val>: Number, enables/disables "no delay" option. 1: enable, 0: disable (default)
		  • 2: Keepalive option: send keepalive probes when idle for <opt_val> milliseconds; <opt_val>: signed 32 bit Number value representing the milliseconds for "keepalive" option. Range 0-2147483647. Default value 7200000 (2 hours).
		• 65535: Socket
		<opt_name> for Socket level options may be:
		  • 4: Local address re-use.
		<opt_val>: Number, enables/disables "local address re-use" option. 1: enable, 0: disable (default 0)
		  • 8: Keep connections alive.
		<opt_val>: Number, enables/disables "keep connections alive" optio. 1: enable, 0: disable (default 0)
		  • 32: Sending of broadcast messages. <opt_val>: Number enables/disables "sending of broadcast messages". 1: enable, 0: disable (default 0)
		  • 128: Linger on close if data present. <opt_val>: Number, sets on/off "linger" option. 1: enable, 0: disable (default 0)
		<opt_val2>: signed 16 bit Number, linger time, range 0-32767. Default is 0.
		  • 512: Local address and port re-use. <opt_val>: Number, enables/disables "local address and port re-use". 1: enable, 0: disable (default 0)

☞ In case of error the error code is provided through +USOER AT command (more details in chapter 24.5.2).

24.4 Get Socket Option +USOGO

24.4.1 Description

Retrieves the specified standard option (type of service, local address re-use, linger time, time-to-live, etc) for the specified socket, like the BSD getsockopt routine.

Type	Syntax	Response	Example
Set	AT+USOGO=<socket>, <level>,<opt_name>	+USOGO: <opt_val>[,<opt_val2>] OK	AT+USOGO=0,0,2 +USOGO: 255 OK

24.4.2 Defined Values

Parameter	Type	Description
<socket>	Number	Socket identifier • On LEON-G100/G200 series the range goes from 0 to 15 • On LISA-U1 series the range goes from 0 to 6
<level>	Number	• 0: IP Protocol <opt_name> for IP Protocol level can be: o 1: Type of service. o 2: Time-to-live. • 6: TCP Protocol <opt_name> for TCP protocol level may be: o 1: No delay option: don't delay send to coalesce packets. o 2: Keepalive option: send keepalive probes when idle for <opt_val> milliseconds. • 65535: Socket <opt_name> for Socket level options may be: o 4: Local address re-use. o 8: Keep connections alive. o 32: Sending of broadcast messages. o 128: Linger on close if data present; <opt_val2>: Number, linger time; o 512: Local address and port re-use.

☞ For values returned by the +USOGO command, refer to +USOSO description (paragraph 24.3.2).

☞ In case of error the error code is provided through +USOER AT command (more details in chapter 24.5.2).

24.5 Close Socket +USOCL

24.5.1 Description

Closes the specified socket, like the BSD close routine. In case of remote socket closure the user is notified via the URC **+UUSOCL: <socket>**.

Type	Syntax	Response	Example
Set	AT+USOCL=<socket>	OK	AT+USOCL=2 OK
URC		+UUSOCL: <socket>	+UUSOCL: 2

24.5.2 Defined Values

Parameter	Type	Description
<socket>	Number	Socket identifier • On LEON-G100/G200 series the range goes from 0 to 15 • On LISA-U1 series the range goes from 0 to 6

24.6 Get Socket Error +USOER

24.6.1 Description

Retrieves the last error occurred in the last socket operation, stored in the BSD standard variable error.

Type	Syntax	Response	Example
Action	AT+USOER	+USOER: <socket_error> OK	+USOER: 104 OK

24.6.2 Defined Values

Parameter	Tye	Description
<socket_error>	Number	Code of the last error occurred in a socket operation. The allowed values are listed in A.1.4 0: no error

24.7 Connect Socket +USOCO

24.7.1 Description

Establishes a peer-to-peer connection of the socket to the specified remote host on the given remote port, like the BSD connect routine. If the socket is a TCP socket, the command will actually perform the TCP negotiation (3-way handshake) to open a connection. If the socket is a UDP socket, this function will just declare the remote host address and port for later use with other socket operations (e.g. +USOWR, +USORD). This is important to note because if <socket> refers to a UDP socket, errors will not be reported prior to an attempt to write or read data on the socket.

(UDP socket) due to the UDP specific AT commands, this command should be considered obsolete and it is strongly recommend avoiding its usage while working with UDP sockets. The command's functionality for UDP socket is maintained for backward compatibility only, please consider to use +USOST and +USORF command instead of +USOCO with +USOWR and +USORD.

Type	Syntax	Response	Example
Set	AT+USOCO=<socket>, <remote_addr>, <remote_port>	OK	AT+USOCO=3,"151.63.16.9",1200 OK

24.7.2 Defined Values

Parameter	Type	Description
<socket>	Number	Socket identifier • On LEON-G100/G200 series the range goes from 0 to 15 • On LISA-U1 series the range goes from 0 to 6

Parameter	Type	Description
<remote_addr>	String	Remote host IP address in dotted decimal notation form (i.e. four numbers in range 0-255 separated by periods) or domain name of the remote host
<remote_port>	Number	Remote host port, in range 1-65535

In case of error the error code is provided through +USOER AT command (more details in chapter 24.5.2).

24.8 Write Socket Data +USOWR

24.8.1 Description

Writes the specified amount of data to the specified socket, like the BSD write routine, and returns the number of bytes of data actually written. Applied to UDP sockets too, after a +USOCO Connect Socket command.

There are three kinds of syntax:

- Base syntax normal: writing simple strings to the socket, there are characters which are forbidden
- Base syntax HEX: writing hexadecimal strings to the socket, the string will be converted in binary data and sent to the socket
- Binary extended syntax: mandatory for writing any character in the ASCII range [0x00, 0xFF]

(about UDP socket): due to the UDP specific AT commands, it is preferred to use the +USOST command to send data via UDP socket. +USOST command doesn't require the usage of +USOCO before sending data.

(about TCP socket): if no network signal is available, TCP packets are enqueued until the network will become available again. It the TCP queue is full the +USOWR command will return error. To get the last socket error use the +USOCTL command with param_id 1 (see +USOCTL command description). If the error returned is 11, it means that the queue is full.

(about UDP socket): if no network signal is available, out going UDP packet may be lost.

The URC indicates that data has been sent to lower level of protocol stack. This is not an indication of an acknowledgment received by the remote server the socket is connected to.

The base syntax HEX mode is available only on LEON from LEON-G100-06x/LEON-G200-06x and subsequent versions.

To enable the base syntax HEX mode please refer to the AT+UDCONF command description (chapter 18.19).

Type	Syntax	Response	Example
Set (Base)	AT+USOWR=<socket>, <length>,<data>	+USOWR: <socket>,<length> OK	AT+USOWR= 3,12,"Hello world!" +USOWR: 3,12 OK
Set (Binary)	AT+USOWR=<socket>, <length> After the"@" prompt <length> bytes of data are entered	@ +USOWR: <socket>,<length> OK	AT+USOWR: 3,16 @16 bytes of data +USOWR: 3,16 OK

(about TCP socket): if the connection is closed by the remote host the +UUSOCL indication is not sent until all received data is read using the AT+USORD command. If AT+USOWR command is used in this situation, it returns +USOWR: <socket>,0<CR><LF>OK.

24.8.2 Defined Values

Parameter	Type	Description
<socket>	Number	Socket identifier • On LEON-G100/G200 series the range goes from 0 to 15 • On LISA-U1 series the range goes from 0 to 6
<length>	Number	Number of data bytes to write: • Base syntax normal mode: range 0-512 (on LISA-U1 series the range goes from 0 to 1024) • Base syntax HEX mode: range 0-250 • Binary extended syntax: range 0-1024
<data>	String	Data bytes to be written. Please note that not all of the ASCII charset can be use

☞ For Base Syntax:

- Allowed ASCII characters: 0x20 (space), 0x21 and from 0x23 to 0xFF, all the alphanumeric set, symbols and extended ASCII charset from 0x80 to 0xFF
- Forbidden: The control characters from 0x00 to 0x1F (included), 0x22 character, quotation marks (")
- The value of <length> and the actual length of <data> must match
- For base syntax HEX mode, only ASCII characters 0-9, A-F and a-f are allowed. The length of the <data> parameter must be two times the <length> parameter

☞ For Binary Syntax:

- After the command is sent, the user waits for the @ prompt. When it appears the stream of bytes can be provided. After the specified amount of bytes has been sent, the system returns with OK (or ERROR). The feed process cannot be interrupted i.e. the return in the command mode can be effective only when the number of bytes provided is the declared one
- The binary extended syntax is the only way for the system to accept control characters as data; for the AT command specifications [16], characters like <CR>, <CTRL-Z>, quotation marks, etc. have a specific meaning and they cannot be used like data in the command itself. The command is so extended with a specific acceptance state identified by the @ prompt
- This feature can be successfully used when there is need to send a byte stream which belongs to a protocol that has any kind of characters in the ASCII range [0x00,0xFF]
- In binary mode LISA doesn't display the echo of data bytes
- In binary mode LEON displays the echo of data bytes
- Binary syntax is not affected by HEX mode option

☞ In case of error the error code is provided through +USOER AT command (more details in chapter 24.5.2).

☞ For <data> parameter not all of the ASCII charset can be used.

24.9 Send To command +USOST (UDP only)

24.9.1 Description

Writes the specified amount of data to the remote address, like the BSD sendto routine, and returns the number of bytes of data actually written. It can be applied to UDP sockets only. This command allows the reuse of the same socket to send data to many different remote hosts.

There are three kinds of syntax:

- Base syntax normal: writing simple strings to the socket, there are characters which are forbidden

- Base syntax HEX: writing hexadecimal strings to the socket, the string will be converted in binary data and sent to the socket
- Binary extended syntax: mandatory for writing any character in the ASCII range [0x00, 0xFF]

☞ It is strongly recommend using this command to send data while using UDP sockets. It is also recommended avoiding +USOCO usage with UDP socket.

☞ (about UDP socket): if no network signal is available, out coming UDP packet may be lost.

☞ Base syntax HEX mode is available only on LEON from LEON-G100-06x/LEON-G200-06x and subsequent versions.

☞ To enable the base syntax HEX mode please refer to the AT+UDCONF command description (chapter 18.19).

Type	Syntax	Response	Example
Set (Base)	AT+USOST=<socket>,<remote_ip_address>,<remote_port>,<length>,<data>	+USOST: <socket>,<length> OK	AT+USOST=3,"151.9.34.66",449,16,"16 bytes of data" +USOST: 3,16 OK
Set (Binary)	AT+USOST=<socket>,<remote_ip_address>,<remote_port>,<length> After the"@" prompt <length> bytes of data are entered	@ +USOST: <socket>,<length> OK	AT+USOST=3,"151.9.34.66",449,16 @16 bytes of data +USOST: 3,16 OK

24.9.2 Defined Values

Parameter	Type	Description
<socket>	Number	Socket identifier • On LEON-G100/G200 series the range goes from 0 to 15 • On LISA-U1 series the range goes from 0 to 6
<remote_ip_address>	String	Remote host IP address
<remote_port>	Number	Remote host port
<length>	Number	Number of data bytes to write • Base syntax normal mode: range 0-512 (on LISA-U1 series the range goes from 0 to 1024) • Base syntax HEX mode: range 0-250 • Binary syntax mode: range 0-1024
<data>	String	Data bytes to be written (Please note that not all of the ASCII charset can be used)

☞ For Base Syntax:

- Allowed ASCII characters: 0x20 (space), 0x21 and from 0x23 to 0xFF. Substantially all of the alphanumeric set, symbols and extended ASCII charset from 0x80 to 0xFF
- Forbidden: The control characters from 0x00 to 0x1F (included), 0x22 character, quotation marks (")
- The value of <length> and the actual length of <data> must match
- For base syntax HEX mode, only ASCII characters 0-9, A-F and a-f are allowed. The length of the <data> parameter must be two times the <length> parameter

☞ For Binary Syntax:

- After the command is sent, the user waits for the @ prompt. When it appears the stream of bytes can be provided. After the specified amount of bytes has been sent, the system returns

with OK (or ERROR). The feed process cannot be interrupted i.e. the return in the command mode can be effective only when the number of bytes provided is the declared one

- That binary extended syntax is the only way for the system to accept control characters as data; for the AT command specifications [16], characters like <CR>, <CTRL-Z>, quotation marks, etc. have a specific meaning and they cannot be used like data in the command itself. The command is so extended with a specific acceptance state identified by the @ prompt
- This feature can be successfully used when there is need to send a byte stream which belongs to a protocol that has any kind of characters in the ASCII range [0x00,0xFF]
- In binary mode LISA doesn't display the echo of data bytes
- In binary mode LEON displays the echo of data bytes
- Binary syntax is not affected by HEX mode option

☞ In case of error the error code is provided through +USOER AT command (more details in chapter 24.5.2).

24.10 Read Socket Data +USORD

24.10.1 Description

Reads the specified amount of data from the specified socket, like the BSD read routine. This command can be used to know the total amount of unread data.

For the TCP socket type the URC **+UUSORD: <socket>,<length>** notifies the data bytes available for reading, either when buffer is empty and new data arrives or after a partial read by the user.

For the UDP socket type the URC **+UUSORD: <socket>,<length>** notifies that a UDP packet has been received, either when buffer is empty or after a UDP packet has been read and one or more packets are stored in the buffer.

In case of a partial read of a UDP packet **+UUSORD: <socket>,<length>** will show the remaining number of data bytes of the packet the user is reading.

☞ (about UDP socket) Due to the UDP specific AT command, it is preferred to use the +USORF command to read data from UDP socket. +USORF command doesn't require the usage of +USOCO before reading data.

☞ When applied to UDP active sockets if the UDP socket is not set in listening mode (see +USOLI) it won't be possible to receive any packet if a previous write operation is not performed.

☞ If the HEX mode is enabled (refer to +UDCONF command, chapter 18.19) the received data will be displayed using an hexadecimal string.

☞ Base syntax HEX mode is available only on LEON from LEON-G100-06x/LEON-G200-06x and subsequent versions.

Type	Syntax	Response	Example
Set	AT+USORD=<socket>, <length>	+USORD: <socket>,<length>,<data in the ASCII [0x00,0xFF] range> OK	AT+USORD=3,16 +USORD: 3,16,"16 bytes of data" OK
URC		+UUSORD: <socket>,<length>	+UUSORD: 3,16

24.10.2 Defined Values

Parameter	Type	Description
<socket>	Number	Socket identifier • On LEON-G100/G200 series the range goes from 0 to 15

Parameter	Type	Description
		• On LISA-U1 series the range goes from 0 to 6
<length>	Number	Number of data bytes • to read stored in buffer, in range 0-1024 in the set command • read from buffer, in range 0-1024 • stored in buffer for the URC
<data>	String	Data bytes to be read

The returned data may be any ASCII character in the range [0x00,0xFF] i.e. control characters. The starting quotation marks shall not be taken into account like data; the first byte of data starts after the first quotation marks. Then the other characters are provided for a <length> amount. An application should rely on the <length> info to count the received number of characters (after the starting quotation marks) especially if any protocol control characters are expected.

If an application deals with letter and number characters only i.e. all of the expected characters are outside the [0x00, 0x1F] range and are not quotation marks, the AT+USORD response quotation marks can be assumed to identify the start and the end of the received data packet. Always check <length> to identify the valid data stream.

If the number of data bytes requested to be read from the buffer is bigger than the number of bytes stored in the buffer only the available amount of data bytes will be read.

When <length>= 0, the command returns the total amount of data present in the network buffer.

If the HEX mode is enabled, the length of <data> will be 2 times <length>.

Example: 23 unread bytes in the socket

AT+USORD=3,0

+USORD: 3,23

OK

In case of error the error code is provided through +USOER AT command (more details in chapter 24.5.2).

24.11 Receive From command +USORF (UDP only)

24.11.1 Description

Reads the specified amount of data from the specified UDP socket, like the BSD recvfrom routine. The URC **+UUSORF: <socket>,<length>** (or also +UUSORD: <socket>,<length>) notifies that new data is available for reading, either when new data arrives or after a partial read by the user for the socket. This command can also return the total amount of unread data.

This command can be applied to UDP sockets only, and it can be used to read data after both +UUSORD and +UUSORF unsolicited indication.

It is strongly recommend using this command to read data while using UDP sockets. It is also recommended avoiding +USOCO usage with UDP socket.

If the HEX mode is enabled (see AT+UDCONF) the received data will be displayed using an hexadecimal string.

Base syntax HEX mode is available only on LEON from LEON-G100-06x/LEON-G200-06x and subsequent versions.

Type	Syntax	Response	Example
Set	AT+USORF=<socket>,<length>	+UUSORF: <socket>,<length> +USORF: <socket>,<remote_ip_addr>,<remote_port>,<length>,<data in the ASCII [0x00,0xFF] range> OK	+UUSORF: 3,16 AT+USORF=3, 16 +USORF: 3,"151.9.34.66",2222,16,"16 bytes of data" OK
URC		+UUSORF: <socket>,<length>	+UUSORF: 3,16

24.11.2 Defined Values

Parameter	Type	Description
<socket>	Number	Socket identifier • On LEON-G100/G200 series the range goes from 0 to 15 • On LISA-U1 series the range goes from 0 to 6
<remote_ip_address>	String	Remote host IP address
<remote_port>	Number	Remote host port
<length>	Number	Number of data bytes to read, in range 0-1024
<data>	String	Data bytes to be read

☞ Each packet received from the network is stored in a separate buffer and the command is capable to read only a packet (or e portion of it) at time. This means that if <length> is greater than the packet size, the command will return a maximum amount of data equal to the packet size, also if there are other packets in the buffer. The remaining data (i.e. the remaining UDP packets) can be read with further reads.

☞ The returned data may have any kind of ASCII character in the range [0x00,0xFF] i.e. control characters too. The starting quotation marks shall not be taken into account like data; the first byte of data starts after the first quotation marks. Then the other characters are provided for a <length> amount. At the end of the length byte stream, another quotation marks followed by <CR><LF> are provided for user convenience and visualization purposes. An application should rely on the <length> info to count the received number of characters (after the starting quotation marks) especially if any protocol control characters are expected.

☞ If an application deals with letter and number characters only i.e. all of the expected characters are outside the [0x00, 0x1F] range and are not quotation marks, the AT+USORD response quotation marks can be assumed to identify the start and the end of the received data packet, anyway the <length> field usage to identify the valid data stream is recommended.

☞ When <length>= 0, the command returns the total amount of data present in the network buffer.

☞ If the HEX mode is enabled, the length of <data> will be 2 times <length>.

Example: 23 unread bytes in the socket

AT+USORF=3,0

+USORF: 3,23

OK

☞ In case of error the error code is provided through +USOER AT command (more details in chapter 24.5.2).

24.12 Set Listening Socket +USOLI

24.12.1 Description

Sets the specified socket in listening mode on the specified port of service, waiting for incoming connections (TCP) or data (UDP).

For **TCP sockets**, incoming connections will be automatically accepted and notified via the URC **+UUSOLI: <socket>,<ip_address>,<port>,<listening_socket>,<local_ip_address>,<listening_port>**, carrying the connected socket identifier, the remote IP address and port.

For **UDP sockets**, incoming data will be notified via URC **+UUSORF: <listening_socket>,<length>**. To know from which remote IP address and port the data is coming from, use the AT+USORF command.

Type	Syntax	Response	Example
Set	AT+USOLI=<socket>,<port>	OK	***(TCP)*** AT+USOLI=2,1200 OK +UUSOLI: 3,"151.63.16.7",1403,2,"82.89.67.164",1200 ***(UDP)*** AT+USOLI=0,1182 OK +UUSORF: 0,1024
URC (TCP)		+UUSOLI: <socket>,<ip_address>,<port>,<listening_socket>,<local_ip_address>,<listening_port>	+UUSOLI: 3,"151.63.16.7",1403,0,"82.89.67.164",200
URC (UDP)		+UUSORF: <listening_socket>,<len>	+UUSORF: 1,967

24.12.2 Defined Values

Parameter	Type	Description
<socket>	Number	Socket identifier • On LEON-G100/G200 series the range goes from 0 to 15 • On LISA-U1 series the range goes from 0 to 6
<port>	Number	Port of service, range 1-65535. Port numbers below 1024 are not recommended since they are usually reserved
<ip_address>	String	Remote host IP address (only in URC +UUSOLI)
<listening_socket>	Number	Socket identifier specified within the AT+USOLI command, indicates on which listening socket the connection has been accepted (only in +UUSOLI URC)
<local_ip_address>	String	TE IP address (only in +UUSOLI URC)
<listening_port>	Number	Listening port that has accepted the connection. This port is specified within the AT+USOLI command (only in +UUSOLI URC)
<length>	Number	Data length received on the UDP listening socket (only in +UUSORF unsolicited indication). In order to know the sender IP address and port, use the +USORF command.

☞ In case of notification via the URC +UUSOLI <port> is intended as the remote port.

☞ In case of error the error code is provided through +USOER AT command (more details in chapter 24.5.2).

24.13 Firewall control +UFRW

24.13.1 Description

Enables/disables internal firewall and controls filtering settings (i.e. define IP white list). When enabled, IP connections are accepted only if the IP address belongs to the defined IP white list.

Firewall applies for incoming connections only (i.e. listening sockets set by means of +USOLI command).

Type	Syntax	Response	Example
Set	AT+UFRW=<action>[,<white_ip_addr_mask>]	OK	AT+UFRW=0 OK
Read	AT+UFRW?	+UFRW: <firewall_status>[,<white_ip_addr_mask1>[,<white_ip_addr_mask2> [,...]]] OK	
Test	AT+UFRW=?	+UFRW: (list of supported <action>s) OK	+UFRW: (0-4) OK

24.13.2 Defined Values

Parameter	Type	Description
<action>	Number	• 0: disable internal firewall. The parameter <white_ip_addr_mask> is not allowed in this case: if present error message will be returned • 1: enable internal firewall. The parameter <white_ip_addr_mask> is not allowed in this case: if present error message will be returned • 2: add specified IP address mask to firewall white list. The parameter <white_ip_addr_mask> is mandatory. The maximum size of firewall white list is 10 IP address masks: up to 10 different IP address masks can be added to firewall white list. • 3: remove specified IP address mask from firewall white list. The parameter <white_ip_addr_mask> is mandatory • 4: clear firewall white list. The parameter <white_ip_addr_mask> is not allowed in this case: if present error message will be returned
<white_ip_addr_mask>	String	white IP address mask to be applied to remote end IP address to decide if to accept or not the remote connection. The IP address mask is made up of 4 bytes of information expressed as four numbers in range 0-255 separated by periods (e.g. "xxx.yyy.zzz.www"). An incoming connection attempt from the remote end IP address <incoming_ip_addr> is accepted if matching the following criterium for at least one of the IP address masks in the firewall white list: <incoming_ip_addr> & <white_ip_addr_mask> == <incoming_ip_addr>
<firewall_status>	Number	• 0: disabled • 1: enabled

24.14 Set TCP socket in Direct Link mode +USODL

24.14.1 Description

This command establishes a transparent end to end communication with an already connected TCP socket via the serial interface. Data can be sent to the socket and can be received via the serial port: the usage of HW handshake is recommended.

The transparent TCP connection mode can be exited via +++ sequence, entered after at least 1 s of suspension of transmission to the port. The socket will remain connected and communication can be re-established anytime.

Type	Syntax	Response	Example
Set	AT+USODL=<socket>	CONNECT	AT+USODL=3 CONNECT

24.14.2 Defined Values

Parameter	Type	Description
<socket>	Number	Socket identifier • On LEON-G100/G200 series the range goes from 0 to 15 • On LISA-U1 series the range goes from 0 to 6

Direct Link mode won't be available for TCP application protocols (HTTP, SMTP). This is because application protocols require a server request formatting and a response evaluation, but in direct link connection this feature is not yet available.

On LISA-U1 series, during a 3G connection on UART interface, the maximum data rate must be at least 115200 b/s.

24.15 Socket Control +USOCTL

24.15.1 Description

Allows interaction with the low level socket layer.

Type	Syntax	Response	Example
Set	AT+USOCTL=<socket>,<param_id>	+USOCTL:<socket>,<param_id>,<param_val>[,<param_val2>] OK	AT+USOCTL=0,2 +USOCTL:0,2,38 OK

24.15.2 Defined Values

Parameter	Type	Description
<socket>	Number	Socket identifier • On LEON-G100/G200 series the range goes from 0 to 15 • On LISA-U1 series the range goes from 0 to 6
<param_id>	Number	Control request identifier. Possible values are: • 0: query for socket type • 1: query for last socket error • 2: get the total amount of bytes sent from the socket • 3: get the total amount of bytes received by the socket • 4: query for remote peer IP address and port • 10: query for TCP socket status (only TCP sockets) • 11: query for TCP outcoming unacknowledged data (only TCP sockets) • 5-9, 12-99: RFU
<param_val>	Number / String	This value may assume different means depending of <param_id>. If <param_id> is 0, <param_val> can assume these values: • 6 TCP socket • 17: UDP socket If <param_id> is 1, <param_val> can assume these values: • N: last socket error

Parameter	Type	Description
		If <param_id> is 2, <param_val> can assume these values: • N: the total amount (in bytes) of sent (acknowledged + unacknowledged) data If <param_id> is 3, <param_val> can assume these values: • N: the total amount (in bytes) of received (read) data If <param_id> is 4, <param_val> can assume these values: • A string representing the remote peer IP address expressed in dotted decimal form If <param_id> is 10, <param_val> can assume these values: • 0: the socket is in INACTIVE status • 1: the socket is in LISTEN status • 2: the socket is in SYN_SENT status • 3: the socket is in SYN_RCVD status • 4: the socket is in ESTABILISHED status • 5: the socket is in FIN_WAIT_1 status • 6: the socket is in FIN_WAIT_2 status • 7: the sokcet is in CLOSE_WAIT status • 8: the socket is in CLOSING status • 9: the socket is in LAST_ACK status • 10: the socket is in TIME_WAIT status If <param_id> is 11, <param_val> can assume these values: • N: the total amount of outcoming unacknowledged data
<param_val2>	Number	This value is present only when <param_id> is 4. It represents the remote peer IP port.

25 FTP AT Commands

Proprietary u-blox AT commands. PSD or CSD connection must be established before using FTP client services (AT commands for establishing connection are described in chapter "Data Connection Setup AT Commands"). AT commands enable sending and receiving files over the available bearer transparently, retrieving and storing them in the file system. Standard file and directory management operations on the remote side are possible.

In general, two AT-commands are defined for an FTP service: one command to set the profile, second command to execute a specific FTP command. The result of an FTP execute command will be notified through the URC +UUFTPCR. Data is provided through URC +UUFTPCD.

25.1 File Transfer Protocol Control +UFTP

25.1.1 Description

Sets up a parameter for FTP service, or resets a parameter to its default value. Set command needs to be executed for each single <param_tag>. Read command returns the current setting of all the FTP parameters, one per line (i.e. the FTP profile). The FTP parameter values set with this command are all volatile (not stored in non-volatile memory)

Type	Syntax	Response	Example
Set	Set command AT+UFTP=<param_tag>, <param_val> Reset command AT+UFTP=<param_tag>	OK OK	AT+UFTP=0 OK
Read	AT+UFTP?	+UFTP: 0,<param_val0> +UFTP: 1,<param_val1> ..... OK	+UFTP: 0,"216.239.59.147" +UFTP: 1,"" +UFTP: 2,"username" +UFTP: 4,"account" +UFTP: 5,0 +UFTP: 6,0 +UFTP: 7,21 OK
Test	AT+UFTP=?	+UFTP: (list of supported <param_tag>s) OK	+UFTP: (0-6) OK

25.1.2 Defined Values

Parameter	Type	Description
<param_val>	Number	type and supported content depend on related <param_tag> (details are given here below). If <param_val> is not specified the value of the corresponding parameter <param_tag> is reset
<param_tag>	Number	• 0: FTP server IP address; <param_val> is the text string of FTP server IP address in dotted decimal notation form (e.g. 111.222.333.444) • 1: FTP server name <param_val> is the text sting of FTP server name (e.g. "ftp.server.com") Maximal length 128 chars • 2: Username <param_val> is the user name text string (maximum 30 chars) for the FTP login procedure • 3: Password <param_val> is the password text string (maximum 30 chars) for the FTP

Parameter	Type	Description
		login procedure • 4: Account <param_val> is the additional user account text string (maximum 30 chars) if required for the FTP login procedure • 5: Inactivity timeout; <param_val> is the inactivity timeout period in seconds, from 0 to 86400 s. 0 means no timeout (the FTP session will not be terminated in the absence of incoming traffic). The default value is 30 s • 6: FTP mode <param_val> selects the FTP mode: o 0: Active (default) o 1: Passive • 7: FTP server port <param_val> is the remote FTP server listening port, it must be a valid TCP port value o Numeric value between 1 and 65535: default value is 21.

<param_tag>=0 and <param_tag>=1 are mutually exclusive. If value for <param_tag>=0 is specified by user, then value for <param_tag>=1 is reset or vice versa.

It is possible to encounter problems using FTP active mode due to limitations introduced by network operators. If the FTP active mode fails to exchange files, try the passive mode.

In case of error the error class and code is provided through +UFTPER AT command (more details in chapter 25.5).

25.2 File Transfer Protocol Command +UFTPC

25.2.1 Description

Triggers the FTP action corresponding to <ftp_command> parameter. The response indicates if sending the command request to FTP process was successful or not. Final result of FTP action will be returned to the user via the URC +UUFTPCR (please refer to paragraph 25.4). As well, when data is requested by user (e.g. file or directory lists), the information is notified after reception from the FTP server via the URC +UUFTPCD (please refer to paragraph 25.3.1).

Type	Syntax	Response	Example
Set	AT+UFTPC=<ftp_command>[,<param1>[,<param2>]]	OK	AT+UFTPC=4,"data.zip","data.zip" OK
Test	AT+UFTPC=?	+UFTPC: (list of supported <ftp_command>s) OK	+UFTPC: (0-5,8,10,11,13,14) OK

25.2.2 Defined Values

Parameter	Type	Description
<param1>	Number	Type and content depend on related <ftp_command> (details are given below)
<param2>	Number	Type and content depend on related <ftp_command> (details are given below)
<ftp_command>	Number	• 0: FTP logout; terminates the FTP session by performing a logout. Notice that this AT command just sends a command request to the FTP process. The final FTP result will be notified via the URC +UUFTPCR (please refer to paragraph 25.4). o <param1>, <param2> are not allowed (do not give any value). • 1: FTP login; connects to the FTP server using the parameters of current FTP profile (set via AT+UFTP command). Notice that this AT command just sends a command request to the FTP process. The final FTP result

Parameter	Type	Description
		will be notified via the URC +UUFTPCR (please refer to paragraph 25.4). o <param1> param2> are not allowed (do not give any value). • 2: Delete file from the FTP server. This AT command just sends a command request to the FTP process. The final FTP result will be notified via the URC +UUFTPCR (see 25.4). o <param1> mandatory parameter; text string of the file name to be deleted from FTP host. o <param2> parameter is not allowed (do not give any value). • 3: Rename file. This AT command just sends requests to the FTP process. The final FTP result will be notified via the URC +UUFTPCR (see 25.4). o <param1> mandatory parameter; text string of the old file name text string on the FTP host, to be renamed. For the limit of the length of the string please refer to 2.1.3. o <param2> mandatory parameter; text string of the new file name. For the limit of the length of the string please refer to 2.1.3. • 4: Retrieve file from the FTP server. This command just sends a command request to the FTP process. The final FTP command result is notified via the URC +UUFTPCR (see 25.4). o <param1> mandatory parameter; is the remote file name text string to be retrieved from FTP host. o <param2> mandatory parameter; is the local file name (module file system) text string to be stored on file system. For the limit of the length of the string please refer to 2.1.3. • 5: Store file on the FTP server. This AT command just sends a command request to the FTP process. The final result will be notified via the URC +UUFTPCR (please refer to paragraph 25.4). o <param1> mandatory parameter; is the local file name (module file system) text string to be sent from file system. For the limit of the length of the string please refer to 2.1.3. o <param2> mandatory parameter; is the remote file name to be stored on the FTP server. For the limit of the length of the string please refer to 2.1.3. • 6: Retrieve a file from FTP server using direct link mode. This command handles the initial steps of FTP protocol for retrieving a file; after that it will establish a transparent end to end communication with the data connection TCP socket via the serial interface. After the CONNECT message, the file content will be sent directly to the serial interface. The user must switch off the direct link mode (sending +++ to the serial interface) when the data stream is finished. This operation may take up to 10 s because of the command also handles the final steps of FTP protocol. The final FTP command result is notified via the URC +UUFTPCR (see 25.4). o <param1> mandatory parameter; is the remote file name to be retrieved from the FTP server; • 7: Send a file to FTP server using direct link mode. This command handles the initial steps of FTP protocol for sending a file; after that it will establish a transparent end to end communication with the data connection TCP socket via the serial interface. After the CONNECT message the user can send the file content via serial interface. Once finished, the user must wait at least 2 s before sending the +++ sequence to switch off the direct link mode. This operation may take a few seconds because the command also handles the final steps of FTP protocol. The final FTP command result is notified via the URC +UUFTPCR (see 25.4). o <param1> mandatory parameter; is the remote file name to be stored in the FTP server; • 8: Change working directory to the specified one. This AT command just sends requests to the FTP process. The final FTP command result will be notified via the URC +UUFTPCR (please refer to paragraph 25.4). o <param1> mandatory parameter; is the text string of the

Parameter	Type	Description
		destination directory name on the FTP host. For the limit of the length of the string please refer to 2.1.3. ○ <param2> parameter is not allowed (do not give a value). • 9: RFU; • 10: Create a directory on the FTP host. This AT command just sends a command request to the FTP process. The final result will be notified via the URC +UUFTPCR (please refer to paragraph 25.4). ○ <param1> mandatory parameter; text string of the new directory name to be made on FTP server. For the limit of the length of the string please refer to 2.1.3. ○ <param2> parameter is not allowed (do not give a value). • 11: Remove directory from the remote FTP server. This AT command just sends a command request to the FTP process. The final result will be notified via the URC +UUFTPCR (please refer to paragraph 25.4). ○ <param1> mandatory parameter; is the string of the existing directory name to be removed. For the limit of the length of the string please refer to 2.1.3. ○ <param2> parameter is not allowed (do not give a value). • 12: RFU; • 13: Information of a file or a directory. Command just sends a command request to the FTP process. Information of specified file or directory from FTP server will be returned via URC +UUFTPCD (please refer to paragraph 25.3). The final FTP command result will be notified via the URC +UUFTPCR (please refer to paragraph 25.4). ○ <param1> optional parameter; text string of the path file/directory name to be listed. If not specified, the current directory list is requested. For the limit of the length of the string please refer to 2.1.3. ○ <param2> parameter is not allowed (do not give a value). • 14: List file names in a specified directory. Command just sends a command request to the FTP process. List of file names received from FTP server will be returned via URC +UUFTPCD (please refer to paragraph 25.3). The final FTP result will be notified via the URC +UUFTPCR (please refer to paragraph 25.4). ○ <param1> optional parameter; text string of the path (file or directory) to be name listed. If not specified, the list of files names of current working directory is requested. For the limit of the length of the string please refer to 2.1.3. ○ <param2> parameter is not allowed (do not give a value).

☞ In case of error the error class and code is provided through +UFTPER AT command (more details in chapter 25.5).

25.3 FTP Unsolicited Data Indication +UUFTPCD

25.3.1 Description

Returns the data received from the remote FTP server in response to a specified <ftp_command> request previously sent via AT+UFTPC command.

Type	Syntax	Response	Example
URC		+UUFTPCD: <ftp_command>,<ftp_data_len>,<ftp_data>	+UUFTPCD: 13,16,"16 bytes of data"

25.3.2 Defined Values

Parameter	Type	Description
<ftp_command>	Number	FTP command as detailed in Defined Values paragraph 25.2.2 "File Transfer Protocol Command +UFTPC".
<ftp_data_len>	Number	Amount of data in bytes
<ftp_data>	String	Data available from FTP server in the ASCII [0x00,0xFF] range. The starting quotation mark shall not be taken into account like data, the first byte of data starts after the first quotation mark. Total number of bytes is <ftp_data_len>. At the end of the byte stream, another quotation mark is provided for user convenience and visualization purposes.

25.4 FTP Unsolicited Result Indication +UUFTPCR

25.4.1 Description

The result of the operation for a FTP command previously sent with +UFTPC is provided with this URC.

Type	Syntax	Response	Example
URC		+UUFTPCR: <ftp_command>,<ftp_result>	+UUFTPCR: 1,1

25.4.2 Defined Values

Parameter	Type	Description
<ftp_command>	Number	Same values as above
<ftp_result>	Number	• 0: Fail • 1: Success

25.5 File Transfer Protocol Error +UFTPER

25.5.1 Description

This command retrieves the error class and code of the last FTP operation.

Type	Syntax	Response	Example
Action	AT+UFTPER	+UFTPER: <error_class>,<error_code> OK	+UFTPER: 1,1 OK

25.5.2 Defined Values

Parameter	Type	Description
<error_class>	Number	Value of error class. Values are listed in paragraph A.1
<error_code>	Number	Value of class-specific error code (reply code if <error_class> is 0). The values are listed in A.1.1

26 HTTP AT commands

u-blox proprietary AT commands. Sending requests to a remote HTTP server and receiving the server response, transparently storing it in the file system. Supported: HEAD, GET, DELETE, PUT, POST file, POST data. GPRS or GSM data connection must be activated, using the specific AT commands described in chapter 22 "Data Connection Setup AT Commands".

26.1 HTTP Control +UHTTP

26.1.1 Description

Sets up the necessary parameters for HTTP service, or resets them to the default values. Up to 4 different HTTP profiles can be defined. To change the settings of a specified HTTP profile set command needs to be executed for each single <param_tag>. The read command returns the current setting of the specified parameter of HTTP profile, while the reset command resets to default values all the parameters of specified HTTP profile.

☞ HTTP parameters are not saved in the non volatile memory.

Type	Syntax	Response	Example
Set	Set command AT+UHTTP=<profile_id>[,<param_tag>[,<param_val>]]	OK	AT+UHTTP=2,0,"125.24.51.133" OK
	Get command AT+UHTTP=<profile_id>,<param_tag>	+UHTTP: <profile_id>, <param_tag>, <param_val> OK	AT+UHTTP=2,0 +UHTTP: 2,0,"125.24.51.133" OK
	Reset command AT+UHTTP=<profile_id>		AT+UHTTP=2 OK
Test	AT+UHTTP=?	+UHTTP: (list of supported <profile_id>s),(list of supported <param_tag>s) OK	+UHTTP: (0-3),(0-5) OK

26.1.2 Defined Values

Parameter	Type	Description
<profile_id>	Number	HTTP profile identifier, in range 0-3
<param_val>	Number	Type and supported content depend on related <param_tag> (details below). If <param_val> is not specified, the current parameter value for the corresponding <param_tag> is returned.

<param_tag>	Number	If <param_tag> and <param_val> are not specified, all the parameters of the corresponding HTTP <profile_id> are reset to default value.
		• 0: HTTP server IP address
		  ○ <param_val>: text string of HTTP server IP address in dotted decimal notation form (i.e. four numbers in range 0-255 separated by periods)
		• 1: HTTP server name
		  ○ <param_val>: text string of HTTP server name (e.g. "http.server.com") Maximum length for string is 128 chars
		• 2: Username
		  ○ <param_val>: user name text string (maximum 30 chars) for the

Parameter	Type	Description
		HTTP login procedure if authentication is used • 3: Password ○ <param_val>: password text string (maximum 30 chars) for the HTTP login procedure if authentication is used • 4: Authentication type ○ <param_val> is the HTTP authentication method (if any) • 0: No authentication (default) • 1: Basic authentication • 5: HTTP server port ○ <param_val> Number type value of the HTTP server port to be used in HTTP request, in range 1-65535. Default value is 80.

<param_tag>=0 and <param_tag>=1 are mutually exclusive. If <param_val> value for <param_tag>=0 is specified by user, then value for <param_tag>=1 is reset, or vice versa.

In case of error the error class and code is provided through +UHTTPER AT command (more details in chapter 26.4).

26.2 HTTP Command +UHTTPC

26.2.1 Description

Triggers the HTTP action specified in <http_command> parameter, using the HTTP profile settings (previously set up by AT+UHTTP command), and corresponding to <profile_id>. The response indicates if sending the command request to HTTP process was successful or not. Final result of HTTP action will be returned to the user via the unsolicited indication +UUHTTPCR (chapter 26.3).

Type	Syntax	Response	Example
Set	AT+UHTTPC=<profile_id>,<http_command>,<param1>,<param2>[,<param3>[,<param4>]]	OK	AT+UHTTPC=0,1,"/path/file.html","responseFilename" OK
Test	AT+UHTTPC=?	+UHTTPC: (list of supported <profile_id>s),(list of supported <http_command>s) OK	+UHTTPC: (0-3), (0-5) OK

26.2.2 Defined Values

Parameter	Type	Description
<profile_id>	Number	HTTP profile identifier, in range 0-3
<param1>	String	Path of HTTP server resource. Maximum length 128 characters
<param2>	String	Filename where the HTTP server response will be stored. If the file already exists, it will be overwritten. If <param2> is the empty string (""), the default "http_last_response_<profile_id>" filename will be used
<param3>	String	Type and content depend on related <http_command> (details below).
<http_command>	Number	• 0: HEAD command; issue an HEAD request to HTTP server. Command just sends a command request to the HTTP process. The final HTTP command result will be notified via the URC +UUHTTPCR (see detailed description) ○ <param3>: not allowed ○ <param4>: not allowed • 1: GET command; perform a GET request to HTTP server. Command just sends a command request to the HTTP process. The final HTTP command result will be notified via the URC +UUHTTPCR (see details below) ○ <param3>: not allowed ○ <param4>: not allowed

Parameter	Type	Description

		• 2: DELETE command; send a DELETE request to HTTP server. Command just sends a command request to the HTTP process. The final HTTP command result will be notified via the URC +UUHTTPCR (see detailed description)
		  ○ <param3>: not allowed
		  ○ <param4>: not allowed
		• 3: PUT command; perform a PUT request to HTTP server. Command just sends a command request to the HTTP process. The final HTTP command result will be notified via the URC +UUHTTPCR (see detailed description)
		  ○ <param3>: mandatory parameter; text string of the file system filename to be sent to the HTTP server within the PUT request
		  ○ <param4>: not allowed
		• 4: POST a file command; issue a POST request for sending a file to the HTTP server. Command just sends a command request to the HTTP process. The final HTTP command result will be notified via the URC +UUHTTPCR (see detailed description).
		  ○ <param3>: mandatory parameter; text string of the file system filename to be sent to the HTTP server with the POST request
		  ○ <param4> mandatory parameter of Number type; it is the HTTP Content-Type identifier
		  • 0: application/x-www-form-urlencoded
		  • 1: text/plain
		  • 2: application/octet-stream
		  • 3: multipart/form-data
		• 5: POST data command; send a POST request to HTTP server using the data specified in <param3> parameter. Command just sends a command request to the HTTP process. The final HTTP command result will be notified via the URC +UUHTTPCR (see detailed description).
		  ○ <param3>: mandatory parameter; text string of the data to be sent to the HTTP server with the POST request. The data must be formatted according to the Content-Type specified in <param4> parameter.

Data string must not exceed the maximum length of 128 bytes and not all of the ASCII charset can be used. Allowed ASCII characters are: 0x20 (space), 0x21 and from 0x23 to 0xFF. Substantially all of the alphanumeric set, symbols and extended ASCII charset from 0x80 to 0xFF. The control characters from 0x00 to 0x1F (included) and the 0x22 char, quotation mark (“), are forbidden.

In case of error the error class and code is provided through +UHTTPER AT command (more details in chapter 26.4).

26.3 HTTP Command Result Unsolicited Indication +UUHTTPCR

26.3.1 Description

This unsolicited indication returns the final result of HTTP command AT+UHTTPC.

Type	Syntax	Response	Example
URC		+UUHTTPCR: <profile_id>,<http_command>, <http_result>	+UUHTTPCR: 0,1,1

26.3.2 Defined Values

Parameter	Type	Description
<profile_id>	Number	HTTP profile identifier, in range 0-3
<http_command>	Number	Specifies values of <http_command> used in +UHTTPC
<http_result>	Number	• 0: Fail

Parameter	Type	Description
		• 1: Success

26.4 HTTP Protocol Error +UHTTPER

26.4.1 Description

Retrieves the error class and code of the last HTTP operation on specified HTTP profile.

Type	Syntax	Response	Example
Set	AT+UHTTPER=<profile_id>	+UHTTPER: <profile_id>, <error_class>,<error_code> OK	AT+UHTTPER=1 +UHTTPER=1,0,0 OK

26.4.2 Defined Values

Parameter	Type	Description
<profile_id>	Number	HTTP profile identifier, in range 0-3
<error_class>	Number	List of the allowed values is in annex A.1
<error_code>	Number	Value of class-specific error codes (reply code if class is 0). When <error_class>=10 (wrong HTTP API usage), allowed <error_code> values are llisted in A.1.2

27 SMTP AT Commands

Proprietary u-blox AT commands. PSD or CSD connection must be activated before using SMTP AT commands. SMTP AT commands provide the capability of sending text mails over the available data connection, with support of some header fields and attachments transparently retrieved from the file system.

27.1 SMTP Control +USMTP

27.1.1 Description

Sets up the necessary parameters for SMTP service, or resets parameters to default value. To change the settings the Set command needs to be executed for each single <param_tag>. Read command returns the current setting of all the SMTP parameters, one per line (i.e. the SMTP profile).

The SMTP parameter values specified with this command are all volatile (not stored in non-volatile memory).

Type	Syntax	Response	Example
Set	Set AT+USMTP=<param_tag>,[<param_val1>[,<param_val2>]] Reset command AT+USMTP=<param_tag>	OK	AT+USMTP=0,"151.9.37.66" OK
Read	AT+USMTP?	+USMTP: 0,<param_val1_0> ..... +USMTP: 6,<param_val1_6>,<param_val2_6> OK	+USMTP: 0,"69.147.102.58" +USMTP: 1,"" +USMTP: 2,"username" +USMTP: 4,1 +USMTP: 5,0 +USMTP: 6,0,0 OK
Test	AT+USMTP=?	+USMTP: (list of supported <param_tag>s) OK	+USMTP: (0-6) OK

27.1.2 Defined Values

Parameter	Type	Description
<param_val1>		Type and content depend on <param_tag> (details below). If <param_val1> is not specified, the value for the corresponding <param_tag> is reset
<param_val2>		Type and content depend on related <param_tag> (see details below)

<param_tag>	Number	• 0: SMTP server IP address;
		  ○ <param_val1> is text string of SMTP server IP address in dotted decimal notation form
		  ○ <param_val2> parameter is not allowed
		• 1: SMTP server name
		  ○ <param_val1> is text string of SMTP server name (e.g. "smtp.server.com") Maximum length is 128 chars
		  ○ <param_val2> is not allowed
		• 2: Username
		  ○ <param_val1> is user name text string (maximum 30 chars) for the SMTP login procedure, if authentication is used
		  ○ <param_val2> is not allowed.
		• 3: Password
		  ○ <param_val1> is password text string (maximum 30 chars) for the SMTP login procedure if authentication is used

Parameter	Type	Description
		○ <param_val2> is not allowed • 4: Authentication type ○ <param_val1> is the SMTP authentication method (if any): ○ 0: No authentication (default); ○ 1: Plain authentication; ○ 2: Login authentication. ○ <param_val2> is not allowed • 5: Inactivity timeout ○ <param_val1> is the inactivity timeout period in seconds, from 0 to 86400 s. 0 means no timeout (the SMTP session will not be terminated in the absence of incoming traffic); the default value is 30 s ○ <param_val2> is not allowed. • 6: Time zone, used for the date header field of mails ○ <param_val1> Number type value of hour differential, in range [-12; 12] (default is 0). ○ <param_val2> Number type value of minute differential, in range [0; 59] (default is 0). This is a mandatory parameter if <param_tag>=6 and <param_val1> is specified.

<param_tag>=0 and <param_tag>=1 are mutually exclusive. If <param_val1> value for <param_tag>=0 is specified by user, then value for <param_tag>=1 is reset or viceversa.

In case of error the error class and code is provided through +USMTPER AT command (more details in chapter 27.5).

27.2 SMTP Mail Control +USMTPM

27.2.1 Description

Sets (or resets) the necessary parameters for envelope and body of a mail for subsequent transmission via SMTP protocol. The Reset command resets all internal SMTP buffers in order to create a new mail. To specify the settings for envelope and body of mail the Set command needs to be executed for each single <param_tag>.

Type	Syntax	Response	Example
Set	Set AT+USMTPM[=<param_tag>,<param_val1>[,<param_val2>,<param_val3>]]	OK	AT+USMTPM=0,"ugo.rossi@u-blox.com" OK
	Reset command AT+USMTPM		AT+USMTPM=6 @<mail text><ctrl_z> OK
	Enhanced mode AT+USMTPM=6 @<mail text><ctrl_z>		
Test	AT+USMTPM=?	+USMTPM: (list of supported<param_tag>s) OK	+USMTPM: (0-5) OK

27.2.2 Defined Values

Parameter	Type	Description
<param_val1>	String	Type and content depend on <param_tag> (details below). If <param_val1> is not specified, the value for the corresponding <param_tag> is reset
<param_val2>	Number	Type and content depend on related <param_tag> (see details below)

Parameter	Type	Description
<param_val3>	String	Type and content depend on related <param_tag> (see details below)

<param_tag>	Number	• 0: Set mail sender address.
		  ○ <param_val1> mandatory parameter, text string of the sender address, must be in the form "local_part@domain" and not exceed 64 characters.
		  ○ <param_val2> is not allowed.
		  ○ <param_val3> is not allowed.
		• 1: Set "Replay-To" field
		  ○ <param_val1> mandatory parameter, text string of the address which replies should be sent to. Must be in form "local_part@domain" and not exceed 64 characters.
		  ○ <param_val2> parameter is not allowed.
		  ○ <param_val3> parameter is not allowed.
		• 2: Add mail receiver. Up to 10 different recipient addresses can be added for each new mail.
		  ○ <param_val1> mandatory parameter, recipient address text string, must be in form "local_part@domain" and not exceed 64 characters.
		  ○ <param_val2> is not allowed.
		  ○ <param_val3> is not allowed.
		• 3: Set mail subject.
		  ○ <param_val1> mandatory parameter, text string of the mail subject.
		  ○ <param_val2> is not allowed.
		  ○ <param_val3> is not allowed.
		• 4: Set mail text.
		  ○ <param_val1> mandatory parameter, text string of the mail text.
		  ○ <param_val2> parameter is not allowed.
		  ○ <param_val3> parameter is not allowed.
		• 5: Add attachment. The attachment must be a file stored in file system and accessible by the SMTP client. Up to 10 attachments can be added for each new mail.
		  ○ <param_val1> mandatory parameter, text string of attachment file name
		  ○ <param_val2> mandatory Number parameter of the media type, can be:
		  • 0: Undefined media type
		  • 1: Text media type
		  • 2: Image media type
		  • 3: Audio media type
		  • 4: Video media type
		  • 5: Application media type
		  ○ <param_val3> mandatory parameter, text string of media sub-type
		• 6: Set mail text in enhanced mode: it is possible to write text messages up to 4096 bytes. After the AT+USMTPM=6 command a '@' prompt will be displayed. After this prompt it is possible to write the mail text. To finish the input send the special character CTRL_Z (0x1A). Anyway if the total length of 4096 characters is reached, the command exits from the input mode automatically.
		  ○ <param_val1>, <param_val2> and <param_val3> are not used.

Mail subject must not exceed the maximum length of 64 bytes and not all of the ASCII charset can be used. Allowed ASCII characters are: 0x20 (space), 0x21 and from 0x23 to 0xFF. Substantially all of the alphanumeric set, symbols and extended ASCII charset from 0x80 to 0xFF. The control characters from 0x00 to 0x1F (included) and the 0x22 char, quotation mark ("), are forbidden.

Mail text must not exceed the maximum length of 512 bytes and not all of the ASCII charset can be used. Allowed ASCII characters are: 0x20 (space), 0x21 and from 0x23 to 0xFF. Substantially all of the alphanumeric set, symbols and extended ASCII charset from 0x80 to 0xFF. The control characters from 0x00 to 0x1F (included) and the 0x22 char, quotation mark ("), are forbidden.

In case <param_val2> = 0 (Undefined media type), the empty string ("") can be used as input value for <param_val3>.

☞ In case of error the error class and code is provided through +USMTPER AT command (more details in chapter 27.5).

27.3 SMTP Command +USMTPC

27.3.1 Description

Execution of this command triggers the SMTP action corresponding to <smtp_command> parameter. The response indicates if sending the command request to SMTP process was successful or not. Final result of SMTP action will be returned to the user via the unsolicited indication +UUSMTPCR (refer to paragraph 27.4).

Type	Syntax	Response	Example
Set	AT+USMTPC=<smtp_command>	OK	AT+USMTPC=1 OK
Test	AT+USMTPC=?	+USMTPC: (list of supported <smtp_command>s) OK	+USMTPC: (0-2) OK

27.3.2 Defined Values

Parameter	Type	Description
<smtp_command>	Number	• 0: SMTP quit; terminates the SMTP session issueing a QUIT command, then closes the TCP connection with the SMTP server. Notice that this AT command just sends a command request to the SMTP process. The final SMTP command result will be notified via the URC +UUSMTPCR (see detailed description). • 1: SMTP connect; using the parameters of current SMTP profile (set via AT+USMTP command) connects to the SMTP server via TCP, reads its greeting and sends the HELO command, after which the handshake is complete, and the SMTP client is ready for sending mails. Notice that this AT command just sends a command request to the SMTP process. The final SMTP command result will be notified via the URC +UUSMTPCR (see details below). • 2: Send mail; sends the previously prepared mail (set up via AT+USMTPM command) to the connected SMTP server via the MAIL – RCPT – DATA commands sequence. This AT command just sends a command request to the SMTP process. The final SMTP command result will be notified via the URC +UUSMTPCR (see detailed description).

☞ In case of error the error class and code is provided through +USMTPER AT command (more details in chapter 27.5).

27.4 SMTP Command Result Unsolicited Indication +UUSMTPCR

27.4.1 Description

Return the final result of SMTP command previously sent via AT+USMTPC.

Type	Syntax	Response	Example
URC		+UUSMTPCR: <smtp_command>,<smtp_result>[,<reject_rcpt_addr1>[,<reject_rcpt_addr2>[,…]]]	+UUSMTPCR: 1,1

27.4.2 Defined Values

Parameter	Type	Description
<smtp_command>	Number	Specifies the corresponding SMTP command as detailed in Defined Values Paragraph of +USMTPC command
<smtp_result>	Number	Result code of SMTP operation • 0: Failure • 1: Success • 2: Partial success; this result code can be returned after AT+USMTPC=2 command (Send mail), when the mail has been delivered to some of the specified recipients only. In this case the list of mail addresses of rejected recipients follows.
<reject_rcpt_addrN>	String	Rejected recipient N, in the form "local_part@domain", in case the final result of AT+USMTPC=2 command (Send mail) is a Partial success.

27.5 SMTP Error +USMTPER

27.5.1 Description

This command retrieves the error class and code of the last SMTP operation.

Type	Syntax	Response	Example
Set	AT+USMTPER	+USMTPER: <error_class>,<error_code> OK	AT+USMTPER +USMTPER: 0,0 OK

27.5.2 Defined Values

Parameter	Type	Description
<error_class>	Number	Value of error class; see annex A.1
<error_code>	Number	Value of class-specific error code (reply code if class is 0). Values are listed in A.1.3

28 PING AT commands

28.1 Ping Command +UPING

28.1.1 Description

The ping command is the common method to know if a remote host is reachable on the internet.

The ping functionality is based on the ICMP protocol (Internet Control Message Protocol), it is part of the Internet Protocol Suite as defined in RFC 792 [57]. ICMP messages are typically generated in response to errors in IP datagrams or for diagnostic or routing purposes.

The ping command sends an ICMP Echo-Request to the remote host and waits for its ICMP Echo-Reply. If the Echo-Reply packet isn't received, it might mean that the remote host is not reachable.

The ping command could be used also to know some internet network measurements like the RTT (Round Trip Time, the time needed by a packet to go to the remote host and come back) and the TTL (Time To Live, it is a value to understand how many gateway a packet has gone through).

The AT+UPING allows the user to execute a ping command from the modem to a remote peer.

The results of the ping command execution will be notified via +UUPING URC, or via +UUPINGER if any error occur while processing the command.

The +UUPING URC reports the result of the +UPING command when no error has occurred.

The +UUPINGER unsolicited indication is raised if an error is occurred while processing the +UPING command. The URC reports the code of occurred error (see Appendix A.2 – Ping error codes to get the meanings of the error codes).

This command is available only on LEON-G100 / G200 series from LEON-G100-06x/LEON-G200-06x and subsequent versions.

Some network operators may disallow ICMP packets traffic on their network, this means that the PING command may not work.

Some remote hosts mightn't reply to ICMP Echo-Request for security reasons (e.g. firewall settings).

Some remote hosts mightn't reply to ICMP Echo-Request if the data size of the Echo-Request is too big.

If a remote peer doesn't reply to an ICMP Echo-Request, it doesn't mean that for sure the peer can't be reached in another way.

An active CSD or PSD connection must be configured and enabled before executing the +UPING command (see Chapter 21 – "Data connection setup AT commands") Insert the cross-reference.

Type	Syntax	Response	Example
Set	AT+UPING=<remote_host>[,<retry_num>,<p_size>,<timeout>,<ttl>]	OK	AT+UPING="www.google.com" OK
Test	AT+UPING=?	+UPING: "remote_host",(list of supported <retry_num>),(list of supported <p_size>),(list of supported <timeout>),(list of supported <ttl>) OK	+UPING: "remote_host",(1-64),(4-1460),(10-60000),(1-255) OK

Type	Syntax	Response	Example
URC		+UUPING: <retry_num>,<p_size>,<remote_hostname>,<remote_ip>,<ttl>,<rtt>	+UUPING: 1,32,"www.l-google.com","72.14.234.104",55,768
URC		+UUPINGER:<error_code>	+UUPINGER:12

28.1.2 Defined Values

Parameter	Type	Description
<remote_host>	String	IP address (dotted decimal representation) or domain name of the remote host • Max Length: 128 characters
<retry_num>	Number	Indicates how many times iterate the ping command. • Range: 1-64 • Default: 4
<p_size>	Number	Size in bytes of the echo packet payload. • Range: 4-1460 • Default: 32
<timeout>	Number	The maximum time in milliseconds to wait for a Echo-Reply response. • Range: 10-60000 • Default: 5000
<ttl>	Number	The value of TTL to be set for the outgoing Echo-Request packet. In the URC it provides the TTL value received in the incoming packet • Range: 1-255 • Default: 32
<remote_hostname>	String	String representing the domain name (if available) of the remote host. It this information is not available, it will be an empty string (i.e. "").
<remote_ip>	String	String representing the remote host IP address in dotted decimal form.
<rtt>	Number	RTT value, the time elapsed in milliseconds before receiving the Echo-Reply response from the remote host. If the value of <rtt> is -1, it means that the timeout is elapsed (no response received).
<error_code>	Number	The error occurred while processing the +UPING command

29 GPS AT Commands

29.1 GPS Power Management +UGPS

29.1.1 Description

Switches on or off a u-blox GPS receiver connected to the Wireless Module via a dedicated DDC (I^2C) interface. For more details about connection between wireless module and u-blox GPS receiver refer to LEON-G100/G200 System Integration Manual [25] and LISA-U1 series System Integration Manual [49].

Furthermore the command sets the aiding type to be used to enhance GPS performance, e.g. decreasing Time To First Fix (TTFF), thus allowing to calculate the position in a shorter time with higher accuracy. The following aiding types are supported:

- Automatic local aiding: the Wireless Module automatically uploads data such as ephemeris, almanac, last position, time, etc. from the GPS receiver into its local memory, and restores back the GPS receiver at next power up of the GPS module (if data is still valid, otherwise it uses GSM information such as country code for a rough position estimation). Almanac file must be stored in the wireless module; otherwise, if not present, the file is downloaded by the module
- AssistNow Online: GPRS must be activated before selecting the AssistNow Online; refer to +UGAOP command description (29.4) and Data Connection Setup AT commands chapter 22. If CellLocate is used the first HTTP profile will be properly configured
- AssistNow Offline: GPRS must be activated before selecting the AssistNow Offline if the almanac file has to be downloaded; refer to +UGAOF command description (29.5) and Data Connection Setup AT commands chapter 22
- AssistNow Autonomous (only on LEON-G100-06x/LEON-G200-06x and subsequent versions)

For a more detailed description on aiding modes and possible suggestions please refer to GPS Implementation Application Note [52].

On LISA-U1 series and LEON-G100/G200 series (from LEON-G100-05S/LEON-G200-05S and subsequent versions) it is possible to combine different aiding modes: to enable more aiding modes it is needed to sum the <mode> value of the interested aiding modes (e.g.: aiding <mode>=3 means local aiding plus AssistNow Offline). Moreover is also possible to switch from one aiding mode to another one without powering off the GPS. If the following sequence is provided (AT+UGPS=1,1 and then AT+UGPS=1,5) at the beginning the GPS will power on with local aiding support and after the second command will be added the AssistNow Online. After the second command the local aiding is not restarted, therefore URC for it will not be sent again.

By default the wireless modules configure the GPS receiver through +UGPS AT command to not provide the NMEA sentences.

Type	Syntax	Response	Example
Set	AT+UGPS=<mode>[,<aid_mode>]	OK	AT+UGPS=1,0 OK
Read	AT+UGPS?	+UGPS: <mode>[,<aid_mode>] OK	+UGPS: 1,0 OK
Test	AT+UGPS=?	+UGPS: (list of supported <mode>s),(list of supported <aid_mode>)	+UGPS: (0-1),(0-15) OK

29.1.2 Defined Values

Parameter	Type	Description
<mode>	Number	• 0: GPS receiver powered OFF (default value) • 1: GPS receiver powered ON
<aid_mode>	Number	Provides the supported aiding mode; the parameter is mandatory if <mode>=1; except for <mode>=0 all these supported values can be combined together • 0: No aiding (default value) • 1: Automatic local aiding • 2: AssistNow offline • 3: Reserved • 4: AssistNow online • 8: AssistNow autonomous

A message error is provided in the following cases:

- <mode> and <aid_mode> values are out of range
- <mode> is set to 1 without <aid_mode> value
- Attempt to power on GPS when it is already on, even if the <aid_mode> is different (this information is available on LEON from LEON-G100-05S/LEON-G200-05S and subsequent versions)
- Attempt to power off the GPS when it is already off
- The value of <aid_mode> to be set is equal to the current GPS aiding mode (this information is available on LEON from LEON-G100-05S/LEON-G200-05S and subsequent versions)
- <aid_mode>=3 (this information is available on LEON from LEON-G100-05S/LEON-G200-05S and subsequent versions)

29.2 Assisted GPS unsolicited indication +UGIND

29.2.1 Description

Enables or disables sending of URCs from MT to TE in the case of GPS aiding operations. <mode> parameter controls the processing of URCs specified within this command.

The URC returns the result of an assisted GPS operation. This information is sent to all the interfaces. Unsolicited information is provided only if one or more aiding modes are enabled (for more details please refer to chapter 29.1 and 29.4).

There can be more than a URC +UUGIND for a single aiding operation: the +UUGIND is reported for each error. For instance if the local aiding is enabled and there are no space left in the file system after +UGPS=0, there will be an error for every failure writing on FFS.

The commands +UGAOS=0 and +UGAOS=1 both related to GPS local aiding, so the unsolicited message will be +UUGIND=1,x in both cases.

Local aiding and AssistNow Autonomous will produce URC both after GPS power on and before GPS power off because some data are transferred from GPS receiver to wireless module.

This command is available on LEON from LEON-G100-05S/LEON-G200-05S and subsequent versions.

<aid_mode>=8 and <result> from 10 to 14 are available only on LEON from LEON-G100-06x/LEON-G200-06x and subsequent versions.

The URCs during GPS power down phase will arrives between the power off command (+UGPS=0) and the effective switch off (OK message).

Type	Syntax	Response	Example
Set	AT+UGIND =<mode>	OK	AT+UGIND =1 OK
Read	AT+UGIND?	+UGIND: <mode> OK	+UGIND: 1 OK
Test	AT+UGIND=?	+UGIND: (list of supported <mode>'s) OK	+UGIND: (0-1) OK
URC		+UUGIND: <aid_mode>,<result>	+UUGIND: 4,5

29.2.2 Defined Values

Parameter	Type	Description
<mode>	Number	Enable/disable the URC • 0: Disabled (default value) • 1: Enabled
<aid_mode>	Number	Provides the supported aiding mode • 0: No aiding • 1: Automatic local aiding • 2: AssistNow offline • 3: Reserved • 4: AssistNow online • 8: AssistNow Autonomous
<result>	Number	• 0: No error • 1: Wrong URL (for AssistNow Offline) • 2: HTTP error (for AssistNow Offline) • 3: Create socket error (for AssistNow Online) • 4: Close socket error (for AssistNow Online) • 5: Write to socket error (for AssistNow Online) • 6: Read from socket error (for AssistNow Online) • 7: Connection/DNS error (for AssistNow Online) • 8: File system error • 9: Generic error • 10: No answer from GPS (for local aiding and AssistNow Autonomous) • 11: Data collection in progress (for local aiding) • 12: GPS configuration failed (for AssistNow Autonomous) • 13: RTC calibration failed (for local aiding) • 14: feature not supported (for AssistNow Autonomous)

The parameter <aid_mode>= 8 (AssistNow Autonomous) is available only on LEON from LEON-G100-06x/LEON-G200-06x and subsequent versions.

29.3 GPS Profile configuration +UGPRF

29.3.1 Description

Configures the data flow to and from a u-blox GPS receiver connected to the Wireless Module. Data flow is possible to and from the:

- UART (via MUX)
- USB only on LISA-U1 series
- Over the air to a remote host: to send data over the air an internet connection must be active and there must be at least one socket free (the GPS shares the socket pool with the other applications). Setting up an Internet connection and network registration is not part of this command and must be handled by the user separately from this command; please refer to chapter 22

Into a file on the Wireless module: a file with GPS data can be accessed via +ULSTFILE command. The file name is automatically chosen by the Wireless Module based on date and time with a further incremental number (e.g. "GPS_20091006_001"). When the files size reaches 500 kB the file is closed and no more data is saved. It is possible to save further data by restarting the GPS (this will create a new file)It is possible to send GPS data to multiple destinations at the same time. To enable more destinations it is needed to sum the <GPS_I/O_configuration> value of the interested destinations (e.g. if AT+UGPRF= 6 the data will be sent on MUX and stored in a file in the file system).

The messages to be output by the u-blox GPS receiver need to be activated separately with UBX-CFG-MSG configuration messages according the u-blox 5 and u-blox 6 Protocol Specification [45].

☞ It is not possible to select the GPS data flow to and from USB and MUX concurrently.

☞ The configuration of the GPS profile must be performed only when GPS is switched off, otherwise a message error will be displayed.

☞ Setting up an Internet connection and network registration is not part of this command and must be handled by the user separately from this command; please refer to chapter 22.

☞ <GPS_I/O_configuration>=16 and 32 are available only on LEON-G100/G200 series from LEON-G100-06x/LEON-G200-06x and subsequent versions.

Type	Syntax	Response	Example
Set	AT+UGPRF=<GPS_I/O_configuration>[, <IP Port>,<"server address string">]	OK	AT+UGPRF=0 OK
Read	AT+UGPRF?	+UGPRF: <GPS_I/O_configuration>, <IP port>,<"server address string"> OK	+UGPRF=0, 0, "" OK
Test	AT+UGPRF=?	+UGPRF: (list of supported <GPS_I/O_configuration>), (list of supported <IP port>), <"server address string"> OK	+UGPRF: (0-63), (0-65535),"addr" OK

29.3.2 Defined Values

Parameter	Type	Description
<GPS_IO_configuration>	Number	• 0: Default value (i.e. no data flow to MUX, file or IP address) • 1: GPS data flow to and from USB (note: UBX-AID messages filtered out) • 2: GPS data flow to and from MUX (note: UBX-AID messages filtered out) • 4: GPS data flow saved to file (note: no filtering) • 8: GPS data flow over the air to an Internet host (note: no filtering) • 16: GPS Tx data ready feature • 32: RTC sharing
<IP port>	Number	IP port to be used when the GPS data flow sent over the air is enabled (default value: 0). If GPS data flow over the air is enabled the parameter is mandatory otherwise is forbidden
<"server address string">	String	Provide the address string of the server where will be sent the GPS data flow (default value: ""). If GPS data flow over the air is enabled the parameter is mandatory otherwise is forbidden.

☞ UBX-AID messages are not passed over the multiplexer if AssistNow Online, AssistNow Online or Local Aiding is enabled (see AT+UGPS; please refer to paragraph 29.1).

29.4 AssistNow Online configuration +UGAOP

29.4.1 Description

Configures the network connection to an AssistNow Online server. Use of this command is only necessary if changes to the default configuration are required.

AssistNow Online server is accessed with the User Datagram Protocol (UDP). The GPS shares the socket pool with the other applications, to execute AssistNow the wireless module will try to open a new socket without dropping any open socket, if there is no socket available then the GPS will start and no aiding operation is performed. By default, the wireless module connects to u-blox' AssistNow Online server. Authentification on u-blox' AssistNow Online server is done automatically (without giving u-blox any information that could be used to identify the customer and/or end user); user name and passwords are not required. Access to proxy servers is possible.

Three different modes of operation are supported:

- AssistNow Online data are automatically downloaded from the server when the GPS receiver is started up (i.e. with command +UGPS and <GPS mode>=1 and <aid_mode>=4)
- AssistNow Online data are only requested upon the reception of a +UGAOS AT command
- AssistNow Online data are kept alive. This is done by periodically (every 2 hours) accessing the AssistNow Online to keep the ephemeris alive. Note: a GPRS session must be active to allow an automatic update of AssistNow Online data

☞ Setting up Internet connection and network registration is not part of this command and must be handled by the user separately to this command; please refer to chapter 22.

☞ If AssistNow Online is not configured with this command the following settings will be assumed:

- <"hostname">: "agps.u-blox.com"
- <server port>: 46434
- <latency>: 1000 ms
- <mode>: 0

The default GPRS ID for AssistNow connection is ID 0. The correct APN must be set in this ID or via AT commands or via M2M functions (i.e. AT+UPSD=0,1,"internet.wind")"then the GPRS profile ID 0 must be activated (i.e. AT+UPSDA=0,3).

Type	Syntax	Response	Example
Set	AT+UGAOP=<"host name">, <server port>, <latency>, <mode>	OK	AT+UGAOP="agps.u-blox.com", 46434,1000,0 OK
Read	AT+UGAOP?	+UGAOP: <"host name">, <server port>, <latency>, <mode> OK	+UGAOP: "agps.u-blox.com", 46434,1000,0 OK

29.4.2 Defined Values

Parameter	Type	Description
<"host name">	String	Host name of the server (i.e. agps.u-blox.com); (max length 47 characters)
<server port>	Number	Value in the range 0 – 65535. (default value: 46434)
<latency>	Number	Expected network latency value from Assist now Online server to client, in seconds. Range goes from 0 to 10000 ms. (default: 1000 ms)
<mode>	Number	• 0: AssistNow Online data are downloaded at GPS receiver power up (default value) • 1: AssistNow Online data automatically kept alive

Parameter	Type	Description
		• 2: Manual AssistNow Online data download

29.5 AssistNow Offline configuration +UGAOF

29.5.1 Description

Configures the network connection to an AssistNow Offline server. Use of this command is only necessary if changes to the default configuration are required.

Access to an AssistNow Offline server is done with HTTP/1.1. The GPS shares the socket pool with the other applications, to execute AssistNow Offline the wireless module will try to open a new socket without dropping any open socket, if there is no socket available then the GPS will start and no aiding operation is performed. By default, the wireless module connects to the 14 day file on the u-blox' AssistNow Offline server.

Setting up Internet connection and network registration is not part of this command and must be handled by the user separately from this command.

Type	Syntax	Response	Example
Set	AT+UGAOF=<"file_url">, <reserved>, <retry timeout>, <max_retry_attempts>	OK	AT+UGAOF="http://alp.u-blox.com/current_14d.alp",0,1,3 OK
Read	AT+UGAOF?	+UGAOF: <"file_url">, 0, <retry timeout>, <max_retry_attempts> OK	+UGAOF: "http://alp.u-blox.com/current_14d.alp",0,1,3 OK

29.5.2 Defined Values

Parameter	Type	Description
<"file_url">	String	URL of AssistNow Offline file (maximum of 255 characters including "http://"). Allows choosing the size/validity of the file. By default, the Wireless Module connects to http://alp.u-blox.com/current_14d.alp
<Reserved>		RFU
<Retry Timeout>	Number	Timeout in minutes after a failed download for the next download attempt (0 … 999) (default value: 1)
<max_retry_attempts>	Number	Maximum number of attempts in case of failed download (0-5); default value is 3

29.6 GPS Aiding request command +UGAOS

29.6.1 Description

Triggers manual download of AssistNow Online and AssistNow Offline data from the configured server in case automatic AssistNow operation is not enabled (see +UGAOF for AssistNow Offline and +UGAOP for AssistNow Online). The command returns only when the received data from the server are valid or an error occurs.

The command is also used to trigger manual upload of local aiding data (e.g. ephemeris, almanac, last position, time, etc) from a u-blox GPS receiver prior to shutting it down and to restore it into the receiver after the power up of the GPS receiver (for more details please refer to command +UGPS, chapter 29.1).

<aid_mode>=8 (AssistNow Autonomous) is available only on LEON from LEON-G100-06x/ LEON-G200-06x and subsequent versions.

Type	Syntax	Response	Example
Set	AT+UGAOS=<aid_mode>	OK	AT+UGAOS=0 OK
Test	AT+UGAOS=?	AT+UGAOS: (list of supported <aid_mode>s) OK	+UGAOS: (0-8) OK

29.6.2 Defined Values

Parameter	Type	Description
<aid_mode>	Number	• 0: Upload of local aiding data from GPS receiver to Wireless Module; • 1: Download of local aiding data from Wireless Module to GPS receiver; • 2: AssistNow Offline file download request (file loaded into Wireless Module); • 4: AssistNow Online data download request (data loaded into GPS receiver). This is only needed if AssistNow Online is not used with automatic operation; • 8: AssistNow autonomous • Other values are reserved for future use.

29.7 Send of UBX string +UGUBX

29.7.1 Description

Sends UBX protocol messages, embedded in an AT command, to a u-blox GPS receiver. The +UGUBX command is transparent, that is the data is sent to the GPS receiver without any check: it is up to the user to control if the UBX data is correct. The checksum in +UGUBX command string is ignored, this is calculated when data is sent to the GPS receiver.

Type	Syntax	Response	Example
Set	AT+UGUBX=<UBX String>	+UGUBX: <UBX String response> OK	AT+UGUBX="B5620601080001060001 0000000017DA" +UGUBX: "B5620501020006010F38" OK

29.7.2 Defined Values

Parameter	Type	Description
<UBX String>	String	UBX message in hexadecimal format. The messages can include spaces to simplify copy/paste from u-center separated with spaces, e.g. AT+UGUBX="B5 62 06 01 08 00 01 06 00 01 00 00 00 00 17 DA" (this is important when copying messages from u-center). The maximum length of <UBX string> is 110 bytes (spaces included)
<UBX String response>	String	The response message depends by the request sent: query/poll UBX messages will return the requested data in hexadecimal format, while configuration message will return the corresponding acknowledge or not-acknowledge. Please refer to UBX protocol specification [45]

☞ If a +UGUBX command triggers multiple strings answer only a single UBX string is returned. E. g. polling GPS Aiding Ephemeris Data (AID-EPH) is done by sending a single message to the receiver but returns 32 messages; only the first one is sent to AT interface.

29.8 GPS Indications timer +UGTMR

29.8.1 Description

Sets date and time format. With <time zone> parameter is possible to set the time zone value; the time and the date will be updated as the local time; the default value is 0. With action command is possible to synchronize the UTC timing.

Type	Syntax	Response	Example
Action	AT+UGTMR	OK	AT+UGTMR OK
Set	AT+UGTMR=<time zone>	OK	AT+UGTMR=-1 OK
Read	AT+UGTMR?	+UGTMR=<time zone> OK	+UGTMR: -1 OK
Test	AT+UGTMR=?	+UGTMR: (list of supported <time zone>s) OK	+UGTMR: (-48 – 48) OK

29.8.2 Defined Values

Parameter	Type	Description
<time zone>	Number	Indicates the time zone value set by the user; the data module can provide an error message if the offset has not been calculated (default value: 0) • -48, 48: defined range

☞ The time zone is expressed in quarters of hour.

29.9 Get GPS Time and date +UGZDA

29.9.1 Description

Enables/disables storing of the last value of NMEA $ZDA messages, and get the current messaging state. If <state> parameter is enabled, the last value of NMEA $ZDA messages can be retrieved with the read command even when the GPS is switched off.

The NMEA $ZDA messages are volatile.

Type	Syntax	Response	Example
Set	AT+UGZDA=<state>	OK	AT+UGZDA=1 OK
Read	AT+UGZDA?	+UGZDA: <state>,<$ZDA msg> OK	+UGZDA: 1,Not available OK +UGZDA: 0,NULL OK
Test	AT+UGZDA=?	+UGZDA: (list of supported <state>s) OK	+UGZDA: (0-1) OK

29.9.2 Defined Values

Parameter	Type	Description
<state>	Number	• 0: disable the NMEA $ZDA messages (default value) • 1: enable the NMEA $ZDA messages (default)
<$ZDA msg>	String	NMEA $ZDA messages. If the parameter value is "Not available" then the NMEA string is enabled but this information has not been still sent to the user.

☞ If <$ZDA msg> value is "Not Available", check that the GPS ZDA message is enabled. To enable it use the +UGUBX command (for further information see the UBX-CFG-MSG message in the u-blox 6 Receiver Description Including Protocol Specification [45]).

☞ On LEON-G100/LEON-G200 series, for LEON-G100-05S/LEON-G200-05S and previous versions <state> default value is 1.

29.10 Get GPS fix data +UGGGA

29.10.1 Description

Enables/disables storing of the last value of NMEA $GGA messages, and gets the current messaging state. If <state> parameter is enabled, the last value of NMEA $GGA messages can be retrieved with the read command even when the GPS is switched off.

The NMEA $GGA messages are volatile.

Type	Syntax	Response	Example
Set	AT+UGGGA=<state>	OK	AT+UGGGA=1 OK
Read	AT+UGGGA?	+UGGGA: <state>,<$GGA msg> OK	+UGGGA: 1,Not available OK +UGGGA: 0,NULL OK
Test	AT+UGGGA=?	+UGGGA: (list of supported <state>s) OK	+UGGGA: (0-1) OK

29.10.2 Defined Values

Parameter	Type	Description
<state>	Number	• 0: to disable the NMEA $GGA messages (default value) • 1: to enable the NMEA $GGA messages
<$GGA msg>	String	NMEA $GGA messages. If the parameter value is "Not available" then the NMEA string is enabled but this information has not been still sent to the user.

☞ If <$GGA msg> is "Not Available" check that the GPS GGA message is enabled. To enable it use the +UGUBX command (for further information see the UBX-CFG-MSG message in the u-blox 6 Receiver Description Including Protocol Specification [45]).

☞ On LEON-G100/LEON-G200 series, for LEON-G100-05S/LEON-G200-05S and previous versions <state> default value is 1.

29.11 Get geographic position +UGGLL

29.11.1 Description

Enables/disables storing of the last value of NMEA $GLL messages, and also to know the current messaging state. If <state> parameter is enabled, the last value of NMEA $GLL messages can be retrieved with the read command even when the GPS is switched off.

The NMEA $GLL messages are volatile.

Type	Syntax	Response	Example
Set	AT+UGGLL=<state>	OK	AT+UGGLL=1 OK
Read	AT+UGGLL?	+UGGLL: <state>,<$GLL msg> OK	+UGGLL: 1,Not available OK +UGGLL: 0,NULL OK
Test	AT+UGGLL=?	+UGGLL: (list of supported <state>s) OK	+UGGLL: (0-1) OK

29.11.2 Defined Values

Parameter	Type	Description
<state>	Number	• 0: to disable the NMEA $GLL messages (default value) • 1: to enable the NMEA $GLL messages
<$GLL msg>	String	NMEA $GLL messages. If the parameter value is "Not available" then the NMEA string is enabled but this information has not been still sent to the user.

If <$GLL msg> is "Not Available" check that the GPS GLL message is enabled. To enable it use the +UGUBX command (for further information see the UBX-CFG-MSG message in the u-blox 6 Receiver Description Including Protocol Specification [45]).

On LEON-G100/LEON-G200 series, for LEON-G100-05S/LEON-G200-05S and previous versions <state> default value is 1.

29.12 Get number of GNSS satellites in view +UGGSV

29.12.1 Description

Enable/disables the storing of the last value of NMEA $GSV messages, and gets the current messaging state. If <state> parameter is enabled, the last value of NMEA $GSV messages can be retrieved with the read command even when the GPS is switched off.

The NMEA $GSV messages are volatile.

Type	Syntax	Response	Example
Set	AT+UGGSV=<state>	OK	AT+UGGSV=1 OK
Read	AT+UGGSV?	+UGGSV: <state>, <$GSV msg> OK	+UGGSV: 1,Not available OK +UGGSV: 0,NULL OK

Type	Syntax	Response	Example
Test	AT+UGGSV=?	+UGGSV: (list of supported <state>s) OK	+UGGSV: (0-1) OK

29.12.2 Defined Values

Parameter	Type	Description
<state>	Number	• 0: to disable the NMEA $GSV messages (default value) • 1: to enable the NMEA $GSV messages
<$GSV msg>	String	NMEA $GSV messages. If the parameter value is "Not available" then the NMEA string is enabled but this information has not been still sent to the user.

☞ If <$GSV msg> is "Not Available" check that the GPS GSV message is enabled. To enable it use the +UGUBX command (for further information see the UBX-CFG-MSG message in the u-blox 6 Receiver Description Including Protocol Specification [45]).

☞ On LEON-G100/LEON-G200 series, for LEON-G100-05S/LEON-G200-05S5 and previous versions <state> default value is 1.

29.13 Get recommended minimum GNSS data +UGRMC

29.13.1 Description

Enable/disables storing of the last value of NMEA $RMC messages, and gets the current messaging state. If <state> parameter is enabled, the last value of NMEA $RMC messages can be retrieved with the read command even when the GPS is switched off.

The NMEA $RMC messages are volatile.

Type	Syntax	Response	Example
Set	AT+UGRMC=<state>	OK	AT+UGRMC=1 OK
Read	AT+UGRMC?	+UGRMC: <state>,<$RMC msg> OK	+UGRMC: 1,Not available OK +UGRMC: 0,NULL OK
Test	AT+UGRMC=?	+UGRMC: (list of supported <state>s) OK	+UGRMC: (0-1) OK

29.13.2 Defined Values

Parameter	Type	Description
<state>	Number	• 0: to disable the NMEA $RMC messages (default value) • 1: to enable the NMEA $RMC messages
<$RMC msg>	String	NMEA $RMC messages. If the parameter value is "Not available" then the NMEA string is enabled but this information has not been still sent to the user.

☞ If <$RMC msg> is "Not Available" check that the GPS RMC message is enabled. To enable it use the +UGUBX command (for further information see the UBX-CFG-MSG message in the u-blox 6 Receiver Description Including Protocol Specification [45]).

☞ On LEON-G100/LEON-G200 series, for LEON-G100-05S/LEON-G200-05S and previous versions <state> default value is 1.

29.14 Get course over ground and ground speed +UGVTG

29.14.1 Description

Enables/disables storing of the last value of NMEA $VTG messages, and gets know the current messaging state. If <state> parameter is enabled, the last value of NMEA $VTG messages can be retrieved with the read command even when the GPS is switched off.

The NMEA $VTG messages are volatile.

Type	Syntax	Response	Example
Set	AT+UGVTG=<state>	OK	AT+UGVTG=1 OK
Read	AT+UGVTG?	+UGVTG: <state>,<$VTG msg> OK	+UGVTG: 1,Not available OK +UGVTG: 0,NULL OK
Test	AT+UGVTG=?	+UGVTG: (list of supported <state>s) OK	+UGVTG: (0-1) OK

29.14.2 Defined Values

Parameter	Type	Description
<state>	Number	• 0: to disable the NMEA $VTG messages (default value) • 1: to enable the NMEA $VTG messages
<$VTG msg>	String	NMEA $VTG messages. If the parameter value is "Not available" then the NMEA string is enabled but this information has not been still sent to the user.

☞ If <$VTG msg> is "Not Available" check that the GPS VTG message is enabled. To enable it use the +UGUBX command (for further information see the UBX-CFG-MSG message in the u-blox 6 Receiver Description Including Protocol Specification [45]).

☞ On LEON-G100/LEON-G200 series, for LEON-G100-05S/LEON-G200-05S and previous versions <state> default value is 1.

29.15 Get satellite information +UGGSA

29.15.1 Description

Enables/disables storing of the last value of NMEA $GSA messages, and gets the current messaging state. If <state> parameter is enabled, the last value of NMEA $GSA messages can be retrieved with the read command even when the GPS is switched off.

The NMEA $GSA messages are volatile.

Type	Syntax	Response	Example
Set	AT+UGGSA=<state>	OK	AT+UGGSA=1 OK
Read	AT+UGGSA?	+UGGSA: <state>,<$VTG msg> OK	+UGGSA: 1,Not available OK +UGGSA: 0,NULL OK

Type	Syntax	Response	Example
Test	AT+UGGSA=?	+UGGSA: (list of supported <state>s) OK	+UGGSA: (0-1) OK

29.15.2 Defined Values

Parameter	Type	Description
<state>	Number	• 0: to disable the NMEA $GSA messages (default value) • 1: to enable the NMEA $GSA messages
<$GSA msg>	String	NMEA $GSA messages. If the parameter value is "Not available" then the NMEA string is enabled but this information has not been still sent to the user.

If <$GSA msg> is "Not Available" check that the GPS GSA message is enabled. To enable it use the +UGUBX command (for further information see the UBX-CFG-MSG message in the u-blox 6 Receiver Description Including Protocol Specification [45]).

On LEON-G100/LEON-G200 series, for LEON-G100-05S/LEON-G200-05S and previous versions <state> default value is 1.

29.16 Ask for localization information +ULOC

29.16.1 Description

Requests wireless module to provide location data; location can be determined using:

- GPS receiver
- CellLocate™ (location based on network cells data)
- Combination of both technologies (Hybrid)

A URC is sent as answer to provide the requested information via +ULOC set command.

This command is available only on LEON from LEON-G100-06x/LEON-G200-06x and subsequent versions.

If +ULOC command is sent while a previous +ULOC activity is still in progress the previous activity is aborted, the available position is immediately output and the next +ULOC request is served.

The commands +ULOC and +UGPS are mutually exclusive; if a +ULOC request is sent when the GPS is already started with +UGPS the +ULOC will return ERROR (error code: 1702 with +CMEE=2) and vice versa (error code: 1713 with +CMEE=2). When the + ULOC command has been triggered also +UGAOP, +UGAOF, +UGAOS, +UGUBX AT commands will report an error, but it is possible to query NMEA strings.

The wireless module date and time is not used in the answer, so if no sensor is available these fields are filled with '0'.

According to the aiding chosen a data connection could be required; refer to AT+UGPS command description (chapter 29.1).

If no position is available (no GPS coverage, no network information and no previous data available) then <lat> latitude and <long> longitude will be set to '0'.

If the previous position degradated by the elapsed time satisfies the desired accuracy then sensor '0' is reported in the answer.

Type	Syntax	Response	Example
Set	AT+ULOC=<mode>,<sensor>,<response_type>,<timeout>,<accuracy>	OK	AT+ULOC=2,3,0,120,1 OK
Read	AT+ULOC?	+ULOC: <mode>,<sensor>,<response_type>,<timeout>,<accuracy>,0 OK	+ULOC: 0,3,1,0,20,0 OK
Test	AT+ULOC=?	+ULOC: (list of supported <modes>),(list of supported<sensor>s,(list of supported <response_type>s),(list of supported <timeout>s,(list of supported <accuracy>),(0) OK	+ULOC: (0-2),(0-3),(0-1),(1-999),(0-999999),(0) OK
URC		If <response_type>=0: +UULOC:<"date">,<"time">,<lat>,<long>,<alt>,<accuracy> OK If <response_type>=1: +UULOC:<"date">,<"time">,<lat>,<long>,<alt>,<accuracy>,<speed>,<direction>,<vertical_acc>,<sensor_used>,<SV_used>,<antenna_status>,<jamming_status> OK	+UULOC: 13/04/2011,09:54:51.000,45.633452,13.061862,49,1

29.16.2 Defined Values

Parameter	Type	Description
<mode>	Number	• 0: Reserved • 1: Reserved • 2: Single shot position
<sensor>	Number	Sensor selection: it is possible to combine different sensors summing <sensor> values of the selected sensors • 1: Use GPS receiver for localization • 2: Use CellLocate location information
<response_type>	Number	Type of response • 0: standard response • 1: detailed response
<timeout>	Number	Timeout period in seconds (1 – 999)
<accuracy>	Number	Target accuracy in meters (1 – 999.999)
<date>	String	UTC date (DD/MM/YY) of estimate position
<time>	String	UTC time (hh:mm:ss.sss) of estimate position
<lat>	String	Estimate latitude expressed in degrees (+/-DD.DDDDD)
<long>	String	Estimate longitude expressed in degrees (+/-DDD.DDDDD)
<alt>	Number	Estimated altitude expressed in meters [3]
<speed>	Number	Speed over ground m/s [3]
<direction>	Number	Course over ground in degree (0° – 360°) [3]
<vertical_acc>	Number	Vertical accuracy in meters [3]

[3] only for GNSS positioning, 0 in case of CellLocate

Parameter	Type	Description
<sensor_used>	Number	Sensor used for position calculation
<SV_used>	Number	Number of satellite used to calculate the position [3]
<antenna_status>	Number	Antenna status (0 – 4) [3]. For more details please refer to u-blox Receiver description [45]
<jamming_status>	Number	Jamming status [3]. For more details please refer to u-blox Receiver description [45]

29.17 Configure GNSS sensor +ULOCGNSS

29.17.1 Description

Configures the GNSS sensor used with the +ULOC command.

This command is available only on LEON from LEON-06x and subsequent versions.

Type	Syntax	Response	Example
Set	AT+ULOCGNSS=<aiding>[,<psv_mode>[, <minSV>[,<minCNO>[,<ini_3d_fix>[, <staticHoldMode>[,<SBAS>[, <jamming>[,<antenna>[, <BBthreshold>[,<CWthreshold>[, <reserved1>[, <reserved2>[, <reserved3>]]]]]]]]]]]	OK	AT+ULOCGNSS=15 OK
Read	AT+ULOCGNSS?	+ULOCGNSS: <aiding>,<psv_mode>,<minSV>,<minCNO>,<ini_3d_fix>,<staticHoldMode>,<SBAS>,<jamming>,<antenna>,<BBthreshold>,<CWthreshold>,<reserved1>,<reserved2>,<reserved3> OK	+ULOCGNSS: 15,1,6,8,0,1,1,1,1,1,1,0,0,0 OK
Test	AT+ULOCGNSS=?	+ULOCGNSS: (list of supported <aiding>),(list of supported <psv_mode>),(list of supported <minSV>),(list of supported <minCNO>),(list of supported <ini_3d_fix>),(list of supported <staticHoldMode>),(list of supported <SBAS>),(list of supported <jamming>),(list of supported <antenna>),(list of supported <BBthreshold>),(list of supported <CWthreshold>),(list of supported <reserved1>),(list of supported <reserved2>),(list of supported <reserved3>) OK	+ULOCGNSS: (0-15),(0-1),(3-32),(0-50),(0-1),(0-1000),(0-1),(0-1),(0-2),(0-15),(0-31),(0),(0),(0) OK

29.17.2 Defined Values

Parameter	Type	Description
<aiding>	Number	GPS aiding mode configuration; it is possible the combination of different aiding modes: to enable more aiding modes it is needed to sum the <mode> value of the interested aiding modes • 1: Local aiding (incl. RTC sharing): enabled by default • 2: AssistNow offline enabled by default • 4: AssistNow online enabled by default • 8: AssistNow autonomous: enabled by default
<psv_mode>	Number	Power Save Mode (UBX-CFG-PM2): • 0: disabled (default value) • 1: enabled
<minSV>	Number	• Minimum number of satellites for navigation (UBX-CFG-NAVX5) (3 – 32) use GPS FW default (default value 3)
<minCNO>	Number	• Minimum satellite signal level for navigation (UBX-CFG-NAVX5) (0 – 50) use GPS FW default (default value 7)
<ini_3d_fix>	Number	Initial Fix must be 3D flag (UBX-CFG-NAVX5). (0 – 1) : • 0: disabled (default value) • 1: enabled
<staticHoldMode>	Number	• Static Hold Mode (UBX-CFG-NAV5). (0 – 1.000 cm/s), use GPS FW default (0)
<SBAS>	Number	SBAS configuration: • 0: disabled (default value) • 1: enabled
<jamming>	Number	Jamming indicator (UBX-CFG-ITFM) : • 0: disabled (default value) • 1: enabled
<antenna>	Number	Antenna setting • 0=unknown (default value) • 1=passive • 2=active
<BBthreshold>	Number	Broadband jamming detection threshold (dB) (UBX-CFG- ITFM). (0 - 15), 0 by default
<CWthreshold>	Number	Continuous wave jamming detection threshold (dB) (UBX-CFG- ITFM). (0 - 31), 0 by default
<Reserved1>	Number	0 (reserved value)
<Reserved2>	Number	0 (reserved value)
<Reserved3>	Number	0 (reserved value)

For more details on parameter description refer to u-blox-5/6 Receiver Description [45].

29.18 Configure cellular location sensor (CellLocate) +ULOCCELL

29.18.1 Description

Configures the Cellular location sensor (CellLocate) used with the +ULOC command.

☞ This command is available only on LEON from LEON-G100-06x/LEON-G200-06x and subsequent versions.

☞ This command influences the amount of data exchanged with the server.

Type	Syntax	Response	Example
Set	AT+ULOCCELL=[<scan_mode>[,<reserved1>[,<reserved2>[,<reserved3>[,<reserved4>[,<reserved5>]]]]]]	OK	
Read	AT+ULOCCELL?	+ULOCCELL: <scan_mode>,<reserved1>,<reserved2>,<reserved3>,<reserved4>,<reserved5> OK	
Test	AT+ULOCCELL=?	+ULOCCELL: (list of supported <scan_mode>s),(list of supported <reserved1>),(list of supported <reserved2>),(list of supported <reserved3>), (list of supported <reserved4>), (list of supported <reserved5>) OK	+ULOCCELL: (0-1),(0),"",(0),(0),(0) OK

29.18.2 Defined Values

Parameter	Type	Description
<scan_mode>	Number	Network scan mode • 0:normal (default) • 1: deep scan
<reserved1>	Number	RFU
<reserved2>	String	RFU
<reserved3>	String	"" (reserved value)
<reserved4>	Number	0 (reserved value)
<reserved5>	Number	0 (reserved value)

Appendix

A Appendix 1

A.1 Internet suite error classes

The following table lists all allowed error class that can be provided by the <error_class> parameter for each AT error command (+UFTPER, +UHTTPER, +USMTPER) for FTP, HTTP and SMTP. For more details on the command syntax please refer to chapter 25.5, 26.4 and 27.5.

<error_class >	Meaning	<error_codes>	Resulting from the following commands
0	OK, no error occurred		All
1	FTP Protocol error class	Refer to chapter A.1.1	+UFTPC, +UFTP, +UFTPER
2	SMTP Protocol error class	Refer to chapter A.1.2	+USMTP, +USMTPM, +USMTPC, +USMTPER
3	HTTP Protocol error class	Refer to chapter A.1.3	+UHTTP, +UHTTPC, +UHTTPER
4	Flash File System error class	Refer to chapter A.1.4	+UFTPC, +UFTPER, +UHTTPC, +UHTTPER
5	DNS error class		+UFTPC, +UFTPER, +UHTTPC, +UHTTPER, +USMTPC, +USMTPER
6	Socket error class	BSD error codes standard	All
7	Dynamic Memory error	0	All
8	Wrong FTP API usage (e.g. missing/null parameters)	Refer to chapter A.1.1	+UFTPC, +UFTP, +UFTPER
9	Wrong SMTP API usage (e.g. missing/null parameters)	Refer to chapter A.1.2	+USMTP, +USMTPM, +USMTPC, +USMTPER
10	Wrong HTTP API usage (e.g. missing/null parameters)	Refer to chapter A.1.3	+UHTTP, +UHTTPC, +UHTTPER
11	Syntax error in high layer Protocol (wrong/missing/corrupted data)		+UFTPC, +UFTPER, +UHTTPC, +UHTTPER, +USMTPC, +USMTPER
12	Unspecified error	0	All

A.1.1 FTP class error codes

The following table lists the available values of <error_code> parameter of the last FTP operation provided through +UFTPER AT command if <error_class>=1 or 8 (for more details please refer to the AT command description in chapter 25.5).

<err>	Meaning	Resulting from the following commands
0	No error	+UFTPC, +UFTP
1	User missing	+UFTPC
2	Password missing	+UFTPC
3	Account missing	+UFTPC
4	Server missing	+UFTPC
5	Directory name missing	+UFTPC
6	File name missing	+UFTPC

<err>	Meaning	Resulting from the following commands
7	Null parameter	+UFTPC, +UFTP
8	Unknown FTP command	+UFTPC, +UFTP
9	Unknown file action	+UFTPC
10	Wrong FTP state	+UFTPC
11	Wrong parameter	+UFTPC, +UFTP
12	PSD or CSD connection not established	+UFTPC
421	Service not available, closing control connection. User limit reached You are not authorized to make the connection Max connections reached Max connections exceeded	+UFTPC
425	Cannot open data connection.	+UFTPC
426	Connection closed; transfer aborted. The command opens a data connection to perform an action, but that action is canceled, and the data connection is closed.	+UFTPC
450	Requested file action not taken. File unavailable (e.g., file busy).	+UFTPC
451	Requested action aborted: local error in processing.	+UFTPC
452	Requested action not taken. Insufficient storage space in system.	+UFTPC
500	Syntax error, command unrecognized, command line too long.	+UFTPC
501	Syntax error in parameters or arguments.	+UFTPC
502	Command not implemented.	+UFTPC
503	Bad sequence of commands.	+UFTPC
504	Command not implemented for that parameter.	+UFTPC
530	User not logged in.	+UFTPC
532	Need account for storing files.	+UFTPC
550	Requested action not taken. File unavailable, not found, not accessible	+UFTPC
552	Requested file action aborted. Exceeded storage allocation.	+UFTPC
553	Requested action not taken. File name not allowed.	+UFTPC

A.1.2 HTTP class error codes

The following table lists the available values of <error_code> parameter of the last HTTP operation provided through +HTTPER AT command if <error_class>=2 or 9 (for more details please refer to the AT command description in chapter 26.4).

<err>	Meaning	Resulting from the following commands
0	No error	+UHTTP, +UHTTPC
1	Invalid profile ID	+UHTTP, +UHTTPC
2	Invalid input	+UHTTP, +UHTTPC
3	Server hostname too long	+UHTTP
4	Invalid server hostname	+UHTTP
5	Invalid server IP address	+UHTTP

<err>	Meaning	Resulting from the following commands
6	Invalid authorization method	+UHTTP
7	Server missing	+UHTTPC
8	Username length exceeded	+UHTTP
9	Password length exceeded	+UHTTP
10	Internal error	+UHTTP, +UHTTPC
11	Server connection error	+UHTTPC
12	Error occurred in HTTP request	+UHTTPC
13	Internal error	+UHTTP, +UHTTPC
14	Internal error	+UHTTP, +UHTTPC
15	Invalid POST data size	+UHTTPC
16	Empty FFS file name	+UHTTPC
17	Invalid FFS file length	+UHTTPC
18	Invalid content-type specified	+UHTTP, +UHTTPC
19	Internal error	+UHTTP, +UHTTPC
20	Internal error	+UHTTP, +UHTTPC
21	Internal error	+UHTTP, +UHTTPC
22	PSD or CSD connection not established	+UHTTPC

A.1.3 SMTP class error codes

The following table lists the available values of <error_code> parameter of the last SMTP operation provided through +USMTPER AT command if <error_class>=3 or 10 (for more details please refer to the AT command description in chapter 27.5).

<err>	Meaning	Resulting from the following commands
0	No error	+USMTP, +USMTPM, +USMTPC
1	Server missing	+USMTPC
2	Sender address missing	+USMTPC
3	Receiver address missing	+USMTPC
4	Maximum number of receivers exceeded	+USMTPC
5	Maximum address length exceeded	+USMTPC
6	Internal error	+USMTPM, +USMTPC
7	Maximum subject length exceeded	+USMTPC
8	Maximum number of attachments exceeded	+USMTPC
9	Wrong SMTP state	+USMTPM, +USMTPC
10	Wrong parameter	+USMTPC
11	Internal error	+USMTP, +USMTPM, +USMTPC
12	PSD or CSD connection not established	+USMTPC

A.1.4 File System Class Error codes

The following table lists the available values of <error_code> parameter of the last FTP, HTTP or SMTP operation provided through +UFTPER, +UHTTPER +USMTPER AT commands if the <error_class> is 4 "Flash File System error class" (for more details please refer to the AT command description in chapter 25.5, 26.4 and 27.5.

<err>	Meaning	Resulting from the following commands
2	Operation performed with success	+UHTTPC, +UFTPC, +USMTPC
3	Initialization in progress	+UHTTPC, +UFTPC, +USMTPC
4	File already opened	+UHTTPC, +UFTPC, +USMTPC
5	File not opened	+UHTTPC, +UFTPC, +USMTPC
6	File not found	+UHTTPC, +UFTPC, +USMTPC
7	File already created	+UHTTPC, +UFTPC, +USMTPC
8	Illegal id	+UHTTPC, +UFTPC, +USMTPC
9	Illegal file handle	+UHTTPC, +UFTPC, +USMTPC
10	Illegal type	+UHTTPC, +UFTPC, +USMTPC
11	Illegal mode	+UHTTPC, +UFTPC, +USMTPC
12	File range error	+UHTTPC, +UFTPC, +USMTPC
13	The operation is not possible	+UHTTPC, +UFTPC, +USMTPC
14	Write error	+UHTTPC, +UFTPC, +USMTPC
15	User id error	+UHTTPC, +UFTPC, +USMTPC
16	Internal fatal error	+UHTTPC, +UFTPC, +USMTPC
17	Memory resource error	+UHTTPC, +UFTPC, +USMTPC
18	Maximum number of files exceeded	+UHTTPC, +UFTPC, +USMTPC
19	Memory not available	+UHTTPC, +UFTPC, +USMTPC
20	Invalid filename	+UHTTPC, +UFTPC, +USMTPC
21	Streaming not enabled	+UHTTPC, +UFTPC, +USMTPC
22	Operation not allowed on static file	+UHTTPC, +UFTPC, +USMTPC
23	Memory table inconsistency	+UHTTPC, +UFTPC, +USMTPC
24	Not a factory default file	+UHTTPC, +UFTPC, +USMTPC
25	Requested memory temporary not available	+UHTTPC, +UFTPC, +USMTPC
26	Operation not allowed for a directory	+UHTTPC, +UFTPC, +USMTPC
27	Space in the directory space not available	+UHTTPC, +UFTPC, +USMTPC
28	Too many streaming files opened	+UHTTPC, +UFTPC, +USMTPC
29	Requested dynamic memory temporary not available	+UHTTPC, +UFTPC, +USMTPC
30	The user provided a NULL parameter instead of a suitable buffer	+UHTTPC, +UFTPC, +USMTPC

A.2 Ping error codes

The following table lists the available values of <error_code> parameter of the last PING operation provided through +UUPINGER unsolicited indication.

<err>	Meaning	Resulting from the following commands
1 – 6	Internal error (ping level)	+UPING
7	Empty remote host	+UPING
8	Cannot resolve host	+UPING
9	Unsupported IP version (RFU)	+UPING
10	Invalid IPv4 address	+UPING
11	Invalid IPv6 address (RFU)	+UPING
12	Remote host too long	+UPING
13	Invalid payload size	+UPING
14	Invalid TTL value	+UPING
15	Invalid timeout value	+UPING
16	Invalid retries number	+UPING
17	PSD or CSD connection not established	+UPING
100 – 105	Internal error (ICMP level)	+UPING
106	Error creating socket for ICMP	+UPING
107	Error settings socket options for ICMP	+UPING
108	Cannot end ICMP packet	+UPING
109	Read for ICMP packet failed	+UPING
110	Received unexpected ICMP packet	+UPING

A.3 Internal TCP/UDP/IP stack class error codes

The following table lists all allowed error classes that can be provided by the internal TCP/UDP/IP stack through +USOER and +USOCTL (with param_id=1) AT commands (for more details please refer to the AT command description in chapters 24.6 and 24.15).

<err>	Meaning	Resulting from the following commands
0	No error	+USOCR, +USOSO,+USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI
2	ENOENT - No such resource (internal error)	+USOCR, +USOSO,+USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI
4	EINTR - Interrupted system call (internal error)	+USOCR, +USOSO,+USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI
5	EIO - I/O error (internal error)	+USOCR, +USOSO,+USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI
9	EBADF - Bad file descriptor (internal error)	+USOCR, +USOSO,+USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI
10	ECHILD - No child processes (internal error)	+USOCR, +USOSO,+USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI
11	EWOULDBLOCK - Current operation would block, try again	+USOWR

<err>	Meaning	Resulting from the following commands
12	ENOMEM - Out of memory (internal error)	+USOCR, +USOSO,+USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI
14	EFAULT - Bad address (internal error)	+USOCR, +USOSO,+USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI
22	EINVAL - Invalid argument	+USOCR, +USOSO,+USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI
32	EPIPE - Broken pipe (internal error)	+USOCR, +USOSO,+USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI
38	ENOSYS - Function not implemented	+USOSO, +USOGO
92	ENOPROTOOPT - Protocol not available	+USOCR
98	EADDRINUSE - Address already in use	+USOLI
103	ECONNABORTED - Software caused connection abort	+USOCR, +USOSO,+USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI
104	ECONNRESET - Connection reset by peer	+USOCR, +USOSO,+USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI
105	ENOBUFS - No buffer space available	+USOCR, +USOSO,+USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI
107	ENOTCONN - Transport endpoint is not connected	+USOCR, +USOSO,+USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI
108	ESHUTDOWN - Cannot send after transport endpoint shutdown	+USOCR, +USOSO,+USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI
110	ETIMEDOUT - Connection timed out	+USOCO, +USOST, +USORD, +USORF
113	EHOSTUNREACH - No route to host	+USOCO, +USOWR, +USOST, +USORD, +USORF
115	EINPROGRESS - Operation now in progress	+USOCR, +USOSO,+USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI
160	ENSRNODATA - DNS server returned answer with no data	+UDNSRN
161	ENSRFORMERR - DNS server claims query was misformatted	+UDNSRN
162	ENSRSERVFAIL - DNS server returned general failure	+UDNSRN
163	ENSRNOTFOUND - Domain name not found	+UDNSRN
164	ENSRNOTIMP - DNS server does not implement requested operation	+UDNSRN
165	ENSRREFUSED - DNS server refused query	+UDNSRN
166	ENSRBADQUERY - Misformatted DNS query	+UDNSRN
167	ENSRBADNAME - Misformatted domain name	+UDNSRN
168	ENSRBADFAMILY - Unsupported address family	+UDNSRN
169	ENSRBADRESP - Misformatted DNS reply	+UDNSRN
170	ENSRCONNREFUSED - Could not contact DNS servers	+UDNSRN
171	ENSRTIMEOUT - Timeout while contacting DNS servers	+UDNSRN
172	ENSROF - End of file	+UDNSRN
173	ENSRFILE - Error reading file	+UDNSRN
174	ENSRNOMEM - Out of memory	+UDNSRN
175	ENSRDESTRUCTION - Application terminated lookup	+UDNSRN
176	ENSRQUERYDOMAINTOOLONG - Domain name is too long	+UDNSRN
177	ENSRCNAMELOOP - Domain name is too long	+UDNSRN

A.4 FOAT Error Messages

Refer to chapter 18.2 for +UFWUPD command description.

Response	Description
ERROR1	The operation has been interrupted and the actual FW is unchanged; the module drops out from Firmware Update Mode
ERROR2	The operation has been interrupted during FW updating; the actual firmware is corrupted and the module remains in Firmware Update Mode
ERROR3	The signature check fails
ERROR4	The module has received unexpected EOT because not all excepted bytes have been received
ERROR5	The boot does not support the selected baudrate
ERROR6	Invalid AT command sent during boot
FLS header decoding failed	An error occurs during decoding of file header
Buffer Data Overrun	The buffers are not filled at least with a 1029 packet: data comes too slowly
Timeout	The command must be re-sent: no data is coming

A.5 FOTA Error codes

In case of an upgrade several entities are involved: the application that handles the SMS, the GPRS connection, the HTTP download and the UA; all these facilities have their own errors and the report operation result combines them in this way. Refer to chapter 18.1 for +UFOTA command description.

16 bit	16 bit
Error type	**Error code**

The error type bits are mapped in this way:

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
UA error								GPRS error	SMS error			HTTP error			

The allowed error codes are listed in the following tables:

A.5.1 FOTA class - UA errors

Response	Description
invocation errors	
2	error in a run parameter
3	no valid UPI found
4	future use
update package errors	
11	expected length error
12	expected length error

Response	Description
13	structural error
14	signature error
15	foreign key not signed
16	not for current version
17	non-compatible UPI
18	update for UPI does not match its version
19	update for UPI does not match its version
resources errors	
30	given RAM is not enough
31	does not behave as RAM
32	new version is too big
33	flash writing failure
34	flash erasing failure
35	flash reading failure
36	memory allocation failure
final-stage errors	
40	can not restore new
41	signature error of new
42	foreign key not signed
43	one API function is not declared recommended
File System update	
205	file does not exist
206	RO or no access rights
207	file does not exist
208	no access rights
209	cannot resize file
210	cannot read specified size
211	cannot close file handle
300	bad operation number for FS update
301	bad operation number for FW update
302	unsupported compression
303	Can not apply reverse update for delta not generated as reverse delta
304	number of backup buffers given to UPI does not match number in delta file
305	Sector size mismatch between UPI and delta
306	UPI was not compiled to support reverse update
307	UPI was not compiled to support IFS on compressed images
308	UPI was not compiled to support IFS
309	Image verified is not source image
310	In scout only operation we should do only verify of image
311	There is not enough RAM to run with operation=2

Response	Description
312	Delta file too long - corrupted
313	Mismatch between deletes sig and delta deletes buffers signature
314	Number of fragments in section is not 1
315	Over all number of backup sects too big
316	Delta file is corrupt: signature mismatch between delta header signature and calculated signature
317	Source file size mismatch from file on device to delta file size
318	File signature does not match signature
319	Signature for the target buffer does not match the one stored in the delta file
320	Too many dirty buffers
321	UPI version mismatch between UPI and delta
322	Scout version mismatch between UPI and delta

A.5.2 FOTA class - GPRS errors

Response	Description
1	Generic operation error
2	Network does not recognize a valid APN
3	Network does not recognize a valid userid or password
4	QoS parameters are inconsistent (i.e. minimum values greater that the required ones)
5	Network failure
6	The context is busy in some other operation
7	Cannot read or write on the flash for unknown reasons
8	Illegal MS
9	Illegal ME
10	GPRS services not allowed
11	PLMN not allowed
12	Location area not allowed
13	National roaming not allowed in this location area
14	Service option not supported
15	Requested service option not subscribed
16	Service option temporarily out of order
17	NS-API already used

A.5.3 FOTA class - SMS Errors

Response	Description
1	SMS URL too long
2	Invalid SMS URL, missing “http://”
3	Invalid SMS URL, missing file path
4	Wrong security check code

Response	Description
5	Delta firmware unavailable on FOTA server

A.5.4 FOTA class - HTTP errors

Response	Description
1	FTP Protocol error class
2	SMTP Protocol error class
3	HTTP Protocol error class
4	flash file system error class
5	DNS error class
6	socket error class
7	dynamic memory error
8	wrong FTP API usage (ex missing/null parameters)
9	wrong SMTP API usage (ex missing/null parameters)
10	wrong HTTP API usage (ex missing/null parameters)
11	syntax error in high layer Protocol (wrong/missing/corrupted data)
12	unspecified error

A.6 Mobile Termination error result codes +CME ERROR

The error codes from 1621 to 1649 are supported only on LEON-G100/G200 series from LEON-G100-06x/LEON-G200-06x and subsequent versions.

<err>	Meaning	Resulting from the following commands
0	Phone failure	undeterminated
1	No connection to phone	
2	Phone-adaptor link reserved	
3	Operation not allowed	Refer to the footnote[4]
4	Operation not supported	Refer to the footnote[4], +CMER and +UCIND
5	PH-SIM PIN required	Refer to the footnote[4]
10	SIM not inserted	Refer to the footnote[4]
11	SIM PIN required	Refer to the footnote[4]
12	SIM PUK required	Refer to the footnote[4]
13	SIM failure	Refer to the footnote[4]
14	SIM busy	Refer to the footnote[4]

[4] +CACM, +CALA, +CALD,+CALM, +CAMM,+CAOC, +CBC,+CBST, +CCFC, +CCLK, +CCUG, +CCWA, +CCWE, +CEER, +CFUN, +CGACT, +CGATT, +CGCLASS, +CGDATA, +CGDCONT, +CGEREP, +CGMI, +CGMM, +CGMR, +CGPADDR, +CGQMIN, +CGQREQ, +CGREG, +CGSMS, +CGSN, +CHLD, +CHUP, +CIMI, +CIND, +CLAC, +CLCC, +CLCK, +CLIP, +CLIR, +CLVL, +CMEE, +CMOD, +CMUT, +CMUX, +CNUM, +COLP, +COPS, +CPAS, +CPBF, +CPBR, +CPBS, +CPBW, +CPIN, +CPOL, +CPUC, +CPWD, +CR, +CRC, +CREG, +CRLP, +CRSL, +CRSM, +CSCS, +CSGT, +CSNS, +CSQ, +CSSN, +CSTA, +CTFR, +CTZR, +CTZU

<err>	Meaning	Resulting from the following commands
15	SIM wrong	Refer to the footnote[4]
16	Incorrect password	+CLCK, +CPWD, +CPIN, ATD*...#...
17	SIM PIN2 required	
18	SIM PUK2 required	
20	Memory full	+CPBW, +CPOL
21	Invalid index	+CPBR, +CPBW
22	Not found	+COPS, +CHLD, +CGATT, ATD*...#...
23	Memory failure	+CSAS, +CRES, +CSGT
24	Text string too long	+CPBW
25	Invalid characters in text string	ATD*...#...
26	Dial string too long	ATD, +CPBW
27	Invalid characters in dial string	ATD, +CPBW, ...
30	No network service	ATD, +COPS, +CLIR, ...
31	Network timeout	ATD
32	Network not allowed - emergency calls only	
40	Network personalisation PIN required	
41	Network personalisation PUK required	
42	Network subset personalisation PIN required	
43	Network subset personalisation PUK required	
44	Service provider personalisation PIN required	
45	Service provider personalisation PUK required	
46	Corporate personalisation PIN required	
47	Corporate personalisation PUK required	
50	Incorrect parameters	+CIND
100	Unknown	Commands with wrong syntax
103	Illegal MS	+CGATT, +COPS
106	Illegal ME	+CGATT, +COPS
107	GPRS services not allowed	+CGATT
108	GPRS and non GPRS services not allowed	+CGATT
111	PLMN not allowed	+CGATT, +COPS
112	Location area not allowed	+CGATT, +COPS
113	Roaming not allowed in this location area	+CGATT, +COPS
132	Service option not supported	+CGACT, or other non-GPRS commands
133	Requested service option not subscribed	+CGACT, or other non-GPRS commands
134	Service option temporarily out of order	+CGACT, or other non-GPRS commands
135	NS-api already used	
148	Unspecified GPRS error	all GPRS related commands
149	PDP authentication failure	+CGACT
150	Invalid mobile class	all GPRS related commands
254	Invalid error mapping	

<err>	Meaning	Resulting from the following commands
255	Internal error	
701	Incorrect security code	
702	Max attempts reached	
1001	Unassigned (unallocated) number	
1003	No rout to destination	
1006	Channel unacceptable	
1008	Operator determined barring	
1016	Normal call clearing	
1017	User busy	
1018	No user responding	
1019	User alerting, no answer	
1021	Call rejected	
1022	Number changed	
1026	Non selected user clearing	
1027	Destination out of order	
1028	Invalid number format (incomplete number)	
1029	Facility rejected	
1030	Response to STATUS ENQUIRY	
1031	Normal, unspecified	
1034	No circuit/channel available	
1038	Network out of order	+COPS, +CGATT
1041	Temporary failure	+COPS, +CGATT
1042	Switching equipment congestion	+COPS, +CGATT
1043	Access information discarded	
1044	requested circuit/channel not available	
1047	Resources unavailable, unspecified	
1049	Quality of service unavailable	
1050	Requested facility not subscribed	
1055	Incoming calls barred within the CUG	
1057	Bearer capability not authorized	
1058	Bearer capability not presently available	
1063	Service or option not available, unspecified	
1065	Bearer service not implemented	
1068	ACM equal to or greater than ACMmax	
1069	Requested facility not implemented	
1070	Only restricted digital information bearer capability is available	
1079	Service or option not implemented, unspecified	
1081	Invalid transaction identifier value	
1087	User not member of CUG	
1088	Incompatible destination	

<err>	Meaning	Resulting from the following commands
1091	Invalid transit network selection	
1095	Semantically incorrect message	
1096	Invalid mandatory information	
1097	Message type non-existent or not implemented	
1098	Message type not compatible with protocol state	
1099	Information element non-existent or not implemented	
1100	Conditional IE error	
1101	Message not compatible with protocol state	
1102	Recovery on timer expiry	
1111	Protocol error, unspecified	
1127	Interworking, unspecified	
1279	Number not allowed	
1283	CCBS possible	
1500	Wrong GPIO identifier	+UGPIOC, +UGPIOR, +UGPIOW
1501	Set GPIO default error	+UGPIOC
1502	Select GPIO mode error	+UGPIOC
1503	Read GPIO error	+UGPIOR
1504	Write GPIO error	+UGPIOW
1520	Wrong ADC identifier	+UADC
1521	Read ADC error	+UADC
1540	Wrong ringer identifier	+URNG
1550	GPRS generic operation error	+UPSD, +UPSDA
1551	GPRS invalid APN	+UPSDA
1552	GPRS authentication failure	+UPSDA
1553	GPRS QoS parameters inconsistent	+UPSD
1554	GPRS network failure	+UPSDA, +CGATT, +CGACT
1555	GPRS context busy	+UPSD, +UPSDA
1556	CSD generic operation error	+UCSD, +UCSDA
1557	CSD undefined profile	+UCSDA
1558	CSD context busy	+UCSD, +UCSDA
1600	FFS error	
1612	File not found	+UPLAYFILE, +UDELFILE
1620	Buffer full	+USOWR +USOST
1621	FFS initializing	+UDWNFILE
1622	FFS already open file	+UDWNFILE
1623	FFS not open file	+UDWNFILE
1624	FFS file not found	+UDWNFILE
1625	FFS file already created	+UDWNFILE
1626	FFS illegal id	+UDWNFILE
1627	FFS illegal file handle	+UDWNFILE

<err>	Meaning	Resulting from the following commands
1628	FFS illegal type	+UDWNFILE
1629	FFS illegal mode	+UDWNFILE
1630	FFS file range	+UDWNFILE
1631	FFS operation not possible	+UDWNFILE
1632	FFS write error	+UDWNFILE
1633	FFS user id error	+UDWNFILE
1634	FFS internal fatal error	+UDWNFILE
1635	FFS memory resource error	+UDWNFILE
1636	FFS maximum number of files exceeded	+UDWNFILE
1637	FFS memory not available	+UDWNFILE
1638	FFS invalid filename	+UDWNFILE
1639	FFS streaming not enabled	+UDWNFILE
1640	FFS operation not allowed on static file	+UDWNFILE
1641	FFS memory table inconsistency	+UDWNFILE
1642	FFS not a factory default file	+UDWNFILE
1643	FFS requested memory temporary not available	+UDWNFILE
1644	FFS operation not allowed for a directory	+UDWNFILE
1645	FFS directory space not available	+UDWNFILE
1646	FFS too many streaming files open	+UDWNFILE
1647	FFS requested dynamic memory temporary not available	+UDWNFILE
1648	FFS user provided a NULL parameter instead of a suitable buffer	+UDWNFILE
1649	FFS timeout	+UDWNFILE
1650	Command line too long	All commands
1660	Call barred - Fixed dialing numbers only	D
1700	GPS GPIO not configured	+UGPS
1701	GPS GPIO ownership error	+UGPS
1702	Invalid operation with GPS ON	+UGPRF, +ULOC
1703	Invalid operation with GPS OFF	+UGPS, +UGTMR, +UGAOS, +UGUBX
1704	Invalid GPS aiding mode	+UGPS, +UGAOS
1705	Reserved GPS aiding mode	+UGPS
1706	GPS aiding mode already set	+UGPS
1707	Invalid GPS trace mode	+UGPRF
1708	Parameter valid only in case of GPS OTA	+UGPRF
1709	GPS trace invalid server	+UGPRF
1710	Invalid TimeZone	+UGTMR
1711	Invalid value	+UGZDA, +UGGGA, +UGGLL, +UGGSV, +UGRMC, +UGVTG,+UGGSA
1712	Invalid parameter	+UGAOF, +UGAOP
1713	Invalid operation with LOC running	+UGPS

A.7 Message service failure result codes +CMS ERROR

<err>	Meaning	Resulting from the following commands
1	Unassigned (unallocated) number	
5	Delta firmware unavailable on FOTA server	
8	Operator determined barring	
10	Call barred	
17	Network failure	
21	Short message transfer rejected	
22	Memory capacity exceeded	
27	Destination out of service	
28	Unidentified subscriber	
29	Facility rejected	
30	Unknown Subscriber	
38	Network out of order	
41	Temporary failure	
42	Congestion	
47	Resources unavailable, unspecified	
50	Requested facility not subscribed	
69	Requested facility not implemented	
81	Invalid short message reference value	
95	Invalid message, unspecified	
96	invalid mandatory information	
97	Message type non-existent or not implemented	
98	Message not compatible with short message protocol state	
99	Information element non-existent or not implemented	
111	Protocol error, unspecified	
127	Interworking, unspecified	
128	Telematic interworking not supported	
129	Short message type 0 not supported	
130	Cannot replace short message	
143	Unspecified TP-PID error	
144	Data coding scheme (alphabet) not supported	
145	Message class not supported	
159	Unspecified TP-DCS error	
160	Command cannot be actioned	
161	Command unsupported	
175	Unspecified TP-Command error	
176	TPDU not supported	
192	SC busy	
193	No SC subscription	
194	SC system failure	

<err>	Meaning	Resulting from the following commands
195	Invalid SME address	
196	Destination SME barred	
197	SM Rejected-Duplicate SM	
198	TP-VPF not supported	
199	TP-VP not supported	
208	SIM SMS storage full	
209	No SMS storage capability in SIM	
210	Error in MS	
211	Memory Capacity Exceeded	
212	SIM Application Toolkit Busy	
213	SIM data download error	
300	ME failure	
301	SMS service of ME reserved	+CSMS
302	Operation not allowed	all SMS commands
303	operation not supported	all SMS commands
305	Invalid Text mode parameter	
310	SIM not inserted	all SMS commands
311	SIM PIN necessary	all SMS commands
312	PH-SIM PIN necessary	all SMS commands
313	SIM failure	all SMS commands
314	SIM busy	all SMS commands
315	SIM wrong	all SMS commands, +COPS
320	memory failure	+CMGR
321	invalid memory index	+CMGR, +CMGL
322	memory full	
330	SMSC address unknown	+CMGR
331	no network service	
332	network timeout	+CNMA
500	unknown error	commands with wrong syntax
516	MS invalid TP-Message-Type-Indicator	
517	MS no TP-Status-Report in Phase 1	
518	MS no TP-Reject-Duplicate in phase 1	
519	MS no TP-Replay-Path in Phase 1	
520	MS no TP-User-Data-Header in Phase 1	
521	MS missing TP-Validity-Period	
522	MS invalid TP-Service-Centre-Time-Stamp	
523	MS missing TP-Destination- Address	
524	MS invalid TP-Destination-Address	
525	MS missing Service-Centre-Address	
526	MS invalid Service-Centre-Address	

<err>	Meaning	Resulting from the following commands
527	MS invalid alphabet	
528	MS invalid TP-User-Data-length	
529	MS missing TP-User-Data	
530	MS TP-User-Data to long	
531	MS no Command-Request in Phase 1	
532	MS Cmd-Req invalid TP-Destination-Address	
533	MS Cmd-Req invalid TP-User-Data-Length	
534	MS Cmd-Req invalid TP-User-Data	
535	MS Cmd-Req invalid TP-Command-Type	
536	MN MNR creation failed	
537	MS CMM creation failed	
538	MS network connection lost	
539	MS pending MO SM transfer	
540	RP-Error OK	
541	RP-Error OK no icon display	
542	SMS-PP Unspecified	
543	SMS rejected By SMS CONTROL	

A.8 +CEER error codes

In the following table is provided the list of supported values for <cause> (Number) and <error_description> (String) for +CEER AT command if <type> assumes one of these values:

- "CC setup error"
- "CC modification error"
- "CC release"
- "SM attach error"
- "SM detach"
- "SM activation error"
- "SM deactivation

In the last column "LISA" and "LEON" icons are reported to indicate the applicability of the <cause> / <error_description> to LISA-U1 series or to LEON-G100 / LEON-G200 series.

<cause>	<error_description>	Resulting from the following products	
0	No cause information available	LISA	
1	Unassigned (unallocated) number	LISA	LEON
3	No route to destination	LISA	LEON
6	Channel unacceptable	LISA	LEON

<cause>	<error_description>	Resulting from the following products	
8	Operator determined barring	LISA	LEON
16	Normal call clearing	LISA	LEON
17	User busy	LISA	LEON
18	No user responding	LISA	LEON
19	User alerting, no answer	LISA	LEON
21	Call rejected	LISA	LEON
22	Number changed	LISA	LEON
26	Non selected user clearing	LISA	LEON
27	Destination out of order	LISA	LEON
28	Invalid number format (incomplete number)	LISA	LEON
29	Facility rejected	LISA	LEON
30	Response to STATUS ENQUIRY	LISA	LEON
31	Normal, unspecified	LISA	LEON
34	No circuit/channel available	LISA	LEON
38	Network out of order	LISA	LEON
41	Temporary failure	LISA	LEON
42	Switching equipment congestion	LISA	LEON
43	Access information discarded	LISA	LEON
44	Requested circuit/channel not available	LISA	LEON
47	Resources unavailable, unspecified	LISA	LEON
49	Quality of service unavailable	LISA	LEON
50	Requested facility not subscribed	LISA	LEON
55	Incoming calls barred within the CUG	LISA	LEON
57	Bearer capability not authorized	LISA	LEON
58	Bearer capability not presently available	LISA	LEON

<cause>	<error_description>	Resulting from the following products	
63	Service or option not available, unspecified	LISA	LEON
65	Bearer service not implemented	LISA	LEON
68	ACM equal to or greater than ACMmax	LISA	LEON
69	Requested facility not implemented	LISA	LEON
70	Only restr. digital information bearer capability	LISA	LEON
79	Service or option not implemented, unspecified	LISA	LEON
81	Invalid transaction identifier value	LISA	LEON
87	User not member of CUG	LISA	LEON
88	Incompatible destination	LISA	LEON
91	Invalid transit network selection	LISA	LEON
95	Semantically incorrect message	LISA	LEON
96	Invalid mandatory information	LISA	LEON
97	Message type non-existent or not implemented	LISA	LEON
98	Message type not compatible with protocol state	LISA	LEON
99	Information element non-existent or not implemented	LISA	LEON
100	Conditional IE error	LISA	LEON
101	Message not compatible with protocol state	LISA	LEON
102	Recovery on timer expiry	LISA	LEON
103	Illegal MS	LISA	
106	Illegal ME	LISA	
107	GPRS service not allowed	LISA	
112	Location area not allowed	LISA	
113	Roaming not allowed in this location area	LISA	
132	Service not supported	LISA	
133	Service not subscribed	LISA	

<cause>	<error_description>	Resulting from the following products	
134	Service option temporarily out of order	LISA	
148	Unspecified GPRS error	LISA	
149	PDP authentification error	LISA	
111	Protocol error, unspecified	LISA	LEON
127	Interworking, unspecified	LISA	LEON
256	Internal, unspecified	LISA	
257	Out of memory	LISA	
258	Invalid parameters	LISA	
259	Data call active	LISA	
260	Speech call active	LISA	
262	Missing ACM information	LISA	
263	Temporary forbidden	LISA	
264	Called party is blacklisted	LISA	
265	Blacklist is full	LISA	
266	No service	LISA	
267	Limited service	LISA	
268	Client conflict	LISA	
269	Dual service call active	LISA	
271	Unknown SIM error	LISA	
274	Active Client is Gone	LISA	
277	SIM status failure	LISA	
278	Rejected by call control	LISA	
279	FDN failed	LISA	
280	BDN failed	LISA	
283	CCBS possible	LISA	

<cause>	<error_description>	Resulting from the following products
284	Invalid alternate service line	LISA
285	LND overflow	LISA
287	MM network failure unspecified	LISA
288	MM no service	LISA
289	MM access class barred	LISA
290	MM RR no resource	LISA
291	MM ME busy	LISA
292	MM unspecified	LISA
301	MMI not registered	LISA
303	Rejected by user	LISA
304	Rejected due to time out	LISA
306	Disconnected due to SIM-Toolkit call setup	LISA
307	Pending SIM-Toolkit call setup	LISA
310	SIM reset	LISA
340	MM sapi3 release	LISA
341	MM lower layer failure	LISA
342	MM authentification failure	LISA
343	MM PS reject	LISA
344	MM service rejected	LISA
345	MM abort by network	LISA
346	MM timeout	LISA
347	MM detach	LISA
348	MM RR connection release	LISA
349	MM not registered	LISA
350	MM reestablishment failure	LISA

<cause>	<error_description>	Resulting from the following products
351	Failure due to handover	LISA
352	Link establishment failure	LISA
353	Random access failure	LISA
354	Radio link aborted	LISA
355	Lower layer failure in Layer 1	LISA
356	Immediate Assignment Reject	LISA
357	Failure due to paging	LISA
358	Abnormal release unspecified	LISA
359	Abnormal release channel unacceptable	LISA
360	Abnormal release timer expired	LISA
361	Abnormal release no act on radio path	LISA
362	Preemptive release	LISA
363	UTRAN configuration unknown	LISA
364	Handover impossible	LISA
365	Channel mode unacceptable	LISA
366	Frequency not implemented	LISA
367	Originator leaving call group area	LISA
368	Lower layer failure from network	LISA
369	Call already cleared	LISA
370	Semantically incorrect message	LISA
371	Invalid mandatory info	LISA
372	Message type non existing	LISA
373	Message type incompatible in state	LISA
374	Conditional information element error	LISA
375	No cell allocation available	LISA

<cause>	<error_description>	Resulting from the following products
376	Protocol error unspecified	LISA
377	Normal event	LISA
378	Unspecified	LISA
379	Preemptive release	LISA
380	Congestion	LISA
381	RE establishment reject	LISA
382	Directed sig conn establishment	LISA
383	User inactivity	LISA
384	Lower layer failure downlink	LISA
385	Lower layer failure uplink	LISA
386	Cell barred due to authentication failure	LISA
387	signalling connection release	LISA
388	CS connection release triggered by MM	LISA
389	RRC connection establishment failure	LISA
390	RRC connection establishment reject with redirection	LISA
391	resource conflict	LISA
392	Layer 2 sequence error	LISA
393	Layer 2 T200 exp N200 plus 1 times	LISA
394	Layer 2 unsolicited DM resp MFES	LISA
395	Layer 2 contention resolution	LISA
396	Layer 2 normal cause	LISA
397	RR connection release due to BAND change (2G)	LISA
400	MM RR connection error while release	LISA
	Outgoing calls barred within CUG	LEON
	No CUG selected	LEON

<cause>	<error_description>	Resulting from the following products
	Unknown CUG index	LEON
	CUG index incompatible with requested basic service	LEON
	CUG call failure, unspecified	LEON
	CLIR not subscribed	LEON
	CCBS possible	LEON
	CCBS not possible	LEON
	Normal, unspecified	LEON
	Resources unavailable, unspecified	LEON
	Service or option not available, unspecified	LEON
	Service or option not implemented, unspecified	LEON
	Semantically incorrect message	LEON
	Protocol error, unspecified	LEON
	Interworking, unspecified	LEON
	Unknown	LEON
	normal	LEON
	alternate call unsuccessful modify	LEON
	mobile originated unsuccessful call setup	LEON
	mobile terminated unsuccessful call setup	LEON
	unsuccessful in-call-modification	LEON
	normal user request	LEON
	last call release	LEON
	last data call release	LEON
	unsuccessful GPRS attach	LEON
	GPRS detach	LEON
	unsuccessful PDP context activation	LEON

<cause>	<error_description>	Resulting from the following products
	PDP context deactivation	LEON

B AT Commands List

Legend:

PRF: the parameters of the command can be saved in the profiles stored internally in the non volatile memory;

SIM: the command needs of the SIM module to work correctly;

PIN: the command needs of the PIN insertion to work correctly;

NVM: the parameter of the command can be stored in the non volatile memory of the module.

ABT: the command is abortable if a character is sent to DCE during the command execution

AT command	LEON-G100	LEON-G200	LISA-U100 / LISA-U110	LISA-U120 / LISA-U130	Supported Feature	
&A	●	●				
&B	●	●				
&C	●	●	●	●	PRF	
&D	●	●	●	●	PRF	
&E	●	●				
&F	●	●	●	●		
&H	●	●	●	●		
&I	●	●				
&K	●	●	●	●	PRF	
&M	●	●				
&R	●	●				
&S	●	●	●	●	PRF	
&V	●	●	●	●		
&W	●	●	●	●		
&Y	●	●	●	●	NVM	
\Q	●	●	●	●		
+CACM	●	●	●	●	SIM	
+CALA	●	●	●	●	NVM	PIN
+CALD	●	●	●	●	NVM	PIN
+CALM	●	●		●	NVM	
+CAMM	●	●	●	●	SIM	

AT command	LEON-G100	LEON-G200	LISA-U100 / LISA-U110	LISA-U120 / LISA-U130	Supported Feature	
+CAOC	●	●	●	●	PIN	
+CBC		●				
+CBST	●	●	●	●	PRF	
+CCFC	●	●	●	●	PIN	ABT
+CCID	●	●	●	●	SIM	
+CCLK	●	●	●	●	NVM	
+CCUG	●	●	●	●	NVM	PIN
+CCWA	●	●	●	●	PIN	ABT
+CCWE	●	●	●	●		
+CEER	●	●	●	●		
+CFUN	●	●	●	●		
+CGACT	●	●	●	●	PIN	ABT
+CGATT	●	●	●	●	PIN	ABT
+CGCLASS	●	●	●	●	PIN	
+CGCMOD			●	●		
+CGDATA	●	●	●	●	PIN	
+CGDCONT	●	●	●	●	PIN	
+CGDSCONT			●	●		
+CGED	●	●	●	●		
+CGEQMIN			●	●		
+CGEQNEG			●	●		
+CGEQREQ			●	●		
+CGEREP	●	●	●	●	PIN	
+CGMI	●	●	●	●	NVM	
+CGMM	●	●	●	●	NVM	
+CGMR	●	●	●	●	NVM	
+CGPADDR	●	●	●	●	PIN	
+CGQMIN	●	●	●	●	PIN	
+CGQREQ	●	●	●	●	PIN	

AT command	LEON-G100	LEON-G200	LISA-U100 / LISA-U110	LISA-U120 / LISA-U130	Supported Feature		
+CGREG	●	●	●	●			
+CGSMS	●	●	●	●	NVM	PIN	
+CGSN	●	●	●	●			
+CGTFT			●	●			
+CHLD	●	●	●	●	PIN		
+CHUP	●	●	●	●			
+CIMI	●	●	●	●			
+CIND	●	●	●	●			
+CLAC	●	●	●	●			
+CLAN			●	●			
+CLCC	●	●	●	●	PIN		
+CLCK	●	●	●	●	PIN	ABT	
+CLIP	●	●	●	●	PIN	ABT	
+CLIR	●	●	●	●	NVM	PIN	ABT
+CLVL	●	●		●	NVM		
+CMEE	●	●	●	●			
+CMER	●	●	●	●			
+CMGD	●	●	●	●	PIN		
+CMGF	●	●	●	●	PIN	PRF	
+CMGL	●	●	●	●	PIN		
+CMGR	●	●	●	●	PIN		
+CMGS	●	●	●	●	PIN	ABT	
+CMGW	●	●	●	●	PIN	ABT	
+CMMS			●	●			
+CMOD	●	●	●	●			
+CMSS	●	●	●	●	PIN		
+CMUT	●	●		●			
+CMUX	●	●	●	●			
+CNAP	●	●	●	●	PIN	ABT	
+CNMA	●	●	●	●	PIN		

AT command	LEON-G100	LEON-G200	LISA-U100 / LISA-U110	LISA-U120 / LISA-U130	Supported Feature	
+CNMI	●	●	●	●	PIN	PRF
+CNUM	●	●	●	●	PIN	
+COLP	●	●	●	●	PIN	ABT
+COLR	●	●	●	●	PIN	ABT
+COPN	●	●	●	●	PIN	
+COPS	●	●	●	●	PRF	ABT
+CPAS	●	●	●	●		
+CPBF	●	●	●	●	PIN	
+CPBR	●	●	●	●	PIN	
+CPBS	●	●	●	●	PIN	
+CPBW	●	●	●	●	PIN	
+CPIN	●	●	●	●	NVM	SIM
+CPLS			●	●		
+CPMS	●	●	●	●	NVM	PIN
+CPOL	●	●	●	●	PIN	
+CPUC	●	●	●	●		
+CPWD	●	●	●	●	ABT	
+CPWROFF	●	●	●	●		
+CR	●	●	●	●	PRF	
+CRC	●	●	●	●	PRF	
+CREG	●	●	●	●		
+CRES	●	●	●	●	PIN	
+CRLP	●	●	●	●	PRF	
+CRSL	●	●		●	NVM	
+CRSM	●	●	●	●	PIN	
+CSAS	●	●	●	●	NVM	PIN
+CSCA	●	●	●	●	NVM	PIN

AT command	LEON-G100	LEON-G200	LISA-U100 / LISA-U110	LISA-U120 / LISA-U130	Supported Feature	
+CSCB	●	●	●	●	NVM	PIN
+CSCS	●	●	●	●		
+CSDH	●	●	●	●	PIN	
+CSGT	●	●	●	●	NVM	
+CSIM			●	●		
+CSMP	●	●	●	●	NVM	PIN
+CSMS	●	●	●	●	PIN	
+CSNS	●	●	●	●		
+CSQ	●	●	●	●	PIN	
+CSSN	●	●	●	●		
+CSTA	●	●	●	●		
+CTFR	●	●	●	●	PIN	
+CTZR	●	●	●	●	PIN	
+CTZU	●	●	●	●	PIN	
+CUSD	●	●	●	●	PIN	ABT
+CUUS1	●	●			PIN	
+FAA	●	●			PIN	
+FAP	●	●			PIN	
+FBO	●	●			PIN	
+FBS	●	●			PIN	
+FBU	●	●			PIN	
+FCC	●	●			PIN	
+FCLASS	●	●	●	●		
+FCQ	●	●			PIN	
+FCR	●	●			PIN	
+FCS	●	●			PIN	
+FCT	●	●			PIN	

AT command	LEON-G100	LEON-G200	LISA-U100 / LISA-U110	LISA-U120 / LISA-U130	Supported Feature
+FDR	●	●			PIN
+FDT	●	●			PIN
+FEA	●	●			PIN
+FFC	●	●			PIN
+FFD	●	●			PIN
+FHS	●	●			PIN
+FIE	●	●			PIN
+FIP	●	●			PIN
+FIS	●	●			PIN
+FIT	●	●			PIN
+FKS, +FK	●	●			PIN
+FLI	●	●			PIN
+FLO	●	●			PIN
+FLP	●	●			PIN
+FMI	●	●			
+FMM	●	●			
+FMR	●	●			
+FMS	●	●			PIN
+FND	●	●			PIN
+FNR	●	●			PIN
+FNS	●	●			PIN
+FPA	●	●			PIN
+FPI	●	●			PIN
+FPP	●	●			PIN
+FPS	●	●			PIN
+FPW	●	●			PIN

AT command	LEON-G100	LEON-G200	LISA-U100 / LISA-U110	LISA-U120 / LISA-U130	Supported Feature	
+FRQ	●	●			PIN	
+FRY	●	●			PIN	
+FSA	●	●			PIN	
+FSP	●	●			PIN	
+GCAP	●	●	●	●		
+GMI	●	●	●	●		
+GMM	●	●	●	●		
+GMR	●	●	●	●		
+GSN	●	●	●	●		
+ICF	●	●	●	●	PRF	
+IFC	●	●	●	●	PRF	
+IPR	●	●	●	●	PRF	
+STKCC	●	●	●	●		
+STKCNF	●	●	●	●		
+STKENV	●	●	●	●	PIN	
+STKPRO	●	●	●	●	PIN	
+STKPROF	●	●	●	●	PIN	
+STKTR	●	●	●	●	PIN	
+UADC	●					
+UANTR	●	●	●	●		
+UBANDSEL	●	●	●	●	NVM	
+UCALLSTAT	●	●	●	●		
+UCD	●	●			PIN	
+UCEER			●	●		
+UCELLINFO			●	●		
+UCGCLASS			●	●		
+UCGOPS	●	●	●	●	PIN	ABT
+UCIND			●	●		
+UCLASS	●	●	●	●	NVM	
+UCMGL	●	●				

AT command	LEON-G100	LEON-G200	LISA-U100 / LISA-U110	LISA-U120 / LISA-U130	Supported Feature	
+UCMGR	●	●				
+UCMGS	●	●			ABT	
+UCMGW	●	●			ABT	
+UCSD	●	●			NVM	
+UCSDA	●	●			NVM	
+UCSND	●	●				
+UCSP			●	●		
+UDBF	●	●		●	PRF	
+UDCONF	●	●				
+UDELFILE	●	●	●	●		
+UDNSRN	●	●	●	●		
+UDOPN			●	●	PIN	
+UDTMF				●	NVM	
+UDWNFILE	●	●	●	●		
+UEONS	●	●	●	●	PIN	ABT
+UFOTA		●			NVM	
+UFRW	●	●				
+UFTP	●	●				
+UFTPC	●	●				
+UFTPER	●	●				
+UFWUPD	●	●				
+UGAOF	●	●	●	●	NVM	
+UGAOP	●	●	●	●	NVM	
+UGAOS	●	●	●	●		
+UGCNTRD	●	●	●	●	PIN	
+UGCNTSET	●	●	●	●	PIN	
+UGGGA	●	●	●	●	NVM	
+UGGLL	●	●	●	●	NVM	
+UGGSA	●	●	●	●	NVM	
+UGGSV	●	●	●	●	NVM	

AT command	LEON-G100	LEON-G200	LISA-U100 / LISA-U110	LISA-U120 / LISA-U130	Supported Feature
+UGIND	●	●	●	●	
+UGPIOC	●	●	●	●	NVM
+UGPIOR	●	●	●	●	
+UGPIOW	●	●	●	●	
+UGPRF	●	●	●	●	NVM
+UGPS	●	●	●	●	
+UGRMC	●	●	●	●	NVM
+UGTMR	●	●	●	●	
+UGUBX	●	●	●	●	
+UGVTG	●	●	●	●	NVM
+UGZDA	●	●	●	●	NVM
+UHFP	●	●		●	PRF
+UHOMEZR			●	●	
+UHSDUPA			●	●	NVM
+UHTTP	●	●			
+UHTTPC	●	●			
+UHTTPER	●	●			
+UI2S	●	●		●	NVM
+ULOC	●	●			
+ULOCCELL	●	●			NVM
+ULOCGNSS	●	●			NVM
+ULSTFILE	●	●	●	●	
+UMGC	●	●		●	PRF
+UMSM	●	●		●	
+UPAR	●	●		●	
+UPINCNT	●	●	●	●	SIM
+UPING	●	●			
+UPLAYFILE	●	●		●	
+UPROGRESS			●	●	
+UPSD	●	●	●	●	NVM
+UPSDA	●	●	●	●	NVM

AT command	LEON-G100	LEON-G200	LISA-U100 / LISA-U110	LISA-U120 / LISA-U130	Supported Feature
+UPSND	●	●	●	●	
+UPSV	●	●	●	●	PRF
+URAT			●	●	NVM
+URDBLOCK	●	●			
+URDFILE	●	●	●	●	
+UREG			●	●	
+URNG	●	●		●	NVM
+USAR	●	●		●	
+USCELLLOCK			●	●	
+USGC	●	●		●	PRF
+USMTP	●	●			
+USMTPC	●	●			
+USMTPER	●	●			
+USMTPM	●	●			
+USOCL	●	●	●	●	
+USOCO	●	●	●	●	
+USOCR	●	●	●	●	
+USOCTL	●	●	●	●	
+USODL	●	●	●	●	
+USOER	●	●	●	●	
+USOGO	●	●	●	●	
+USOLI	●	●	●	●	
+USORD	●	●	●	●	
+USORF	●	●	●	●	
+USOSO	●	●	●	●	
+USOST	●	●	●	●	
+USOWR	●	●	●	●	
+USPM	●	●		●	NVM
+USTN	●	●		●	PRF
+USTOPFILE	●	●		●	
+USTS	●	●	●	●	PRF
+UTEST	●				
+UTGN	●	●		●	
+UUBF	●	●		●	PRF
+UUICC			●	●	

AT command	LEON-G100	LEON-G200	LISA-U100 / LISA-U110	LISA-U120 / LISA-U130	Supported Feature	
+UVTS			●	●		
+VTD	●	●		●		
+VTS	●	●		●	PIN	ABT
+WS46			●	●		
A	●	●	●	●		
A/	●	●	●	●		
B	●	●				
D	●	●	●	●	PIN	
DL	●	●	●	●	SIM	ABT
E	●	●	●	●	PRF	
H	●	●	●	●		
H	●	●	●	●		
I	●	●	●	●		
L	●	●	●	●		
M	●	●	●	●		
O	●	●	●	●	PIN	
P	●	●	●	●		
Q	●	●	●	●	PRF	
S0	●	●	●	●	PRF	
S10	●	●	●	●		
S12	●	●	●	●		
S2	●	●	●	●	PRF	
S3	●	●	●	●	PRF	
S4	●	●	●	●	PRF	
S5	●	●	●	●	PRF	
S6	●	●	●	●		
S7	●	●	●	●	PRF	
S8	●	●	●	●		
T	●	●	●	●		
V	●	●	●	●	PRF	
X	●	●	●	●	PRF	

AT command	LEON-G100	LEON-G200	LISA-U100 / LISA-U110	LISA-U120 / LISA-U130	Supported Feature
Z	●	●	●	●	

B.1 Parameters stored in profiles

Some parameter settings can be stored in the NVRAM profiles available in the memory module. To store, display, activate and de-activate these profiles, refer to AT&W (chapter 15.7), AT&V (chapter 15.8), AT&Y (chapter 15.9) command description.

☞ Not all parameter setting are displayed through with AT&V command.

☞ Some AT commands have a unique configuration for all ATinterfaces while for other AT commands it is possible to set a different configuration for each AT interface: the "AT interface configuration sharing" column in the next table provides this information

The following table lists the AT commands that can be stored in the profiles with their parameters as well as the default values.

AT command	Description	AT interface configuration sharing	Default value [5]	Comment
&C	DCD Status	No	1	DCD enabled
&D	DTR Status	No	1	DTR enabled
&K	Flow control status	No	3	RTS/CTS DTE flow control enabled
&S	DSR override	No	1	DSR line set to OFF
+CBST	Bearer service type (speed/ name/ connection element)	Yes	7,0,1	standard configuration for bearer service parameters: • speed: 9600 b/s • name: data circuit asynchronous • connection element: non-transparent
+CMGF	Preferred message format	Yes	0	Format of messages in PDU mode
+CNMI		Yes	1,0,0,0,0	• discard indication and reject new received message URCs when MT-DTE link is reserved • No SMS-DELIVER indications are routed to the TE • No CBM indications to the DTE • No SMS-STATUS-REPORTs are routed to the DTE
+COPS	Operator selection	Yes	0, 0, FFFF	• Autoregistration enabled (<mode>: 0) • Operator expressd in long alphanumeric format (<format>: 0) • PLMN to register when COPS=1 (FFFF: undefined)
+CR	Reporting control status	No	0	Reporting disabled
+CRC	Cellular result code status	No	0	Extended format disabled
+CRLP	Radio Link protocol settings	Yes	61,61,48,6	standard configuration for radio link protocol • IWF to MT window size: 61 • MT to IWF window size: 61 • acknowledgement timer: 48 • retransmission attempts: 6
+ICF	DTE-DCE character framing	No	3,1	Framing format: 8 data 1 stop, no parity
+IFC	DTE-DCE local flow control	No	2,2	• <DCE_by_DTE> on circuit 106 (CTS)

[5] The default value is a factory setting

AT command	Description	AT interface configuration sharing	Default value [5]	Comment
				• <DTE_by_DCE> on circuit 105 (RTS)
+IPR	Baud rate	No	0	Autobauding enabled
+UDBF	Downlink Biquad Digital Filters	Yes	On LEON Path 0: Filter1: 0, 0, 0, 0, 32767 Filter2: 0, 0, 0, 0, 32767 Path 1: Filter1: -29322, -29141, 29322, 26240, 29322 Filter2: 29322, 29141, 29322, 26240, 29322 Path 3: Filter1: 0, 0, 0, 0, 32767 Filter2: 0, 0, 0, 0, 32767 Path 4: Filter1: 0, 0, 0, 0, 32767 Filter2: 0, 0, 0, 0, 32767	On LEON Path 0: • Filter1: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter2: a1:0, b1:0, a2:0, b2:0, a0:32767 Path 1: • Filter1: a1:-29322, b1:-29141, a2:29322, b2:26240, a0:29322 • Filter2: a1:29322, b1:29141, a2:29322, b2:26240, a0:29322 Path 3: • Filter1: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter2: a1:0, b1:0, a2:0, b2:0, a0:32767 Path 4: • Filter1: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter2: a1:0, b1:0, a2:0, b2:0, a0:32767
			On LISA Path 0: Filter1: 0, 0, 0, 0, 32767 Filter2: 0, 0, 0, 0, 32767 Filter3: 0, 0, 0, 0, 32767 Filter4: 0, 0, 0, 0, 32767 Filter5: 0, 0, 0, 0, 32767 Filter6: 0, 0, 0, 0, 32767 Filter7: 0, 0, 0, 0, 32767 Filter8: 0, 0, 0, 0, 32767 Path 1: Filter1: 0, 0, 0, 0, 32767 Filter2: 0, 0, 0, 0, 32767 Filter3: 0, 0, 0, 0, 32767 Filter4: 0, 0, 0, 0, 32767 Filter5: 0, 0, 0, 0, 32767 Filter6: 0, 0, 0, 0, 32767 Filter7: 0, 0, 0, 0, 32767 Filter8: 0, 0, 0, 0, 32767 Path 3: Filter1: 0, 0, 0, 0, 32767 Filter2: 0, 0, 0, 0, 32767 Filter3: 0, 0, 0, 0, 32767 Filter4: 0, 0, 0, 0, 32767 Filter4: 0, 0, 0, 0, 32767 Filter5: 0, 0, 0, 0, 32767 Filter6: 0, 0, 0, 0, 32767 Filter7: 0, 0, 0, 0, 32767	On LISA Path 0: • Filter1: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter2: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter3: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter4: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter5: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter6: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter7: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter8: a1:0, b1:0, a2:0, b2:0, a0:32767 Path 1: • Filter1: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter2: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter3: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter4: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter5: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter6: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter7: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter8: a1:0, b1:0, a2:0, b2:0, a0:32767 Path 3: • Filter1: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter2: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter3: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter4: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter5: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter6: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter7: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter8: a1:0, b1:0, a2:0, b2:0, a0:32767 Path 4: • Filter1: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter2: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter3: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter4: a1:0, b1:0, a2:0, b2:0, a0:32767

AT command	Description	AT interface configuration sharing	Default value [5]	Comment
			Filter8: 0, 0, 0, 0, 32767 Path 4: Filter1: 0, 0, 0, 0, 32767 Filter2: 0, 0, 0, 0, 32767 Filter3: 0, 0, 0, 0, 32767 Filter4: 0, 0, 0, 0, 32767 Filter5: 0, 0, 0, 0, 32767 Filter6: 0, 0, 0, 0, 32767 Filter7: 0, 0, 0, 0, 32767 Filter8: 0, 0, 0, 0, 32767	• Filter5: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter6: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter7: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter8: a1:0, b1:0, a2:0, b2:0, a0:32767
+UHFP	Hand Free Parameters	Yes	On LEON: Path 0: 0x01fd, 0x016e, 2200, 250, 3, 5, 150, 0, 0, 500, 4096, 16384, 16384 Path 1: 0x01fd, 0x016e, 2200, 250, 3, 5, 150, 0, 0, 500, 4096, 16384, 16384 Path 2: 0x01fd, 0x016e, 2200, 250, 8, 5, 150, 0, 0, 500, 4096, 16384, 16384	On LEON: Path 0: • HF_algorithm_init:0x01fd, HF_Algorithm_Restart:0x016e, Step_Width:2200, LMS_Length:250, LMS_Offset:3, Block_Length:5, RXTX_Relation:150, Add_Atten:0, Min_Atten:0, Max_Atten:500, NR_sw_2:4096, NR_u_fak_0:16384, NR_u_fak:16384 Path 1: • HF_algorithm_init:0x01fd, HF_Algorithm_Restart:0x016e, Step_Width:2200, LMS_Length:250, LMS_Offset:3, Block_Length:5, RXTX_Relation:150, Add_Atten:0, Min_Atten:0, Max_Atten:500, NR_sw_2:4096, NR_u_fak_0:16384, NR_u_fak:16384 Path 2: • HF_algorithm_init:0x01fd, HF_Algorithm_Restart:0x016e, Step_Width:2200, LMS_Length:250, LMS_Offset:8, Block_Length:5, RXTX_Relation:150, Add_Atten:0, Min_Atten:0, Max_Atten:500, NR_sw_2:4096, NR_u_fak_0:16384, NR_u_fak:16384
			On LISA: Path 0: 0x01fd, NA,NA,NA,NA,NA,NA, 0, 0, 500, 8192, 7500, 7500, 2,100,100,100,60,60,60 Path 1: 0x01fd, NA,NA,NA,NA,NA,NA, 0, 0, 500, 8192, 7500, 7500, 2,100,100,100,60,60,60 Path 2: 0x01fd, NA,NA,NA,NA,NA,NA, 0, 0, 500, 8192, 7500, 7500, 2,100,100,100,60,60,60	On LISA Path 0: • HF_algorithm_init:0x01fd, HF_Algorithm_Restart:Not Available, Step_Width:Not Available, LMS_Length:Not Available, LMS_Offset:Not Available, Block_Length:Not Available, RXTX_Relation:Not Available, Add_Atten:0, Min_Atten:0, Max_Atten:500, NR_sw_2:8192, NR_u_fak_0:7500, NR_u_fak:7500, EC_block_length:2, EC_nr_coeff_real:100, EC_nr_coeff_complex1:100, EC_nr_coeff_complex2:100, EC_nr_coeff_complex3:60, EC_nr_coeff_complex4:60, EC_nr_coeff_complex5:60 Path 1: • HF_algorithm_init:0x01fd, HF_Algorithm_Restart:Not Available, Step_Width:Not Available, LMS_Length:Not Available, LMS_Offset:Not Available,

AT command	Description	AT interface configuration sharing	Default value [5]	Comment
			Path 4: 0x01fd, NA,NA,NA,NA,NA,NA, 50, 100, 500, 8192, 7500, 7500, 2,220,220,220,60,60,60	Block_Length:Not Available, RXTX_Relation:Not Available, Add_Atten:0, Min_Atten:0, Max_Atten:500, NR_sw_2:8192, NR_u_fak_0:7500, NR_u_fak:7500, EC_block_length:2, EC_nr_coeff_real:100, EC_nr_coeff_complex1:100, EC_nr_coeff_complex2:100, EC_nr_coeff_complex3:60, EC_nr_coeff_complex4:60, EC_nr_coeff_complex5:60 Path 2: • HF_algorithm_init:0x01fd, HF_Algorithm_Restart:Not Available, Step_Width:Not Available, LMS_Length:Not Available, LMS_Offset:Not Available, Block_Length:Not Available, RXTX_Relation:Not Available, Add_Atten:0, Min_Atten:0, Max_Atten:500, NR_sw_2:8192, NR_u_fak_0:7500, NR_u_fak:7500, EC_block_length:2, EC_nr_coeff_real:100, EC_nr_coeff_complex1:100, EC_nr_coeff_complex2:100, EC_nr_coeff_complex3:60, EC_nr_coeff_complex4:60, EC_nr_coeff_complex5:60 Path 4: • HF_algorithm_init:0x01fd, HF_Algorithm_Restart:Not Available, Step_Width:Not Available, LMS_Length:Not Available, LMS_Offset:Not Available, Block_Length:Not Available, RXTX_Relation:Not Available,Add_Atten:50, Min_Atten:100, Max_Atten:500, NR_sw_2:8192, NR_u_fak_0:7500, NR_u_fak:7500,EC_block_length:2, EC_nr_coeff_real:220, EC_nr_coeff_complex1:220, EC_nr_coeff_complex2:220,EC_nr_coeff_complex 3:60, EC_nr_coeff_complex4:60, EC_nr_coeff_complex5:60
+UMGC	Microphone Gain Control	Yes	On LEON: Path 0: 10,9384 Path 1: 12,8192 Path 2: 6,8192	On LEON: Path 0: • Analog gain:10, Digital gain: 9384 Path 1: • Analog gain:12, Digital gain: 8192 Path 2: • Analog gain:6, Digital gain: 8192
			On LISA Path 0:12,8192 Path 1:12,8192 Path 2:6,8192 Path 4:13,8192	On LISA Path 0: • Analog gain:12, Digital gain: 8192 Path 1: • Analog gain:12, Digital gain: 8192 Path 2: • Analog gain:6, Digital gain: 8192 Path 4:

AT command	Description	AT interface configuration sharing	Default value [5]	Comment
				• Analog gain:13, Digital gain: 8192
+UPSV	Power Saving (mode, timeout)	Yes	0	Power saving disabled
+USGC	Speaker Gain Control	Yes	On LEON: Path 0: 6, 1, 8192, 16384, 8192 Path 1: 6, 0, 8192, 16384, 10240 Path 3: 0, 6, 8192, 16384, 8191 Path 4: 6, 6, 8192, 16384, 8191	On LEON: Path 0: • Speaker gain: 6, Headset gain: 1, speech and Tone Generator gain: 8192, Synthesizers gain: 16384, Speech gain: 8192 Path 1: • Speaker gain:6, Headset gain:0, speech and Tone Generator gain: 8192, Synthesizers gain: 16384, Speech gain:10240 Path 3: • Speaker gain: 0, Headset gain: 6, speech and Tone Generator gain: 8192, Synthesizers gain:16384, Speech gain: 8191 Path 4: • Speaker gain: 6, Headset gain: 6, speech and Tone Generator gain: 8192, Synthesizers gain: 16384, Speech gain: 8191
			On LISA Path 0: NA,0,8192,16384,NA Path 1: NA,1,8192,16384,NA Path 3: NA,0,8192,16384,NA Path 4: NA,3,8192,16384,NA	On LISA Path 0: • Speaker gain: Not Available, Headset gain: 0, speech and Tone Generator gain: 8192, Synthesizers gain: 16384, Speech gain: Not Available Path 1: • Speaker gain: Not Available, Headset gain1, speech and Tone Generator gain: 8192, Synthesizers gain: 16384, Speech gain: Not Available Path 3: • Speaker gain: Not Available, Headset gain: 0, speech and Tone Generator gain: 8192, Synthesizers gain: 16384, Speech gain: Not Available Path 4: • Speaker gain: Not Available, Headset gain: 3, speech and Tone Generator gain: 8192, Synthesizers gain: 16384, Speech gain: Not Available
+USTS	Smart Temperature Supervisor	Yes	0	Smart temperature URC disabled
+USTN	Sidetone	Yes	On LEON: Path 0: 2249 Path 1: 2249 Path 3: 0 Path 4: 0	On LEON: Path 0: • Gain for side tone: 2249 Path 1: • Gain for side tone: 2249 Path 3: • Gain for side tone: 0

AT command	Description	AT interface configuration sharing	Default value [5]	Comment
				Path 4: • Gain for side tone: 0
			On LISA Path 0: 512 Path 1: 512 Path 3: 0 Path 4: 0	On LISA Path 0: • Gain for side tone: 512 Path 1: • Gain for side tone: 512 Path 3: • Gain for side tone: 0 Path 4: • Gain for side tone: 0
+UUBF	Uplink Digital Filters (Uplink Biquad Filters)	Yes	On LEON: Path 0: Filter1: -13915, 2249, 4377, -325, 23450 Filter2: 21682, -2312, 17984, -15517, 32767 Path 1: Filter1: -29322, -29141, 29322, 26240, 29322 Filter2: 29322, 29141, 29322, 26240, 29322 Path 2: Filter1: 0, 0, 0, 0, 32767 Filter2: 0, 0, 0, 0, 32767	On LEON: Path 0: • Filter1: a1:-13915, b1:2249, a2:4377, b2:-325, a0:23450 • Filter2: a1:21682, b1:-2312, a2:17984, b2:-15517, a0:32767 Path 1: • Filter1: a1:-29322, b1:-29141, a2:29322, b2:26240, a0:29322 • Filter2: a1:29322, b1:29141, a2:29322, b2:26240, a0:29322 Path 2: • Filter1: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter2: a1:0, b1:0, a2:0, b2:0, a0:32767
			ON LISA Path 0: Filter1: 0, 0, 0, 0, 32767 Filter2: 0, 0, 0, 0, 32767 Filter3: 0, 0, 0, 0, 32767 Filter4: 0, 0, 0, 0, 32767 Filter5: 0, 0, 0, 0, 32767 Filter6: 0, 0, 0, 0, 32767 Filter7: 0, 0, 0, 0, 32767 Filter8: 0, 0, 0, 0, 32767) Path 1: Filter1: 0, 0, 0, 0, 32767 Filter2: 0, 0, 0, 0, 32767 Filter3: 0, 0, 0, 0, 32767 Filter4: 0, 0, 0, 0, 32767 Filter5: 0, 0, 0, 0, 32767 Filter6: 0, 0, 0, 0, 32767	On LISA Path 0: • Filter1: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter2: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter3: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter4: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter5: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter6: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter7: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter8: a1:0, b1:0, a2:0, b2:0, a0:32767 Path 1: • Filter1: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter2: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter3: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter4: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter5: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter6: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter7: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter8: a1:0, b1:0, a2:0, b2:0, a0:32767 Path 2: • Filter1: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter2: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter3: a1:0, b1:0, a2:0, b2:0, a0:32767

AT command	Description	AT interface configuration sharing	Default value [5]	Comment
			Filter7: 0, 0, 0, 0, 32767 Filter8: 0, 0, 0, 0, 32767) Path 2: Filter1: 0, 0, 0, 0, 32767 Filter2: 0, 0, 0, 0, 32767 Filter3: 0, 0, 0, 0, 32767 Filter4: 0, 0, 0, 0, 32767 Filter5: 0, 0, 0, 0, 32767 Filter6: 0, 0, 0, 0, 32767 Filter7: 0, 0, 0, 0, 32767 Filter8: 0, 0, 0, 0, 32767) Path 4: Filter1: 0, 0, 0, 0, 32767 Filter2: 0, 0, 0, 0, 32767 Filter3: 0, 0, 0, 0, 32767 Filter4: 0, 0, 0, 0, 32767 Filter5: 0, 0, 0, 0, 32767 Filter6: 0, 0, 0, 0, 32767 Filter7: 0, 0, 0, 0, 32767 Filter8: 0, 0, 0, 0, 32767)	• Filter4: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter5: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter6: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter7: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter8: a1:0, b1:0, a2:0, b2:0, a0:32767 Path 4: • Filter1: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter2: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter3: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter4: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter5: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter6: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter7: a1:0, b1:0, a2:0, b2:0, a0:32767 • Filter8: a1:0, b1:0, a2:0, b2:0, a0:32767
E	Echo status	No	1	Echo enabled
Q	Result code suppression	No	0	DCE transmits result codes
S0	Automatic answer	No	0	Automatic answering disabled
S2	Escape character selection	No	43	043 corresponds the '+' character
S3	Command line termination character	No	13	0x0d corresponds to the carriage return character
S4	Response formatting character	No	10	0x0a corresponds to the line feed character
S5	Command line editing character	No	8	008 corresponds to the backspace character
S7	Connection completion timeout	No	60	
V	DCE Response format	No	1	Verbose response text
X	Result code selection and call progress monitoring control	No	4	CONNECT <text> result code is given upon entering online data state; dial tone and busy detection are both enabled

B.2 Parameters stored in non volatile memory

The following table lists the AT commands that can be stored in the non volatile memory with their parameters and the default values.

AT command	Description	Default value	Comment
&Y	Designate a default reset profile	0	Profile 0 selected
+CALA	Alarm		With manufacturer settings no alarm are stored
+CALM	Alert sound mode	0	Mute disabled
+CCLK	Clock	04/01/01,00:00:00+00	
+CCUG	Closed user group		
+CGMI	Manufacturer identification	u-blox	
+CGMM	Request model identification	LEON-G200 (or LEON-G100)	
+CGMR	Request Firmware version	07.30.01	
+CGSMS	Select service for MO SMS messages	1	CSD service enabled
+CLIR	Calling line identification restriction		
+CLVL	Speech volume level	On LEON: 80 On LISA: 70	On LEON: Speech volume level: 80 On LISA: Speech volume level: 70
+CPIN	Enter PIN		
+CPMS	Preferred message storage	"MT", "MT", "MT"	<mem1>, <mem2> and <mem3> are set to "MT"="ME"+"SM" with "ME" preferred
+CRSL	Ringer sound level	4	Ringer sound level: 4
+CSAS	Save settings	0	Profile 0 where to store the active message settings
+CSCA	Service center address	""	Service center address set empty
+CSCB	Select cell broadcast message types	0, "", ""	Accepted the message types specified in <mids> and <dcss>
+CSGT	Set greeting text	""	Greeting text is empty
+CSMP	Set text mode parameters	17, 167, 0, 0	First octet is SMS-SUBMIT <fo>=17 <vp>=167 <pid>=0 <dcs>=0
+UCLASS	Device class setting	10	GPRS class 10
+UCSD	Circuit Switched Data		With the default settings the profile is empty
+UDTMF	User setting for proactive DTMF tone generation	1	Proactive DTMF tone generation available
+UGAOF	AssistNow Offline configuration	"http://alp.u-blox.com/current_14d.alp",0,1,3	AssistNow Offline URL file: http://alp.u-blox.com/current_14d.alp One minute of timeout after a fail download Three attempts in case of failed download
+UGAOP	AssistNow Online configuration	"agps.u-blox.com", 46434,1000,0	Host name server: "agps.u-blox.com" server port: 46434 expected network latency: 1000 ms AssistNow Online data downloaded at GPS receiver power up
+UGGGA	Get GPS fix data	0	NMEA $GGA messages disabled

AT command	Description	Default value	Comment
+UGGLL	Get geographic position	0	NMEA $GLL messages disabled
+UGGSA	Get satellite information	0	NMEA $GSA messages disabled
+UGGSV	Get number of GNSS satellites in view	0	NMEA $GSV messages disabled
+UGRMC	Get recommended minimum GNSS data	0	NMEA $RMC messages disabled
+UGPIOC	GPIO functionality setting	255	Default setting for <gpio1>, <gpio2>, <gpio3>, <gpio4>, <gpio5> at the first power up. All the GPIOs are in tristate.
+UFOTA	FOTA Configuration	0, 1, 0, ""	<enable>= 0 <attempts>=1 <configuration>=0 <code>=""
+UGVTG	Get course over ground and ground speed	0	NMEA $VTG messages disabled
+UGZDA	Get GPS Time and date	0	NMEA $ZDA messages disabled
+UGPRF		0, 0, ""	No data flow on mux, file and IP address IP port not defined Server address string not defined
+UI2S	I2S Digital Interface Mode	On LEON: 4,2,1 On LISA: 0,1,0	On LEON: • I2S mode: normal mode 4 • I2S port: I2Sy • I2S_CLK and I2S_WA signals are active in continuos mode On LISA • I2S mode: PCM mode 0 • I2S port: I2Sx • I2S_CLK and I2S_WA signals are active in dynamic mode
+ULOCCELL	Configure cellular location sensor (CellLocate)	0	Normal mode enabled
+ULOCGNSS	Configure GNSS sensor	15,0,3,7,0,0,0,0,0,0,0,0,0,0	Local aiding, AssistNow online, AssistNow offline, AssistNow autonomous enabled Power saving disabled Minimum number of satellites for navigation: 3 Minimum satellite signal level for navigation: 7 Disabled initial Fix must be 3D flag Static Hold Mode: 0 SBAS disabled Jamming indicator disabled Antenna settings unknown Broadband jamming detection threshold: 0 dB Continuous wave jamming detection threshold: 0 dB
+UPSD	Packet Switched Data		With the default settings the profile is empty
+URAT	Selection of Radio Access technology	1,2	• Radio Access technology: GSM/UMTS Dual mode • RAT UMTS
+URNG	Ringing tone selection	0	Melody 0

AT command	Description	Default value	Comment
+USPM	Audio Path mode setting	On LEON: 0,0,1,1,0 On LISA: 1,1,0,0,2	On LEON: • Speech audio output path: Handset microphone • Speech audio input path: Normal earpiece • Alert sound on Loudspeaker • Headset indication: considered • VMIC is switched On /Off On LISA: • Speech audio output path: Headset microphone • Speech audio input path: Mono headset earpiece • Alert sound on main downlink path (Mono headset earpiece) • Headset indication: not considered • VMIC is always switched Off

B.3 Saving of AT commands configuration

The following procedure can be used to store the AT commands configuration for the AT commands listed in chapter B.1 and B.2.

- Write the run-time configuration of the active AT interface to the RAM profile mirror with the AT&W command (e.g. AT&W0; more details in chapter 15.7)
- Confirm that boot loading is performed with the desired parameter profile (e.g. profile 0 if the parameter save was performed with AT&W0; use AT&Y0 to select this)
- Save the RAM profile mirror and the non-profile AT commands configuration (refer to chapter B.1) to NVRAM memory with the AT+CPWROFF command
- Perform a reboot/PWR_ON reset of the device

The last two steps can also be performed with the AT command AT+CFUN=15 (switches off and reboots the device).

B.4 Estimated command response time

After having sent a command to a u-blox wireless module, the time to obtain a resulting response depends on the SIM and the network. It is possible to have an immediate response if the command doesn't interact with either the network or the SIM.

The following table reports the maximum time to get the response for the AT commands that perform a network scan or read the SIM card. The commands are grouped by categories.

Category	Estimated maximum time to get response	Commands
Call control and Supplmentary services	< 20 s	+VTS, A, H, +CHLD, +CHUP, +CNAP, +COLP, +COLR
Power Off	< 20 s	+CPWROFF
Profile management	< 20 s	ATZ

Category	Estimated maximum time to get response	Commands
Network commands	Up to 3 min (<1 s for prompt ">" when present)	+CCFC, +CCWA, +CLCK, +CLIP, +CLIR, +CPWD, +CTFR, +CUSD, +UCGOPS, D, +CFUN, +CMSS, +CMGS, +CGDATA, +CGACT, +CGATT, Data connect, +COPS
SIM management	< 10 s	+CRES, +CACM, +CAMM, +CNUM, +CPIN, +CPOL, +CPUC, +CRSM
SIM toolkit	< 20 s	+STKPRO, +STKENV, +STKTR
GPS commands	< 10 s (except +UGPS for which timeout is according to the performed operation)	+UGAOP, +UGAOS, +UGGGA, +UGGLL, +UGGSA, +UGGSV, +UGPRF, +UGPS, +UGRMC, +UGTMR, +UGUBX, +UGVTG, +UGZDA, +ULOC, +ULOCCELL, +ULOCGNSS
GPIO commands	< 10 s	+UGPIOC, +UGPIOR, +UGPIOW
Internet suite (TCP/IP, DNS, FTP, HTTP, SMTP)	< 10 s (except URC)	+USOCR, +USOSO, +USOGO, +USOCL, +USOER, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI, +UFRW, +USODL, +USOCTL, +UDNSRN, +UFTP,+UFTPC,+UFTPER, +UHTTP, +UHTTPC, +UHTTPER, +USMTP, +USMTPM, +USMTPC, +USMTPER
Phonebook commands	< 20 s	+CPBS, +CPBR, +CPBF, +CPBW

B.5 Multiple AT command interfaces

Both LEON-G100/G200 and LISA-U1 series support multiple AT command interfaces, that means a certain number of virtual or physical channels (LEON-G100/G200 has only one physical interface (UART), the others are virtual interfaces implemented via the MUX protocol) that work as described in chapter 2.1.

Each interface maintains an own run-time AT commands configuration (AT command profile); this means that the AT command profile is different amongs the interfaces and therefore the AT commands configuration for the commands belonging to the profile can be different among the interfaces.

At start-up, since there is only a set of NVRAM profiles (not one for each interface), all the interfaces are configured in the same way (AT commands configuration for the commands in the profile is the same for all the interfaces). Subsequentelly, each interface can change its run-time AT profile (stored in RAM). The commands AT&W (chapter 15.7), AT&V (chapter 15.8) manage this run-time AT commands configuration for the interface where they are issued.

As mentioned in chapter 2.1, generally there is not difference in the execution of an AT command among the interfaces. But, there are some exceptions due to interface restrictions. In particular, the differences are related to the AT commands that configure the DCE-DTE interface.

Major differences are reported in the following table.

AT command	UART	MUX	USB (where available)	SPI (where available)
AT&K	Effective	When allowed it is effective	When allowed, it returns OK but it is not effective	When allowed, it returns OK but it is not effective
AT\Q	Effective	When allowed it is effective	When allowed, it returns OK but it is not effective	When allowed, it returns OK but it is not effective
AT+IFC	Effective	When allowed it is effective	When allowed, it returns OK but it is not effective	When allowed, it returns OK but it is not effective
AT+IPR	Effective	Returns OK but it is not effective	Returns OK but it is not effective	Returns OK but it is not effective
AT+ICF	Effective	Returns OK but it is not effective	Returns OK but it is not effective	Returns OK but it is not effective
AT+UPSV	Effective	Returns OK but it changes UART setting	Returns OK but it changes UART setting	Returns OK but it changes UART setting

Table 9: Interface comparison

C Glossary

3GPP	3rd Generation Partnership Project
ADC	Analog to Digital Converter
ADN	Abbreviated Dialing Numbers
AMR	Adaptive Multi Rate
APN	Access Point Name
ASCII	American Standard Code for Information Interchange
AT	AT Command Interpreter Software Subsystem, or attention
BL	Black List
BSD	Berkley Standard Distribution
CB	Cell Broadcast
CBM	Cell Broadcast Message
CLI	Calling Line Identification
CLIP	Calling Line Identification Presentation
CLIR	Calling Line Identification Restriction
COLP	Connected Line Identification Presentation
COLR	Connected Line Identification Restriction
CM	Connection Management
CPHS	Common PCN Handset Specification
CR	Carriage Return
CS	Circuit Switch
CSD	Circuit-Switched Data
CTS	Clear To Send
CUG	Closed User Group
DA	Destination Address
DCD	Data Carrier Detect
DCE	Data Communication Equipment
DCM	Data Connection Management
DNS	Domain Name Server
DSR	DSC transponder response
DTE, TE	Data Terminal Equipment
DTMF	Dual Tone Multi Frequency
DTR	Data Terminal Ready
DUT	Device Under Test
EEP	EEPROM Emulation Parameters
$EF_{PLMNwAcT}$	Elementary File "User controlled PLMN Selector with Access Technology"
EONS	Enhanced Operator Name from SIM-files EF-OPL and EF-PNN
EPD	Escape Prompt Delay
ETSI	European Telecommunications Standards Institute
FDN	Fixed Dialling Number
FOAT	Firmware Over AT

FOTA	Firmware Over The Air
FTP	File Transfer Protocol
FW	Firmware
GPIO	General Purpose Input Output
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global System for Mobile Communications
HDLC	High Level Data Link Control
HPLMN	Home PLMN
HTTP	HyperText Transfer Protocol
I	Information
I2S	Inter IC Sound
ICCID	Integrated Circuit Card ID
ICMP	Internet Control Message Protocol
ICP	Inter Processor Communication
IMEI	International Mobile Equipment Identity
IMSI	International Mobile Station Identity
IP	Internet Protocol
IRA	International Reference Alphabet
IRC	Intermediate Result Code
ISDN	Integrated Services Digital Network
ISP	Internet Service Provider
L3	Layer 3
LCP	Link Control Protocol
LF	Line Feed
M2M	Machine-To-Machine
MCC	Mobile Country Code
ME	Mobile Equipment
MMI	Man Machine Interface
MN	Mobile Network Software Subsystem
MNC	Mobile Network Code
MO	Mobile Originated
MS	Mobile Station
MSISDN	Mobile Systems International Subscriber Identity Number
MT	Mobile Terminated
NITZ	Network Identity and Time Zone
NVM	Non-Volatile Memory
NVRAM	Not Volatile RAM
OLCM	On Line Commands Mode
PAD	Packet Assembler/Disassembler
PDP	Packet Data Protocol
PDU	Protocol Data Unit

PIN	Personal Identification Number
PLMN	Public Land Mobile Network
PPP	Point-to-Point Protocol
PSD	Packet-Switched Data
PUK	Personal Unblocking Key
QoS	Quality of Service
RAM	Random Access Memory
RFU	Reserved for Future Use
RI	Ring Indicator
RTC	Real Time Clock
RTS	Request To Send
Rx	Receiver
SC	Service Centre
SI	SIM Application Part Software Subsystem
SIM	Subscriber Identity Module
SMS	Short Message Service
SMSC	Short Message Service Center
SMTP	Simple Mail Transfer Protocol
TA	Terminal Adaptor
TCP	Transfer Control Protocol
TE	Terminal Equipment
TP	Transfer layer Protocol
Tx	Transmitter
TZ	Time Zone
UCS2	Universal Character Set
UDP	User Datagram Protocol
UI	Unnumbered Information
UIH	Unnumbered Information with header Check
URC	Unsolicited Result Code
USIM	UMTS Subscriber Identity Module
UUS1	User-to-User Signalling Supplementary Service 1

Related documents

[1] Stevens. TCP/IP Illustrated Volume1 & 2 Addison-Wesley, 1994.

[2] 3GPP TS 27.007 Technical Specification Group Core Network and Terminals; AT command set for User Equipment (UE)

[3] 3GPP TS 22.004 General on supplementary services

[4] GSM 02.04 - Digital cellular telecommunication system (Phase 2+); Mobile Stations (MS) features

[5] 3GPP TS 22.030 - Man-Machine Interface (MMI) of the User Equipment (UE)

[6] 3GPP TS 22.090 Unstructured Supplementary Service Data (USSD); Stage 1

[7] 3GPP TS 23.038 - Alphabets and language-specific information

[8] 3GPP TS 23.040 - Technical realization of Short Message Service (SMS)

[9] 3GPP TS 23.041 - Technical realization of Cell Broadcast Service (CBS)

[10] 3GPP TS 23.060 - Technical Specification Group Services and System Aspects; General Packet Radio Service (GPRS); Service description

[11] 3GPP TS 24.007 Mobile radio interface signalling layer 3; General aspects

[12] 3GPP TS 24.008 - Mobile radio interface layer 3 specification

[13] 3GPP TS 24.011 Point-to-point (PP) Short Message Service (SMS) support on mobile radio interface

[14] GSM 04.12 - Digital cellular telecommunications system (Phase 2+); Short Message Service Cell Broadcast (SMSCB) Support on Mobile Radio Interface.

[15] 3GPP TS 22.030 - Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Man-Machine Interface (MMI) of the User Equipment (UE)

[16] 3GPP TS 27.005 - Technical Specification Group Terminals; Use of Data Terminal Equipment - Data Circuit terminating Equipment (DTE-DCE) interface for Short Message Services (SMS) and Cell Broadcast Service (CBS)

[17] 3GPP TS 27.060 - Technical Specification Group Core Network; Packet Domain; Mobile Station (MS) supporting Packet Switched Services

[18] GSM 11.11 Digital cellular telecommunications system (Phase 2+); Specification of the Subscriber Identity Module – Mobile Equipment (SIM – ME) interface

[19] 3GPP TS 31.102 Characteristics of the Universal Subscriber Identity Module (USIM) application

[20] ITU-T Recommendation V250, 05-99.

[21] ITU-T V.25ter ITU-T V.25 ter Recommendation: Data Communications over the Telephone Network; Serial asynchronous automatic Dialling and control.

[22] ITU-T T.32 ITU-T Recommendation T.32 Asynchronous Facsimile DCE Control - Service Class 2

[23] ISO 639 (1988) Code for the representation of names of languages

[24] LEON-G100/G200 Datasheet Docu No GSM.G1-HW-10004

[25] LEON-G100/G200 System Integration Manual Docu No GSM.G1-HW-09002

[26] ITU-T Recommendation V24, 02-2000. List of definitions for interchange circuits between Data Terminal Equipment (DTE) and Data Connection Equipment (DCE).

[27] RFC 791 - Internet Protocol - http://www.ietf.org/rfc/rfc791.txt

[28] 3GPP TS 05.08 Radio subsystem link control

[29] 3GPP TS 22.087 User-to-User Signalling (UUS)

[30] 3GPP TS 24.008 Mobile radio interface layer 3 specification

[31] 3GPP TS 22.022 Personalisation of Mobile Equipment (ME)

[32] 3GPP TS 22.082 Call Forwarding (CF) supplementary services

[33] 3GPP TS 22.083 Call Waiting (CW) and Call Holding (HOLD)

[34] 3GPP TS 22.081 Line identification Supplementary Services- Stage 1

[35] 3GPP TS 23.081 Line identification supplementary services- Stage 2
[36] 3GPP TS 22.086 Advice of Charge (AoC) Supplementary Services
[37] 3GPP TS 22.024 Description of Charge Advice Information (CAI)
[38] 3GPP TS 22.085 Closed User Group (CUG) Supplementary Services
[39] 3GPP TS 22.096 Name identification supplementary services
[40] 3GPP TS 04.18 Mobile radio interface layer 3 specification; Radio Resource Control (RRC) protocol
[41] 3GPP TS 04.60 General Packet Radio Service (GPRS); Mobile Station (MS) - Base Station System (BSS) interface; Radio Link Control/ Medium Access Control (RLC/MAC) protocol
[42] 3GPP TS 05.02 Multiplexing and Multiple Access on the Radio Path
[43] EVK-G25H Evaluation Kit Getting Started Docu No. GSM.G1-EK-09022
[44] 3GPP TS 51.014 Specification of the SIM Application Toolkit for the Subscriber Identity Module - Mobile Equipment (SIM - ME) interface
[45] u-blox 5/6 Receiver Description including Protocol Specification, Docu. No GPS-SW-09017
[46] 3GPP TS 27.010 V3.4.0 - Terminal Equipment to User Equipment (TE-UE) multiplexer protocol (Release 1999)
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[54] RFC3267 - Real-Time Transport Protocol (RTP) Payload Format and File Storage Format for the Adaptive Multi-Rate (AMR) and Adaptive Multi-Rate Wideband (AMR-WB) Audio Codecs
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For regular updates to u-blox documentation and to receive product change notifications please register on our homepage.

Revision history

Revision	Date	Name	Status / Comments
-	30/04/2009	tgri	Initial release
P1	06/05/2011	lpah	Changed the title, removed “2G and 3.75G”
1	11/05/2011	lpah	New commands for LEON-06x supported
2	26/05/2011	lpah	Improvement for GPS and GPIO AT commands
3	07/07/2011	lpah	Assistnow online and offline description in +ULOCGNSS corrected Changed status to Preliminary

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