CELLULAR

# u-blox Cellular Modules

## Data and Voice Modules

## AT Commands Manual

Objective Specification

**Abstract**

Description of standard and proprietary AT commands used with u-blox cellular modules.

www.u-blox.com

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| Objective Specification | Document contains target values. Revised and supplementary data will be published later. |
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| Early Production Information | Document contains data from product verification. Revised and supplementary data may be published later. |
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# Preface

## Applicable products

This document applies to the following products:

| Name | Type number | Modem version | Application version | PCN reference |
|---|---|---|---|---|
| LEON-G100 | LEON-G100-06S-02 | 07.60.17 | | UBX-13005361 |
| | LEON-G100-07S-01 | 07.92 | | UBX-13005361 |
| | LEON-G100-08S-01 | 07.92 | | UBX-13005361 |
| LISA-U100 | LISA-U100-01S-00 | 11.40 | | UBX-TN-12008 |
| LISA-U110 | LISA-U110-01S-00 | 11.40 | | UBX-TN-12008 |
| | LISA-U110-50S-00 | 11.46 | | UBX-TN-12081 |
| | LISA-U110-60S-00 | 11.43 | | UBX-TN-12050 |
| LISA-U120 | LISA-U120-01S-00 | 11.40 | | UBX-TN-12008 |
| | LISA-U120-01S-01 | 11.50 | | UBX-13002821 |
| LISA-U130 | LISA-U130-01S-00 | 11.40 | | UBX-TN-12008 |
| | LISA-U130-60S-00 | 11.43 | | UBX-TN-12050 |
| LISA-U200 | LISA-U200-00S-00 | 21.21 | - | UBX-TN-12009 |
| | LISA-U200-01S-00 | 22.40 | - | UBX-TN-12040 |
| | LISA-U200-02S-01 | 22.90 | A01.01 | UBX-14005768 |
| | LISA-U200-03S-00 | 23.41 | A01.01 | UBX-15020745 |
| | LISA-U200-52S-01 | 22.86 | A01.01 | UBX-14005768 |
| | LISA-U200-62S-01 | 22.90 | A01.01 | UBX-14005768 |
| LISA-U200 FOTA | LISA-U200-82S-00 | 22.92 | - | UBX-13004629 |
| | LISA-U200-83S-00 | 23.41 | A01.01 | UBX-15020745 |
| LISA-U201 | LISA-U201-03A-00 | 23.41 | A01.01 | UBX-16010501 |
| | LISA-U201-03S-00 | 23.41 | A01.01 | UBX-15020745 |
| LISA-U201 FOTA | LISA-U201-83S-00 | 23.41 | A01.02 | UBX-16006079 |
| LISA-U230 | LISA-U230-01S-01 | 22.40 | A01.00 | UBX-TN-12040 |
| LISA-U260 | LISA-U260-01S-02 | 22.61 | A01.02 | UBX-14042086 |
| | LISA-U260-02S-02 | 22.90 | A01.02 | UBX-14042086 |
| LISA-U270 | LISA-U270-01S-02 | 22.61 | A01.02 | UBX-TN-12061 |
| | LISA-U270-02S-02 | 22.90 | A01.02 | UBX-13003492 |
| | LISA-U270-62S-04 | 22.93 | A01.02 | UBX-13003492 |
| | LISA-U270-62S-05 | 22.93 | A01.04 | UBX-15029938 |
| | LISA-U270-62S-06 | 22.93 | A01.05 | UBX-16009934 |
| | LISA-U270-63S-00 | 22.93 | A01.06 | UBX-16010383 |
| | LISA-U270-68S-00 | 22.93 | A01.03 | UBX-15019240 |
| SARA-G300 | SARA-G300-00S-00 | 08.58 | - | GSM.G2-TN-13007 |
| | SARA-G300-00S-01 | 08.58 | A01.01 | UBX-16010060 |
| SARA-G310 | SARA-G310-00S-00 | 08.58 | - | GSM.G2-TN-13007 |
| | SARA-G310-00S-01 | 08.58 | A01.01 | UBX-16010060 |
| SARA-G340 | SARA-G340-00S-00 | 08.49 | - | UBX-14000382 |
| | SARA-G340-01S-00 | 08.70 | - | UBX-14039634 |
| | SARA-G340-02S-00 | 08.90 | A00.02 | UBX-16001074 |
| SARA-G350 | SARA-G350-00S-00 | 08.49 | - | GSM.G2-TN-13002 |
| | SARA-G350-01S-00 | 08.70 | - | UBX-14039634 |
| | SARA-G350-02A-00 | 08.90 | A00.03 | UBX-16010502 |

Objective Specification

| Name | Type number | Modem version | Application version | PCN reference |
|---|---|---|---|---|
| | SARA-G350-02S-00 | 08.90 | A00.02 | UBX-16001074 |
| | SARA-G350-01B-00 | TBD | - | TBD |
| SARA-G350 ATEX | SARA-G350-00X-00 | 08.49 | - | GSM.G2-TN-13002 |
| SARA-U201 | SARA-U201-03A-00 | TBD | TBD | TBD |
| | SARA-U201-03B-00 | 23.56 | TBD | UBX-16012129 |
| SARA-U201 ATEX | SARA-U201-03X-00 | TBD | TBD | TBD |
| SARA-U260 | SARA-U260-00S-01 | 23.20 | A01.01 | UBX-15013844 |
| | SARA-U260-03S-00 | 23.41 | A01.01 | UBX-15020745 |
| SARA-U270 | SARA-U270-00S-00 | 23.20 | A01.00 | UBX-14015739 |
| | SARA-U270-00S-01 | 23.20 | A01.01 | UBX-16006754 |
| | SARA-U270-03S-00 | 23.41 | A01.01 | UBX-15020745 |
| | SARA-U270-53S-00 | 23.41 | A01.03 | UBX-16008757 |
| SARA-U270 ATEX | SARA-U270-00X-00 | 23.20 | A01.00 | TBD |
| SARA-U280 | SARA-U280-00S-00 | 23.28 | A01.00 | UBX-15013708 |
| | SARA-U280-03S-00 | 23.41 | A01.01 | UBX-15020745 |
| TOBY-L200 | TOBY-L200-00S-00 | 09.71 | A01.15 | UBX-14044437 |
| | TOBY-L200-02S-00 | 15.90 | A01.00 | UBX-15029946 |
| TOBY-L201 | TOBY-L201-01S-00 | 09.93 | A01.07 | UBX-15021135 |
| TOBY-L210 | TOBY-L210-00S-00 | 09.71 | A01.15 | UBX-14044437 |
| | TOBY-L210-02S-00 | 15.63 | A01.03 | UBX-15029946 |
| | TOBY-L210-60S-00 | 09.94 | A01.00 | UBX-15021694 |
| | TOBY-L210-60S-01 | 09.94 | A01.01 | UBX-16005471 |
| | TOBY-L210-62S-00 | 15.74 | A01.00 | UBX-16004802 |
| TOBY-L220 | TOBY-L220-02S-00 | 15.83 | A01.00 | UBX-16007614 |
| TOBY-L280 | TOBY-L280-00S-00 | 09.90 | A01.02 | UBX-15016802 |
| | TOBY-L280-02S-00 | 15.63 | A01.03 | UBX-15029946 |
| MPCI-L200 | MPCI-L200-00S-00 | 09.71 | A01.15 | UBX-14044437 |
| | MPCI-L200-02S-00 | 15.90 | A01.00 | UBX-15029946 |
| MPCI-L201 | MPCI-L201-01S-00 | 09.93 | A01.07 | UBX-15031360 |
| MPCI-L210 | MPCI-L210-00S-00 | 09.71 | A01.15 | UBX-14044437 |
| | MPCI-L210-02S-00 | 15.63 | A01.03 | UBX-15029946 |
| | MPCI-L210-60S-00 | 09.94 | A01.00 | UBX-15021694 |
| | MPCI-L210-60S-01 | 09.94 | A01.01 | UBX-16005471 |
| MPCI-L280 | MPCI-L280-02S-00 | 15.63 | A01.03 | UBX-15029946 |

Objective Specification

# How to use this Manual

The u-blox Cellular Modules AT Commands Manual provides the necessary information to successfully design in and configure the applicable u-blox cellular modules.

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.

# Summary table

The summary table on the top of each command section is a quick reference for the user.

| command_name | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LEON-G SARA-G | | | | | |
| | LISA-U110 LISA-U120 LISA-U130 LISA-U2 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | - |

It is composed by two sections:

- **Modules**: lists all the modules that support the command. The modules are grouped in rows by cellular standard (i.e. G for GSM/GPRS, U for UMTS/HSPA, L for LTE). In each row the modules are grouped by: form factor (i.e. SARA, LISA), platform technology (e.g. SARA-G), platform generation (e.g. SARA-G3), product name (e.g. SARA-G350) and ordering code (e.g. SARA-G350-00S). In example: if 'LISA-U2' is reported, the command applies to all the modules having LISA form factor, second chipset version provided with any release of firmware.
- **Attributes**
  - **Syntax**
    - **full**: the command syntax is fully compatible among all the products listed in the "Modules" section
    - **partial**: the products support different syntaxes (usually backward compatible with respect to previous cellular standards)
  - **PIN required**
    - **Yes**: it is necessary to insert the PIN before the set and/or read command execution
    - **No**: the PIN insertion is not needed to execute the command
  - **Settings saved**
    - **Profile**: the command setting can be saved in a personal profile as specified in *Chapter 1.2*
    - **NVM**: the command setting is saved in the non-volatile memory as specified in *Chapter 1.2*
    - **No**: the current command setting is volatile and cannot be saved
  - **Can be aborted**
    - **Yes**: the command execution can be aborted if a character is sent to the DCE during the command execution
    - **No**: the command cannot be aborted during the command execution

    When a command is aborted the ABORTED result code is displayed.
  - **Response time**: estimated maximum time to get the result code for the AT command execution. More precisely, the command response time measures the time from the complete acquisition of the command line to the issuing of the command result code.

    The response time specified in this manual is generally lower than the time measured by the application on the DTE, because the issuing of the command on the DTE is influenced by the AT interface characteristics

Objective Specification

(e.g. the synchronous/asynchronous transfer type, the selected baudrate, etc.), by power saving and flow control, which introduces a variable latency in the command acquisition by the DCE.

If the response time for a command is left blank (actually "-"), it is an "immediate" response. It means that the command is executed without asynchronous requests to the protocol stack or the internal applications, which usually require time to be answered: the command execution is synchronous, (implying that no long blocking processing is done) and lasts a negligible time (the command response is issued by the module in typically less than 10 ms, and in any case less than 1 s).

- **Error reference**: reference to the error result codes listed in the *Appendix A*

SARA-G / LEON-G
When a command is aborted the OK result code is displayed.

TOBY-L2 / MPCI-L2
The AT commands can not be aborted, except if explicitly stated in the corresponding AT command description.

# 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 AT commands supported by u-blox cellular modules.

**System Integration Manual**: This document describes u-blox cellular modules from the hardware and the software point of view. It provides hardware design guidelines for the optimal integration of the cellular module in the application device and it provides information on how to set up production and final product tests on application devices integrating the cellular module.

**Application Notes**: These documents provide guidelines and information on specific hardware and/or software topics on u blox cellular modules. See *Related documents* for a list of application notes related to your cellular module.

# Questions

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

- Read this manual carefully
- Contact our information service on our homepage *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. SARA-G350-00S-00) and firmware version (e.g. 08.49)
- Module configuration

Objective Specification

- Clear description of your question or the problem
- A short description of the application
- Your complete contact details

Objective Specification

# Contents

**1 AT command settings....20**
1.1 Definitions....20
1.2 Profiles....24
1.3 S-parameters....24
**2 General operation....25**
2.1 Start up and initialization....25
2.2 AT commands types....25
**3 IPC - Inter Processor Communication....28**
3.1 Multiplexing mode +CMUX....28
**4 General....31**
4.1 Manufacturer identification +CGMI....31
4.2 Manufacturer identification +GMI....31
4.3 Model identification +CGMM....31
4.4 Model identification +GMM....32
4.5 Firmware version identification +CGMR....32
4.6 Firmware version identification +GMR....33
4.7 IMEI identification +CGSN....33
4.8 IMEI identification +GSN....34
4.9 Identification information I....34
4.10 TE character set configuration +CSCS....35
4.11 International mobile subscriber identification +CIMI....35
4.12 Card identification +CCID....36
4.13 Request complete capabilities list +GCAP....36
4.14 Display FGI settings +UFGI....37
4.15 Repeat last command A/....37
4.16 List all available AT commands +CLAC....38
4.17 Help displaying all commands &H....38
**5 Mobile equipment control and status....40**
5.1 Phone activity status +CPAS....40
5.2 Module switch off +CPWROFF....40
5.3 Set module functionality +CFUN....41
5.4 Indicator control +CIND....42
5.5 Configuration of indicator control +UCIND....44
5.6 Mobile termination event reporting +CMER....45
5.7 Clock +CCLK....47
5.8 Alarm +CALA....47
5.9 Delete alarm +CALD....49
5.10 Alert sound mode +CALM....49
5.11 Ringer sound level +CRSL....50
5.12 Loudspeaker volume level +CLVL....51
5.13 Mute control +CMUT....52
5.14 Set greeting text +CSGT....52
5.15 Automatic time zone update +CTZU....53
5.16 Time zone reporting +CTZR....54
5.17 Monitor of current calls +CMCCS....55
5.18 List of current calls +CLCCS....58

Objective Specification

5.19 IMS single radio voice call continuity +CISRVCC....60
5.20 Report mobile termination error +CMEE....61
5.21 Extended error report +CEER....61
5.22 Proprietary extended error report +UCEER....62
**6 Call control....64**
6.1 Select type of address +CSTA....64
6.2 Dial command D....64
6.3 Direct calling from phonebooks D>....66
6.4 Select tone dialling T....67
6.5 Select pulse dialling P....67
6.6 Call answer A....68
6.7 Hook control H....68
6.8 Monitor speaker loudness L....69
6.9 Monitor speaker mode M....69
6.10 Call mode +CMOD....69
6.11 Voice call mode +CVMOD....70
6.12 Hang up call +CHUP....71
6.13 Single numbering scheme +CSNS....71
6.14 Set reporting call status +UCALLSTAT....72
6.15 Information to in-band-tones availability +UPROGRESS....73
6.16 Tone duration +VTD....74
6.17 DTMF and tone generation +VTS....74
6.18 Start and stop tone generation +UVTS....75
6.19 Redial last telephone number DL....76
6.20 Automatic answer S0....76
6.21 Set voice mail number +CSVM....77
6.22 Emergency call reporting configuration +UEMC....78
6.23 Emergency number verification +UEMN....78
**7 Network service....80**
7.1 Subscriber number +CNUM....80
7.2 Signal quality +CSQ....80
7.3 Extended signal quality +CESQ....82
7.4 Operator selection +COPS....83
7.5 Radio Access Technology (RAT) selection +URAT....88
7.6 Display EONS names +UEONS....90
7.7 Display operator name +UDOPN....90
7.8 Preferred PLMN list selection +CPLS....91
7.9 PS operator selection +UCGOPS....92
7.10 Network registration status +CREG....94
7.11 HSDPA/HSUPA mode configuration +UHSDUPA....96
7.12 Preferred operator list +CPOL....98
7.13 Read operator names +COPN....100
7.14 Network emergency bearer services support +CNEM....100
7.15 Steering of Roaming configuration +UDCONF=20....101
7.16 Fast Dormancy activation +UFDAC....102
7.17 Fast Dormancy configuration +UDCONF=61....103
7.18 Network selection control +PACSP....103
7.19 Integrity check on test networks configuration +UDCONF=81....104
7.20 Select band +UBANDSEL....105
7.21 Cell environment description +CGED....106
7.22 Neighbour cells configuration +UDCONF=83....116
7.23 Channel and network environment description +UCGED....117
7.24 Provide cell information +UCELLINFO....121

Objective Specification

7.25 Lock on a specific cell +UCELLLOCK....123
7.26 Wireless service selection +WS46....127
7.27 Service specific access control restriction status +CSSAC....128
7.28 Home zone reporting +UHOMEZR....130
7.29 Jamming detection +UCD....131
7.30 IMSI detach +UCSDETACH....134
7.31 MNO configuration +UMNOCONF....134
7.32 PLMN list extensions +UMNOPLMN....137
7.33 LTE category configuration +ULTECAT....138
**8 IP Multimedia Subsystem (IMS)....140**
8.1 Introduction....140
8.2 IMS configuration setting +UIMSCONF....140
8.3 Read IMS configuration +UIMSRCONF....144
8.4 IMS registration information +CIREG....145
8.5 Availability for SMS using IMS +CASIMS....146
8.6 Availability for voice calls with IMS +CAVIMS....146
8.7 Dial URI +CDU....147
8.8 UE's voice domain preference UTRAN +CVDP....149
8.9 UE's voice domain preference E-UTRAN +CEVDP....149
**9 Security....151**
9.1 Enter PIN +CPIN....151
9.2 Read remaining SIM PIN attempts +UPINCNT....152
9.3 Facility lock +CLCK....152
9.4 Change password +CPWD....154
9.5 Custom SIM lock +USIMLCK....155
**10 Phonebook....157**
10.1 Select phonebook memory storage +CPBS....157
10.2 Read phonebook entries +CPBR....158
10.3 Find phonebook entries +CPBF....159
10.4 Write phonebook entry +CPBW....161
**11 Short Messages Service....163**
11.1 Introduction....163
11.2 Select message service +CSMS....164
11.3 Preferred message storage +CPMS....165
11.4 Preferred message format +CMGF....166
11.5 Save settings +CSAS....167
11.6 Restore settings +CRES....167
11.7 Show text mode parameters +CSDH....168
11.8 New message indication +CNMI....168
11.9 Incoming SMS/CBM indication via different AT interfaces +UDCONF=82....172
11.10 Select service for MO SMS messages +CGSMS....172
11.11 Read message +CMGR....173
11.12 New message acknowledgement to MT +CNMA....176
11.13 List message +CMGL....177
11.14 Send message +CMGS....179
11.15 Write message to memory +CMGW....180
11.16 Send message from storage +CMSS....181
11.17 Set text mode parameters +CSMP....181
11.18 Delete message +CMGD....182
11.19 Primary notification event reporting +CPNER....183
11.20 Service center address +CSCA....184
11.21 Select cell broadcast message types +CSCB....184

Objective Specification

11.22 Read concatenated message +UCMGR....186
11.23 List concatenated message +UCMGL....188
11.24 Send concatenated message +UCMGS....191
11.25 Write concatenated message to memory +UCMGW....192
11.26 More messages to send +CMMS....193
11.27 Peek message +UCMGP....193
11.28 Message waiting indication +UMWI....195
**12 Supplementary services....197**
12.1 Call forwarding +CCFC....197
12.2 Call waiting +CCWA....198
12.3 Calling line identification restriction +CLIR....200
12.4 Calling line identification presentation +CLIP....200
12.5 Connected line identification presentation +COLP....201
12.6 Connected line identification restriction +COLR....202
12.7 Advice of charge +CAOC....203
12.8 Accumulated call meter +CACM....204
12.9 Call meter maximum event +CCWE....204
12.10 Accumulated call meter maximum +CAMM....205
12.11 Price per unit and currency table +CPUC....205
12.12 Call related supplementary services +CHLD....206
12.13 Call deflection +CTFR....207
12.14 List current calls +CLCC....208
12.15 Supplementary service notifications +CSSN....209
12.16 User to user signalling service 1 +CUUS1....210
12.17 Unstructured supplementary service data +CUSD....212
12.18 Closed user group +CCUG....213
12.19 Calling name presentation +CNAP....214
12.20 eMLPP priority registration and interrogation +CAEMLPP....215
12.21 eMLPP subscriptions +CPPS....215
12.22 Automatic answer for eMLPP service +CAAP....216
**13 Circuit switched data services....217**
13.1 Introduction....217
13.2 Select bearer service type +CBST....217
13.3 Connection type groups configuration +UDCONF=32....219
13.4 Circuit switched data (CSD) configuration +UCSD....220
13.5 Circuit switched data (CSD) action +UCSDA....221
13.6 Circuit switched network-assigned data +UCSND....222
13.7 Service class selection and identification +FCLASS....223
13.8 Service reporting control +CR....224
13.9 Cellular result codes +CRC....224
13.10 Radio link protocol +CRLP....225
**14 FAX class 2....227**
14.1 Introduction....227
14.2 Adaptive answer +FAA....227
14.3 Address & polling capabilities +FAP....227
14.4 Buffer size +FBS....228
14.5 Data bit order +FBO....228
14.6 HDLC frame reporting +FBU....229
14.7 DS capabilities parameters +FCC....229
14.8 Copy quality checking +FCQ....230
14.9 Capability to receive data +FCR....230
14.10 Current session results +FCS....231

Objective Specification

14.11 DTE phase C response timeout +FCT ..... 231
14.12 Receive data +FDR ..... 232
14.13 Transmit Data +FDT ..... 232
14.14 Phase C received EOL alignment +FEA ..... 232
14.15 Format conversion +FFC ..... 233
14.16 Report file transfer diagnostic frame +FFD ..... 234
14.17 Call termination status +FHS ..... 234
14.18 Procedure interrupt enable +FIE ..... 234
14.19 Initialize facsimile parameters +FIP ..... 235
14.20 Current session parameters +FIS ..... 236
14.21 Inactivity timeout +FIT ..... 236
14.22 Session termination +FKS, +FK ..... 237
14.23 Local ID string +FLI ..... 237
14.24 Set flow control +FLO ..... 238
14.25 Indicate document to poll +FLP ..... 238
14.26 Request manufacturer identification +FMI ..... 239
14.27 Request model identification +FMM ..... 239
14.28 Request revision identification +FMR ..... 239
14.29 Minimum phase C speed +FMS ..... 240
14.30 Negotiation reporting +FNR ..... 240
14.31 Non-standard frame FIF octet string +FNS ..... 241
14.32 NSF message data indication +FND ..... 241
14.33 Selective polling address +FPA ..... 242
14.34 Local polling ID string +FPI ..... 242
14.35 Packet protocol control +FPP ..... 243
14.36 Page status +FPS ..... 243
14.37 Password parameter +FPW ..... 244
14.38 Receive quality thresholds +FRQ ..... 244
14.39 Error correction mode retry count +FRY ..... 245
14.40 SubAddress parameter +FSA ..... 245
14.41 Request to poll +FSP ..... 246
14.42 Fax intermediate result codes ..... 246

**15 V24 control and V25ter ..... 247**

15.1 Introduction ..... 247
15.2 Circuit 109 behavior &C ..... 247
15.3 Circuit 108/2 behavior &D ..... 247
15.4 DSR override &S ..... 249
15.5 Flow control &K ..... 249
15.6 DTE-DCE character framing +ICF ..... 252
15.7 DTE-DCE local flow control +IFC ..... 254
15.8 Set flow control \Q ..... 255
15.9 UART data rate configuration +IPR ..... 256
15.10 Return to on-line data state O ..... 260
15.11 Escape character S2 ..... 261
15.12 Command line termination character S3 ..... 262
15.13 Response formatting character S4 ..... 262
15.14 Command line editing character S5 ..... 263
15.15 Pause before blind dialling S6 ..... 263
15.16 Connection completion timeout S7 ..... 264
15.17 Command dial modifier time S8 ..... 264
15.18 Automatic disconnect delay S10 ..... 265
15.19 Escape prompt delay (EPD) S12 ..... 265
15.20 Command echo E ..... 266
15.21 Result code suppression Q ..... 266

Objective Specification

15.22 DCE response format V....267
15.23 Result code selection and call progress monitoring control X....267
15.24 Reset to default configuration Z....268
15.25 Set to factory defined configuration &F....268
15.26 Store current configuration &W....269
15.27 Display current configuration &V....269
15.28 Designate a default reset profile &Y....270
15.29 Parity bit transmission over the air +UTPB....271
**16 SIM management....274**
16.1 Generic SIM access +CSIM....274
16.2 Restricted SIM access +CRSM....274
16.3 Read the SIM language +CLAN....276
16.4 Check for UICC card +UUICC....276
16.5 Customer service profile +UCSP....277
16.6 SIM hot insertion configuration +UDCONF=50....277
16.7 UICC application discovery +CUAD....278
16.8 Open logical channel +CCHO....279
16.9 Close logical channel +CCHC....279
16.10 Generic UICC logical channel access +CGLA....280
16.11 Restricted UICC logical channel access +CRLA....281
16.12 SIM states reporting +USIMSTAT....282
16.13 Answer To Reset contents +USIMATR....283
**17 SIM toolkit....284**
17.1 Introduction....284
17.2 Terminal profile +STKPROF....284
17.3 Proactive command in dedicated mode +STKPRO....285
17.4 Terminal response in dedicated mode +STKTR....288
17.5 Proactive session status in dedicated mode +STKCNF....290
17.6 Bearer Independent Protocol status indication +UBIP....291
17.7 Default BIP APN configuration +UBIPAPN....292
17.8 Envelope in dedicated mode +STKENV....292
17.9 Call and short message control in dedicated mode +STKCC....293
17.10 Proactive command indication in raw mode +SATI....294
17.11 Proactive command notification in raw mode +SATN....294
17.12 Send terminal response in raw mode +SATR....295
17.13 Terminal response confirmation in raw mode +SATF....295
17.14 User confirmation for setup call in raw mode +SATD....295
17.15 Envelope download in raw mode +SATE....296
17.16 Call and Short Message Control in Raw Mode +STKCTRLIND....296
17.17 Terminal profile +UCATPROF....298
17.18 Proactive command indication in dedicated mode +UCATPROI....298
17.19 Proactive command notification in dedicated mode +UCATPRON....299
17.20 Terminal response in dedicated mode +UCATTR....300
17.21 Proactive Session Status in Dedicated Mode +UCATCNF....301
17.22 Envelope in Dedicated Mode +UCATENV....302
17.23 Call and Short Message Control in Dedicated Mode +UCATCC....302
17.24 Proactive Command Indication in Raw Mode +URCATI....302
17.25 Proactive Command Notification in Raw Mode +URCATN....303
17.26 Terminal response in Raw Mode +URCATR....303
17.27 Proactive Session Status in Raw Mode +URCATF....304
17.28 Envelope in Raw Mode +URCATE....304
17.29 Call and Short Message Control in Raw Mode +URCATCC....305
17.30 User setting for proactive DTMF tone generation +UDTMF....305

Objective Specification

17.31 Refresh delay events management +UDCONF=54 ... 306

**18 Packet switched data services ... 308**

18.1 Introduction and common parameters definition ... 308
18.2 PPP LCP handshake behaviour ... 315
18.3 Printing IP address format +CGPIAF ... 316
18.4 PDP context definition +CGDCONT ... 317
18.5 Packet switched data configuration +UPSD ... 319
18.6 Packet switched data action +UPSDA ... 325
18.7 Packet switched network-assigned data +UPSND ... 327
18.8 Read PDP context DNS information +UDCONF=11 ... 328
18.9 Quality of service profile (requested) +CGQREQ ... 329
18.10 Quality of service profile (minimum acceptable) +CGQMIN ... 330
18.11 GPRS attach or detach +CGATT ... 331
18.12 Configure the auto attach to PS domain on power on +UCGATT ... 331
18.13 PDP context activate or deactivate +CGACT ... 332
18.14 Manual response to a network request for PDP context activation +CGANS ... 335
18.15 Automatic response to a network request for PDP context activation +CGAUTO ... 335
18.16 Enter data state +CGDATA ... 336
18.17 Enter PPP state/GPRS dial-up D* ... 338
18.18 Show PDP address +CGPADDR ... 340
18.19 GPRS MS class configuration +CGCLASS ... 340
18.20 GPRS MS class configuration at start up +UCGCLASS ... 341
18.21 Device class setting +UCLASS ... 342
18.22 GPRS event reporting +CGEREP ... 344
18.23 GPRS network registration status +CGREG ... 346
18.24 Extended Packet Switched network registration status +UREG ... 348
18.25 Manual deactivation of a PDP context H ... 349
18.26 PDP context modify +CGCMOD ... 350
18.27 3G Quality of service profile (requested) +CGEQREQ ... 350
18.28 3G Quality of service profile (minimum acceptable) +CGEQMIN ... 352
18.29 3G Quality of Service Profile (negotiated) +CGEQNEG ... 354
18.30 Define secondary PDP context +CGDSCONT ... 356
18.31 UE modes of operation for EPS +CEMODE ... 357
18.32 EPS network registration status +CEREG ... 358
18.33 Delete non-active PDP contexts +CGDEL ... 359
18.34 Traffic flow template read dynamic parameters +CGTFTRDP ... 360
18.35 Configure the authentication parameters of a PDP/EPS bearer +UAUTHREQ ... 361
18.36 Send custom packets over a context +UTGSINK ... 362
18.37 Define EPS quality of service +CGEQOS ... 363
18.38 EPS quality of service read dynamic parameters +CGEQOSRDP ... 364
18.39 Secondary PDP context read dynamic parameters +CGSCONTRDP ... 365
18.40 UE's usage setting for EPS +CEUS ... 365
18.41 PDP Context Read Dynamic Parameters +CGCONTRDP ... 366
18.42 Configure the initial PDP context +UCGDFLT ... 367
18.43 Always-On mode parameters settings +CGPERMSET ... 370
18.44 Always-On mode settings +CGPERMACT ... 370
18.45 Always-On mode check state +CGPERMSTATE ... 371
18.46 Traffic Flow Template +CGTFT ... 372
18.47 Read counters of sent or received PSD data +UGCNTRD ... 374
18.48 Set/reset counter of sent or received PSD data +UGCNTSET ... 374
18.49 Uplink user data plane configuration +UDCONF=9 ... 375
18.50 Multiple PDP contexts ... 376
18.51 Primary and secondary PDP contexts ... 376

Objective Specification

**19 System features..... 378**
19.1 Firmware installation +UFWINSTALL..... 378
19.2 Firmware update Over AT (FOAT) +UFWUPD..... 380
19.3 Antenna detection +UANTR..... 382
19.4 RX antenna selection +UANT..... 383
19.5 Rx diversity +URXDIV..... 384
19.6 ADC read command +UADC..... 385
19.7 Power saving control (Power SaVing) +UPSV..... 385
19.8 End user test +UTEST..... 389
19.9 Smart temperature supervisor +USTS..... 397
19.10 MSPR profile handling configuration +UDCONF=40..... 398
19.11 Data channel configuration +UDATACHANNEL..... 399
19.12 RING line handling +URING..... 401
19.13 CTS line state in case of disabled HW flow control +UCTS..... 401
19.14 PPP/LCP silent mode configuration +UDCONF=0..... 402
19.15 F-DPCH/enhanced F-DPCH configuration +UDCONF=60..... 403
19.16 USB profiles configuration +UUSBCONF..... 403
19.17 Serial interfaces configuration selection +USIO..... 405
19.18 Establish ECM data connection +UCEDATA..... 407
19.19 IPv6 configuration +UDCONF=66..... 408
19.20 MCC update table +UNVMMCC..... 409
19.21 PLMN information list +UNVMPLMN..... 410
19.22 Enable, disable or configure the OMA-DM client +UOMADM..... 412
19.23 OMA-DM alert +UOMADMALERT..... 413
19.24 OMA-DM repository access +UOMADMREP..... 413
19.25 Enable/disable OMA-DM unsolicited status messages +UOMASTAT..... 414
19.26 Network Friendly Mode (NFM) activation +UNFM..... 415
19.27 Network Friendly Mode (NFM) configuration +UNFMCONF..... 416
19.28 Radio Policy Manager (RPM) activation +URPM..... 418
19.29 Restore factory configuration +UFACTORY..... 418
19.30 KT remote reset KTCFUN..... 420
19.31 KT reading quality information KTDEVSTAT..... 420
19.32 KT configuration command KTUBXCONF..... 422
19.33 Reject international calls KTUCALLREJ..... 422
19.34 Request KT OTA opening *KTF*OPENING..... 423
19.35 Display the current UMTS environment KTUUMTSENV..... 423
**20 GPIO..... 426**
20.1 Introduction..... 426
20.2 GPIO select configuration command +UGPIOC..... 433
20.3 GPIO read command +UGPIOR..... 436
20.4 GPIO set command +UGPIOW..... 436
**21 File System..... 438**
21.1 File tags..... 438
21.2 Download file +UDWNFILE..... 438
21.3 List files information +ULSTFILE..... 439
21.4 Read file +URDFILE..... 441
21.5 Partial download file +URDBLOCK..... 441
21.6 Delete file +UDELFILE..... 442
21.7 File system limits..... 443
**22 Audio interface..... 444**
22.1 Audio path mode setting +USPM..... 444
22.2 $I^2S$ digital interface mode +UI2S..... 449

Objective Specification

22.3 Play audio resource +UPAR ... 457
22.4 Stop audio resource +USAR ... 459
22.5 Play audio file +UPLAYFILE ... 460
22.6 Stop audio file +USTOPFILE ... 461
22.7 Tone generator +UTGN ... 462
22.8 Ringing tone selection +URNG ... 463
22.9 SMS alert sound mode (Message Sound Muting) +UMSM ... 464
22.10 Master clock control +UMCLK ... 465
22.11 External device configuration +UEXTDCONF ... 466
22.12 Speech codec configuration +UDCONF=30 ... 467

**23 Audio parameters tuning ... 470**
23.1 Introduction ... 470
23.2 Microphone gain (Microphone Gain Control) +UMGC ... 478
23.3 Speaker Gain (Speaker Gain Control) +USGC ... 479
23.4 Sidetone configuration +USTN ... 481
23.5 Uplink Digital Filters (Uplink Biquad Filters) +UUBF ... 482
23.6 Downlink Digital Filters (Downlink Biquad Filters) +UDBF ... 485
23.7 Hands-Free Parameters (Hands-Free Parameters) +UHFP ... 487
23.8 Audio parameters tuning +UAPT ... 494
23.9 Volume gain control +UVGC ... 496
23.10 Record audio file +URECFILE ... 498

**24 DNS ... 500**
24.1 Resolve name / IP number through DNS +UDNSRN ... 500
24.2 Dynamic DNS update +UDYNDNS ... 501

**25 TCP/IP UDP/IP ... 504**
25.1 Introduction ... 504
25.2 IPv4/IPv6 addressing ... 504
25.3 Create Socket +USOCR ... 506
25.4 SSL/TLS mode configuration on TCP socket +USOSEC ... 507
25.5 Set socket option +USOSO ... 508
25.6 Get Socket Option +USOGO ... 509
25.7 Close Socket +USOCL ... 510
25.8 Get Socket Error +USOER ... 511
25.9 Connect Socket +USOCO ... 511
25.10 Write socket data +USOWR ... 512
25.11 SendTo command (UDP only) +USOST ... 514
25.12 Read Socket Data +USORD ... 516
25.13 Receive From command (UDP only) +USORF ... 517
25.14 Set Listening Socket +USOLI ... 518
25.15 Firewall control +UFRW ... 520
25.16 HEX mode configuration +UDCONF=1 ... 521
25.17 Set socket in Direct Link mode +USODL ... 521
25.18 UDP Direct Link Packet Size configuration +UDCONF=2 ... 523
25.19 UDP Direct Link Sending timer configuration +UDCONF=3 ... 524
25.20 Timer Trigger configuration for Direct Link +UDCONF=5 ... 524
25.21 Data Length Trigger configuration for Direct Link +UDCONF=6 ... 525
25.22 Character trigger configuration for Direct Link +UDCONF=7 ... 526
25.23 Congestion timer configuration for Direct Link +UDCONF=8 ... 526
25.24 Direct Link disconnect DSR line handling +UDCONF=10 ... 527
25.25 Socket control +USOCTL ... 527
25.26 IP Change Notification +UIPCHGN ... 529
25.27 Socket Always On +USOAO ... 533

Objective specification

**26 SSL/TLS ..... 538**
26.1 Introduction ..... 538
26.2 SSL/TLS certificates and private keys manager +USECMNG ..... 538
26.3 SSL/TLS security layer profile manager +USECPRF ..... 540
26.4 AT+USECMNG command example ..... 543
**27 FTP ..... 545**
27.1 FTP service configuration +UFTP ..... 545
27.2 FTP command +UFTPC ..... 548
27.3 FTP error +UFTPER ..... 551
**28 HTTP ..... 552**
28.1 HTTP control +UHTTP ..... 552
28.2 HTTP advanced control+UHTTPAC ..... 555
28.3 HTTP command +UHTTPC ..... 556
28.4 HTTP protocol error +UHTTPER ..... 558
**29 SMTP ..... 559**
29.1 SMTP control +USMTP ..... 559
29.2 SMTP mail control +USMTPM ..... 561
29.3 SMTP command +USMTPC ..... 563
29.4 SMTP error +USMTPER ..... 563
**30 Ping ..... 565**
30.1 Ping command +UPING ..... 565
30.2 ICMP echo reply configuration +UDCONF=4 ..... 567
**31 GNSS ..... 568**
31.1 NMEA ..... 568
31.2 GNSS power management +UGPS ..... 568
31.3 Assisted GNSS unsolicited indication +UGIND ..... 570
31.4 GNSS profile configuration +UGPRF ..... 572
31.5 AssistNow Online configuration +UGAOP ..... 573
31.6 AssistNow Offline configuration +UGAOF ..... 575
31.7 Aiding server configuration +UGSRV ..... 576
31.8 GNSS aiding request command +UGAOS ..... 577
31.9 Send of UBX string +UGUBX ..... 578
31.10 GNSS indications timer +UGTMR ..... 579
31.11 Get GNSS time and date +UGZDA ..... 580
31.12 Get GNSS fix data +UGGGA ..... 580
31.13 Get geographic position +UGGLL ..... 581
31.14 Get number of GNSS satellites in view +UGGSV ..... 582
31.15 Get recommended minimum GNSS data +UGRMC ..... 583
31.16 Get course over ground and ground speed +UGVTG ..... 583
31.17 Get satellite information +UGGSA ..... 584
31.18 Ask for localization information +ULOC ..... 585
31.19 Localization information request status unsolicited indication +ULOCIND ..... 588
31.20 Specify the device autonomous solution +ULOCAID ..... 589
31.21 GNSS sensor configuration +ULOCGNSS ..... 590
31.22 Configure cellular location sensor (CellLocate®) +ULOCCELL ..... 592
**32 Location Services ..... 593**
32.1 LCS positioning capabilities configuration +UDCONF=70 ..... 593
32.2 Mobile originated location request +CMOLR ..... 594
32.3 Mobile terminated location request notification +CMTLR ..... 596
32.4 Mobile terminated location request disclosure allowance +CMTLRA ..... 597

Objective Specification

32.5 Report mobile originated location request error +CMOLRE ... 598
32.6 LCS event notification +ULCSEVT ... 599
**33 DTMF ... 600**
33.1 DTMF detection +UDTMFD ... 600
33.2 Local and in-band DTMF tone generation configuration +UDCONF=31 ... 602
**34 eCall ... 603**
34.1 Introduction ... 603
34.2 eIM sends and receives data +UECALLDATA ... 604
34.3 IVS eIM voice control +UECALLVOICE ... 606
34.4 eCall configuration +UECALLSTAT ... 610
34.5 eCall and InBM test configuration +UDCONF=90 ... 611
34.6 eCall type +UECALLTYPE ... 613
34.7 Initiate eCall +CECALL ... 614
**35 I²C ... 615**
35.1 Introduction ... 615
35.2 I²C open logical channel +UI2CO ... 615
35.3 I²C write to peripheral +UI2CW ... 616
35.4 I²C read from peripheral +UI2CR ... 617
35.5 I²C read from peripheral register +UI2CREGR ... 617
35.6 I²C close logical channel +UI2CC ... 618
**36 SAP ... 619**
36.1 Introduction ... 619
36.2 SAP mode activation +USAPMODE ... 619
36.3 SAP mode indications +USAPIND ... 620
**37 Networking ... 622**
37.1 Introduction ... 622
37.2 Change the boot mode configuration +UBMCONF ... 623
37.3 Configure the USB IP network +UIPCONF ... 624
37.4 Get the USB IP configuration +UIPADDR ... 625
37.5 IP routing configuration +UIPROUTE ... 626
37.6 IP tables configuration +UIPTABLES ... 627
37.7 Configure PDP/EPS bearer connection type over USB +UDPDP ... 629
37.8 RNDIS driver optimization configuration +UDCONF=67 ... 630
**38 Wi-Fi ... 631**
38.1 Introduction ... 631
38.2 Web User Interface (WebUI) ... 634
38.3 Wi-Fi module power mode and connection manager +UWCFG ... 635
38.4 Wi-Fi access point physical layer configuration +UWAPCFG ... 636
38.5 Wi-Fi access point network layer configuration +UWAPIPCFG ... 637
38.6 Wi-Fi station physical layer configuration +UWSTACFG ... 638
38.7 Wi-Fi station network layer configuration +UWSTAIPCFG ... 639
38.8 Wi-Fi access point connected stations list +UWAPSTALIST ... 641
38.9 Wi-Fi access point MAC address +UWAPMACADDR ... 641
38.10 Web user interface configuration +UWWEBUI ... 642
38.11 Web user interface customization through FTP service +UWWEBUIFTP ... 642
38.12 Wi-Fi module firmware reset +UWFWRESET ... 643
38.13 Wi-Fi network scan +UWSCAN ... 644
38.14 Maximum allowed output power configuration +UWMP ... 645
38.15 Wi-Fi regulatory domains block configuration +UWREGBLOCK ... 646
38.16 Wi-Fi test mode +UWTEST ... 647

Objective Specification

**A Appendix: Error result codes ..... 649**
A.1 Mobile termination error result codes +CME ERROR ..... 649
A.2 Message service error result codes +CMS ERROR ..... 653
A.3 +CEER error result codes ..... 655
A.4 Firmware install error result codes ..... 658
A.5 FOAT error result codes ..... 660
A.6 Dynamic DNS unsolicited indication codes ..... 661
A.7 Internal TCP/UDP/IP stack class error codes ..... 661
A.8 Internet suite error classes ..... 663
A.9 IP change notification error result codes ..... 668
A.10 Ping error result codes ..... 668
A.11 Mobile termination error result codes ..... 669
**B Appendix: AT Commands List ..... 670**
B.1 Parameters stored in profiles ..... 705
B.2 Parameters stored in non volatile memory ..... 711
B.3 Saving AT commands configuration ..... 720
B.4 Estimated command response time ..... 720
B.5 Multiple AT command interfaces ..... 721
**C Appendix: UDP Direct Link workflow ..... 723**
C.1 Data from the IP network to the external port ..... 723
C.2 Data from the external port to the IP network ..... 723
**D Appendix: Glossary ..... 725**
**Related documents ..... 728**
**Revision history ..... 732**
**Contact ..... 737**

Objective Specification

# 1 AT command settings

u-blox cellular modules provide at least one physical serial interface, which is compliant to V.24ter *[26]*. At the module power on the module enter the command mode. For more details on command mode see the *Chapter 1.1*.

For module and hyper terminal connection and settings see the corresponding evaluation kit user guide.

## 1.1 Definitions

In this document the following naming conventions are used:

- MT (Mobile Terminal) or DCE (Data Communications Equipment): u-blox cellular module
- TE (Terminal Equipment) or DTE (Data Terminal Equipment): terminal that issues the command to the module
- TA (Terminal Adaptor): the function, integrated in the MT, of supporting AT command interface according to the applicable standards
- ME (Mobile Equipment): equivalent to MT, it is used to refer to the device itself regardless of the inserted SIM card

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

u-blox cellular modules can implement more than one interface between the DTE and the DCE, either virtual interfaces (multiplexer 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 each interface.

*Appendix B.5* describes the different behaviour among the interfaces in reference to the AT command interface.

See the corresponding module data sheet for the list of available AT command interfaces.

SARA-G340-02S / SARA-G350-02A / SARA-G350-02S
Two UART AT interfaces can be used at the same time (it is not the default behaviour).
See *+USIO* command description for details on how to set such behaviour.
According to the terminology used in the data sheet, UART is the 9-wire asynchronous serial interface, while AUX UART is the 3-wire auxiliary asynchronous interface.
The same naming will be used in the rest of the document (when not clearly specified, the description shall be considered applicable to both the interfaces).

The DCE/MT interface can operate in these modes:

- **Command mode**: the DCE waits for AT command instructions. The DCE interprets all the characters received as commands 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 the command mode (in both directions) is terminated by the command line termination character.
- **Data mode**: the DCE transfers data after having sent the "CONNECT" string; all the characters sent to the DCE are 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 Circuit Switched Data (CSD) or Packet Switched Data (PSD) connection.
- **Online command mode**: the DCE has a data connection established with a remote party, but treats signals from the DTE as command lines and sends back responses and unsolicited indications to the DTE.

For more details on CSD or PSD connection see the *+UCSD*, *+UCSDA*, *+UCSND*, *+UPSD*, *+UPSDA*, *+UPSND* commands description.

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

- with the escape sequence: for more details see the *S2* command description

Objective Specification

- via a DTR transition: during data mode, the current DTR state is not important, but only its transition. Furthermore, only the DTR transition from ON to OFF is detected; it can be used to control the switch to online command mode, or to command mode (the data connection is released). For more details see the *Table 13* and the *Table 14*

To switch back to data mode from online command mode the *O* command is used. For more details see also the *&D* command.

SARA-G340-02S / SARA-G350-02A / SARA-G350-02S
The AUX UART only supports the command mode. CSD or PSD connection are not allowed.

### 1.1.1 Command description

The AT commands configure and enable the cellular module functionalities according to 3GPP normative and u-blox specifications. The AT commands are issued to the module via a hyper terminal through a command line and are described in the following sections. A general description of each command is provided including the functionalities, the correct syntax to be provided by the TE/DTE, the allowed responses and an example. The command description defines each named parameter with its type, its range (valid / acceptable values), the default value (when available) and the factory-programmed value (when applicable).

The summary table on the top of each command section and the *Appendix B* lists all the u-blox cellular modules that support that command.

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

In this document <CR><LF> are intentionally omitted in the command syntax.

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.

### 1.1.2 Default values

If the command parameters are optional, they can be left out in the command line. If not otherwise specified, the default values are assumed as follows:

- For parameters of type Number, the default value is 0
- For parameters of type String, the default value is an empty string

### 1.1.3 Command line

The AT commands are typically issued to the cellular 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 parameters value following the syntax provided in this manual
  The following rules are used when describing the command syntax:
  - <...>: the 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 DCE information text response. Brackets themselves do not appear in the command line. When a parameter is not given, the value will be set to the default value provided in the command description
- <S3_character>: command line termination character; it can be set with *ATS3* command; the factory-programmed termination character is <CR>

Objective Specification

☞ The maximum length of the command line is the maximum number of characters which can be accepted on a single command line (including the command line termination character).

☞ The command line is not case sensitive unless autobauding is enabled; in this case the prefix "AT" must be typed either as "AT" or "at"; other combinations ("aT" or "Ta") are not allowed.

☞ When writing or sending an SMS, Ctrl-Z or ESC terminates the command; <CR> is used between the two 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>

If a command in the command line causes an error, or is not recognized as a valid command, then the execution is terminated, the remaining commands in the command line are ignored and an error result code is returned.

If all the commands are correctly executed, only the "OK" final result code of the last command is returned.

☞ Not all the commands can be entered with other commands on the same command line: *+CMGW*, *+CMGS*, *+USOWR*, *+USOST*, *+UDWNFILE* must be used by themselves.

The serial interface driver generally does not allow a new command until the previous one has been terminated by "OK" or by an error result code. In specific cases (see the abortability attribute), the command execution may be aborted if a character is sent to DCE before the command has ended.

### 1.1.4 Notes

**TOBY-L2 / MPCI-L2**

- Any character entered at the end of the command line (e.g. after the <CR> has been entered) will not be discarded but will be processed at the end of the current command execution, namely after the result code has been issued. This usage is deprecated; it is warmly recommended to always wait for the command to end before entering new commands.
- The maximum length of the command line is 1024 characters.

**LISA-U / SARA-U**

- The maximum length of the command line is 1024 characters.

**SARA-G / LEON-G**

- The maximum length of the command line is 544 characters.

### 1.1.5 Information text responses and result codes

The AT command response comprises an optional information text string and a result code. The *V* command configures the result code format (0 - numeric or 1- verbose).

In the factory-programmed setting 1, i.e. verbose, the response is as follows:

- Information text response(s): <S3_character><S4_character><text><S3_character><S4_character>
- Result code: <S3_character><S4_character><verbose code><S3_character><S4_character>

where

- <S3_character> is the command line termination character; it can be set with *S3* command
- <S4_character> is the linefeed character; it can be set with *S4* command

In numerical format 0, the response is as follows:

- Information text response(s): <S3_character><S4_character><text><S3_character><S4_character>
- Result code: <S3_character><S4_character><numerical_code><S3_character><S4_character>

*Table 1* lists the allowed result codes.

Objective Specification

| Verbose | Numeric | Result code type | Description |
|---|---|---|---|
| OK | 0 | Final | Command line successfully processed and the command is correctly executed |
| CONNECT | 1 | Intermediate | Data connection established |
| RING | 2 | Unsolicited | Incoming call signal from the network |
| NO CARRIER | 3 | Final | Connection terminated from the remote part or attempt to establish a connection failed |
| ERROR | 4 | Final | General failure. The *AT+CMEE* command configures the error result format |
| NO DIALTONE | 6 | Final | No dialtone detected |
| BUSY | 7 | Final | Engaged signal detected (the called number is busy) |
| NO ANSWER | 8 | Final | No hang up detected after a fixed network timeout |
| CONNECT<data rate> | 9 | Intermediate | Same as CONNECT including also the data rate (data call). See the *+CBST* AT command for the allowed values of <data rate>.<br>In case of data/fax call, see *Circuit 108/2, +++ behaviour for the different &D: summarizing table* to return in command mode and disconnect the call. |
| ABORTED | 18 | Final | Command execution aborted issuing a character to the DCE |

**Table 1: Allowed result codes**

SARA-G / LEON-G
The "ABORTED" result code is not supported.

Intermediate outputs as well as descriptive outputs of a command are formatted as information text responses; if more than one string has to be printed out (see for example *+UPSD* command description), additional command line termination and linefeed characters may be inserted for sake of readability.

If the command is not accepted by the MT an error result code will be displayed. The *AT+CMEE* command configures the error result code format. In this manual it is assumed that AT+CMEE=2, which results in error result code of the format:

- "+CMS ERROR: <err>" for SMS-related AT commands
- "+CME ERROR: <err>" for any other AT commands

where <err> represents the verbose error result code.

The most typical error result codes are the following:

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

TOBY-L2 / MPCI-L2
The AT command parser accepts optional commas at the end of the command line, as well as String parameters not delimited by "".

The list of all the possible error result codes is available in *Appendix A.1* and *Appendix A.2*. For some commands only the "ERROR" final result code is displayed and is documented in the command description.

The proprietary AT commands supporting the following features may trigger different operations:

- Firmware update Over AT command and over the air: see the *Appendix A.4* and *Appendix A.5*
- DNS: see the *Appendix A.6* and *Appendix A.7*
- TCP and UDP connections, FTP, HTTP and SMTP: see the *Appendix A.7*, *Appendix A.8*, *Appendix A.8.1*, *Appendix A.8.2*, *Appendix A.8.3*
- IP change notification: see the *Appendix A.9*
- Ping: see the *Appendix A.10*

The corresponding sections provide more details for retrieving the error result codes for these operations.

Objective Specification

## 1.2 Profiles

Several user settings may be stored in the cellular module's memory. Some are directly stored in the non volatile memory (NVM), while the others are organized into two personal profiles. The first profile is the default profile, whose data is by default loaded during the module's power on.

*Appendix B.2* lists the complete settings that can be directly stored in NVM and the corresponding commands.

*Appendix B.1* lists the complete settings stored in the profiles and the corresponding commands.

More details about loading, storing and updating profiles can be found in the command descriptions for: *ATZ*, *AT&F*, *AT&W*, *AT&V*, and *AT&Y*.

## 1.3 S-parameters

The S-parameters, as specified in ITU-T recommendation 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 the module operates. Their syntax is:

ATS<parameter_number>?

ATS<parameter_number>=<value>

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

u-blox cellular modules support the following set of S-parameters (<parameter_number>):

- 0: automatic answer setting (for more details see the *S0*)
- 2: escape character setting (for more details see the *S2*)
- 3: command line termination character setting (for more details see the *S3*)
- 4: response formatting character setting (for more details see the *S4*)
- 5: command line editing character setting (for more details see the *S5*)
- 6: pause before blind dialling setting (for more details see the *S6*)
- 7: connection completion timeout setting (for more details see the *S7*)
- 8: command dial modifier time setting (for more details see the *S8*)
- 10: automatic disconnect delay setting (for more details see the *S10*)
- 12: escape prompt delay setting (for more details see the *S12*)

If a <parameter_number> other than those listed above is introduced, the S command returns an error result code (+CME ERROR: operation not supported).

Objective Specification

# 2 General operation

## 2.1 Start up and initialization

A complete start up can take place only with a SIM card with disabled PIN check. For a SIM card with enabled PIN check, most commands answers with "+CME ERROR: SIM-PIN requested". After entering the PIN via the *+CPIN* command, which allows a start up completion, a lot of SIM files will be read: it is possible that some commands are affected by this preliminary phase, resulting in a temporary error response.

### 2.1.1 Operational restrictions

Operational restrictions may derive from several settings: PIN required, SIM lock, invalidation of the IMEI or SIM credentials by the Mobile Network Operator (MNO) during the registration procedure, FDN enabled. Restrictions to access the network are applied by the module also in eCall only state (for all modules supporting the eCall feature), in minimum functionality power modes (+CFUN: 0, +CFUN: 4, +CFUN: 19, +CFUN: 127 where supported), when the W_DISABLE# line is asserted (MPCI-L2 series), or when Radio Policy Manager has reached the maximum number of registrations or PDP contexts activation per hour (LISA-U2, SARA-U and TOBY-L2 series with AT&T SIM cards *[61]*).

In case the module is in operational restricted state, it may reject all or specific service requests (e.g. operator selection, connection establishment).

When the W_DISABLE# line (MPCI-L2 series) is asserted, in order to SW reset the module, AT+CFUN=0,1 or AT +CFUN=4,1 may be used as they refer to minimum functionality power modes.

TOBY-L2 / MPCI-L2
If the SIM is not inserted or the PIN is required and not inserted, the network scan (*+COPS=?*) is not allowed.

## 2.2 AT commands types

### 2.2.1 Action command

An action command forces the DCE to print information text or execute a specific action for the command. A typical example of this command type is the provision of the factory-programmed settings of the DCE like manufacturer name, firmware version, etc.

### 2.2.2 Set command

A set command configures the preferred settings for the specified command. The set command is the only way to set the preferred settings in the DCE. For some commands it is possible to store the current settings in the profile or in the non volatile memory and retrieve them in another connection.

TOBY-L2 / MPCI-L2
The set command without parameters (e.g. AT+CGEQREQ=) is syntactically equivalent to the action command (e.g. AT+CGEQREQ).

### 2.2.3 Read command

A read command provides the current setting of the command parameters. It is used to find out the current command configuration.

### 2.2.4 Test command

A test command provides the list of the values allowed by each parameter of the command.

Objective Specification

## 2.2.5 Unsolicited Result Code (URC)

An unsolicited result code is a string message (provided by the DCE) that is not triggered as a information text 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. the +CMTI URC must be enabled by *AT+CNMI* AT command).

### 2.2.5.1 URCs presentation deferring

Since the URCs are text responses issued by the DCE without being requested by the DTE, their occurrence is completely uncorrelated to an AT command execution. Therefore, a collision between a URC and an AT command response might occur and it may lead the DTE to misunderstand the URC as part of the AT command's text response or viceversa.

The module avoids this collision by delaying the URCs presentation in case the AT command interface is busy. The AT command interface can be busy in the following cases:

- During a data call (data mode)
- During the execution of an AT command in command or online command mode

The command execution starts when the command line is completed by the command line termination character and the AT interpreter in the module accepts it; the command execution ends when the final result code for the command is sent out. Inside this period, the module is not allowed to send the not buffered URCs. For most of the messages, the DCE needs to be configured whether or not to send a URC. After enabling, for most of the URCs, if the AT command interface is busy, the pending URCs are buffered and their sending to the DCE is deferred. The RING indication is always generated as an unsolicited result code. The NO CARRIER indication is generated as an unsolicited result code when it has not to be considered the final response for the executing command (e.g.: ATH); in case it is handled as an unsolicited result code, it follows the rule of the other URCs.

Generally, the buffered URCs are sent to the terminal as soon as the terminal exits the data mode or the command execution is terminated. An exception to this behavior is implemented for the following URCs classes:

- Reception of a new SMS related URCs, whose configuration is done via *AT+CNMI* command
- +CIEV URCs, whose configuration is done via *AT+CMER* command
- +CGEV URCs, whose configuration is done via *AT+CGEREP* command

For the above three classes, it is possible to select the presentation strategy in case of AT interface busy according the 3GPP TS 27.007 *[2]*; the buffering or discarding are the two possible choices (URCs are lost in the latter case). This is done via a proper configuration command (see *AT+CNMI*, *AT+CMER* and *AT+CGEREP* commands description). If the URCs are enabled or for the three described classes of URCs, the buffered URCs are sent out only when the AT interface is in idle again; this occurs as soon as:

- The data mode is released (the data call is disconnected)
- The final result code for an AT command is issued

LEON-G
The modules does not support the full URCs buffering/deferring capability: only the presentation deferring of the three above specified URCs classes is supported.

The DTE should wait some time (the recommended value is at least 20 ms) after the reception of an AT command final result code or URC before issuing a new AT command to give the DCE the opportunity to transmit the buffered URCs. Otherwise the collision of the URCs with the subsequent AT command is still possible.

In case multiple AT interfaces are available, it is in any case suggested to exclusively dedicate an AT interface to the URCs presentation. In this way, deferring is not experienced, and there is no risk of losing any URCs (buffering capabilities are actually limited).

## 2.2.6 Intermediate Result Code (IRC)

An intermediate result code is a string message (provided by the DCE) which provides to the DTE some information about the processing status of the pending AT command.

Objective Specification

Objective Specification

# 3 IPC - Inter Processor Communication

## 3.1 Multiplexing mode +CMUX

| +CMUX | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-60S TOBY-L210-62S TOBY-L220 TOBY-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | No | No | - | *+CME Error* |

### 3.1.1 Description

Enables the multiplexing protocol control channel as defined in 3GPP TS 27.010 *[46]*. The command sets the parameters for the control channel. The result code is returned using the old interface speed. The parameters become active only after sending the OK result code.

The usage of +CMUX command during the multiplexing is not allowed.

The multiplexer configuration is as follows:

- Channel 0: control channel
- Channel 1 - 5: AT commands / data connection
- Channel 6: GNSS tunnelling
- Channel 7: SAP (SIM Access Profile)

### 3.1.2 Syntax

| 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<br>OK |
| Read | AT+CMUX? | +CMUX: <mode>,[<subset>],<port_speed>,<N1>,<T1>,<N2>,<T2>,<T3>[,<k>]<br>OK | +CMUX: 0,0,0,1500,253,3,254,0,0<br>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)<br>OK | +CMUX: (0),(0),,(1-1509),(1-255),(0-5),(2-255),,<br>OK |

### 3.1.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | Multiplexer transparency mechanism:<br>• 0: basic option |
| <subset> | Number | The way in which the multiplexer control channel is set up:<br>• 0 (default value): UIH frames used only<br>• 1: UI frames used only<br>See *Notes* for the parameter applicability. |
| <port_speed> | Number | Transmission rate. The allowed range is 0-7.<br>This parameter is ignored and the value 0 is always displayed in case of read command. |
| <N1> | Number | Maximum frame size: |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • Allowed range is 1-1509.<br>• The default value is 31. |
| <T1> | Number | Acknowledgement timer in units of ten milliseconds. The allowed range is 1-255.<br>This parameter is ignored and the value 253 is always set. |
| <N2> | Number | Maximum number of re-transmissions:<br>• Allowed range is 0-5.<br>• The default value is 3. |
| <T2> | Number | Response timer for the multiplexer control channel in units of ten milliseconds. The allowed range is 2-255.<br>This parameter is ignored and the value 254 is always set. |
| <T3> | Number | Wake up response timer. The allowed range is 0-255.<br>This parameter is ignored and the value 0 is always displayed in case of the read command. |
| <k> | Number | Window size, for advanced operation with Error Recovery options. The allowed range is 0-255.<br>This parameter is ignored and the value 0 is always displayed in case of the read command. |

### 3.1.4 Notes

- If the multiplexer protocol is not started (the +CMUX set command has not been issued or returned an error result code) and *AT+CMEE* is set to 2, the +CMUX read command returns the following error result code: +CME ERROR: operation not allowed.
- For complete compatibility between u-blox products, leave the unsupported/unused parameters blank (which are reported as blank by the +CMUX test command).
- <T1> must be lower than or equal to <T2>.

**TOBY-L2**

- The GNSS tunnelling and SAP channels are not supported.
- <subset> can only assume the value 0.

**LISA-U / SARA-U**

- <subset> can only assume the value 0.
- <T1>, <T2>, <N2> values are ignored, since the related timers are not implemented.

**LISA-U1 / LISA-U200-00S**

- The SAP channel is not supported.

**SARA-G**

- The SAP channel is not supported.
- <subset> can assume the value 0 and 1.
- The range of <T2> is 0-255 (0 means that the timer is ignored).

**SARA-G300 / SARA-G310**

- The multiplexer configuration is as follows:
  - Channel 0: control channel
  - Channel 1 - 2: AT commands / data connection
- <subset> can only assume the value 0.

**SARA-G340-00S / SARA-G340-01S / SARA-G350-00S / SARA-G350-00X / SARA-G350-01B / SARA-G350-01S**

- <subset> can only assume the value 0.

**SARA-G340-02S / SARA-G350-02A / SARA-G350-02S**

- On the AUX UART interface, the multiplexer protocol is not supported.

**LEON-G**

- The SAP channel is not supported.

Objective Specification

- <subset> can only assume the value 0.
- The requested <N1> value is correctly set, but the +CMUX read command returns a value higher (<N1>+6 or <N1>+7), since it returns the maximum multiplexer protocol frame size (including the 6 or 7 bytes of the frame header). This does not affect the multiplexer protocol behavior, which uses the requested value.
- The range of <T2> is 0-255 (0 means that the timer is ignored).

**LEON-G100-06S**

- <port_speed>, <T3> and <k> can only assume the value 0.

Objective Specification

# 4 General

## 4.1 Manufacturer identification +CGMI

| +CGMI | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 4.1.1 Description

Text string identifying the manufacturer.

### 4.1.2 Syntax

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

### 4.1.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <manufacturer> | String | Manufacturer name |

## 4.2 Manufacturer identification +GMI

| +GMI | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 4.2.1 Description

Text string identifying the manufacturer.

### 4.2.2 Syntax

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

### 4.2.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <manufacturer> | String | Manufacturer name |

## 4.3 Model identification +CGMM

| +CGMM | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 4.3.1 Description

Text string identifying the model identification.

Objective Specification

### 4.3.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | AT+CGMM | <model> | LISA-U200 |
| | | OK | OK |
| Test | AT+CGMM=? | OK | |

### 4.3.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <model> | String | Name of model |

## 4.4 Model identification +GMM

| +GMM | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 4.4.1 Description

Text string identifying the model identification.

### 4.4.2 Syntax

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

### 4.4.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <model> | String | Name of model |

## 4.5 Firmware version identification +CGMR

| +CGMR | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 4.5.1 Description

Returns the firmware version of the module.

### 4.5.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | AT+CGMR | <version> | 11.40 |
| | | OK | OK |
| Test | AT+CGMR=? | OK | |

### 4.5.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <version> | String | Firmware version |

Objective Specification

# 4.6 Firmware version identification +GMR

| +GMR | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 4.6.1 Description

Returns the firmware version of the module.

## 4.6.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | AT+GMR | <version> | 11.40 |
| | | OK | OK |

## 4.6.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <version> | String | Firmware version |

# 4.7 IMEI identification +CGSN

| +CGSN | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 4.7.1 Description

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

## 4.7.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | AT+CGSN[=<snt>] | <sn> | 004999010640000 |
| | | OK | OK |
| Test | AT+CGSN=? | OK | |

## 4.7.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <sn> | String | Serial number, by default the IMEI |
| <snt> | Number | It indicates the requested serial number type. Depending on <snt> value, the <sn> parameter in the information text response provides different information:<br>• 0: International Mobile station Equipment Identity (IMEI)<br>• 1: International Mobile station Equipment Identity (IMEI)<br>• 2: International Mobile station Equipment Identity and Software Version number (IMEISV)<br>• 3: Software Version Number (SVN)<br>• 255: IMEI (not including the spare digit), the check digit and the SVN |

## 4.7.4 Notes

**TOBY-L2 / MPCI-L2 / LISA-U1 / LISA-U200-00S / LISA-U200-01S / LISA-U200-02S / LISA-U200-52S / LISA-U200-62S / LISA-U200-82S / LISA-U230 / LISA-U260 / LISA-U270 / SARA-U260-00S / SARA-U270-00S / SARA-U270-00X / SARA-U280-00S / SARA-G / LEON-G**

- The <snt> parameter is not supported.

Objective Specification

# 4.8 IMEI identification +GSN

| +GSN | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 4.8.1 Description

The commands handling is the same of *+CGSN*.

## 4.8.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | AT+GSN[=<snt>] | <sn> | 004999010640000 |
| | | OK | OK |
| Test | AT+GSN=? | OK | |

## 4.8.3 Defined values

See *+CGSN* AT command.

# 4.9 Identification information I

| I | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 4.9.1 Description

Returns some module information as the module ordering code, the modem and the application version.

The information text response of ATI9 contains the modem version and the application version of the module where applicable; it returns "Undefined" where not applicable.

## 4.9.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | Ordering code request | <ordering_code> | ATI0 |
| | ATI[0] | OK | SARA-G350-00S-00 |
| | | | OK |
| | Modem and application version request | <modem_version>,<applications_version> | ATI9 |
| | ATI9 | | 29.90,A01.00 |
| | | OK | OK |

## 4.9.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <ordering_code> | String | Product ordering code |
| <modem_version> | String | Module modem version |
| <applications_version> | String | Module application version. Where not applicable the module provides "Undefined" |

Objective Specification

# 4.10 TE character set configuration +CSCS

| +CSCS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 4.10.1 Description

Selects the TE character set.

The selected character set is actually used for encoding/decoding of only the AT commands' string type parameters whose description explicitly references the +CSCS setting itself.

## 4.10.2 Syntax

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

## 4.10.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <chset> | String | • "IRA" (factory-programmed value): International Reference Alphabet (ITU-T T.50)<br>• "GSM": GSM default alphabet (3GPP TS 23.038)<br>• "PCCP437": PC character set Code Page 437<br>• "8859-1": ISO 8859 Latin 1 character set<br>• "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<br>• "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 |

## 4.10.4 Notes

### TOBY-L2 / MPCI-L2

- <chset>="PCCP437" is not supported.

# 4.11 International mobile subscriber identification +CIMI

| +CIMI | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

## 4.11.1 Description

Request the IMSI (International Mobile Subscriber Identity).

## 4.11.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | AT+CIMI | <IMSI><br>OK | 222107701772423<br>OK |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| Test | AT+CIMI=? | OK | |

### 4.11.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <IMSI> | String | International Mobile Subscriber Identity |

## 4.12 Card identification +CCID

| +CCID | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 4.12.1 Description

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

### 4.12.2 Syntax

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

### 4.12.3 Defined values

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

### 4.12.4 Notes

- The command needs of the SIM to correctly work.

## 4.13 Request complete capabilities list +GCAP

| +GCAP | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 4.13.1 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.

### 4.13.2 Syntax

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

Objective Specification

### 4.13.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <capability_area> | String | Command name or predefined response of the specific capability area<br>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 |

## 4.14 Display FGI settings +UFGI

| +UFGI | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L210-02S MPCI-L280 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 4.14.1 Description

Gets and displays the contents of the FGI bits stored on the module that are reported during the LTE registration to the network as part of the UE-EUTRA-Capability information element. The description of each bit can be found in 3GPP TS 36.331, Annex B *[108]*.

### 4.14.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | AT+UFGI | +UFGI: <FGI>,<FGI_rel9><br>OK | |

### 4.14.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <FGI> | Number | 32 bits number that describes bits 1-32 of featureGroupIndicators. The leftmost bit represents index 1 in the field featureGroupIndicators |
| <FGI_rel9> | Number | 32 bits number that describes bits 33-64 of featureGroupIndRel9Add. The leftmost bit represents index 33 in the field featureGroupIndRel9Add. |

## 4.15 Repeat last command A/

| A/ | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 4.15.1 Description

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

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

### 4.15.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | A/ | | |

Objective Specification

# 4.16 List all available AT commands +CLAC

| +CLAC | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 4.16.1 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.

## 4.16.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | AT+CLAC | <AT command 1><br>[<AT command 2><br>[...]]<br>OK | |
| Test | AT+CLAC=? | OK | |

## 4.16.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <AT command> | String | AT command name |

# 4.17 Help displaying all commands &H

| &H | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | No | No | - | *+CME Error* |

## 4.17.1 Description

Lists all the supported commands.

## 4.17.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | AT&H | <AT command 1> : <AT command 1 title>[<CR><LF><AT command 2> : <AT command 2 title><br>[...]]<br>OK | ATA : Answer an Incoming Call<br>ATE : Echo<br>ATH : Hook Control<br>ATV : Enable/Disable verbose response<br>...<br>AT+UTEST : End User Test<br>ATS : Query or Set an S-register<br>ATD : Dial<br>OK |

## 4.17.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <AT command n> | String | AT command name |
| <AT command n title> | String | AT command title |

Objective Specification

### 4.17.4 Notes

**TOBY-L2 / MPCI-L2 / SARA-G / LEON-G**

- The response is:
  <AT command 1>, <AT command 2>, ..., <AT command n>[,<CR><LF><AT command n+1>, ..., <AT command n+m>

  [...]]

  OK

  Example:

  &W, &Y, A, B, E, H, I, L, M, O, P, Q, S0, S10, S12,

  S2, S3, S4, S5, S6, S7, S8, T, V, X, Z, \Q,

  ...

  +USORD, +USORF, +USOSO, +USOST, +USOWR, +USPM, +USTN,

  +USTOPFILE, +USTS, +UTEST, +UTGN, +UUBF

  OK

Objective Specification

# 5 Mobile equipment control and status

## 5.1 Phone activity status +CPAS

| +CPAS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 5.1.1 Description

Returns the activity status <pas> of the MT.

### 5.1.2 Syntax

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

### 5.1.3 Defined values

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

### 5.1.4 Notes

#### TOBY-L2 / MPCI-L2

- During a MO call the information text response of the action command returns 4 (call in progress).

## 5.2 Module switch off +CPWROFF

| +CPWROFF | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | *< 40 s* | *+CME Error* |

### 5.2.1 Description

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

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

See the corresponding System Integration Manual for the timing and the electrical details of the module power-off sequence via the +CPWROFF command.

MPCI-L2
The command does not switch off the PCIe module but it causes a reset (reboot). The current parameter settings are stored in the NVM performing a network detach, with a subsequent module reset (reboot).

Objective Specification

### 5.2.2 Syntax

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

## 5.3 Set module functionality +CFUN

| +CFUN | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | No | No | *Up to 3 min* | *+CME Error* |

### 5.3.1 Description

Selects the level of functionality <fun> in the MT.

If the syntax +CFUN=15 or +CFUN=16 (resets) or +CFUN=127 is used, the rest of the command line, placed after that, will be ignored.

### 5.3.2 Syntax

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

### 5.3.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <fun> | Number | Selected functionality<br>• 0: sets the MT to minimum functionality (disable both transmit and receive RF circuits by deactivating both CS and PS services)<br>• 1 (factory-programmed value): sets the MT to full functionality, e.g. from airplane mode or minimum functionality<br>• 4: disables both transmit and receive RF circuits by deactivating both CS and PS services and sets the MT into airplane mode. Airplane mode is persistent between power cycles triggered by +CFUN=16 or *+CPWROFF*)<br>• 6: enables the SIM-toolkit interface in dedicated mode and fetching of proactive commands by SIM-APPL from the SIM-card<br>• 7 or 8: disables the SIM-toolkit interface and fetching of proactive commands by SIM-APPL from the SIM-card<br>• 9: enables the SIM-toolkit interface in raw mode and fetching of proactive commands by SIM-APPL from the SIM-card<br>• 15: MT silent reset (with detach from network and saving of NVM parameters), without reset of the SIM card<br>• 16: MT silent reset (with detach from network and saving of NVM parameters), with reset of the SIM card<br>• 19: sets the MT to minimum functionality by deactivating CS and PS services and the SIM card<br>• 127: sets the MT in a deep low power state "HALT" (with detach from the network and saving of the NVM parameters); the only way to wake up the module is a power cycle or a module reset |
| <rst> | Number | Reset mode. This parameter can be used only when <fun> is 1, 4 or 19.<br>• 0 (default value): do not reset the MT before setting it to the selected <fun><br>• 1: performs a MT silent reset (with detach from network and saving of NVM parameters) with reset of the SIM card before setting it to the selected <fun> |
| <power_mode> | Number | • 0: MT is switched on with minimum functionality |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 1: MT is switched on<br>• 4: MT is in "airplane mode"<br>• 19: MT is in minimum functionality with SIM deactivated |
| <STK_mode> | Number | • 6: the SIM-toolkit interface in dedicated mode and fetching of proactive commands by SIM-APPL from the SIM-card are enabled<br>• 0, 7 or 8: the SIM-toolkit interface is disabled; fetching of proactive commands by SIM-APPL from the SIM-card is enabled<br>• 9: the SIM-toolkit interface in raw mode and fetching of proactive commands by SIM-APPL from the SIM-card are enabled |

### 5.3.4 Notes

**TOBY-L2 / MPCI-L2**

- After enabling the STK interface in raw mode it is not possible to switch to dedicated mode (and viceversa) without performing a reset.
- <fun>=7 and 8 are not supported
- <fun>=15 restarts the protocol stack tasks while retaining the SIM status, i.e. the PIN shall not be inserted again. This mimics a silent reset and sets the module in a known initial state. Drivers and applications are not restarted, therefore if e.g. a MUX port was opened, communication with it is maintained. Additionally, most non volatile parameters are not saved, as this kind of reset does not imply a complete module restart
- <rst> parameter is ignored when entered after a <fun> not supporting reset.

**TOBY-L200-00S / TOBY-L201 / TOBY-L210-00S / TOBY-L210-60S / TOBY-L280-00S / MPCI-L200-00S / MPCI-L201 / MPCI-L210-00S / MPCI-L210-60S**

- <fun>=15 behaves as <fun>=16: the MT is reset as well as the SIM card.
- <fun>=4 is not persistent between power cycles.

**LISA-U / SARA-U**

- <fun>=19 and 127 are not supported
- <power_mode>=19 is not supported

**SARA-G / LEON-G**

- <fun>=4 is not supported (<fun>=0 can be used instead)
- <fun>=9, 19 and 127 are not supported
- <fun>=15 behaves as <fun>=16: the MT is reset as well as the SIM card
- <rst>=1 can be used only if <fun>=1
- <power_mode>=19 is not supported
- <STK_mode>=9 is not supported

## 5.4 Indicator control +CIND

| +CIND | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | No | No | - | *+CME Error* |

### 5.4.1 Description

Provides indication states related to network status, battery information and so on.

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

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

For more details see the 3GPP TS 27.007 *[2]*.

Objective Specification

### 5.4.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CIND=[<ind>[,<ind>[,...]]] | OK | AT+CIND=<br>OK |
| Read | AT+CIND? | +CIND: <ind>[,<ind>[,...]]<br>OK | +CIND: 5,0,0,0,0,0,0,0,0,0,0<br>OK |
| Test | AT+CIND=? | +CIND: (list of <descr>s)<br>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))<br>OK |

### 5.4.3 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:<br>• "battchg": battery charge level (0-5)<br>• "signal": signal quality. See mapping in the note below<br>• "service": network service availability<br>o 0: not registered to any network<br>o 1: registered to the network<br>o 65535: indication not available<br>• "sounder": sounder activity, indicating when the module is generating a sound<br>o 0: no sound<br>o 1: sound is generated<br>• "message": unread message available in <mem1> storage<br>o 0: no messages<br>o 1: unread message available<br>• "call": call in progress<br>o 0: no call in progress<br>o 1: call in progress<br>• "roam": registration on a roaming network<br>o 0: not in roaming or not registered<br>o 1: roaming<br>o 65535: indication not available<br>• "smsfull": indication that an SMS has been rejected with the cause of SMS storage full<br>o 0: SMS storage not full<br>o 1: SMS storage full<br>• "gprs": PS indication status:<br>o 0: no PS available in the network<br>o 1: PS available in the network but not registered<br>o 2: registered to PS<br>o 65535: indication not available<br>• "callsetup": call set-up:<br>o 0: no call set-up<br>o 1: incoming call not accepted or rejected<br>o 2: outgoing call in dialling state<br>o 3: outgoing call in remote party alerting state<br>• "callheld": call on hold:<br>o 0: no calls on hold<br>o 1: at least one call on hold<br>• "simind": SIM detection<br>o 0: no SIM detected<br>o 1: SIM detected |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | o 2: not available |

### 5.4.4 Notes

- If the battery charging is not supported, "battchg" always returns 5 (full charge).
- The <descr> values cannot be changed with +CIND set.
- The following mapping of "signal" value to <rssi> parameter (*+CSQ* AT command) exists:

| "signal" value | <rssi> value | Power level |
|---|---|---|
| 0 | < 4 or 99 | (< -105 dBm or unknown) |
| 1 | < 10 | (< -93 dBm) |
| 2 | < 16 | (< -81 dBm) |
| 3 | < 22 | (< -69 dBm) |
| 4 | < 28 | (< -57 dBm) |
| 5 | >=28 | (>= -57 dBm) |

**TOBY-L2 / MPCI-L2**

- The set command is actually a dummy command always returning the "OK" final result code.

**TOBY-L200-00S / TOBY-L201 / TOBY-L210-00S / TOBY-L210-60S / TOBY-L280-00S / MPCI-L200-00S / MPCI-L201 / MPCI-L210-00S / MPCI-L210-60S**

- <descr>="simind" is not supported.
- The "callsetup", "callheld", "sounder" indications are not provided.

**LISA-U / SARA-U**

- To enable the "SIM detection" feature the SIM_DET pin must be properly configured (if not already set); for more details see the *GPIO introduction* and *+UGPIOC* command description.

**SARA-G340 / SARA-G350**

- If the battery charging is not supported, "battchg" always returns 0 (full charge).
- <descr>="sounder" indication is always set to 0, hence the *+CIEV: 4,x* URC is never displayed.

**SARA-G300 / SARA-G310 / LEON-G**

- <descr>="simind" is not supported.
- <descr>="sounder" indication is always set to 0, hence the *+CIEV: 4,x* URC is never displayed.

## 5.5 Configuration of indicator control +UCIND

| +UCIND | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| | LISA-U SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 5.5.1 Description

Allows the configuration of unsolicited results for indications with +CIEV.

### 5.5.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UCIND=[<conf>] | OK | AT+UCIND=7<br>OK |
| Read | AT+UCIND? | +UCIND: <conf><br>OK | +UCIND: 7<br>OK |
| Test | AT+UCIND=? | OK | |

Objective Specification

### 5.5.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <conf> | Number | The unsigned integer (0 to 4095) is a bitmask representing the list of the indications active for +CIEV URC reporting. The bit position corresponds to the indicator order number (see the <descr> parameter of *+CMER*). The least significant bit is used for the first indicator.<br>The bits corresponding to unused indicator order numbers (greater than 13) must be set to 0 (setting a <conf> greater than 4095 causes an error). The default value is 4095 (all the indications are enabled). |

## 5.6 Mobile termination event reporting +CMER

| +CMER | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | No | No | - | *+CME Error* |

### 5.6.1 Description

Configures sending of URCs from MT to DTE for indications. The <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 +CMER settings.

The command *+UCIND* allows enabling or disabling indicators.

### 5.6.2 Syntax

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

### 5.6.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | • 0 (default value): buffer URCs in the MT<br>• 1: discard URCs when the V.24 interface is reserved for data; otherwise directly display them on the DTE<br>• 2: buffer URCs in MT when the V.24 interface is reserved and flush them after reservation; otherwise directly display them on the DTE<br>• 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<br>• 1: indicator event reporting using the +CIEV URC. Only the indicator events which are not caused by *+CIND* shall be indicated by the MT to the DTE.<br>• 2: indicator event reporting using the +CIEV URC. All the indicator events shall be directed from MT to DTE. |
| <bfr> | Number | • 0: MT buffer of URCs defined within this command is cleared when <mode> 1...3 is entered<br>• 1: MT buffer of URCs defined within this command is flushed to the DTE when <mode> 1...3 is entered (the OK response shall be given before flushing the codes). |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| <descr> | Number | Indicates the indicator order number. The name in the brackets indicates the corresponding <descr> parameter of *+CIND*; <value> is the new value of indicator<br>• 1 ("battchg"): <value> provides the battery charge level (0-5)<br>• 2 ("signal"): <value> provides the signal quality<br>o 0: < -105 dBm<br>o 1: < -93 dBm<br>o 2: < -81 dBm<br>o 3: < -69 dBm<br>o 4: < - 57 dBm<br>o 5: >= -57 dBm<br>• 3 ("service"): <value> provides the network service availability<br>o 0: not registered to the network<br>o 1: registered to the network<br>• 4 ("sounder"): <value> provides the sounder activity<br>o 0: no sound<br>o 1: sound is generated<br>• 5 ("message"): <value> provides the unread message available in <mem1> storage<br>o 0: no messages<br>o 1: unread message available<br>• 6 ("call"): <value> provides the call in progress<br>o 0: no call in progress<br>o 1: call in progress<br>• 7 ("roam"): <value> provides the registration on a roaming network<br>o 0: not in roaming<br>o 1: roaming<br>• 8 ("smsfull"): <value> provides the SMS storage status<br>o 0: SMS storage not full<br>o 1: SMS Storage full (an SMS has been rejected with the cause of SMS storage full)<br>• 9 ("gprs"): <value> provides the GPRS indication status:<br>o 0: no GPRS available in the network<br>o 1: GPRS available in the network but not registered<br>o 2: registered to GPRS<br>• 10 ("callsetup"): <value> provides the call set-up:<br>o 0: no call set-up<br>o 1: incoming call not accepted or rejected<br>o 2: outgoing call in dialing state<br>o 3: outgoing call in remote party alerting state<br>• 11 ("callheld") : <value> provides the call on hold:<br>o 0: no calls on hold<br>o 1: at least one call on hold<br>• 12 ("simind"): <value> provides the SIM detection<br>o 0: no SIM detected<br>o 1: SIM detected |

## 5.6.4 Notes

### TOBY-L2 / MPCI-L2

- The <mode> parameter cannot be set to 2 and 3.
- The "callsetup", "callheld", "sounder" indications are not provided.

### SARA-G300 / SARA-G310 / LEON-G

- <descr>=12 is not supported.

Objective Specification

# 5.7 Clock +CCLK

| +CCLK | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

## 5.7.1 Description

Sets the real-time clock of the MT.

## 5.7.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CCLK=<time> | OK | AT+CCLK="14/07/01,15:00:00+01"<br>OK |
| Read | AT+CCLK? | +CCLK: <time><br>OK | +CCLK: "14/07/01,15:00:00+01"<br>OK |
| Test | AT+CCLK=? | OK | |

## 5.7.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <time> | String | Format is "yy/MM/dd,hh:mm:ss+TZ". Characters indicate year, month, day, hours, minutes, seconds, time zone. The factory-programmed value is "04/01/01,00:00:00+00". Values prior to the factory-programmed value are not allowed. |

## 5.7.4 Notes

- If the parameter value is out of range, then the error result code "+CME ERROR: operation not supported" will be provided (if *+CMEE* is set to 2).
- "TZ": The Time Zone information is represented by two digits. The value is updated during the registration procedure when the automatic time zone update is enabled (using *+CTZU* command) and the network supports the time zone information.
- The Time Zone information is expressed in steps of 15 minutes and it can assume a value in the range that goes from -96 to +96.

**SARA-G340 / SARA-G350 / LEON-G**

- The PIN insertion is mandatory before the command execution.

# 5.8 Alarm +CALA

| +CALA | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

## 5.8.1 Description

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

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

Objective Specification

### 5.8.2 Syntax

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

### 5.8.3 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. |
| <n>, <n1>, <n2> | Number | Indicates the index of the alarm, the range is 1-3; the default value is 1 |
| <type> | Number | Type of the alarm |
| <text> | String | Indicates the text to be displayed when the alarm time is reached. |
| <tlength> | Number | Indicates the maximum length of <text>; the maximum length is 255. |
| <recurr> | String | Maximum string length is 13, it indicates the day of week for the alarm in one of the following formats:<br>• "<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.<br>• "0": sets a recurrent alarm for all days in the week and all following weeks<br>• when the recurrent parameter is set, the time parameter format is "hh:mm:ss+TZ" (hour, minutes, seconds, time zone) |
| <rlength> | Number | Indicates the maximum length of <recurr> |
| <silent> | Number | Indicates if the alarm is silent or not<br>• 0: the alarm will not be silent (this value is available only if the audio interface is supported)<br>• 1: the alarm will be silent and the only result from the alarm is the URC +CALV |

### 5.8.4 Notes

- The alarm is not by default configured.
- The <type> parameter is ignored
- The module can be switched off after setting the alarm, in which case the module switches on as soon as the alarm time is reached. The following is an example procedure using the alarm setting:
  - Set the RTC clock by AT command: AT+CCLK="06/12/29,11:00:00+00" (the time can be checked with the *AT+CCLK* read command)
  - Set the RTC alarm by AT command: AT+CALA="06/12/29,11:01:00+00",1,0,"","",0 (the alarm set can be checked by the AT+CALA read command)
  - 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.

**TOBY-L2 / MPCI-L2**

- The <n> parameter can only be set to 1

Objective Specification

- If <recurr> parameter is used, the <time> parameter must not contain a date (the format "hh:mm:ss+TZ" is used in this case)
- Alarm reprogramming is possible only after deletion through *+CALD* command

**LISA-U2 / SARA-U2**

- The <text> parameter is ignored

**SARA-G340 / SARA-G350 / LEON-G**

- The <tlength> parameter is ignored

# 5.9 Delete alarm +CALD

| +CALD | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 5.9.1 Description

Deletes an alarm in the MT.

## 5.9.2 Syntax

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

## 5.9.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <n> | Number | Indicates the index of the alarm; see the *+CALA* command description for the allowed range of indexes. |

## 5.9.4 Notes

**SARA-G340 / SARA-G350 / LEON-G**

- The PIN insertion is mandatory before the command execution.

# 5.10 Alert sound mode +CALM

| +CALM | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S | | | | | |
| | LISA-U120 LISA-U130 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | *NVM* | No | - | *+CME Error* |

## 5.10.1 Description

Selects the general alert sound mode.

## 5.10.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CALM=<mode> | OK | AT+CALM=0 |

Objective Specification

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

### 5.10.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | • 0 (factory-programmed value): normal mode<br>• 1: silent mode (ring tones and SMS tones are muted; *+UTGN* AT command is not supported) |

### 5.10.4 Notes

- If +CALM is set to 1, the *+UTGN* command returns an error result code (+CME ERROR: operation not supported).
- If an incorrect number of parameters is provided or the parameter value is out of range, then the error result code "+CME ERROR: operation not supported" will be provided (if *+CMEE* is set to 2).

**TOBY-L2 / SARA-G340 / SARA-G350 / LEON-G**

- If +CALM is set to 1, the service tones (e.g.: Call Waiting tone) and alarm tone (see *+CALA* command) are also muted; furthermore the *+UPLAYFILE* and *+UPAR* commands return an error result code (+CME ERROR: operation not supported).

## 5.11 Ringer sound level +CRSL

| +CRSL | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S | | | | | |
| | LISA-U120 LISA-U130 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | *NVM* | No | - | *+CME Error* |

### 5.11.1 Description

Selects the sound level for the ringer of an incoming call and for the tone generator (see the *+UPAR* command).

### 5.11.2 Syntax

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

### 5.11.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <level> | Number | Range 0-5 (0 means mute). The default value and factory-programmed value is 4. |

### 5.11.4 Notes

- If an incorrect number of parameters is provided or the parameter value is out of range, then the error result code "+CME ERROR: operation not supported" will be provided (if *+CMEE* is set to 2).

Objective Specification

**LISA-U1**

- If +CRSL is set to 0, the AMR player (see the *+UPLAYFILE* command) is muted.

**SARA-G340 / SARA-G350 / LEON-G**

- The <level> parameter is mandatory.
- If +CRSL is set to 0, the *+UPLAYFILE* command returns an error result code (+CME ERROR: operation not supported).
- The command also selects the volume of the MIDI player (see the *+UPAR* command), the AMR player (see the *+UPLAYFILE* command), the service tones (e.g.: Call Waiting tone) and the alarm tone (see the *+CALA* command).

# 5.12 Loudspeaker volume level +CLVL

| +CLVL | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S | | | | | |
| | LISA-U120 LISA-U130 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | *NVM* | No | - | *+CME Error* |

## 5.12.1 Description

Selects the speech volume.

## 5.12.2 Syntax

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

## 5.12.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <level> | Number | 0-100 (0 means mute). The default and factory-programmed value is 80<br>100 means +6 dB; the step size is 0.5 dB; e.g.: 80 means -4 dB |

## 5.12.4 Notes

- If an incorrect number of parameters is provided or the parameter value is out of range, then the error result code "+CME ERROR: operation not supported" will be provided (if *+CMEE* is set to 2).
- The command affects only the speech volume during the call. Other players volume and tone generator volume are not affected.

**TOBY-L2**

- The allowed <level> range is 0-37, where 0 means mute, 37 means 0 dB and the step size is 1 dB (e.g.: 30 means -7 dB). The default and factory-programmed value is 30.

**SARA-G340 / SARA-G350 / LEON-G**

- The <level> parameter is mandatory. Moreover <level>= 100 means 0 dB and the step size is 0.25 dB (e.g.: 80 means -5 dB).

Objective Specification

# 5.13 Mute control +CMUT

| +CMUT | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S | | | | | |
| | LISA-U120 LISA-U130 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 5.13.1 Description

Configures the uplink voice muting during all the voice calls.

## 5.13.2 Syntax

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

## 5.13.3 Defined values

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

## 5.13.4 Notes

- If an incorrect number of parameters is provided or the parameter value is out of range, then the error result code "+CME ERROR: operation not supported" will be provided (if *+CMEE* is set to 2).

# 5.14 Set greeting text +CSGT

| +CSGT | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | *NVM* | No | - | *+CME Error* |

## 5.14.1 Description

Configures and activates/deactivates the greeting text. The greeting text configuration's change will be applied at the subsequent boot. If active, the greeting text is shown at boot once, on any AT interface, the first time the TE sets the DTR line to ON state.

## 5.14.2 Syntax

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

Objective Specification

### 5.14.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <text> | String | Greeting text. The factory-programmed value is the empty string. |
| <mode> | Number | • 0: turn off the greeting text<br>• 1: turn on the greeting text |
| <ltext> | Number | Maximum length of the <text> parameter. |

### 5.14.4 Notes

#### SARA-G / LEON-G

- The greeting text is shown even if the DTR line is set to OFF state.

## 5.15 Automatic time zone update +CTZU

| +CTZU | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | *NVM* | No | - | *+CME Error* |

### 5.15.1 Description

Configures the automatic time zone update via NITZ.

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

### 5.15.2 Syntax

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

### 5.15.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <on_off> | Number | • 0 (factory-programmed value): automatic time zone via NITZ disabled<br>• 1: automatic time zone update via NITZ enabled; if the network supports the service, the local time of the module is changed (not only time zone) |

### 5.15.4 Notes

#### TOBY-L210-62S

- The factory-programmed value of the <on_off> parameter is 1.

Objective Specification

# 5.16 Time zone reporting +CTZR

| +CTZR | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | Yes | No | No | - | *+CME Error* |

## 5.16.1 Description

Configures the time zone change event reporting. If the reporting is enabled, the MT returns the **+CTZE** URC (if supported) or the **+CTZV** URC whenever the time zone changes and additionally the **+CTZDST** URC (if supported) if the daylight saving time information is available.

## 5.16.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CTZR=<onoff> | OK | AT+CTZR=1<br>OK |
| Read | AT+CTZR? | +CTZR: <onoff><br>OK | +CTZR: 0<br>OK |
| Test | AT+CTZR=? | +CTZR: (list of supported <onoff>s)<br>OK | +CTZR: (0-1)<br>OK |
| URC | | +CTZV: <tz>[,<time>] | +CTZV: +04,"12/12/31,23:46:33" |
| URC | | +CTZE: <tz>,<dst>[,<time>] | +CTZE: +04,1,"12/12/31,23:46:33" |
| URC | | +CTZDST: <dst> | +CTZDST: 1 |

## 5.16.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <onoff> | Number | • 0 (default value): disable the time zone change event reporting<br>• 1: enable the time zone reporting by +CTZV and +CTZDST unsolicited result codes<br>• 2: enable the time zone reporting by +CTZE unsolicited result code |
| <tz> | Number | Indicates the time zone. The range goes from -48 to +56. |
| <time> | String | Current local time in format "yy/MM/dd,hh:mm:ss". The characters indicate year, month, day, hour, minutes, seconds. |
| <dst> | Number | Indicates the daylight saving time. The allowed values are:<br>• 0: no adjustments<br>• 1: +1 hour adjustment<br>• 2: +2 hours adjustment |

## 5.16.4 Notes

- 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.
- The reported <tz> reflects the <dst> offset: if time zone is +1 hour and the daylight saving time is +1 hour, the reported <tz> is +08.

**TOBY-L2 / MPCI-L2**

- +CTZDST URC is not supported.

**LISA-U / SARA-U**

- <onoff>=2 and +CTZE URC are not supported.

**SARA-G / LEON-G**

- The <time> parameter is not supported.
- <onoff>=2, +CTZE and +CTZDST +URC are not supported.

Objective Specification

# 5.17 Monitor of current calls +CMCCS

| +CMCCS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L210-62S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 5.17.1 Description

Activates or deactivates a call monitoring function in the ME. When this function is activated in the ME, the ME informs about events for calls by means of URCs. The purpose of the call monitoring function is to:

- gather relevant information for the detected calls in a TE
- make it possible for the TE to display call state information for ongoing calls

For every supplementary service related event, the +CMCCSS<x> URCs are given in consecutive order, and the +CMCCSSEND URC terminates the URCs sequence. It is manufacturer specific when and if this additional service reporting will be issued.

- Whenever a service event is to be reported using these URCs, the codes +CMCCSS1 and +CMCCSSEND are mandatory
- +CMCCSS1 contains essential information that is always needed (for example <ccidx>)
- +CMCCSSEND indicates the end of this particular set of URCs
- The other URCs (+CMCCSS2 to +CMCCSSn) are optional, intended to provide information related to a given service
- E.g. for the supplementary service CNAP, the unsolicited result code +CMCCSS4 (containing <name>) may be issued

For situations where ringing is applicable, the +CMCCSS<x> / +CMCCSSEND URCs are typically returned after the first RING (or *+CRING: <type>*) result code sent from TA to TE.

When the +CMCCSI URC report that the <ccstatus>=1 (Idle), the call identification number is reset and the call identification number <ccidx> can be used by new calls.

## 5.17.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | +CMCCS=[<n>] | [+CMCCS: (list of supported <x>s)]<br>OK | |
| Read | AT+CMCCS? | +CMCCS: <n><br>OK | |
| Test | AT+CMCCS=? | +CMCCS: (list of supported <n>s)<br>OK | |
| URC | | +CMCCSI: <ccidx>,<dir>,<neg_status_present>,<neg_status>,<SDP_md>,<cs_mode>,<ccstatus>,<mpty>,<numbertype>,<ton>,<number>,<exittype>,<exitcause> | |
| URC | | +CMCCSS1: <ccidx>,<dir>,<service><br>[+CMCCSS3: <CLI_validity>]<br>[+CMCCSS5: <subaddr>,<satype>]<br>+CMCCSSEND | |

## 5.17.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <n> | Number | Allowed values:<br>• 0 (default value): the call monitoring function is disabled<br>• 1: issues the +CMCCSS<x> URCs supported by the TE |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 2: enables the call monitoring function for basic call information (+CMCCSI URC)<br>• 3: enables the call monitoring function for basic call information (+CMCCSI URC) and supplementary service information (+CMCCSS<x> / +CMCCSSEND URCs) |
| <x> | Number | Suffix in the +CMCCSS<x> URCs. Alloed values: 1, 3 and 5. |
| <ccidx> | Number | Call identification number as described in 3GPP TS 22.030 [5] subclause 6.5.5.1. This number can be used in +CHLD command operations. Value range is from 1 to 5. The call identification number must not be reused until the +CMCCSI URC has indicated that the <ccstatus>=1 (Idle). |
| <dir> | Number | • 0: mobile originated (MO) call<br>• 1: mobile terminated (MT) call |
| <neg_status_present> | Number | Indicates whether the <neg_status> parameter has any valid information<br>• 0: no valid information in the <neg_status> parameter. The <neg_status> parameter is set to zero<br>• 1: valid information in the <neg_status> parameter |
| <neg_status> | Number | • 0: the parameter has no valid content. Parameter <SDP_md> is set to an empty string ("").<br>• 1: the <SDP_md> parameter describes the active media in the call.<br>• 2: the <SDP_md> parameter describes a proposed but not yet active new set of media for the call.<br>• 3: a proposed new set of media for the call was accepted by the remote party. The <SDP_md> parameter describes the active media in the call (if any).<br>• 4: a proposed new set of media for the call was rejected by the remote party. The <SDP_md> parameter describes the active media in the call (if any). |
| <SDP_md> | String | Media description represented with IRA characters. This parameter is not subject to conventional character conversion as per +CSCS. This parameter is an empty string ("") if the call has no multimedia content. |
| <cs_mode> | Number | Applicable to CS calls only:<br>• 0: no relevant information about bearer/teleservice<br>• 1: voice<br>• 2: data<br>• 3: fax<br>• 4: voice followed by data, voice mode<br>• 5: alternating voice/data, voice mode<br>• 6: alternating voice/fax, voice mode<br>• 7: voice followed by data, data mode<br>• 8: alternating voice/data, data mode<br>• 9: alternating voice/fax, fax mode<br>• 255: unknown |
| <ccstatus> | Number | Call status. Allowed values:<br>• 1: Idle<br>• 2: Calling (MO); the call setup has been started<br>• 3: Connecting (MO); the call is in progress<br>• 4: Alerting (MO): an alert indication has been received<br>• 5: Alerting (MT); an alert indication has been sent<br>• 6: Active; the connection is established<br>• 7: Released; an outgoing (MO) call is released<br>• 8: Released; an incoming (MT) call is released<br>• 9: User Busy<br>• 10: User Determined User Busy<br>• 11: Call Waiting (MO)<br>• 12: Call Waiting (MT)<br>• 13: Call Hold (MO)<br>• 14: Call Hold (MT) |
| <mpty> | Number | • 0: call is not one of multiparty (conference) call parties<br>• 1: call is one of multiparty (conference) call parties |
| <numbertype> | Number | Indicating type of information in parameter <number>. Allowed values:<br>• 0: no valid information in parameter <number>. <number> shall then be set to empty string ("").<br>• 1: number in <number> according to URI including the prefix specifying the URI type (see the +CDU AT command). Parameter <ton> has no relevant information and is set to zero. |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 2: number in <number> according to one of the formats supported by 3GPP TS 24.008 [12] subclause 10.5.4.7) |
| <ton> | Number | Type of number (see 3GPP TS 24.008 [12] subclause 10.5.4.7):<br>• Originating call: the parameter provides the number (line identity) information which has been dialled with +CDU AT command or ATD<br>• Terminating call: it provides the number (line identity) information of the calling user.<br>• The parameter is set to zero when it has no meaningful content, e.g. when <numbertype>=1. |
| <number> | String | Phone number in format specified by <numbertype>. The used character set should be the one selected with the +CSCS.<br>• Originating call: the parameter provides the number (line identity) information which has been dialled with +CDU AT command or ATD<br>• Terminating call: it provides the number (line identity) information of the calling user.<br>• When no number is available, <number> is set to an empty string (""). |
| <exittype> | Number | Indicating the information type in the <exitcause> parameter<br>• 0: no valid information in parameter <exitcause><br>• 1: cause in <exitcause> according to 3GPP TS 24.008 [12], Annex H<br>• 2: cause in <exitcause> according to 3GPP TS 24.229 [102], Annex A.2.1.4.1 |
| <exitcause> | Number | Additional information provided if relevant. If there is no relevant cause to report, or if <exittype>=0 the exitcause is set to 0 (<exitcause>=0). |
| <service> | Number | Indication of the indicated (supplementary) service. The related +CMCCSS<x> URCs are provided as applicable for a given <service>:<br>• 0: no service<br>• 1: Originating identification presentation - CLIP / OIP, see the 3GPP TS 22.081 [34] and 3GPP TS 24.607 [127]. CLIP / OIP specific information can be provided in +CMCCSI; additional CLIP / OIP specific information can be provided in +CMCCSS1, +CMCCSS3 and +CMCCSS5<br>• 3: Terminating identification presentation - COLP / TIP, see the 3GPP TS 22.081 [34] and 3GPP TS 24.608 [128]. COLP / TIP specific information can be provided in +CMCCSI; additional COLP / TIP specific information can be provided in +CMCCSS1 and +CMCCSS5<br>• 5: Called line presentation - CDIP. Additional CDIP specific information can be provided in +CMCCSS1, +CMCCSS2 and +CMCCSS5<br>• 14: Communication waiting - CW, see the 3GPP TS 22.083 [33] and 3GPP TS 24.615 [63]. Additional CW specific information can be provided in +CMCCSS1 and +CMCCSS6 |
| <CLI_validity> | Number | Provides details why the <number> parameter does not contain a calling party BCD number (see the 3GPP TS 24.008 [12] subclause 10.5.4.30). The parameter is not relevant for MO call types<br>• 0: CLI valid<br>• 1: CLI has been withheld by the originator (see 3GPP TS 24.008 [12] table 10.5.135a/3GPP TS 24.008 code "Reject by user")<br>• 2: CLI is not available due to interworking problems or limitations of originating network (see 3GPP TS 24.008 [12] table 10.5.135a/3GPP TS 24.008 code "Interaction with other service")<br>• 3: CLI is not available due to calling party being of type payphone (see 3GPP TS 24.008 [12] table 10.5.135a/3GPP TS 24.008 code "Coin line/payphone")<br>• 4: CLI is not available due to other reasons (see 3GPP TS 24.008 [12] table 10.5.135a/3GPP TS 24.008 code "Unavailable")<br>When CLI is not available (<CLI_validity>=2, <CLI_validity>=3 or <CLI_validity>=4), <number> shall be an empty string ("") and <ton> value will not be significant. The <numbertype> parameter will be set to 0. Nevertheless, the TA may return the recommended value 128 for <ton> (TON/NPI unknown in accordance with 3GPP TS 24.008 [12] subclause 10.5.4.7).<br>When CLI has been withheld by the originator, (<CLI_validity>=1) and the CLIP is provisioned with the "override category" option (see 3GPP TS 22.081 [34] and 3GPP TS 23.081 [35]), the <number> and <ton> parameters are provided. Otherwise, the TA returns the same setting for <number> and <type> as if the CLI was not available. The parameter <numbertype> is set as appliccable. |
| <name> | String | Calling name. String length up to 80 characters. |
| <subaddr> | String | Subaddress of format specified by <satype> |
| <satype> | Number | Type of subaddress octet (see the 3GPP TS 24.008 [12] subclause 10.5.4.8) or RFC 4715 [131] appendix A |
| <priority> | Number | eMLPP priority level of the call; the values are specified in 3GPP TS 22.067 [59]. |
| <CUG_index> | String | Sets the CUG index for the <CUG_pointer><br>• "0" ... "32767": CUG index |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • "": no CUG index, indicated by an empty string. Preferential CUG taken from subscriber data |

# 5.18 List of current calls +CLCCS

| +CLCCS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L210-62S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 5.18.1 Description

Returns a list of current calls controlled by the MT for which the <ccidx> is allocated. The information returned is a subset of the information provided by the call monitoring function (see *+CMCCS* and the corresponding +CMCCSI and +CMCCSS<x> / +CMCCSSEND URCs). If no particular <ccidx> is included in the request, data for all allocated <ccidx> are returned. If the command succeeds but no <ccidx> is allocated, no text information response is sent to the TE.

The restrictions and limitations of the call identification number as described in 3GPP TS 22.030 [*5*] subclause 6.5.5.1 and 3GPP TS 22.084 [*126*] do not apply.

The call identification number is not reset until the +CMCCSI URC has indicated that the <ccstatus>= 1 (Idle).

## 5.18.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CLCCS[=<ccidx>] | [+CLCCS: <ccid1>,<dir>,<neg_status_present>,<neg_status>,<SDP_md>,<cs_mode>,<ccstatus>,<mpty>,[,<numbertype>,<ton>,<number>[,<priority_present>,<priority>[,<CLI_validity_present>,<CLI_validity>]]]<br>[+CLCCS: <ccid2>,<dir>,<neg_status_present>,<neg_status>,<SDP_md>,<cs_mode>,<ccstatus>,<mpty>,[,<numbertype>,<ton>,<number>[,<priority_present>,<priority>[,<CLI_validity_present>,<CLI_validity>]]]<br>[...]]]<br>OK | |
| Test | AT+CLCCS=? | OK | OK |

## 5.18.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <ccidx> | Number | Call identification number (see 3GPP TS 22.030 [*5*] subclause 6.5.5.1). This number can be used in *+CHLD* command operations. The range goes from 1 to 5. |
| <dir> | Number | Allowed values:<br>• 0: mobile originated (MO) call<br>• 1: mobile terminated (MT) call |
| <neg_status_present> | Number | Indicates whether parameter <neg_status> has any valid information. Allowed values:<br>• 0: no valid information in <neg_status> parameter. The <neg_status> parameter is set to zero.<br>• 1: valid information in <neg_status> parameter |
| <neg_status> | Number | Allowed values:<br>• 0: the parameter has no valid content. The <SDP_md> parameter is set to an empty string ("")<br>• 1: the <SDP_md> parameter describes the active media in the call<br>• 2: the <SDP_md> parameter describes a proposed but not yet active new set of media for the call<br>• 3: a proposed new set of media for the call was accepted by the remote party. The <SDP_md> parameter describes the active media in the call (if any) |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 4: a proposed new set of media for the call was rejected by the remote party. The <SDP_md> parameter describes the active media in the call (if any) |
| <SDP_md> | String | String type represented with IRA characters. This parameter is not subject to conventional character conversion as per +CSCS. This parameter is an empty string ("") if the call has no multimedia content. |
| <cs_mode> | Number | Bearer/teleservice status. Allowed values:<br>• 0: no relevant information about bearer/teleservice<br>• 1: voice<br>• 2: data<br>• 3: fax<br>• 4: voice followed by data, voice mode<br>• 5: alternating voice/data, voice mode<br>• 6: alternating voice/fax, voice mode<br>• 7: voice followed by data, data mode<br>• 8: alternating voice/data, data mode<br>• 9: alternating voice/fax, fax mode<br>• 255: unknown |
| <ccstatus> | Number | Indicates the call state. Allowed values:<br>• 1: idle<br>• 2: calling (MO); the call setup has been started<br>• 3: connecting (MO); the call is in progress<br>• 4: alerting (MO): an alert indication has been received<br>• 5: alerting (MT); an alert indication has been sent<br>• 6: active; the connection is established<br>• 7: released; an outgoing (MO) call is released.<br>• 8: released; an incoming (MT) call is released<br>• 9: user busy<br>• 10: User Determined User Busy<br>• 11: call waiting (MO)<br>• 12: call waiting (MT)<br>• 13: call hold (MO)<br>• 14: call hold (MT) |
| <mpty> | Number | • 0: call is not one of multiparty (conference) call parties<br>• 1: call is one of multiparty (conference) call parties |
| <numbertype> | Number | Indicates the information type in the <number> parameter. Allowed values:<br>• 0: no valid information in the <number> parameter<br>• 1: number in <number> according to URI including the prefix specifying the URI type (see the +CDU AT command). The <ton> parameter has no relevant information and is set to zero<br>• 2: number in <number> according to one of the formats supported by 3GPP TS 24.008 [12] subclause 10.5.4.7) |
| <ton> | Number | Type of number (see the 3GPP TS 24.008 [12] subclause 10.5.4.7):<br>• Originating call: the parameter provides the number (line identity) information which has been dialled with ATD<br>• Terminating call: the parameter provides the number (line identity) information of the calling user<br>• The parameter is set to zero when it has no meaningful content, e.g. when <numbertype>=1 |
| <number> | String | Phone number in format specified by <numbertype>. This parameter is not subject to conventional character conversion as per +CSCS.<br>• Originating call: the parameter provides the number (line identity) information which has been dialled with ATD<br>• Terminating call: the parameter provides the number (line identity) information of the calling user |
| <priority_present> | Number | Indicates whether <priority> parameter has any valid information:<br>• 0: no valid information in the <priority> parameter. The <priority> parameter is set to zero<br>• 1: valid information in the <priority> parameter |
| <priority> | Number | Indicates the eMLPP priority level of the call, values specified in 3GPP TS 22.067 [59] |
| <CLI_validity_present> | Number | Indicates whether parameter <CLI_validity> has any valid information<br>• 0: no valid information in the <CLI_validity> parameter. |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 1: valid information in the <CLI_validity> parameter. |
| <CLI_validity> | Number | Provides details why the <number> parameter does not contain a calling party BCD number (see the 3GPP TS 24.008 [12] subclause 10.5.4.30). The parameter is not relevant for MO call types. Allowed values:<br>• 0: CLI valid<br>• 1: CLI has been withheld by the originator (see the 3GPP TS 24.008 [12] table 10.5.135a/3GPP TS 24.008 code "Reject by user")<br>• 2: CLI is not available due to interworking problems or limitations of originating network (see the 3GPP TS 24.008 [12] table 10.5.135a/3GPP TS 24.008 code "Interaction with other service")<br>• 3: CLI is not available due to calling party being of type payphone (see the 3GPP TS 24.008 [12] table 10.5.135a/3GPP TS 24.008 code "Coin line/payphone")<br>• 4: CLI is not available due to other reasons (see the 3GPP TS 24.008 [12] table 10.5.135a/3GPP TS 24.008 code "Unavailable")<br>When the CLI is not available (<CLI_validity>=2, <CLI_validity>=3 or <CLI_validity>=4), the <number> parameter shall be an empty string ("") and <type> value will not be significant. The parameter <numbertype> will be set to 0. Nevertheless, the TA may return the recommended value 128 for <ton> (TON/NPI unknown in accordance with 3GPP TS 24.008 [12] subclause 10 .5.4.7).<br>When the CLI has been withheld by the originator, (<CLI_validity>=1) and the CLIP is provisioned with the "override category" option (see the 3GPP TS 22.081 [34] and 3GPP TS 23.081 [35]), <number> and <type> is provided. Otherwise, TA shall return the same setting for <number> and <type> as if the CLI was not available. |

# 5.19 IMS single radio voice call continuity +CISRVCC

| +CISRVCC | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L210-62S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 5.19.1 Description

Informs the MT about the SRVCC support. MT normally updates the network when changing this parameter. The SRVCC provides the ability to have a seamless handover of a voice call between the PS domain and the CS domain for calls that are anchored in IMS, when the UE is capable of transmitting/receiving on only one of those access networks (PS or CS) at a given time, see 3GPP TS 23.221 [89] subclause 7.2a, annex A.1 and annex A.2

## 5.19.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CISRVCC=[<uesrvcc>] | OK | AT+CISRVCC=0<br>OK |
| Read | AT++CISRVCC? | +CISRVCC: <uesrvcc><br>OK | +CISRVCC: 1<br>OK |
| Test | AT+CISRVCC=? | +CISRVCC: (list of supported <uesrvcc>s)<br>OK | +CISRVCC: (0,1)<br>OK |

## 5.19.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <uesrvcc> | Number | SRVCC support status. Allowed values:<br>• 0 (default value): SRVCC not supported<br>• 1: SRVCC supported |

Objective Specification

# 5.20 Report mobile termination error +CMEE

| +CMEE | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 5.20.1 Description

Configures the formatting of the 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. The error result code is returned normally when an error is related to syntax, invalid parameters or MT functionality.

## 5.20.2 Syntax

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

## 5.20.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <n> | Number | • 0: +CME ERROR: <err> result code disabled and ERROR used<br>• 1: +CME ERROR: <err> result code enabled and numeric <err> values used<br>• 2: +CME ERROR: <err> result code enabled and verbose <err> values used |

## 5.20.4 Notes

- When +CMEE=2 selected, the following convention is valid:
  - If the error result code is related to a parameter not covered by the GSM/ETSI or u-blox specification, the value <err>="operation not supported" shall be reported.
  - If the MT is in a state which does not allow performing the entered command, the value <err>= "operation not allowed" shall be reported.

# 5.21 Extended error report +CEER

| +CEER | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | No | No | - | *+CME Error* |

## 5.21.1 Description

Causes the MT to return one or more lines of the information text response 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,
- the last SM STATUS message sent to the network.

The total number of characters in the information text response shall not exceed 2041 characters (including line terminators). The textual report is the failure cause according with 3GPP TS 24.008 *[12]*.

Objective Specification

When <type>="SM STATUS msg sent" is reported, it is suggested to reset the PS data connection.

### 5.21.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | AT+CEER | +CEER: <type>[,<cause>,<error_description>] | +CEER: "CC setup error",277,"SIM status failure" |
| | | OK | OK |
| Test | AT+CEER=? | OK | |

### 5.21.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <type> | String | • "CC setup error": <cause> and <error_description> parameters are provided<br>• "CC modification error": <cause> and <error_description> parameters are provided<br>• "CC release": <cause> and <error_description> parameters are provided<br>• "SM attach error": <cause> and <error_description> parameters are provided<br>• "SM detach": <cause> and <error_description> parameters are provided<br>• "SM activation error": <cause> and <error_description> parameters are provided<br>• "SM deactivation": <cause> and <error_description> parameters are provided<br>• "SS network GSM cause": <SS_cause_errors> parameters are provided<br>• "SS network reject cause": <tag> and <SS_cause> parameters are provided<br>• "No report available": no more parameters are provided<br>• "SM STATUS msg sent": <cause> and <error_description> parameters indicate respectively the SM cause (see 3GPP TS 24.008 *[12]*) and the time, based on *+CCLK?*, when the message was sent to the network |
| <cause> | Number | Code number of the received error (internal or network originated); more details in *Appendix A.3* |
| <error_description> | String | Code description of the received error; more details in *Appendix A.3* |

### 5.21.4 Notes

**TOBY-L2 / MPCI-L2 / LISA-U / SARA-U**

- <type>="SM STATUS msg sent" is not supported.

**SARA-G**

- If no mapping for <cause> is available, the <error_description> response is "Unknown".

**SARA-G300 / SARA-G310 / SARA-G340-00S / SARA-G340-01S / SARA-G350-00S / SARA-G350-00X / SARA-G350-01B / SARA-G350-01S**

- <type>="SM STATUS msg sent" is not supported.

**LEON-G**

- <type> parameter is not supported while <cause> and <error_description> parameters are mandatory in the response to the action command.
- If no mapping for <cause> is available, the <error_description> response is "Unknown".
- <type>="SM STATUS msg sent" is not supported.

## 5.22 Proprietary extended error report +UCEER

| +UCEER | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U1 LISA-U200-00S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | No | No | - | *+CEER Error* |

### 5.22.1 Description

Causes the MT to return one or more lines of information text (<report>, <cause>) determined by the MT providing an extended report of the reason of:

Objective Specification

- The failure in the last unsuccessful call set-up 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

### 5.22.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | AT+UCEER | +UCEER: <report>,<cause> | +UCEER: 1,1 |
| | | OK | OK |
| Test | AT+UCEER=? | OK | |

### 5.22.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <report> | Number | Numeric error result code |
| <cause> | Number | Indicates the error result code as previously displayed with the response +CME ERROR on DTE corresponding to the <report> |

Objective Specification

# 6 Call control

## 6.1 Select type of address +CSTA

| +CSTA | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 6.1.1 Description

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

The type of address is automatically detected from the dialling string thus the +CSTA command has no effect.

TOBY-L2

The type of address is not automatically detected on voice capable devices.

### 6.1.2 Syntax

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

### 6.1.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <type> | Number | Type of address in integer format<br>• 145: dialing string includes international access code character '+'<br>• 129 (default value): national coded dialing string |

## 6.2 Dial command D

| D | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | Yes | *Up to 3 min* | *+CME Error* |

### 6.2.1 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 3GPP TS 22.030 *[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 dial string, 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.

"ATD1;" is used to call the Voice Mail number. The number is stored in the SIM card (in $EF_{CPHS}$ or $EF_{MBDN}$) but the presence of both files is not mandatory. The command returns an error result code if the number cannot be retrieved but also if the Voice Mail number has been disabled (see *+CSVM* for further details).

Objective Specification

### 6.2.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | ATD<number>[<I>][<G>][;] | See *Result codes* | **Voice call**<br>ATD123456;<br>OK<br>**Data / fax call**<br>ATD123456<br>CONNECT 9600<br>**Supplementary services**<br>ATD*#43#<br>+CCWA: 0,1<br>+CCWA: 0,2<br>OK |

### 6.2.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <number> | Number | Dial string; the allowed characters are: 1 2 3 4 5 6 7 8 9 0 * # + A B C D , T P ! W @ (see the 3GPP TS 27.007 *[2]*). The following characters are ignored: , T ! W @.<br>The first occurrence of P is interpreted as pause and separator between the dialling number and the DTMF string. The following occurrences are interpreted only as pause. The use of P as pause has been introduced for AT&T certification.<br>TOBY-L2 / MPCI-L2<br>The character D is ignored when present in the dial number (it is valid only for the DTMF string).<br>SARA-U / LISA-U / SARA-G / LEON-G<br>The character A is interpreted as P due to the BCD extended coding (see the 3GPP TS 31.102 *[19]* and 3GPP TS 24.008 *[30]*).<br>SARA-U / LISA-U / SARA-G / LEON-G<br>The character D is ignored due to the BCD extended coding (see the 3GPP TS 31.102 *[19]* and 3GPP TS 24.008 *[30]*). |
| <I> | String | Set the CLI status; the allowed values are:<br>• I (ASCII code 49 Hex): CLI presentation restricted<br>• i: CLI presentation allowed<br>The CLIR supplementary service subscription is overridden for this call. |
| <G> | String | Configures the CUG supplementary service for the specific call:<br>• G: CUG activated<br>• g: CUG deactivated<br>The index and the information parameters used during the call will be the same previously set with *+CCUG* command. |

### 6.2.4 Notes

**LEON-G**

- The syntax ATD is allowed. It is only used for service TS61 (alternate speech and G3 FAX) to trigger an in-call modification.

### 6.2.5 Voice call example

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

Objective Specification

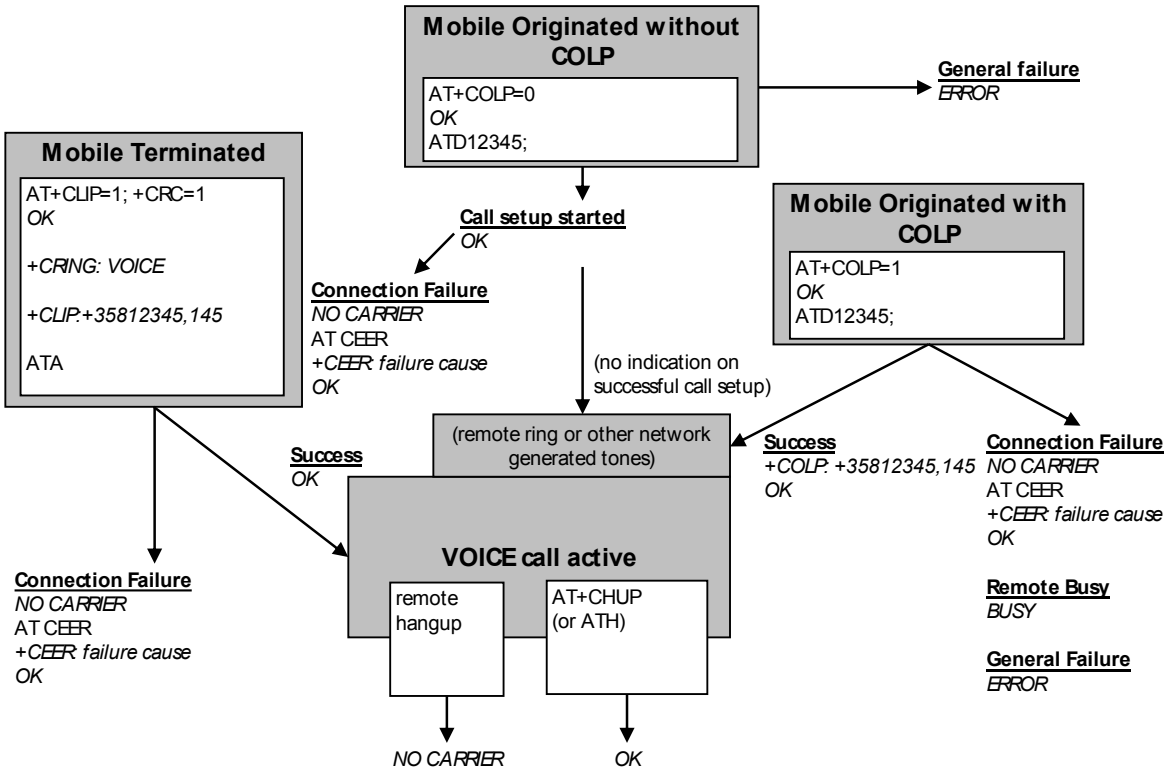



**Figure 1: Mobile Terminated and Mobile Originated calls possible transitions**

# 6.3 Direct calling from phonebooks D>

| D> | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | *Up to 3 min* | *+CME Error* |

## 6.3.1 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 See *+FCLASS* command.

## 6.3.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | ATD><str>[I][G][;] | See *Result codes* | ATD>"u-blox";<br>OK |
| | ATD><mem><n>[I][G][;] | See *Result codes* | ATD>SM1;<br>OK |
| | ATD><n>[I][G][;] | See *Result codes* | ATD>1;<br>OK |

Objective Specification

### 6.3.3 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) 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>; see the *+CPBS* command for <mem> value.<br>☞ <mem> value must be inserted without quotation marks (") |
| <n> | String | D><n>[I][G][;] originate a call to phone number in entry location <n> of the phonebook (set via *+CPBS* command). |
| [I][G][;] | String | See the *D* |

## 6.4 Select tone dialling T

| T | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 6.4.1 Description

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

### 6.4.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | ATT | OK | |

## 6.5 Select pulse dialling P

| P | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 6.5.1 Description

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

### 6.5.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | ATP | OK | |

Objective Specification

## 6.6 Call answer A

| A | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | *< 20 s* | *+CME Error* |

### 6.6.1 Description

Instructs the DCE to immediately connect to the 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 RING IRC or +CRING: <type> (see the *+CRLP*) displayed on MT.

### 6.6.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | ATA | RING<br>OK | |

## 6.7 Hook control H

| H | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | *< 20 s* | - |

### 6.7.1 Description

Disconnects the remote user. In case of multiple calls, all the active calls and held calls are released while the waiting calls are not.

In case of dual service calls, the command will switch the call from data (if different from fax) to voice.

If the module has a PDP context activated and is in On-Line Command Mode (OLCM), the command deactivates the context. During the PSD OLCM an incoming CS call can be accepted with an *ATA* command. Subsequent ATH command releases the current CS call while leaving the PDP context activated. In this state a second ATH command also deactivates the PDP context.

### 6.7.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | ATH | OK | |

### 6.7.3 Notes

**LISA-U**

- A CS data call cannot be established during PSD OLCM (CS voice call only where is supported).

**SARA-G340 / SARA-G350 / LEON-G**

- In case of multiple calls, all the active calls are released while the waiting and held calls are not.

Objective Specification

# 6.8 Monitor speaker loudness L

| L | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 6.8.1 Description

This command has no effect. It is implemented for compatibility with ITU-T V.25ter recommendation *[21]*.

## 6.8.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | ATL[<value>] | OK | ATL0<br>OK |

## 6.8.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <value> | Number | 0-3 |

# 6.9 Monitor speaker mode M

| M | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 6.9.1 Description

This command has no effect. It is implemented for compatibility with ITU-T V.25ter recommendation *[21]*.

## 6.9.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | ATM<value> | OK | ATM0<br>OK |

## 6.9.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <value> | Number | 0-2 |

# 6.10 Call mode +CMOD

| +CMOD | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 6.10.1 Description

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

Objective Specification

### 6.10.2 Syntax

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

### 6.10.3 Defined values

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

### 6.10.4 Notes

- <mode>=1 is only available on modules where the fax is available.

**TOBY-L200-00S / TOBY-L201 / TOBY-L210-00S / MPCI-L200-00S / MPCI-L201 / MPCI-L210-00S**

- The set command returns an error result code and the test command result code only returns "OK".

## 6.11 Voice call mode +CVMOD

| +CVMOD | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L210-62S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 6.11.1 Description

Selects the voice call mode for making a Mobile Originated voice call from the UE.

The preferences are not applicable for the emergency call.

The preferences are not applicable if operator has set preferences for UE originated calls/sessions, 3GPP TS 24.216 *[113]* subclause 5.6.

### 6.11.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CVMOD=<voice_mode> | OK | AT+CVMOD=1<br>OK |
| Read | AT+CVMOD? | +CVMOD: <voice_mode><br>OK | +CVMOD: 1<br>OK |
| Test | AT+CVMOD=? | +CVMOD: (list of supported <voice_mode>s)<br>OK | +CVMOD: (0-3)<br>OK |

### 6.11.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <voice_mode> | Number | Call mode. Allowed values:<br>• 0: CS_ONLY; the *ATD* command will make a call in CS mode<br>• 1: VOIP_ONLY; the *ATD* command will make a call in VoIP mode<br>• 2: CS_PREFERRED; the *ATD* command gives preference for CS based voice call<br>• 3 (factory-programmed value): VOIP_PREFERRED; the *ATD* command gives preference for VoIP based voice call |

Objective Specification

# 6.12 Hang up call +CHUP

| +CHUP | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | *< 20 s* | *+CME Error* |

## 6.12.1 Description

Causes the MT to hang up the current GSM or UMTS call.

In case of multiple calls, all active calls will be released, while waiting and held calls are not.

The command does not replace the ITU-T V.250 *[20]* command H, but gives an assured procedure to terminate an alternating mode call. For further information see the 3GPP TS 27.007 *[2]*.

## 6.12.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | AT+CHUP | OK | AT+CHUP<br>OK |
| Test | AT+CHUP=? | OK | AT+CHUP=?<br>OK |

# 6.13 Single numbering scheme +CSNS

| +CSNS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U SARA-U | | | | | |
| | SARA-G LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | *Profile* | No | - | *+CME Error* |

## 6.13.1 Description

Selects the bearer service to be used when a mobile terminated single numbering scheme call is established, i.e. when a call without bearer capability information element is received. See the 3GPP TS 23.972 [62]. Parameter values set with *+CBST* command shall be used when <mode> equals to a data service.

The behavior of this command depends on the network service.

The 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).

## 6.13.2 Syntax

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

## 6.13.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | • 0 (factory-programmed value): voice<br>• 2: fax (TS 62; TS means Tele Service) |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 4: data |

### 6.13.4 Notes

- <mode>=0 is only supported by modules where the voice is available.
- <mode>=2 is only supported by modules where the fax is available.

**LISA-U1 / LISA-U200-00S / LISA-U200-01S / LISA-U200-02S / LISA-U200-52S / LISA-U200-62S / LISA-U200-82S / LISA-U230 / LISA-U260 / LISA-U270**

- The command setting is not stored in the *Profile*.

**SARA-G300 / SARA-G310 / SARA-G340-00S / SARA-G340-01S / SARA-G350-00S / SARA-G350-00X / SARA-G350-01B / SARA-G350-01S / LEON-G**

- The command setting is not stored in the *Profile*.

## 6.14 Set reporting call status +UCALLSTAT

| +UCALLSTAT | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-60S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L2 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 6.14.1 Description

Allows to enable / disable the reporting voice or data call status on the 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) a URC +UCALLSTAT is generated for each of them.

### 6.14.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UCALLSTAT=<enable> | OK | AT+UCALLSTAT=1<br>OK |
| Read | AT+UCALLSTAT? | +UCALLSTAT: <enable><br>OK | +UCALLSTAT: 1<br>OK |
| Test | AT+UCALLSTAT=? | +UCALLSTAT: (list of supported <enable>'s)<br>OK | +UCALLSTAT: (0-1)<br>OK |
| URC | | +UCALLSTAT: <call_id>,<stat> | +UCALLSTAT: 1,2 |

### 6.14.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <enable> | Number | • 0: reporting disabled<br>• 1: reporting enabled |
| <call_id> | Number | Indicates the call identification (refer to 3GPP TS 22.030 *[15]*) |
| <stat> | Number | Indicates the call status<br>• 0: active<br>• 1: hold<br>• 2: dialling (Mobile Originated call)<br>• 3: alerting (Mobile Originated call; ringing for the remote party)<br>• 4: ringing (Mobile Terminated call)<br>• 5: waiting (Mobile Terminated call)<br>• 6: disconnected<br>• 7: connected (indicates the completion of a call setup first time for MT and MO calls - this is reported in addition to state active) |

Objective Specification

### 6.14.4 Notes

- The URC is displayed on the terminal where the command has been issued. For the USB terminals, the <enable> flag is reset when the USB cable is disconnected.

## 6.15 Information to in-band-tones availability +UPROGRESS

| +UPROGRESS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 6.15.1 Description

Configures the display of URC **+UPROGRESS: <cin>,<status>** on the DTE while a call is in progress.

### 6.15.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UPROGRESS=<mode> | OK | AT+UPROGRESS=1<br>OK |
| Read | AT+UPROGRESS? | +UPROGRESS: <mode><br>OK | +UPROGRESS: 1<br>OK |
| Test | AT+UPROGRESS=? | +UPROGRESS: (list of the supported <mode>s)<br>OK | +UPROGRESS: (0,1)<br>OK |
| URC | | +UPROGRESS: <cin>,<status> | +UPROGRESS: 1,7 |

### 6.15.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | Enabling the +UPROGRESS URC. Allowed values:<br>• 0: disable the +UPROGRESS URC<br>• 1: enable the +UPROGRESS URC |
| <cin> | String | Call number indication |
| <status> | Number | Indicates the call progress status. Allowed values:<br>• 0: no progress<br>• 1: alerting, in-band tones or TCH not yet available<br>• 2: mobile terminated call now accepted, TCH yet available<br>• 3: in-band tones available<br>• 4: in-band tones not available<br>• 5: TCH now available, mobile terminated call accepted<br>• 6: TCH now available, in-band tones available<br>• 7: TCH now available, in-band tones not available<br>• 8: TCH changed from data to speech<br>• 9: TCH changed from speech to data<br>• 10: TCH changed to signalling or data<br>• 11: the last speech call has been terminated and the speech can be disabled. Mute uplink, downlink and disable speech<br>• 12: fast connection is available<br>• 13: fast connection is closed<br>• 14: progress information element playing announcement has been received |

### 6.15.4 Notes

**TOBY-L2 / MPCI-L2**

- <status>=5, 6, 7, 8, 9 and 10 (CSD calls with alternate voice-data BS not supported) are not supported.

Objective Specification

# 6.16 Tone duration +VTD

| +VTD | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U120 LISA-U130 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 6.16.1 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).

## 6.16.2 Syntax

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

## 6.16.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <n> | Number | Range is from 0 to 255. The value 1 is default. A value different than zero causes a tone of duration <n>/10 seconds (<n> * 0.1 s). If the value 0 is selected, the tone duration is set to the default value. |

# 6.17 DTMF and tone generation +VTS

| +VTS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U120 LISA-U130 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | Yes | *Up to 7 min* | *+CME Error* |

## 6.17.1 Description

Allows the 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. The command can be aborted if a character is sent to DCE during the command execution; this behavior is not covered by the 3GPP specification.

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

The tone duration is network dependent; hence the value set with +VTS command is only the "desired" duration. For more information see the 3GPP TS 23.014 [*78*].

Objective Specification

### 6.17.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+VTS=<DTMF>[,<duration>] | OK | AT+VTS=2<br>OK<br>or<br>AT+VTS=2A,10<br>OK |
| Test | AT+VTS=? | +VTS: (list of <DTMF>s),(list of supported <duration>s)<br>OK | +VTS: (0-9,#,*,A-D),(0-255)<br>OK |

### 6.17.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <DTMF> | Character | String (without quotation marks) of ASCII characters from the set 0-9, #, *, A-D. |
| <duration> | Number | Range 0-255, expressed in <duration>/100 seconds (0.01 s). If left out or set to 0, the tone duration is given by the *+VTD* setting |

### 6.17.4 Notes

- If the command is invoked when not in a call, an error result code is reported ("+CME ERROR: no connection to phone" if *+CMEE=2* is set to 2).

**TOBY-L210-62S**

- In case of single DTMF tone the <duration> parameter must be set to 11 or above as per SBM requirement.
- In case of multiple DTMF tones the <duration> parameter must be in range [11,38]; the gap time between each tone is set to 215 ms as per SBM requirement.
- It is not possible to concatenate more +VTS AT commands (an error result code is provided in that case).

## 6.18 Start and stop tone generation +UVTS

| +UVTS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U120 LISA-U130 LISA-U2 SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 6.18.1 Description

Starts and stops the DTMF tones. In GSM this operates only in voice mode. For more information see the 3GPP TS 23.014 [*78*].

When the <DTMF> parameter is omitted the tone is stopped.

### 6.18.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UVTS=[<DTMF>] | OK | AT+UVTS=2<br>OK |
| Test | AT+UVTS=? | +UVTS: (list of supported <DTMF>s)<br>OK | +UVTS: (0-9,#,*,A-D)<br>OK |

### 6.18.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <DTMF> | Char | Single ASCII character in the set 0-9, #, *, A-D |

Objective Specification

### 6.18.4 Notes

- If the command is invoked when not in a call, an error result code is reported ("+CME ERROR: no connection to phone" if *+CMEE* is set to 2).

**TOBY-L2 / MPCI-L2**

- A tone started with AT+UVTS shall always be explicitly stopped with AT+UVTS=, otherwise subsequent DTMF tone generations triggered via +UVTS or *+VTS* commands are not allowed.

## 6.19 Redial last telephone number DL

| DL | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | *Up to 3 min* | *+CME Error* |

### 6.19.1 Description

Redials the last number used in the ATD command. The command redials the last called number as a data call, while the ATDL; command redials the last called number as a voice call, regardless of whether the number was previously dialled as data or voice call. The last called number is stored locally in volatile memory.

### 6.19.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | ATDL[;] | See *Result codes* | ATDL<br>OK |

### 6.19.3 Notes

**SARA-G340 / SARA-G350 / LEON-G**

- 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. The last called number is stored in the SIM card's last-dialling phonebook.

## 6.20 Automatic answer S0

| S0 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | *Profile* | No | - | *+CME Error* |

### 6.20.1 Description

Controls the automatic answering feature of the DCE. If set to 0, the 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.

For an incoming CSD call, if the autoanswering is enabled and the <value> parameter of *&D* command is set to 2, the autoanswering only works if the DTR line of the AT interface with activated autoanswering is set to ON. Otherwise, if DTR is OFF, then the call is rejected. If the <value> parameter of &D command is not set to 2, the DTR state has no impact on autoanswering.

### 6.20.2 Syntax

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

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | OK | OK |

### 6.20.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <value> | Number | Value in the range 0-255; the answer to the read command is in "xxx" format.<br>• 0 (factory-programmed value): disables automatic answer mode<br>• 1-255: enables automatic answering after specified number of rings |

### 6.20.4 Notes

**TOBY-L210-62S**

- The voice call autoanswering is not supported and the command is therefore not effective.

**SARA-G / LEON-G**

- The <value> parameter is not mandatory, the default value is 0.

**SARA-G340-02S / SARA-G350-02A / SARA-G350-02S**

- On the AUX UART interface, the CSD call autoanswering is actually not supported.

## 6.21 Set voice mail number +CSVM

| +CSVM | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | *< 20 s* | *+CME Error* |

### 6.21.1 Description

Sets the phone number of the voice mail server.

If the parameter <mode> is set to 0, the remaining parameters are ignored.

The voice number is stored in $EF_{CPHS}$ or $EF_{MBDN}$. Their presence on the SIM card is not mandatory. If neither are present, then the set and read command returns an error result code.

To call the voice mail number (if possible), use the *ATD1;* command.

### 6.21.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CSVM=<mode>[,<number>[,<type>]] | OK | AT+CSVM=1,"+1234567890",145<br>OK |
| Read | AT+CSVM? | +CSVM: <mode>,<number>,<type><br>OK | +CSVM: 0,"+1234567890",145<br>OK |
| Test | AT+CSVM=? | +CSVM: (list of supported <mode>s),(list of supported <type>s)<br>OK | +CSVM: (0-1),(128-255)<br>OK |

### 6.21.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | • 0: voice mail number disabled<br>• 1: voice mail number enabled |
| <number> | String | Phone number; see the *D* command description |
| <type> | Number | Type of address, octet in number format |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 145: <number> string includes '+'<br>• 129: otherwise |

### 6.21.4 Notes

- The <number> and <type> parameters can be left out if the parameter <mode> is set to 0.

## 6.22 Emergency call reporting configuration +UEMC

| +UEMC | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U201 SARA-U260-03S SARA-U270-03S SARA-U270-53S SARA-U280-03S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 6.22.1 Description

Enables / disables the +UUEMC URC that reports the presence of an emergency call.

### 6.22.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UEMC=<mode> | OK | AT+UEMC=0<br>OK |
| Read | AT+UEMC? | +UEMC: <mode><br>OK | +UEMC: 0<br>OK |
| Test | AT+UEMC=? | +UEMC: (list of supported <mode>s)<br>OK | +UEMC: (0,1)<br>OK |
| URC | | +UUEMC: <state> | +UUEMC: 1 |

### 6.22.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | • 0: +UUEMC URC reporting disabled<br>• 1: +UUEMC URC reporting enabled |
| <state> | Number | • 0: emergency call ended<br>• 1: emergency call ongoing |

## 6.23 Emergency number verification +UEMN

| +UEMN | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U201 SARA-U260-03S SARA-U270-03S SARA-U270-53S SARA-U280-03S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 6.23.1 Description

Verifies if the given <number> is recognized as an Emergency Call Code (ECC).

### 6.23.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UEMN=<number> | +UEMN: <number>,<result><br>OK | AT+UEMN="911"<br>+UEMN: "911",1<br>OK |
| Test | AT+UEMN=? | OK | OK |

Objective Specification

### 6.23.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <number> | String | Number to be verified |
| <result> | Number | • 0: <number> is not recognized as an ECC<br>• 1: <number> is recognized as an ECC |

Objective Specification

# 7 Network service

## 7.1 Subscriber number +CNUM

| +CNUM | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | *< 10 s* | *+CME Error* |

### 7.1.1 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.

### 7.1.2 Syntax

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

### 7.1.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <alphax> | String | Associated with <numberx>; used character set is selected by setting +CSCS (refer to *Chapter 4.10*) |
| <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) |

## 7.2 Signal quality +CSQ

| +CSQ | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 7.2.1 Description

Returns the Received Signal Strength Indication (RSSI) <rssi> and <qual> 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 information text response of *+CIND* and in the +CIEV URC (see the *+CMER* command description).

In dedicated mode, during the radio channel reconfiguration (e.g. handover), invalid measurements may be returned for a short transitory because the MT must compute them on the newly assigned channel.

Objective Specification

### 7.2.2 Syntax

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

### 7.2.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <rssi> | Number | Received Signal Strength Indication (RSSI):<br>• In 2G RAT it remaps the RXLEV of the serving cell or the RXLEV of the GSM dedicated channel, if any (see <RxLev> in *+CGED* command description)<br>• In UMTS RAT it remaps the Received Signal Code Power (RSCP) of the current cell (see <rscp_lev> in *+CGED* command description)<br>The range is the following:<br>• 0: -113 dBm or less<br>• 1: -111 dBm<br>• 2..30: from -109 to -53 dBm with 2 dBm steps<br>• 31: -51 dBm or greater<br>• 99: not known or not detectable or currently not available<br>See *Notes* for the parameter meaning in LTE RAT. |
| <qual> | Number | The allowed range is 0-7 and 99. The information provided depends on the selected RAT:<br>• In 2G RAT CS dedicated and GPRS packet transfer mode indicates the Bit Error Rate (BER) as specified in 3GPP TS 45.008 *[28]*<br>• In 2G RAT EGPRS packet transfer mode indicates the Mean Bit Error Probability (BEP) of a radio block. 3GPP TS 45.008 *[28]* specifies the range 0-31 for the Mean BEP which is mapped to the range 0-7 of <qual><br>• In UMTS RAT indicates the Energy per Chip/Noise (ECN0) ratio in dB levels of the current cell (see <ecn0_lev> in *+CGED* command description). 3GPP TS 25.133 *[105]* specifies the range 0 -49 for EcN0 which is mapped to the range 0-7 of <qual><br>• In LTE RAT indicates the Reference Signal Received Quality (RSRQ). TS 36.133 *[105]* specifies the range 0-34 for RSRQ which is mapped to the range 0-7 of <qual><br>See *Notes* for the complete parameter mapping |

### 7.2.4 Notes

| <qual> | 2G RAT CS and GPRS | 2G RAT EGPRS | UMTS RAT | LTE RAT |
|---|---|---|---|---|
| 0 | BER < 0.2% | 28 <= MEAN_BEP <= 31 | ECN0_LEV >= 44 | RSRQ_LEV < 5 |
| 1 | 0.2% < BER < 0.4% | 24 <= MEAN_BEP <= 27 | 38 <= ECNO_LEV < 44 | 5 <= RSRQ_LEV < 10 |
| 2 | 0.4% < BER < 0.8% | 20 <= MEAN_BEP <= 23 | 32 <= ECNO_LEV < 38 | 10 <= RSRQ_LEV < 14 |
| 3 | 0.8% < BER < 1.6% | 16 <= MEAN_BEP <= 19 | 26 <= ECNO_LEV < 32 | 14 <= RSRQ_LEV < 18 |
| 4 | 1.6% < BER < 3.2% | 12 <= MEAN_BEP <= 15 | 20 <= ECNO_LEV < 26 | 18 <= RSRQ_LEV < 22 |
| 5 | 3.2% < BER < 6.4% | 8 <= MEAN_BEP <= 11 | 14 <= ECNO_LEV < 20 | 22 <= RSRQ_LEV < 26 |
| 6 | 6.4% < BER < 12.8% | 4 <= MEAN_BEP <= 7 | 8 <= ECNO_LEV < 14 | 26 <= RSRQ_LEV < 30 |
| 7 | BER > 12.8% | 0 <= MEAN_BEP <= 3 | ECNO_LEV < 8 | RSRQ _LEV >= 30 |
| 99 | Not known or not detectable | | | |

**TOBY-L2 / MPCI-L2**

- When the module enters the Out Of Service condition, the lowest <rssi> level is reported.
- The command can be used with no need of SIM insertion, because the module always try to camp on a suitable cell at boot, unless it is started in minimum functionality or it is deregistered from network (*+COPS: 2*).

**TOBY-L200-02S / TOBY-L210-02S / TOBY-L210-62S / TOBY-L220 / TOBY-L280-02S / MPCI-L200-02S / MPCI-L210-02S / MPCI-L280**

- In LTE RAT the <rssi> parameter represents the effective Received Signal Strength Indication (RSSI).

Objective Specification

**TOBY-L200-00S / TOBY-L201 / TOBY-L210-00S / TOBY-L210-60S / TOBY-L280-00S / MPCI-L200-00S / MPCI-L201 / MPCI-L210-00S / MPCI-L210-60S**

- In LTE RAT the <rssi> parameter remaps the Reference Signal Received Power (RSRP) of the current serving cell (see the *+CESQ* command description).

**LISA-U1 / LISA-U200-00S / LISA-U200-01S / LISA-U200-02S / LISA-U200-52S / LISA-U200-62S / LISA-U200-82S / LISA-U230 / LISA-U260 / LISA-U270 / SARA-U260-00S / SARA-U270-00S / SARA-U270-00X / SARA-U280-00S**

- The <qual> parameter is not updated in GPRS and EGPRS packet transfer mode.

**SARA-G300 / SARA-G310 / SARA-G340-00S / SARA-G340-01S / SARA-G350-00S / SARA-G350-00X / SARA-G350-01B / SARA-G350-01S**

- The <qual> parameter is not updated in GPRS packet transfer mode.

**LEON-G100-07S / LEON-G100-08S**

- The <rssi> and the <qual> parameters are updated in GPRS packet transfer mode.
- If CS4 is used in GPRS packet transfer mode, the module is allowed to report <qual>=7.

**LEON-G100-06S**

- The <qual> parameter is not updated in GPRS packet transfer mode.

# 7.3 Extended signal quality +CESQ

| +CESQ | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 7.3.1 Description

Returns the received signal quality and level:

- If the current serving cell is not a GERAN cell, the <rxlev> and <ber> parameters are set to value 99
- If the current serving cell is not a UTRA FDD cell, the <rscp> and the <ecn0> parameters are set to 255
- If the current serving cell is not an E-UTRA cell, the <rsrq> and <rsrp> parameters are set to 255.

The Reference Signal Received Power (RSRP) is a LTE specific measure that averages the power received on the subcarriers carrying the reference signal. The RSRP measurement bandwidth is equivalent to a single LTE subcarrier: its value is therefore much lower than the total received power usually referred to as RSSI. In LTE the RSSI depends on the currently allocated bandwidth, which is not pre-determined. Therefore the RSSI is not useful to describe the signal level in the cell.

## 7.3.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | AT+CESQ | +CESQ: <rxlev>,<ber>,<rscp>,<ecn0>,<rsrq>,<rsrp><br>OK | +CESQ: 99,99,255,255,20,80<br>OK |
| Test | AT+CESQ=? | +CESQ: (list of supported <rxlev>s),(list of supported <ber>s),(list of supported <rscp>s),(list of supported <ecn0>s),(list of supported <rsrq>s),(list of supported <rsrp>s)<br>OK | +CESQ: (0-63,99),(0-7,99),(0-96,255),(0-49,255),(0-34,255),(0-97,255)<br>OK |

## 7.3.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <rxlev> | Number | Received Signal Strength Indication (RSSI):<br>• 0: less than -110 dBm |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 1..62: from -110 to -49 dBm with 1 dBm steps<br>• 63: -48 dBm or greater<br>• 99: not known or not detectable |
| <ber> | Number | Bit Error Rate (BER):<br>• 0..7: as the RXQUAL values described in GSM TS 05.08 *[28]*<br>• 99: not known or not detectable |
| <rscp> | Number | Received Signal Code Power (RSCP):<br>• 0: -121 dBm or less<br>• 1..95: from -120 dBm to -24 dBm with 1 dBm steps<br>• 96: -25 dBm or greater<br>• 255: not known or not detectable |
| <ecn0> | Number | Ratio of received energy per PN chip to the total received power spectral density:<br>• 0: -24.5 dB or less<br>• 1..48: from -24 dB to -0.5 dBm with 0.5 dB steps<br>• 49: 0 dB or greater<br>• 255: not known or not detectable |
| <rsrq> | Number | Reference Signal Received Quality (RSRQ):<br>• 0: -19 dB or less<br>• 1..33: from -19.5 dB to -3.5 dB with 0.5 dB steps<br>• 34: -3 dB or greater<br>• 255: not known or not detectable |
| <rsrp> | Number | Reference Signal Received Power (RSRP):<br>• 0: -141 dBm or less<br>• 1..96: from -140 dBm to -45 dBm with 1 dBm steps<br>• 97: -44 dBm or greater<br>• 255: not known or not detectable |

### 7.3.4 Notes

#### TOBY-L2 / MPCI-L2

- When the module enters the Out Of Service condition, the lowest <rxlev> level is reported.
- The command can be used with no need of SIM insertion, because the module always try to camp on a suitable cell at boot, unless it is started in minimum functionality or it is deregistered from network (*+COPS: 2*).

## 7.4 Operator selection +COPS

| +COPS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | *Profile* | Yes | *Up to 3 min* | *+CME Error* |

### 7.4.1 Description

Forces an attempt to select and register with the GSM/UMTS/EPS network operator, that can be chosen in the list of network operators returned by the test command. Through <mode> parameter the network selection can automatically be performed or forced by this command: the access technology is indicated in <AcT> parameter (where supported).

u-blox cellular modules are certified according to all the capabilities and options stated in the Protocol Implementation Conformance Statement document (PICS) of the module. The PICS, according to 3GPP TS 51.010-2 [*83*], 3GPP TS 34.121-2 [*84*], 3GPP TS 36.521-2 [*114*] and 3GPP TS 36.523-2 [*115*], is a statement of the implemented and supported capabilities and options of a device. If the user changes the command settings during the certification process, the PICS of the application device integrating a u-blox cellular module must be changed accordingly.

Objective Specification

To be able to exploit all command functionalities, the SIM card verification is required. The command is accessible also without an inserted SIM. In this case the command AT+COPS=0 always returns an error result code 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 by verifying the active profile with *AT&V* (parameter <format> is then also visible).

The command handling depends on the <mode> parameter value:

- **<mode>=0 and <mode>=1**: the AT command setting is immediately stored in the current activated profile. If the MT is set in automatic selection mode (<mode>= 0), only the mode will be saved. If the MT is set in manual mode (<mode>= 1), also the format (<format>) and operator (<oper>) will be stored in the profile.
- **<mode>=4**: the module starts a manual selection of the specified operator; if this operation is not successful, the module will start an automatic network selection and will remain in automatic mode.
- **<mode>=5 and <mode>=6**: an extended network search is performed
  - **For GSM networks**: all cells found will be reported, including those belonging to the neighbour list of the serving cell. The command response includes the following data (if supported): AcT, MCC, MNC, LAC, CI, BSIC, Arfcn, RxLev (see the *+CGED* command for the parameter description)
  - **For UMTS networks**: all cells found will be reported, including those belonging to the neighbour list of the serving cell. For each cell, the scan will trigger the additional reception of the SIB type 1 and type 3, to properly report the LAC, RAC, and CI of the cell. The command response includes the following data: MCC, MNC, LAC, RAC, CI, DLF, ULF, SC, RSCP LEV, ECN0 LEV (see the *+CGED* command for the parameter description)
- **<mode>=8**: a network timing advance search is performed
  - The network timing advance search is performed only on the serving cell and the 6 neighbour cells of BA list with the higher power levels.
  - The information text response always includes the following data for the serving cell and for the other 6 neighbour cells: MCC, MNC, LAC, CI, BSIC, Arfcn, RxLev (see the *+CGED* command for the parameter description) and TA. When the <CI> value is not valid, no data of the correspondent neighbour cell is inside the information text response.
  - It can be started only when the module is in idle mode and no reselection is ongoing. The network condition could sometimes increase the estimated response time.
  - No mobile terminated/originated SMS, PS or CS call are handled when the network timing advance search is running. Furthermore mobility management procedures (for example: routing area update procedure or location update procedure) are delayed after the end of timing advance search.

If the set command with <mode>=0 is issued, a further set command with <mode>=0 is managed as a user reselection (see the 3GPP TS 23.122 [*70*]), i.e. the module triggers a search for the HPLMN or a higher order PLMN. This is useful when roaming in areas where the HPLMN or a higher order PLMN is available. If no HPLMN or higher order PLMN is found, the module remains in the state it was in prior to the search (e.g. camped and/or registered on the PLMN before the search).

The user should not rely only on the set command "OK" final result code as a confirmation that the network selection has been performed. To determine the current network registration status, *+CREG* and *+CGREG* should be also checked.

The test command returns long and short <oper> strings from the module's ROM PLMN name list (see *+COPN*). To handle possible mismatches between the PLMN names returned by the test command and the read command, the numeric format should be preferred.

## 7.4.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+COPS=[<mode>[,<format>[,<oper>[,<AcT>]]]] | **If <mode>=0, 1, 2, 3, 4:** | AT+COPS=0,0 |
| | | OK | OK |
| | | **If <mode>=5 and on GSM networks:** | AT+COPS=5 |
| | | | MCC:222, MNC: 88, LAC:55fa, CI:ffff, BSIC:3f, Arfcn:00104, RxLev:037 |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | [MCC:<MCC>, MNC:<MNC>, LAC:<LAC>, CI:<CI>, BSIC:<BSIC>, Arfcn:<Arfcn>, RxLev:<RxLev><br>[MCC:<MCC>, MNC:<MNC>, LAC:<LAC>, CI:<CI>, BSIC:<BSIC>, Arfcn:<Arfcn>, RxLev:<RxLev><br>[...]]]<br>OK | MCC:222, MNC: 10, LAC:4e54, CI:ffff, BSIC:32, Arfcn:00080, RxLev:032<br>...<br>...<br>MCC:222, MNC: 88, LAC:55fa, CI:1d39, BSIC:3d, Arfcn:00756, RxLev:005<br>OK |
| | | **If <mode>=5 and on UMTS networks:**<br>[MCC:<MCC>, MNC:<MNC>, LAC:<LAC>, RAC:<RAC>, CI:<CI>, DLF:<dl_frequency>, ULF:<ul_frequency>, SC:<SC>, RSCP LEV:<RSCP LEV>, ECN0 LEV:<ecn0_lev><br>[MCC:<MCC>, MNC:<MNC>, LAC:<LAC>, RAC:<RAC>, CI:<CI>, DLF:<dl_frequency>, ULF:<ul_frequency>, SC:<SC>, RSCP LEV:<rscp_lev>, ECN0 LEV:<ecn0_lev><br>[...]]]<br>OK | AT+COPS=5<br>MCC:222, MNC:10, LAC:61ef, RAC:14, CI:07d2088, DLF:10788, ULF: 9838, SC:81, RSCP LEV:23, ECN0 LEV:41<br>MCC:222, MNC:10, LAC:61ef, RAC:14, CI:07d2085, DLF:10813, ULF: 9863, SC:81, RSCP LEV:26, ECN0 LEV:41<br>...<br>...<br>MCC:222, MNC:01, LAC:ef8d, RAC:0, CI:52d36fb, DLF:10688, ULF: 9738, SC:285, RSCP LEV:16, ECN0 LEV:32<br>OK |
| | | **If <mode>=6 and on GSM networks:**<br>[<AcT>,<MCC>,<MNC>,<LAC>,<CI>,<BSIC>,<Arfcn>,<RxLev><br>[<AcT>,<MCC>,<MNC>,<LAC>,<CI>,<BSIC>,<Arfcn>,<RxLev> [...]]]<br>OK | AT+COPS=6<br>0,222,88,55fa,ffff,3f,00104,037<br>...<br>0,222,10,4e54,ffff,32,00080,032<br>...<br>OK |
| | | **If <mode>=6 and on UMTS networks:**<br>[<MCC>,<MNC>,<LAC>,<RAC>,<CI>,<dl_frequency>,<ul_frequency>,<SC>,<RSCP LEV>,<ecn0_lev><br>[<MCC>,<MNC>,<LAC>,<RAC>,<CI>,<dl_frequency>,<ul_frequency>,<SC>,<RSCP LEV>,<ecn0_lev><br>[...]]]<br>OK | AT+COPS=6<br>222,99,754f,2,03554d7,10713,9763,341,255,14<br>...<br>222,01,ef8d,0,52d2647,10663,9713,453,4,23<br>...<br>OK |
| | | **If <mode>=8 and on GSM networks:**<br>[MCC:<MCC>, MNC:<MNC>, LAC:<LAC>, CI:<CI>, BSIC:<BSIC>, Arfcn:<Arfcn>, RxLev:<RxLev>, TA:<TA><br>[MCC:<MCC>, MNC:<MNC>, LAC:<LAC>, CI:<CI>, BSIC:<BSIC>, Arfcn:<Arfcn>, RxLev:<RxLev>, TA:<TA><br>[...]]]<br>OK | AT+COPS=8<br>MCC:222, MNC: 10, LAC:4e54, CI:12f1, BSIC:3f, Arfcn:00104, RxLev:037, TA:3<br>MCC:222, MNC: 10, LAC:4e54, CI:8841, BSIC:32, Arfcn:00080, RxLev:032, TA:5<br>MCC:222, MNC: 10, LAC:4e54, CI:1ef4, BSIC:31, Arfcn:00082, RxLev:022, TA:255<br>...<br>MCC:222, MNC: 10, LAC:55fa, CI:1d39, BSIC:3d, Arfcn:00756, RxLev:005, TA:7<br>OK |
| Read | AT+COPS? | +COPS: <mode>[,<format>,<oper>[,<AcT>]]<br>OK | +COPS: 0,0,"vodafone IT"<br>OK |
| Test | AT+COPS=? | +COPS: [(<stat>, long <oper>, short <oper>, numeric <oper>[,<AcT>])[,(<stat>, long <oper>, short <oper>, numeric <oper>[,<AcT>]),[...]]], | +COPS: (2,"vodafone IT","voda IT","22210"),(1,"SI vodafone","vodafone SI","29340"),(1,"I WIND","I WIND","22288"),(1,"I TIM","TIM", |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | (list of supported <mode>s),(list of supported <format>s) | "22201"),(1,"MOBITEL","MOBITEL","29341"),,(0-4),(0-2) |
| | | OK | OK |

## 7.4.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | Is used to chose whether the network selection is automatically done by the MT or is forced by this command to the operator <oper> given in the format <format>:<br>• 0 (default value and factory-programmed value): automatic (<oper> field is ignored)<br>• 1: manual<br>• 2: deregister from network<br>• 3: set only <format><br>• 4: manual/automatic<br>• 5: extended network search<br>• 6: extended network search without the tags (e.g. MCC, RxLev will not be printed, see the syntax and the command example)<br>• 8: network timing advance search |
| <format> | Number | • 0 (factory-programmed value): long alphanumeric <oper><br>• 1: short format alphanumeric <oper><br>• 2: numeric <oper> |
| <oper> | String | Given in format <format> this field may be up to 24 characters long for long alphanumeric format, up to 10 characters for short alphanumeric format and 5 or 6 characters long for numeric format (MCC/MNC codes). The factory-programmed value is FFFF (undefined). |
| <stat> | Number | • 0: unknown<br>• 1: available<br>• 2: current<br>• 3: forbidden |
| <AcT> | Number | Indicates the radio access technology<br>• 0: GSM<br>• 1: GSM COMPACT<br>• 2: UTRAN<br>• 3: GSM with EDGE availability<br>• 4: UTRAN with HSDPA availability<br>• 5: UTRAN with HSUPA availability<br>• 6: UTRAN with HSDPA and HSUPA availability<br>• 7: LTE |
| <TA> | Number | Timing Advance; the range is 0-63. If the information is not known or not detectable or currently not available, the value is 255. |

## 7.4.4 Notes

- <format> and <oper> parameters are optional only if the value of <mode> parameter is 0, 2 or 3.
- If the antenna is not connected, then the information text response to the test command is: +COPS: ,, (0-4),(0-2)
- The command can be aborted if a character is sent to DCE during the command execution. When aborted, the result code is "ABORTED".

**TOBY-L2 / MPCI-L2**

- The user reselection cannot be managed through the issuing of two set commands with <mode>=0.
- In case of 3G cells, regardless of the actual HSPA support, the <AcT> value in the information text response of the test command is 2.
- If the set command with <mode>=0 is issued, a further set command with <mode>=0 is managed as a user reselection (see the 3GPP TS 23.122 [70]), i.e. the module triggers a search for the HPLMN or a higher order PLMN. This is useful when roaming in areas where the HPLMN or a higher order PLMN is available. If no HPLMN or higher order PLMN is found, the module remains in the state it was in prior to the search (e.g. camped and/or registered on the PLMN before the search).

Objective Specification

- If the current network selection mode is manual, the user reselection is immediately triggered by issuing the set command with <mode>=0
- In case of 2G cells, regardless of the actual EGPRS support, the <AcT> value in the information text response of the test command is 0.
- If the module is set to "CG" class with *+CGCLASS* command, the manual selection of a forbidden PLMN shall be triggered with *+UCGOPS* command; the AT+COPS=1 command cannot be issued for this purpose.
- <mode>=5 (extended network search) is not supported.
- <mode>=6 (extended network search without the tags) is not supported.
- <mode>=8 (network timing advance search) is not supported.

**LISA-U / SARA-U**

- When <format> is set to alphanumeric (0 or 1) the read command's <oper> value is retrieved from the first match found in the following "name sources" (from highest to lowest priority):
  - $EF_{OPL}$ and $EF_{PNN}$ files (SIM card dependent, see below)
  - NITZ service (network dependant)
  - CPHS operator name string (SIM card dependent)
  - Hardcoded list in the module's firmware

  If no match is found in the "name sources" the broadcasted MCC-MNC is displayed. If the PLMN network name and operator name list services are "enabled" in the SIM card, then the $EF_{OPL}$ and $EF_{PNN}$ are used for displaying the <oper> name if a match can be found.
- <AcT>=1, 3, 4, 5, 6, 7 are not supported.
- <mode>=8 (network timing advance search) is not supported.
- The <AcT> parameter is not available in the information text response of the set command with <mode>=6 (extended network search without the tags).

**SARA-U270-53S / SARA-U280**

- <AcT>=0 is not supported.

**LISA-U200-00S / LISA-U200-01S / LISA-U200-02S / LISA-U200-52S / LISA-U200-62S / LISA-U200-82S / LISA-U230 / LISA-U260 / LISA-U270 / SARA-U260-00S / SARA-U270-00S / SARA-U270-00X / SARA-U280-00S**

- <mode>=6 (extended network search without the tags) is not supported.
- In GSM networks, the extended network search will not report the neighbour cells (BA - BCCH Allocation list) of the 2G serving cell. Such cells are reported by *AT+CGED* command if <mode> is set e.g. to 5.

**SARA-G / LEON-G**

- The AT command settings are not automatically stored in the current activated profile.
- When the command is aborted during the execution the final result code is "OK".
- The <AcT> parameter is only available in the information text response of the set command with <mode>=6 (extended network search without the tags).
- Supporting <mode>=5 the following restrictions apply:
  - If the SIM card is inserted and the PIN verification is enabled but has not been verified, <mode>=5 cannot be used.
  - If the SIM card is not inserted, <mode>=5 cannot be immediately used after a switch on. Before issuing the command, the RF circuits must be enabled, e.g. by starting an emergency call or entering AT+COPS=0.
- If the cellular module boots with <mode>=2 it is not possible to start a network scan (with AT+COPS=? or AT+COPS=5 or AT+COPS=6) until AT+COPS is invoked with <mode>=0 or 1.
- If the RPLMN (Registered PLMN) is not present in the ROM PLMN name list, the read command displays <oper> in the format <MCC>:<MNC>.

Objective Specification

**SARA-G300 / SARA-G310 / SARA-G340-00S / SARA-G340-01S / SARA-G350-00S / SARA-G350-00X / SARA-G350-01B / SARA-G350-01S**

- The extended network search will not report the neighbour cells (BA - BCCH Allocation list) of the serving cell. Such cells are reported by *AT+CGED* command if <mode> is set e.g. to 5.
- <mode>=6 (extended network search without the tags) is not supported.
- <mode>=8 (network timing advance search) is not supported.

**LEON-G**

- The extended network search will not report the neighbour cells (BA - BCCH Allocation list) of the serving cell. Such cells are reported by *AT+CGED* command if <mode> is set e.g. to 5.
- <mode>=8 (network timing advance search) is not supported.

**LEON-G100-06S**

- <mode>=6 (extended network search without the tags) is not supported.

# 7.5 Radio Access Technology (RAT) selection +URAT

| +URAT | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| | LISA-U SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | *NVM* | No | - | *+CME Error* |

## 7.5.1 Description

Forces the selection of the Radio Access Technology (RAT) in the protocol stack. On the subsequent network registration (*+COPS*, *+CGATT*) the selected RAT is used.

u-blox cellular modules are certified according to all the capabilities and options stated in the Protocol Implementation Conformance Statement document (PICS) of the module. The PICS, according to 3GPP TS 51.010-2 [*83*], 3GPP TS 34.121-2 [*84*], 3GPP TS 36.521-2 [*114*] and 3GPP TS 36.523-2 [*115*], is a statement of the implemented and supported capabilities and options of a device. If the user changes the command settings during the certification process, the PICS of the application device integrating a u-blox cellular module must be changed accordingly.

Any change in the RAT selection must be done in the detached state (see *Notes* for the procedure to enter the detach state).

If dual or tri mode is selected, it is also possible to select the preferred RAT, which determines which RAT is selected first (if both available). If the preferred RAT is omitted, the first selected RAT will be the higher RAT selected.

In dual mode and tri mode, all the requested Access Stratum protocols are active and Inter-RAT measurements as well as Inter-RAT handovers may be performed (if ordered by the network).

TOBY-L200 / TOBY-L201 / MPCI-L200 / MPCI-L201
AT&T RAT balancing can force RAT usage regardless of the RAT imposed by means of the AT+URAT command.

## 7.5.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+URAT=<SelectedAcT>[,<PreferredAct>] | OK | AT+URAT=1,0<br>OK |
| Read | AT+URAT? | +URAT: <SelectedAcT>[,<PreferredAct>]<br>OK | +URAT: 1,2<br>OK |
| Test | AT+URAT=? | +URAT: (list of the supported <SelectedAcT>s),(list of the supported <PreferredAct>s) | +URAT: (0-6),(0,2,3)<br>OK |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | OK | |

### 7.5.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <SelectedAcT> | Number | Indicates the radio access technology and may be:<br>• 0: GSM (single mode)<br>• 1: (factory-programmed value): GSM / UMTS (dual mode)<br>• 2: UMTS (single mode)<br>• 3: LTE (single mode)<br>• 4: GSM / UMTS / LTE (tri mode)<br>• 5: GSM / LTE (dual mode)<br>• 6: UMTS / LTE (dual mode) |
| <PreferredAct> | Number | Indicates the preferred access technology; it is ignored if dual mode or tri mode are not selected.<br>• 0: GSM<br>• 2 (default value and factory-programmed value): UTRAN<br>• 3: LTE |

### 7.5.4 Notes

**TOBY-L2 / MPCI-L2**

- The factory-programmed value of <SelectedAcT> is 4.
- The default value and factory-programmed value of <PreferredAct> is 3.
- Issue the *AT+CFUN=4* AT command to detach the module from the network. Use *AT+CFUN=1* to return to the module full functionality.
- The set command changing RAT selection (although entered in de-registered state) re-activates the protocol stack by triggering a network scan. As such network scan may interfere with successive registration commands, that may answer with an error result code due to overlapping activities, it is suggested to wait 15 s after the +URAT set command before entering any AT command that triggers a PS or a CS registration. Alternatively, the user can neglect the error result code and wait for the module to complete the registration by polling the registration status or waiting for appropriate URCs.

**TOBY-L200-02S / TOBY-L210-02S / TOBY-L220 / TOBY-L280-02S / MPCI-L200-02S / MPCI-L210-02S / MPCI-L280**

- When a 2G only SIM is used (the *+UUICC* AT command can be used to check the SIM type), LTE support is implicitly disabled by the module because a 2G SIM cannot register on LTE radio access technology. The +URAT read command will reflect the actual setting of the module. This automatic RAT adaptation occurs after the SIM has been read, e.g. after the PIN insertion.

**TOBY-L201 / TOBY-L220 / MPCI-L201**

- <SelectedAcT>=0, 1, 4, 5 are not supported. The factory-programmed value of <SelectedAcT> is 6.
- <PreferredAct>=0 is not supported.

**LISA-U / SARA-U**

- <SelectedAcT>=3, 4, 5, 6 are not supported.
- <PreferredAct>=3 is not supported.
- Issue the *AT+COPS=2* AT command to detach the module from the network.

**SARA-U270-53S / SARA-U280**

- <SelectedAcT>=0, 1 are not supported.
- <PreferredAct>=0 is not supported.

Objective Specification

# 7.6 Display EONS names +UEONS

| +UEONS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | *< 40 s* | *+CME Error* |

## 7.6.1 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.

## 7.6.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | AT+UEONS | +UEONS: [list of supported (<stat>,long alphanumeric <oper>,short alphanumeric <oper>,numeric <oper>[,<AcT>], [EONS long operator name],[EONS short operator name])s]<br>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")<br>OK |
| Test | AT+UEONS=? | OK | |

## 7.6.3 Defined values

Refer to the description of +COPS parameters (more details in *Chapter 7.4*).

## 7.6.4 Notes

### SARA-G / LEON-G

- the <AcT> parameter is not supported.

# 7.7 Display operator name +UDOPN

| +UDOPN | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | Yes | No | No | *Up to 1 s* | *+CME Error* |

## 7.7.1 Description

Displays the name of the network of the requested <type>:

- If the requested information is not available (e.g. no SIM-files $EF_{OPL}$ and $EF_{PNN}$), the command displays the network name which is most similar to the requested <type>
- If 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 PLMN name matches to the current network, its numeric format (i.e. <type> 0) is returned

The maximum expected response time could request about 1 s if the data are read by the SIM.

Objective Specification

### 7.7.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UDOPN=<type> | +UDOPN: <type>[,<name>[,<display_condition>]]<br>OK | AT+UDOPN=4<br>+UDOPN: 4,"Main Network"<br>OK |
| | | | AT+UDOPN=7<br>+UDOPN: 7,"SERVICE-PROVIDER",1<br>OK |
| | | | AT+UDOPN=7<br>+UDOPN: 7,""<br>OK |
| Test | AT+UDOPN=? | +UDOPN: (list of supported <type>s)<br>OK | +UDOPN: (0-9)<br>OK |

### 7.7.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <type> | Number | • 0: numeric format of MCC/MNC network (three BCD digit country code and two/three BCD digit network code)<br>• 1: short name in ROM<br>• 2: long name in ROM<br>• 3: short network operator name (CPHS)<br>• 4: long network operator name (CPHS)<br>• 5: short NITZ name<br>• 6: full NITZ name<br>• 7: service provider name<br>• 8: EONS short operator name<br>• 9: EONS long operator name<br>• 11: short network operator name<br>• 12: long network operator name |
| <name> | String | • MCC/MNC code for <type> = 0<br>• Corresponding network name for <type> = 1, 2, 3, 4, 5, 6, 8, 9, 11 or 12<br>• Service provider name followed by <display_condition> for <type>=7 |
| <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). |

### 7.7.4 Notes

- EONS means Enhanced Operator Name from SIM-files $EF_{OPL}$ and $EF_{PNN}$.
- The coding of <name> is according to the *+CSCS* setting.

**SARA-G / LEON-G**

- <type>=11 and <type>=12 are not supported.

## 7.8 Preferred PLMN list selection +CPLS

| +CPLS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| | LISA-U SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 7.8.1 Description

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.

Objective Specification

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.

### 7.8.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CPLS=<list> | OK | AT+CPLS=1<br>OK |
| Read | AT+CPLS? | +CPLS: <list><br>OK | +CPLS: 1<br>OK |
| Test | AT+CPLS=? | +CPLS: (list of supported <list>s)<br>OK | +CPLS: (0-2)<br>OK |

### 7.8.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <list> | Number | • 0 (factory-programmed and default value): user controlled PLMN selector with Access Technology $EF_{PLMNwAcT}$, if not found in the SIM/UICC then PLMN preferred list $EF_{PLMNsel}$ (this file is only available in SIM card or GSM application selected in UICC); these files can be read and updated (see the 3GPP TS 31.102 *[19]*).<br>• 1: operator controlled PLMN selector with Access Technology $EF_{OPLMNwAcT}$; this file can be read only (see the 3GPP TS 31.102 *[19]*).<br>• 2: HPLMN selector with Access Technology $EF_{HPLMNwAcT}$; this file can be read only (see the 3GPP TS 31.102 *[19]*). |

### 7.8.4 Notes

#### LISA-U / SARA-U

- The set command can be issued also omitting the <list> parameter.

## 7.9 PS operator selection +UCGOPS

| +UCGOPS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | Yes | No | No | *Up to 3 min* | *+CME Error* |

### 7.9.1 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 can be aborted if a character is sent to the DCE during the command execution. If the automatic selection is set (<mode>=0), the other parameters must be omitted.

### 7.9.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UCGOPS=[<mode>[,<format>[,<oper>[,<AcT>]]]] | OK | AT+UCGOPS=0<br>OK<br>AT+UCGOPS=1,2,"22201"<br>OK |
| Read | AT+UCGOPS? | +UCGOPS: <status>[,<format>,<oper>,<AcT>] | +UCGOPS: 1,2,"22210",0<br>OK |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | OK | |
| 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)<br>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)<br>OK |

## 7.9.3 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<br>• 0 (default value): automatic (<oper> field is ignored)<br>• 1: manual |
| <format> | Number | Mandatory parameter if <mode> value is 1, it specifies the format of the network operator name<br>• 0 (default value): long alphanumeric <oper><br>• 1: short format alphanumeric <oper><br>• 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<br>• 0: unknown<br>• 1: available<br>• 2: current<br>• 3: forbidden |
| <ps_availability> | Number | GPRS availability<br>• 0: not supported<br>• 1: supported |
| <AcT> | Number | Indicates the radio access technology<br>• 0: GSM<br>• 1: GSM COMPACT<br>• 2: UTRAN (UMTS)<br>• 3: GSM with EDGE availability<br>• 4: UTRAN with HSDPA availability<br>• 5: UTRAN with HSUPA availability<br>• 6: UTRAN with HSDPA and HSUPA availability<br>• 7: LTE |
| <status> | Number | Current GPRS registration status and PLMN selection mode of the MT<br>• 0: attached, automatic PLMN selection mode<br>• 1: attached, manual PLMN selection mode<br>• 2: detached |

## 7.9.4 Notes

### TOBY-L2 / MPCI-L2

- The test command triggers a network search only when the MT is in class "CG" or detached from the network (i.e. *+COPS: 2*). If the MT is in class "B", the test command will immediately return an error result code.

### LISA-U / SARA-U

- The <AcT> parameter can be set only to 0 and 2.

### SARA-G / LEON-G

- The <AcT> parameter is not supported.

Objective Specification

# 7.10 Network registration status +CREG

| +CREG | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | No | No | - | *+CME Error* |

## 7.10.1 Description

Configures the network registration information. Depending on the <n> parameter value a URC can be issued:

- +CREG: <stat> if <n>=1 and there is a change in the MT's circuit switched mode network registration status in GERAN/UTRAN/E-UTRAN
- +CREG: <stat>[,<lac>,<ci>[,<AcTStatus>]] if <n>=2 and there is a change of the network cell in GERAN/UTRAN/E-UTRAN

The parameters <AcTStatus>, <lac>, <ci> are provided only if available.

The read command provides the same information issued by the URC together with the current value of <n> parameter. The location information elements <lac>, <ci> and <AcTStatus>, if available, are returned only when <n>=2 and the MT is registered with the network.

When <n>=2, in UMTS RAT, during dedicated connections, unsolicited location information may be received if the network sends the UTRAN INFORMATION MOBILITY message. In GSM RAT, during a CS connection, no unsolicited location information is received.

If the MT also supports GPRS services and/or EPS services in E-UTRAN, the *+CGREG* / *+CEREG* set and read command result codes apply to the registration status and location information for those services.

## 7.10.2 Syntax

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

## 7.10.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <n> | Number | • 0 (default value and factory-programmed value): network registration URC disabled<br>• 1: network registration URC +CREG: <stat> enabled<br>• 2: network registration and location information URC +CREG: <stat>[,<lac>,<ci>[,<AcTStatus>]] enabled |
| <stat> | Number | • 0: not registered, the MT is not currently searching a new operator to register to<br>• 1: registered, home network<br>• 2: not registered, but the MT is currently searching a new operator to register to<br>• 3: registration denied<br>• 4: unknown (e.g. out of GERAN/UTRAN/E-UTRAN coverage)<br>• 5: registered, roaming<br>• 6: registered for "SMS only", home network (applicable only when <AcTStatus> indicates E-UTRAN)<br>• 7: registered for "SMS only", roaming (applicable only when <AcTStatus> indicates E-UTRAN)<br>• 9: registered for "CSFB not preferred", home network (applicable only when <AcTStatus> indicates E-UTRAN) |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 10: registered for "CSFB not preferred", roaming (applicable only when <AcTStatus> indicates E-UTRAN) |
| <lac> | String | Two bytes location area code or tracking area code (if <AcTStatus>=7) in hexadecimal format (e.g. "00C3"). The value FFFF means that the current <lac> value is invalid. |
| <ci> | String | From 2 to 4 bytes cell ID in hexadecimal format (e.g. "A13F" or "129080B"). The value FFFFFFFF means that the current <ci> value is invalid. |
| <AcTStatus> | Number | Indicates the radio access technology<br>• 0: GSM<br>• 1: GSM COMPACT<br>• 2: UTRAN<br>• 3: GSM with EDGE availability<br>• 4: UTRAN with HSDPA availability<br>• 5: UTRAN with HSUPA availability<br>• 6: UTRAN with HSDPA and HSUPA availability<br>• 7: E-UTRAN<br>• 255: the current <AcTStatus> value is invalid |

### 7.10.4 Notes

The following is an overview of the values assumed by the <stat> parameter:

- 0: a technical problem could have occurred, the user is requested to intervene. It is still possible to make emergency calls if some network is available. Possible causes:
  - PIN not entered
  - Invalid HPLMN found on the SIM (SIM read error)
  - SIM card not present

  The registration is not started
- 1: the MT is registered for circuit-switched services on the HPLMN (or on one of the equivalent HPLMN's, whose list is provided by the SIM)
- 2: the module is searching a network to register on. Possible causes:
  - No network available
  - Available networks have insufficient Rx level
  - HPLMN or allowed PLMN are available but the registration is rejected, e.g. roaming is not allowed in this Location Area

  It is still possible to make emergency calls if network coverage is available
- 3: the CS registration failed after a Location Update Reject; possible causes are:
  - Illegal MS
  - Illegal ME
  - IMSI unknown at HLR
  - PLMN not allowed
  - Location area not allowed
  - Roaming not allowed in this location area
  - Network failure
  - Network congestion

  It is still possible to make emergency calls if network coverage is available.

  If the registration type is manual, then no further attempt is made to search for a new PLMN or register with it. If the registration type is automatic, the MS may look for an allowed PLMN if the rejection cause was roaming restriction. In case of illegal MS /ME, there could be possible problems with either the SIM card or with the ME's identity (IMEI): user intervention may be required
- 4: this value, usually transitory, is returned if the registration state does not belong to any of the following:
  - Normal
  - Limited

Objective Specification

  - o No service
  - o Service detached
  - o Service disabled

  It may be issued after the failure of a registration procedure, before starting a PLMN search, when <stat>=2.
- 5: the MT is registered for circuit-switched services on a VPLMN, in national or international roaming
- 6: in LTE, the MT is registered only for the SMS circuit-switched service on the HPLMN (ore on one of the equivalent HPLMN's)

  TOBY-L200-00S / TOBY-L210-00S / TOBY-L210-60S / TOBY-L280-00S / MPCI-L200-00S / MPCI-L210-00S / MPCI-L210-60S
  Being SMS the only non-EPS service supported by these modules, this status is equivalent to 1.
- 7: in LTE, the MT is registered only for the SMS circuit-switched service on a VPLMN, in national or international roaming

  TOBY-L200-00S / TOBY-L210-00S / TOBY-L210-60S / TOBY-L280-00S / MPCI-L200-00S / MPCI-L210-00S / MPCI-L210-60S
  Being SMS the only non-EPS service supported by these modules, this status is equivalent to 5.

**TOBY-L2 / MPCI-L2**

- The information text response to the read command and the URC will assume these values in these conditions:
  - o During the initial network searching at the module power on the <stat> parameter is 2
  - o If the module is CS attached to the GSM/UTRAN/E-UTRAN home network the <stat> parameter is 1
  - o In the out of coverage state the <stat> parameter is 2

**TOBY-L200-00S / TOBY-L210-00S / TOBY-L210-60S / TOBY-L280-00S / MPCI-L200-00S / MPCI-L210-00S / MPCI-L210-60S**

- <stat>=9 and 10 are not supported.

**LISA-U / SARA-U**

- <AcTStatus>=7 is not supported.

**LISA-U1**

- The <AcTStatus> parameter is not supported.

**SARA-G / LEON-G**

- 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.
- <AcTStatus> parameter is not supported.

**SARA-G300 / SARA-G310 / SARA-G340-00S / SARA-G340-01S / SARA-G350-00S / SARA-G350-00X / SARA-G350-01B / SARA-G350-01S / LEON-G**

- Equivalent HPLMN for <stat>=1 is not supported: <stat>=5 is indicated in this case.

# 7.11 HSDPA/HSUPA mode configuration +UHSDUPA

| +UHSDUPA | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| | LISA-U SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | *NVM* | No | - | *+CME Error* |

## 7.11.1 Description

Enables / disables HSDPA and HSUPA also configuring the related data rate. The settings are saved in NVM at power off; the new configuration will be effective at the next power on.

u-blox cellular modules are certified according to all the capabilities and options stated in the Protocol Implementation Conformance Statement document (PICS) of the module. The PICS, according to 3GPP

Objective Specification

TS 51.010-2 [83], 3GPP TS 34.121-2 [84], 3GPP TS 36.521-2 [114] and 3GPP TS 36.523-2 [115], is a statement of the implemented and supported capabilities and options of a device. If the user changes the command settings during the certification process, the PICS of the application device integrating a u-blox cellular module must be changed accordingly.

### 7.11.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UHSDUPA=<HSDPA-mode>,<HS-DSCH_category>[,<HSUPA-mode>[,<E-DCH_category>]] | OK | AT+UHSDUPA=1,8,1,6<br>OK |
| Read | AT+UHSDUPA? | +UHSDUPA: <HSDPA-mode>,<HS-DSCH_category>,<HSUPA-mode>,<E-DCH_category><br>OK | +UHSDUPA: 1,8,1,6<br>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)<br>OK | +UHSDUPA: (0-1),(6,8,10,12,13,14),(0,1),(1,2,6)<br>OK |

### 7.11.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <HSDPA-mode> | Number | • 0: HSDPA off<br>• 1 (default and factory-programmed value): HSDPA on |
| <HS-DSCH_category> | Number | HS-DSCH category defined in 3GPP TS 25.306 [53]<br>• 6: category 6<br>• 8 (default and factory-programmed value): category 8<br>• 10: category 10<br>• 12: category 12<br>• 13: category 13<br>• 14: category 14<br>• 24: category 24 |
| <HSUPA-mode> | Number | • 0: HSUPA off<br>• 1 (default and factory-programmed value): HSUPA on |
| <E-DCH_category> | Number | E-DCH category defined in 3GPP TS 25.306 [53]<br>• 1: category 1<br>• 2: category 2<br>• 4: category 4<br>• 5: category 5<br>• 6 (default and factory-programmed value): category 6 |

### 7.11.4 Notes

**TOBY-L2 / MPCI-L2**

- <E-DCH_category>=1, 2, 4 are not supported.

**TOBY-L200 / TOBY-L201 / MPCI-L200 / MPCI-L201**

- <HS-DSCH_category>=6, 10, 12, 13, 24 are not supported.
- The factory-programmed and default value of <HS-DSCH_category> is 14.

**TOBY-L210 / TOBY-L220 / TOBY-L280 / MPCI-L200 / MPCI-L280**

- <HS-DSCH_category>=6, 10, 12, 13 are not supported.
- The factory-programmed and default value of <HS-DSCH_category> is 24.

**LISA-U2 / SARA-U**

- <E-DCH_category>=5 is not supported.

Objective Specification

**LISA-U200-01S / LISA-U200-02S / LISA-U200-52S / LISA-U200-62S / LISA-U200-82S / LISA-U230 / LISA-U260 / LISA-U270 / SARA-U260-00S / SARA-U270-00S / SARA-U270-00X / SARA-U280-00S**

- <E-DCH_category>=4 is not supported.

**LISA-U200 / LISA-U260 / LISA-U270 / SARA-U**

- The <HS-DSCH_category> range goes from 6 to 8.

**LISA-U230**

- The <HS-DSCH_category> range goes from 6 to 14.
- The default value of <HS-DSCH_category> is 14.

**LISA-U1**

- The <HS-DSCH_category> range goes from 6 to 8.

# 7.12 Preferred operator list +CPOL

| +CPOL | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | Yes | No | No | *< 10 s* | *+CME Error* |

## 7.12.1 Description

Edits the user preferred list of networks in the active application on the UICC (GSM or USIM) or preferred list of networks in the SIM card.

The command accesses the list of preferred PLMNs previously selected by *+CPLS*, if implemented. If *+CPLS* is not implemented the command tries to access $EF_{PLMNwAcT}$ and if this file is not present and a UICC GSM application is selected or a SIM card is used then the $EF_{PLMNsel}$ file is accessed.

The set command writes an entry in the selected list. When an entry is added to +CPOL list, it should have a correspondence in the ROM PLMN names returned by the *+COPN* command. 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. The <GSM_AcT>, <GSM_Compact_AcT>, <UTRAN_AcT> and <E-UTRAN_AcT> parameters are required when writing user controlled PLMN selector with Access Technology ($EF_{PLMNwAcT}$).

The read command returns all used entries from the SIM list of preferred PLMNs and the Access Technologies for each PLMN in the list where provided.

If a new PLMN is added in a different format than the one previously set, the <format> parameter always switches to the last used.

If in the *+COPN* list there are more than one PLMN with the same name in alphanumeric (short or long) format, the numeric format shall be used to add this PLMN <entry> in the +CPOL list; otherwise the result will be unpredictable.

## 7.12.2 Syntax

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

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | OK | OK |

## 7.12.3 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* command description<br>• 0: long format alphanumeric <oper><br>• 1: short format alphanumeric <oper><br>• 2 (default value): numeric <oper> |
| <oper> / <opern> | String | Format indicated by <format> |
| <GSM_AcT> | Number | GSM access technology. Allowed values:<br>• 0: access technology not selected<br>• 1: access technology selected |
| <GSM_Compact_AcT> | Number | GSM compact access technology. Allowed values:<br>• 0: access technology not selected<br>• 1: access technology selected |
| <UTRAN_AcT> | Number | UTRA access technology. Allowed values:<br>• 0: access technology not selected<br>• 1: access technology selected |
| <E-UTRAN_AcT> | Number | E-UTRAN access technology<br>• 0: access technology not selected<br>• 1: access technology selected |

## 7.12.4 Notes

**TOBY-L2 / MPCI-L2**

- When an entry is deleted the subsequent entries are shifted up of one position.

**TOBY-L200-02S / TOBY-L210-02S / TOBY-L210-62S / TOBY-L220 / TOBY-L280-02S / MPCI-L200-02S / MPCI-L210-02S / MPCI-L280**

- If the module is not registered (*+COPS=2*), the set command returns an error result code.
- To modify an already inserted entry (whose order number is <index>), delete the original entry and insert the new one with the same <index>.
- When inserting a new entry, it is possible to set to 1 only one "access technology" parameter: <GSM_AcT> or <GSM_Compact_AcT> or <UTRAN_AcT> or <E-UTRAN_AcT>.

**LISA-U / SARA-U**

- The <E-UTRAN_AcT> parameter is not supported.
- The default value of <format> parameter is 0 (long format alphanumeric <oper>).

**SARA-G / LEON-G**

- <GSM_AcT>, <GSM_Compact_AcT>, <UTRAN_AcT> and <E-UTRAN_AcT> parameters are not supported.
- The default value of <format> parameter is 0 (long format alphanumeric <oper>).
- If the network operator is not present in the SIM list of preferred PLMNs, then the information text response to the read command will display the PLMN in the short format alphanumeric format.

Objective Specification

# 7.13 Read operator names +COPN

| +COPN | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

## 7.13.1 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.

## 7.13.2 Syntax

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

## 7.13.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <numeric n> | String | Operator in numeric format (see *+COPS* AT command) |
| <alpha n> | String | Operator in long alphanumeric format (see *+COPS* AT command) |

# 7.14 Network emergency bearer services support +CNEM

| +CNEM | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L210-62S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

## 7.14.1 Description

Configures sending of URCs from MT to the TE, in case of changes in the emergency bearer services support.

## 7.14.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CNEM=[<reporting>] | OK | AT+CNEM=1<br>OK |
| Read | AT+CNEM? | +CNEM: <reporting>,<emb_lu_supp>,<emb_S1_supp><br>OK | +CNEM: 1,0,1<br>OK |
| Test | AT+CNEM=? | +CNEM: (list of supported <reporting>s)<br>OK | +CNEM: (0,1)<br>OK |
| URC | | +CNEMIU: <emb_lu_supp> | +CNEMIU: 1 |
| URC | | +CNEMS1: <emb_S1_supp> | +CNEMS1: 1 |

## 7.14.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <reporting> | Number | Reporting configuration:<br>• 0 (default and factory programmed value): URCs disabled<br>• 1: URCs enabled |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| <emb_Iu_supp> | Number | Emergency bearer services support indicator for Iu mode (see *Notes*)<br>• 0: emergency bearer services in Iu mode and A/Gb mode not supported<br>• 1: emergency bearer services supported in Iu mode, but not supported in A/Gb mode |
| <emb_S1_supp> | Number | Emergency bearer services support indicator for S1 mode (see *Notes*)<br>• 0: emergency bearer services in S1 mode not supported<br>• 1: emergency bearer services in S1 mode supported |

### 7.14.4 Notes

- The command needs the SIM card to work correctly.
- The indicators <emb_Iu_supp> and <emb_S1_supp> are only set to supported when explicitly signalled from the network. When an emergency bearer services support indicator is not signalled from the network or if no network is available, this is interpreted as "emergency bearer services not supported".

## 7.15 Steering of Roaming configuration +UDCONF=20

| +UDCONF=20 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G LEON-G100-07S LEON-G100-08S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

### 7.15.1 Description

Enables / disables the Steering of Roaming feature.

The setting can be changed only when the module is not registered to, and not searching for, a network (i.e. when *+CREG's* <stat> is 0). The new setting is saved in NVM and takes place at the next network registration / search.

### 7.15.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UDCONF=20,<SoR_enable> | OK | AT+UDCONF=20,1<br>OK |
| Read | AT+UDCONF=20 | +UDCONF: 20,<SoR_enable><br>OK | AT+UDCONF=20<br>+UDCONF: 20,1<br>OK |

### 7.15.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <SoR_enable> | Number | Enables / disables the Steering of Roaming feature:<br>• 0: Steering of Roaming disabled<br>• 1 (factory-programmed value): Steering of Roaming enabled<br>• 2: Steering of Roaming enabled with automatic switch from manual to automatic PLMN selection mode if the maximum number of registration attempts rejected with cause 17 (Network Failure) has been reached) |

### 7.15.4 Notes

**LISA-U200-01S / LISA-U200-02S / LISA-U200-52S / LISA-U200-62S / LISA-U200-82S / LISA-U230 / LISA-U260 / LISA-U270 / SARA-U260-00S / SARA-U270-00S / SARA-U270-00X / SARA-U280-00S**

- <SoR_enable>=2 is not supported.

**SARA-G / LEON-G**

- The factory-programmed value of <SoR_enable> parameter is 0.

Objective Specification

- <SoR_enable>=2 is not supported.

# 7.16 Fast Dormancy activation +UFDAC

| +UFDAC | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| | LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U260-02S LISA-U270-02S LISA-U270-62S LISA-U270-63S LISA-U270-68S SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

## 7.16.1 Description

Activates or deactivates the autonomous Fast Dormancy or triggers a single Fast Dormancy request depending on the specified mode. If all the constraints are satisfied a Signaling Connection Release Indication (SCRI) is sent to the network. There is no final confirmation if the SCRI was sent to the network, i.e. the "OK" final result code only indicates that the command's syntax has been fulfilled.

## 7.16.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UFDAC=[[<FD_mode>][,<FD_Delay_Timer_duration>[,<FD_Inhibit_Timer_duration>]]] | OK | AT+UFDAC=1<br>OK |
| Read | AT+UFDAC? | +UFDAC: <FD_mode>,<FD_Delay_Timer_duration>,<FD_Inhibit_Timer_duration><br>OK | +UFDAC: 3,5,5<br>OK |
| Test | AT+UFDAC=? | +UFDAC: (list of the supported <FD_mode>s),(list of the supported <FD_Delay_Timer_duration>s),(list of the supported <FD_Inhibit_Timer_duration>s)<br>OK | +UFDAC: (1-3),(1-60),(0,1-120)<br>OK |

## 7.16.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <FD_mode> | Number | Indicates the action to perform:<br>• 1: one shot SCRI transmission request (application-driven FD)<br>• 2: activate automatic SCRI transmission request (autonomous FD)<br>• 3 (factory-programmed value): deactivate automatic SCRI transmission request<br>If omitted, only the delay and inhibit timer values are saved and no other action is performed. |
| <FD_Delay_Timer_duration> | Number | Delay Timer duration in seconds, range 1-60. The factory-programmed value is 5.<br>The Delay Timer is used for the autonomous FD (<FD_mode>=2). When the module is in connected mode with no data available on the user plane this timer starts running. At its expiry, the evaluation for the SCRI transmission is done. |
| <FD_Inhibit_Timer_duration> | Number | Inhibit Timer duration in seconds, range 1-120 (the value 0 disables the Inhibit Timer). The factory-programmed value is 5.<br>The Inhibit Timer is an extension of T323. If the network supports 3GPP R8 Fast Dormancy, the Inhibit Timer and T323 are the same and thus the timer's duration is network specified. Otherwise the value <FD_Inhibit_Timer_duration> is used. |

## 7.16.4 Notes

- The Fast Dormancy feature is not available in GSM RAT.
- The set command updates the <FD_Delay_Timer_duration> and <FD_Inhibit_Timer_duration> values stored in NVM, if they are specified; otherwise the values previously stored in NVM are used.
- If automatic SCRI transmission request is active, one shot SCRI transmission requests are ignored.
- **Constraints to be satisfied before sending a SCRI**

  No 'relevant' RRC procedure is ongoing

Objective Specification

| Constraints to be satisfied before sending a SCRI |
|---|
| Inhibit Timer is not running |
| No NAS signaling is ongoing |
| No data on the user plane was transferred during the last <FD_Delay_Timer_duration> seconds |

**Table 2: Constraints to be satisfied before sending a SCRI**

**LISA-U270-62S / LISA-U270-63S / LISA-U270-68S**

- The <FD_mode> factory-programmed value is 2.
- The <FD_Delay_Timer_duration> and <FD_Inhibit_Timer_duration> are set respectively to 7 and 120 and cannot be modified by means of AT commands.

# 7.17 Fast Dormancy configuration +UDCONF=61

| +UDCONF=61 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| | LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U260-02S LISA-U270-02S LISA-U270-62S LISA-U270-63S LISA-U270-68S SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

## 7.17.1 Description

Configure the Fast Dormancy modes.

## 7.17.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UDCONF=61,<FD_conf> | OK | AT+UDCONF=61,1<br>OK |
| Read | AT+UDCONF=61 | +UDCONF: 61,<FD_conf><br>OK | AT+UDCONF=61<br>+UDCONF: 61,2<br>OK |

## 7.17.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <FD_conf> | Number | Specifies which <FD_mode>'s values are allowed in the *+UFDAC* AT command. If a not allowed <FD_mode> value is issued, *+UFDAC* will display the message "+CME ERROR: operation not allowed":<br>• 0: values 1 and 2 are not allowed in <FD_mode><br>• 1: value 2 is not allowed in <FD_mode><br>• 2 (factory-programmed value): all the <FD_mode> values are allowed |

# 7.18 Network selection control +PACSP

| +PACSP | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| | LISA-U SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 7.18.1 Description

Allows checking whether the $EF_{CSP}$ (Customer Service Profile) is available on the SIM/USIM card and, if available, what is the value of the PLMN mode bit; otherwise an error result code is provided ("+CME ERROR: operation not allowed" if *+CMEE* is set to 2).

Objective Specification

The URC is enabled if $EF_{CSP}$ (Customer Service Profile) is available: in this case it is output at boot time and whenever the SIM/USIM issues the REFRESH proactive command related to the $EF_{CSP}$.

$EF_{CSP}$ is available on SIM/USIM cards from AT&T. This functionality will typically be used in cases where AT&T subscribers internationally travel, or if there is a need to enable manual network selection functionality.

For further information see the AT&T Device Requirements *[61]*.

### 7.18.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Read | AT+PACSP? | +PACSP<bit_value> | +PACSP1 |
| | | OK | OK |
| URC | | +PACSP<bit_value> | +PACSP0 |

### 7.18.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <bit_value> | Number | PLMN mode bit value<br>• 0: automatic network selection is forced (see the following table)<br>• 1: network selection mode unchanged (see the following table) |

### 7.18.4 Notes

- If $EF_{CSP}$ is available, the PLMN mode bit forces the automatic network registration, according to the *+COPS* <mode> value which is loaded at boot from the selected profile (see the *Appendix B.1* and *&V*). The following table explains the behavior:

| Autoregistration <mode> | PLMN mode bit <bit_value> | Autoregistration behavior |
|---|---|---|
| 0 | 0 | Automatic network selection |
| 1 | 0 | Automatic network selection |
| 2 | 0 | Disabled |
| 0 | 1 | Automatic network selection |
| 1 | 1 | Manual network selection (search for the PLMN stored in the selected profile) |
| 2 | 1 | Disabled |

## 7.19 Integrity check on test networks configuration +UDCONF=81

| +UDCONF=81 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L280<br>LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U260-02S LISA-U270-02S LISA-U270-62S LISA-U270-63S LISA-U270-68S SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 7.19.1 Description

Configures the integrity check on 3G/4G test networks.

Integrity check on 3G/4G test networks shall be disabled only when the authentication and integrity are disabled on the 3G/4G test network on which the module will be registered.

### 7.19.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UDCONF=81,<integrity_check_enabled> | OK | AT+UDCONF=81,0<br>OK |
| Read | AT+UDCONF=81 | +UDCONF: 81,<integrity_check_enabled> | AT+UDCONF=81<br>+UDCONF: 81,1 |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | OK | OK |

### 7.19.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <integrity_check_ enabled> | Number | Integrity check on 3G/4G test networks configuration. Allowed values:<br>• 0: integrity check on test networks disabled (MCC/MNC not available in *+COPN* set command's response)<br>• 1 (factory-programmed value): integrity check on test networks enabled (MCC/MNC not available in *+COPN* set command's response) |

## 7.20 Select band +UBANDSEL

| +UBANDSEL | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

### 7.20.1 Description

Allows switching from the automatic band selection to the selection of one or more (up to four) bands from the following:

- 2G network
  - 850 MHz
  - 900 MHz
  - 1800 MHz
  - 1900 MHz
- 3G and 4G network
  - 700 MHz (band 13, band 17, band 28)
  - 800 MHz (band 6, band 20)
  - 850 MHz (band 5)
  - 900 MHz (band 8)
  - 1500 MHz (band 11)
  - 1700 MHz (band 4)
  - 1800 MHz (band 3)
  - 1900 MHz (band 2)
  - 2100 MHz (band 1)
  - 2600 MHz (band 7)

To make the setting effective, the module must be deregistered and registered again. (see *Notes* for the procedure to enter the detach state).

The MT will camp on a cell, if suitable, belonging to one of the selected band; the OK final result code is not related to the result of the camping on the new cell.

u-blox cellular modules are certified according to all the capabilities and options stated in the Protocol Implementation Conformance Statement document (PICS) of the module. The PICS, according to 3GPP TS 51.010-2 [*83*], 3GPP TS 34.121-2 [*84*], 3GPP TS 36.521-2 [*114*] and 3GPP TS 36.523-2 [*115*], is a statement of the implemented and supported capabilities and options of a device. If the user changes the command settings during the certification process, the PICS of the application device integrating a u-blox cellular module must be changed accordingly.

TOBY-L2 / MPCI-L2 / LISA-U / SARA-U
The list of supported bands presents exclusively GSM, UMTS or LTE bands depending on which RAT the MT is currently registered. If it is not registered, the bands presented depend on *+URAT* command:

Objective Specification

- If in single mode, depends on <AcT>
- If in dual mode, depends on <PreferredAct>

TOBY-L200-00S / TOBY-L201 / TOBY-L210-00S / TOBY-L210-60S / TOBY-L280-00S / MPCI-L200-00S / MPCI-L201 / MPCI-L210-00S
The set command forces a single mode behaviour thus the *+URAT* <AcT> parameter value could be modified.

TOBY-L2 / MPCI-L2
After having issued a set command the module automatically performs a de-registration/registration cycle.

### 7.20.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UBANDSEL=<band_1>[,<band_2>[,...]] | OK | AT+UBANDSEL=900<br>OK |
| Read | AT+UBANDSEL? | +UBANDSEL: <band_1>[,<band_2>[,...]]<br>OK | +UBANDSEL: 850,900,1800,1900<br>OK |
| Test | AT+UBANDSEL=? | +UBANDSEL: (list of supported <band_x>)<br>OK | +UBANDSEL: (0,850,900,1800,1900)<br>OK |

### 7.20.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <band_x> | Number | • 0: restore the factory-programmed configuration of the module<br>• 700: selection of 700 MHz band<br>• 800: selection of 800 MHz band<br>• 850: selection of 850 MHz band<br>• 900: selection of 900 MHz band<br>• 1500: selection of 1500 MHz band<br>• 1700: selection of 1700 MHz band<br>• 1800: selection of 1800 MHz band<br>• 1900: selection of 1900 MHz band<br>• 2100: selection of 2100 MHz band<br>• 2600: selection of 2600 MHz band |

### 7.20.4 Notes

#### TOBY-L2 / MPCI-L2

- Issue the *AT+CFUN=4* AT command to detach the module from the network. Use *AT+CFUN=1* to return to the module full functionality.

#### LISA-U / SARA-U / SARA-G / LEON-G

- Issue the *AT+COPS=2* AT command to detach the module from the network.

## 7.21 Cell environment description +CGED

| +CGED | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U SARA-U | | | | | |
| | SARA-G LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | No | No | - | *+CME Error* |

### 7.21.1 Description

Provides the cell environment information that can be periodic (with a period of 5 s) or performed only once depending on the <mode> parameter value:

Objective Specification

- <mode>=0, 1, 128, 129:
  - Both the serving and neighbour cell information are provided
- <mode>=3, 4, 131, 132:
  - A subset of the network parameters of the serving cell information is provided
- <mode>=5, 6, 133, 134:
  - Both the serving and neighbour cell information are provided
  - A subset of the network parameters of the serving cell information is provided
  - The information on neighbour cells contained in radio resource BA list is reported. The number of neighbour cells can be configured by means of the *+UDCONF=83* AT command (where supported); by default, the neighbour cell content may be available 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 interface as it is used for data transfer (the multiplexer can be used to create two virtual serial ports, one for data transfer, one for AT commands)

If <mode> parameter value is greater than 127 the information text response will provide the network information without the tags (e.g. MCC, RxLev will not be printed).

LISA-U2x0-01S / LISA-U2x0-02S
The SIM verification is needed.

The information text response of the set command depends on the cellular standard and the access technology (if present).

In case of UMTS radio access technology:

- The information for up to 56 neighbour cells is available (32 reserved for 3G cells and 24 for 2G cells)
- The syntax for cell information differs in the channel type

In case of GSM radio access technology:

- The information for up to 32 neighbour cells is available

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 at the end of each location update procedure, routing area update procedure and GPRS attach procedure.

## 7.21.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CGED=[<mode>[,<details>]] | **Response syntax for 2G modules:**<br>+CGED:<br>Service-Cell:<br>MCC: <MCC>, MNC: <MNC>, LAC: <LAC>, CI: <CI>, BSIC: <BSIC><br>[Equivalent PLMNs:<br>MCC: <MCC>, MNC: <MNC>]<br>Arfcn: <arfcn>, [RxLevServ:: <RxLevServ>, ] [RfChannels: <RfChannels>,]Arfcn_ded: <Arfcn_ded>, [RxLevFull: <RxLevFull>, ] [RxLevSub: <RxLevSub>,] [RxQualFull: <RxQualFull>, RxQualSub: <RxQualSub>, Ciphering: <ciphering><br>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>] | |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | Neighbour Cell <n>:<br><br>MCC: <MCC>, MNC: <MNC>, LAC: <LAC>, CI: <CI>, BSIC: <BSIC>, Arfcn: <arfcn>, [RxLev: <RxLev>]<br><br>[C1_nc: <C1_nc>, C2_nc: <C2_nc>]<br><br>[GPRS-Parameters:<br><br>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>,<br><br>PSI1_r_per: <PSI1_r_per>, Count_LR: <Count_LR>, Count_HR: <Count_HR>, C_R_Hyst: <C_R_Hyst>,<br><br>C31: <C31>, C32: <C32>, Prior_Acc_Thr: <Prior_Acc_Thr>]<br><br>OK | |
| | | **Response syntax for 3G modules (3G RAT):**<br><br>+CGED: RAT:<rat>,<br><br>URR:<rrc_state>,<br><br>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>,<br><br>HSC:<hierarchical_cell_structure>, HMD:<high_mobility_detected>, LM:<limited_service>,<br><br>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>,<br><br>[Cell:<cell_type>=AS, SC:<scrambling_code>, RSCP LEV:<rscp_lev>, ECN0 LEV:<ecn0_lev>, DLF:<dl_frequency>]<br><br>[Cell:<cell_type>=VAS, SC:<scrambling_code>, RSCP LEV:<rscp_lev>, ECN0 LEV:<ecn0_lev>, DLF:<dl_frequency>]<br><br>[Cell:<cell_type>=M, SC:<scrambling_code>, RSCP LEV:<rscp_lev>, ECN0 LEV:<ecn0_lev>, DLF:<dl_frequency>]<br><br>[Cell:<cell_type>=D, SC:<scrambling_code>, RSCP LEV:<rscp_lev>, ECN0 LEV:<ecn0_lev>, DLF:<dl_frequency>]<br><br>[Cell:<cell_type>=G, B:<gsm_band>, Arfcn:<arfcn>, RXLEV:<RxLev>, Bsic:<BSIC>, RV:<ranking_value>]<br><br>[Cell:<cell_type>=U, SC:<scrambling_code>, RSCP LEV:<rscp_lev>, ECN0 LEV:<ecn0_lev>, DLF:<dl_frequency>, RV:<ranking_value>]<br><br>[Cell:<cell_type>=NU, SC:<scrambling_code>, RSCP LEV:<rscp_lev>, ECN0 LEV:<ecn0_lev>, DLF:<dl_frequency>, RS:<ranking_status>] | |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | [Cell:<cell_type>=NG B:<gsm band>, Arfcn:<arfcn>, RXLEV:<RxLev>, Bsic:<BSIC>, RS:<ranking_status>]<br><br>RR measurement evaluation:<br><br>MeasId:<meas_id>, EventId:<event_id>, <par 3>, <par 4>, <par 5>, <par 6>,..., <par N>,<br><br>MeasId:<meas_id>, EventId:, <par 3>, <par 4>, <par 5>, <par 6>,..., <par M>, etc...<br><br>MM:<br><br>Process:CO, MMs:<mm_state>, MMSs:<mm_service_state>, MSC:<ms_class>, T:<active_timer_bitmap><br><br>Process:CS, MMs:<mm_state>, MMSs:<mm_service_state>, LUS:<mm_update_status>, T:<active_timer_bitmap>, L:<limited_service><br><br>Process:PS, MMs:<mm_state>, MMSs:<mm_service_state>, LUS:<mm_update_status>, T:<active_timer_bitmap>, L:<limited_service>, GS:<gprs_supported>, R:<ready_state><br><br>Cell change counters:<br><br>CRT:<cell_reselecetion_total>, IRCR:<ir_cell_reselecetion>, AIRCR:<attempted_ir_cell_reselecetion>,IRHO:<ir_handover>, AIRHO:<attempted_ir_handover><br><br>Equivalent PLMNs:<br><br>MCC:<mobile_country_code>, MNC:<mobile_network_code><br><br>Serving PLMN:<br><br>MCC:<mobile_country_code>, MNC:<mobile_network_code>, LAC:<location_area_code>, RAC:<routing_area_code><br><br>OK | |
| | | **Response syntax for 3G modules (2G RAT):**<br><br>+CGED: RAT: <rat>,<br><br>RR:<grr_state><br><br>SFRLC:<signal_failure/radio_link_counter>, RSR:<reselection_reason>, RC:<release_cause>, LM:<limited_service><br><br>B:<gsm_band>, Arfcn:<arfcn>, RXLEV:<RxLev>, C1:<C1>, C2:<C2>, Bsic:<BSIC>, MA:<nr_of_rf_in_ma>, MADed:<dedicated_arfcn>,<br><br>GSM: Ci:<CI>, B:<gsm_band>, Arfcn:<arfcn>,RXLEV:<RxLev>, C1:<C1>, Bsic:<BSIC><br><br>UMTS: SC:<scrambling_code>, RSCP LEV:<rscp_lev>, ECN0 LEV:<ecn0_lev>, DLF:<dl_frequency><br><br>MM:<br><br>Process:CO, MMs:<mm_state>, MMSs:<mm_service_state>, MSC:<ms_class>, T:<active_timer_bitmap> | |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | 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>, 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 | |
| Read | AT+CGED? | +CGED: <mode> | +CGED: 0 |
| | | OK | OK |
| Test | AT+CGED=? | +CGED: (list of supported <mode>s) | +CGED: (0-6) |
| | | OK | OK |

## 7.21.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | • 0 (default value): one shot dump<br>• 1: periodic refreshed dump; the information for up to 32 neighbour cells is available |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 2: stop periodic dump<br>• 3: one shot serving cell dump<br>• 4: periodic serving cell refreshed dump<br>• 5: one shot serving cell and neighbour cells dump<br>• 6: periodic serving cell and neighbour cells refreshed dump<br>• 128: one shot dump without the tags<br>• 129: periodic refreshed dump without the tags<br>• 130: stop periodic dump (same as 2)<br>• 131: one shot serving cell without the tags<br>• 132: periodic serving cell refreshed without the tags<br>• 133: one shot serving cell and neighbour cells without the tags<br>• 134: periodic serving cell and neighbour cells refreshed without the tags |
| <details> | Number | • 0 (default value): it does not display <scrambling_code> if <mode>=3 or <mode>=4 is set<br>• 1: displays <scrambling_code> if <mode>=3 or <mode>=4 is set |
| <rat> | String | Indicates the radio access technology and may be:<br>• "GSM"<br>• "UMTS" |
| <MCC> | Number | Mobile Country Code, range 0 - 999 (3 digits). Other values are to be considered invalid / not available |
| <MNC> | Number | Mobile Network Code, range 0 - 999 (1 to 3 digits). Other values are to be considered invalid / not available |
| <LAC> | Number | Location Area Code, range 0h-FFFFh (2 octets) |
| <CI> | Number | Cell Identity:<br>• 2G cell: range 0h-FFFFh (2 octets)<br>• 3G cell: range 0h-FFFFFFFh (28 bits) |
| <BSIC> | Number | Base Station Identify Code, range 0h-3Fh (6 bits) |
| <arfcn> | Number | Absolute Radio Frequency Channel Number, range 0 - 1023<br>The parameter value also decodes the band indicator bit (DCS or PCS) by means of the most significant byte (8 means 1900 band) (i.e. if the parameter reports the value 33485, it corresponds to 0x82CD, in the most significant byte there is the band indicator bit, so the <arfcn> is 0x2CD (717) and belongs to 1900 band). |
| <RxLev> | Number | Received signal level on the cell, range 0 - 63; see the 3GPP TS 05.08 [28] |
| <RxLevServ> | Number | Received signal level on the cell, range 0 - 63; see the 3GPP TS 05.08 [28] |
| <RfChannels> | Number | Number of frequencies in Mobile Allocation: 0x01 if single RF and 0 if n.a.; see the 3GPP TS 0 4.18 [40] |
| <Arfcn_ded> | Number | Single ARFCN of dedicated channel; it is the first ARFCN of Mobile Allocation |
| <RxLevFull> | Number | Received signal strength on serving cell, measured on all slots; range 0h-3Fh; see the 3GPP TS 0 4.18 [40] |
| <RxLevSub> | Number | Received signal strength on serving cell, measured on a subset of slots; range 0h-3Fh; see the 3GPP TS 04.18 [40] |
| <RxQualFull> | Number | Received signal quality on serving cell, measured on all slots; range 0-7; see the 3GPP TS 04.18 [40] |
| <RxQualSub> | Number | Received signal quality on serving cell, measured on a subset of slots, range 0-7; see the 3GPP TS 04.18 [40] |
| <ciphering> | Number | GSM ciphering. Allowed values:<br>• ON<br>• OFF |
| <ms_txpwr> | Number | Maximum TX power level an MT may use when accessing the system until otherwise commanded, range 0 - 31; see the 3GPP TS 04.18 [40] |
| <rx_acc_min> | Number | RXLEV-ACCESS-MIN, range 0 - 63; see the 3GPP TS 04.18 [40] |
| <cbq> | Number | CELL_BAR_QUALIFY, range 0 - 1; see the 3GPP TS 05.08 [28] |
| <cba> | Number | CELL_BAR_ACCESS, range 0 - 1; see the 3GPP TS 05.08 [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 bits); see the 3GPP TS 04.18 [40] |
| <tmp_offset> | Number | TEMPORARY_OFFSET, range 0 - 7; see the 3GPP TS 04.18 [40] |
| <penalty_t> | Number | Penalty time, range 0 - 31; see the 3GPP TS 04.18 [40] |
| <c1>, <C1_nc> | Number | Value of c1; see the 3GPP TS 05.08 [28] |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| <c2>, <C2_nc> | Number | Value of c2; see the 3GPP TS 05.08 [28] |
| <ch_type> | Number | Channel type of the current connection (see the 3GPP TS 04.18 [40]):<br>• 0: invalid channel type<br>• 1: TCH/F<br>• 2: TCH/H<br>• 3: SDCCH/4<br>• 4: SDCCH/8<br>• other values are to be considered invalid / not available |
| <ch_mode> | Number | Channel mode of current connection (see the 3GPP TS 04.18 [40]):<br>• 0: signalling only<br>• 1: speech full rate<br>• 2: speech half rate<br>• 3: data full rate, 12.0 kb/s radio interface rate<br>• 4: data full rate, 6.0 kb/s radio interface rate<br>• 5: data half rate, 6.0 kb/s radio interface rate<br>• 6: data full rate, 3.6 kb/s radio interface rate<br>• 7: data half rate, 3.6 kb/s radio interface rate<br>• 8: speech full rate version 2<br>• 9: speech full rate version 3<br>• 10: speech half rate version 2<br>• 11: speech half rate version 3<br>• other values are to be considered invalid / not available |
| <txpwr> | Number | Transmit power level of the current connection, range 0-31 or 255 if the module is not connected; see the 3GPP TS 04.18 [40] |
| <dtx_used> | Number | DTX used, range 0 - 1; see the 3GPP TS 04.18 [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); see the 3GPP TS 04.18 [40] |
| <acc> | Number | Access control class (RACH Control Parameters); see the 3GPP TS 04.18 [40] |
| <t_adv> | Number | Timing Advance, it is valid during a connection and it will updated during the next connection; see the 3GPP TS 04.18 [40] |
| <bs_pa_mfrms> | Number | BS_PA_MFRMS (multiframes period for transmission of PAGING REQUEST), range 0 - 7 mapped to 2-9; see the 3GPP TS 05.02 [42] |
| <dsc> | Number | Downlink Signalling Counter |
| <rll> | Number | Radio Link Loss Counter |

GPRS-Parameters:

| Parameter | Type | Description |
|---|---|---|
| <GPRS_sup> | Number | GPRS supported (in serving cell); range 0 - 1; see the 3GPP TS 04.18 [40] |
| <RAC> | Number | Routing Area Code, range 0h-FFh (1 octet); see the 3GPP TS 04.18 [40] |
| <SplitPg> | Number | SPGC_CCCH_SUP split pg_cycle on ccch by network, range 0 - 1 (2 bits); see the 3GPP TS 04.18 [40] |
| <NCO> | Number | NETWORK_CONTROL_ORDER (GPRS_Cell_Options), range 0 - 3 (2 bits); see the 3GPP TS 04.18 [40] |
| <NOM> | Number | NETWORK OPERATION MODE (GPRS_Cell_Options), range 0 - 3 (2 bits); see the 3GPP TS 04.18 [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); see the 3GPP TS 04.60 [41]:<br>• 0: 500 ms<br>• 1: 1000 ms<br>• 2: 1500 ms<br>• 3: 0 ms<br>• 4: 80 ms<br>• 5: 120 ms<br>• 6: 160 ms<br>• 7: 200 ms |
| <Acc_Burst_type> | Number | ACCESS_BURST_TYPE, range 0 - 1 (mapped to 8-bits format,11-bit format); see the 3GPP TS 0 4.60 [41] |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| <DRX_Timer_Max> | Number | DRX_TIMER_MAX, range 0 - 7 (3 bits); see the 3GPP TS 04.60 [41] |
| <PBCCH> | Number | PBCCH present, range 0 - 1 |
| <Ext_Measure_Order> | Number | EXT_MEASUREMENT_ORDER, range 0 - 3 (2 bits); see the 3GPP TS 04.60 [41] |
| <PSI1_r_per> | Number | PSI1_REPEAT_PERIOD, range 0 - 15 mapped to 1-16 (4 bits); see the 3GPP TS 04.60 [41] |
| <Count_LR> | Number | PSI_COUNT_LR, range 0 - 63 (6 bits); see the 3GPP TS 04.60 [41] |
| <Count_HR> | Number | PSI_COUNT_HR, range 0 - 15 mapped to 1-16 (4 bits); see the 3GPP TS 04.60 [41] |
| <C_R_Hyst> | Number | CELL_RESELECT_HYSTERESIS, range 0 - 7 (3 bits); see the 3GPP TS 04.60 [41] |
| <C31> | Number | Value of c31, number; see the 3GPP TS 05.08 [28] |
| <C32> | Number | Value of c32, number; see the 3GPP TS 05.08 [28] |
| <Prior_Acc_Thr> | Number | PRIORITY_ACCESS_THR, range 0-7 (3 bits); see the 3GPP TS 04.18 [40] |

UMTS-Parameters:

| Parameter | Type | Description |
|---|---|---|
| <rrc_state> | String | • "CD": CELL_DCH (0)<br>• "CF": CELL_FACH(1)<br>• "CP": CELL_PCH(2)<br>• "UP": URA_PCH(3)<br>• "ID": IDLE(4)<br>• "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 (octet 1, 2: event, 3: state). For debug purposes only. |
| <as_error_code> | Number | Indicates if an AS error occurred. Allowed values:<br>• 0: no error<br>• 81: UMAC, no TFCI (Transport Format Code identifier) found<br>• 82: UMAC, RLC timing error |
| <release_cause> | Number | MM RR release cause. For debug purposes only |
| <out_of_service> | Number | Service state:<br>• 0: service present<br>• 1: out of service |
| <meas_bler> | Number | Measured BLER (Block Error Rate). Allowed values:<br>• Range: 0.000001 to 0.99<br>• If out of range: - |
| <target_sir> | Number | Targeted SIR (Signal to Interference Ratio). Allowed values:<br>• Range: -10 to 20<br>• If out of range: - |
| <meas_sir> | Number | Measured SIR (Signal to Interference Ratio). Allowed values:<br>• Range: -10 to 20<br>• If out of range: - |
| <hierarchical_cell_structure> | Number | HCS (Hierarchical Cell Structure)<br>• 0: not used<br>• 1: used |
| <high_mobility_detect> | Number | High mobility:<br>• 0: not detected<br>• 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:<br>• 1: enabled<br>• 2: disabled |
| <ps_data_transfered> | Number | PS data:<br>• 0: transferred |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 1: not transferred |
| <power_saving_mode> | Number | Power saving:<br>• 0: disabled<br>• 1: enabled |
| <cell_type> | String | Cell type:<br>• "AS": Active Set<br>• "VAS": Virtual Active Set<br>• "M": Monitored Cells<br>• "D": Detected Cells<br>• "G": GSM cells<br>• "U": UMTS cells<br>• "NU": Non Ranked UMTS cells<br>• "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 0 - 91.<br>0 RSCP < -115 dBm<br>1 -115 = RSCP < -114 dBm<br>... ... ...<br>90 -26 = RSCP < -25 dBm<br>91 RSCP = -25 dBm |
| <ecn0_lev> | Number | Energy per Chip/Noise ratio expressed in dB levels. Range 0 - 49.<br>ECN0 < -24 dB<br>1 -24 = ECN0 < -23.5 dB<br>... ... ...<br>48 -0.5 = ECN0 < 0 dB<br>49 ECN0 = 0 |
| <gsm_band> | String | GSM band:<br>• "D": 1800 MHz<br>• "P": 1900 MHz<br>• "G": 900 MHz |
| <ranking_value> | Number | Cell's ranking value |
| <ranking_status> | Number | Ranking status for Non Ranked UMTS cells. Allowed values:<br>• 0: EM_CELL_SUITABLE<br>• 1: EM_NOT_MEASURED<br>• 2: EM_CELL_BARRED<br>• 3: EM_WRONG_PLMN<br>• 4: EM_HCS_CRITERIA_PRIO<br>• 5: EM_HCS_H_VALUE<br>• 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 | Range 0-99 |
| <signal_failure/radio_link_counter> | Number | Range 0-99. For debug purpose only |
| <reselection_reason> | Number | Indicates the reason for cell reselection. Allowed values:<br>• 0: RESEL_PLMN_CHANGE<br>• 1: RESEL_SERV_CELL_NOT_SUITABLE<br>• 2: RESEL_BETTER_C2_C32<br>• 3: RESEL_DOWNLINK_FAIL<br>• 4: RESEL_RA_FAILURE<br>• 5: RESEL_SI_RECEIPT_FAILURE<br>• 6: RESEL_C1_LESS_NULL<br>• 7: RESEL_CALL_REEST_TIMEOUT<br>• 8: RESEL_ABNORMAL_RESEL<br>• 9: RESEL_CELL_CHANGE_ORDER |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 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:<br>• "NB_CS_1"<br>• "NB_CS_2"<br>• "NB_CS_3"<br>• "NB_CS_4"<br>• "NB_MCS_1"<br>• "NB_MCS_2"<br>• "NB_MCS_3"<br>• "NB_MCS_4"<br>• "NB_MCS_5"<br>• "NB_MCS_6"<br>• "NB_MCS_7"<br>• "NB_MCS_8"<br>• "NB_MCS_9"<br>• "NB_MCS_5_7"<br>• "NB_MCS_6_9"<br>• "AB_8"<br>• "AB_11"<br>• "AB_11_E"<br>• 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. Range 1 - 10. |
| <mm_update_status> | Number | Location update status. For debug purpose only. Allowed values:<br>• 1: updated (MMST_U1_UPDATED)<br>• 2: not updated (MMST_U2_NOT_UPDATED)<br>• 3: roaming not allowed (MMST_U3_ROAMING_NOT_ALLOWED) |
| <ms_class> | String | MS GPRS-class. Allowed values:<br>• 0: class A<br>• 1: class B<br>• 2: class C<br>• 3: class CG: class C in GPRS only mode<br>• 4: class CC: class C in circuit switched only mode (lowest class) |
| <limited_service> | Number | Limited service information. Allowed values:<br>• 0: no limited service<br>• 1: limited Service |
| <ready_state> | Number | MM READY state. Allowed values:<br>• 0: not in ready state<br>• 1: in ready state |
| <active_timer_bitmap> | Number | Bitmap of the active MM timers: T3302, T3310, T3311, T3312, T3314, T3321, T3330.<br>T3302 is the least significant bit and T3330 the most significant bit<br>The bitmap values are presented in hexadecimal format (the range goes from 0x0000 to 0x007F) |
| <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. |

Objective Specification

### 7.21.4 Notes

**LISA-U / SARA-U**

- <mode>=5, 6, 133 and 134 are not supported.

**LISA-U200-00S / LISA-U200-01S / LISA-U200-02S / LISA-U200-52S / LISA-U200-62S / LISA-U200-82S / LISA-U230 / LISA-U260 / LISA-U270**

- <mode>=128, 129, 130, 131, 132, 133 and 134 are not supported.
- The <details> parameter is not supported.

**LISA-U200-01S / LISA-U200-02S / LISA-U200-52S / LISA-U200-62S / LISA-U200-82S / LISA-U230 / LISA-U260 / LISA-U270**

- The SIM verification is needed.

**LISA-U200-00S / LISA-U200-01S / LISA-U230 / LISA-U260-01S / LISA-U270-01S**

- The set command can be issued when the module is not registered to the network.

**LISA-U1**

- <mode>=128, 129, 130, 131, 132, 133 and 134 are not supported.
- The <details> parameter is not supported.

**SARA-U260-00S / SARA-U270-00S / SARA-U270-00X / SARA-U280-00S**

- <mode>=128, 129, 130, 131, 132, 133 and 134 are not supported.

**SARA-G / LEON-G**

- The <details> and <rat> parameters are not supported.

**SARA-G300 / SARA-G310 / SARA-G340-00S / SARA-G340-01S / SARA-G350-00S / SARA-G350-00X / SARA-G350-01B / SARA-G350-01S / LEON-G100-06S**

- <mode>=128, 129, 130, 131, 132, 133 and 134 are not supported.

## 7.22 Neighbour cells configuration +UDCONF=83

| +UDCONF=83 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340-02S SARA-G350-02A SARA-G350-02S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 7.22.1 Description

Configures the number of neighbour cells which information will be reported in the information text response of the *AT+CGED=0 / AT+CGED=1 / AT+CGED=5 / AT+CGED=6 / AT+CGED=128 AT+CGED=129 / AT+CGED=133 / AT+CGED=134* set command.

### 7.22.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UDCONF=83,<max_2g_ncells> | OK | AT+UDCONF=83,6<br>OK |
| Read | AT+UDCONF=83 | +UDCONF: 83,<max_2g_ncells><br>OK | +UDCONF: 83,6<br>OK |

### 7.22.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <max_2g_ncells> | Number | Indicates the number of neighbour cells to be reported.<br>The range goes from 0 to 32. The default value is 32. In the dedicated-mode the <max_2g_ncells> setting will be limited to 6 cells. |

Objective specification

# 7.23 Channel and network environment description +UCGED

| +UCGED | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | No | No | - | *+CME Error* |

## 7.23.1 Description

Enables the protocol stack and network environment information collection.

The information text response of the read command reports only the current RAT (if any) parameters, determined by <rat> value.

<mode>=3 is supported only by these products:
TOBY-L200-00S;

TOBY-L210-00S;

MPCI-L200-00S;

MPCI-L210-00S;

## 7.23.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UCGED=<mode> | [+UCGED: <svc><br><arfcn>,<Gmcc>,<Gmnc>,<GcellId>,<BSIC>,<rxlev><br><uarfcn>,<Wband>,<Wmcc>,<Wmnc>,<WcellId>,<Wrrc>,<rssi>,<ecn0_lev><br><earfcn>,<Lband>,<ul_BW>,<dl_BW>,<Lmcc>,<Lmnc>,<tac>,<LcellId>,<P-CID>,<rsrp>,<rsrq>,<Lsinr>,<Lrrc>]<br>OK | AT+UCGED=2<br>OK<br>AT+UCGED=3<br>+UCGED: 0<br>65535,fff,fff,0000,ff,99<br>10588,1,222,88,1281d24,255,11,40<br>65535,255,255,255,fff,fff,ffff,0000000,65535,255,255,255,255<br>OK |
| Read | AT+UCGED? | **Syntax in case <mode>= 0:**<br>+UCGED: 0<br>**Syntax in case <mode>= 2, <rat>= 2:**<br>+UCGED: 2<br>2,<svc>,<MCC>,<MNC><br><arfcn>,<band1900>,<GcellId>,<BSIC>,<Glac>,<Grac>,<rxlev>,<grr>,<t_adv>,<Gspeech_mode><br>OK<br>**Syntax in case <mode>= 2, <rat>= 3:**<br>+UCGED: 2<br>3,<svc>,<MCC>,<MNC><br><uarfcn>,<Wband>,<WcellId>,<Wlac>,<Wrac>,<scrambling_code>,<Wrrc>,<rssi>,<ecn0_lev>,<Wspeech_mode><br>OK<br>**Syntax in case <mode>= 2, <rat>= 4:**<br>+UCGED: 2<br>4,<svc>,<MCC>,<MNC><br><earfcn>,<Lband>,<ul_BW>,<dl_BW>,<tac>,<LcellId>,<P-CID>,<mTmsi>,<mmeGrId>,<mmeCode>, <rsrp>, | +UCGED: 0<br>OK<br>+UCGED: 2<br>2,4,001,01<br>810,1,0000,01,0000,80,63,255,255,255<br>OK<br>+UCGED: 2<br>3,4,001,01<br>4400,5,0000000,0000,80,9,4,62,42,255<br>OK<br>+UCGED: 2<br>4,0,001,01<br>2525,5,25,50,2b67,69f6bc7,111,00000000,ffff,ff,67,19,0.00,255,255,255,67,11,255,0,255,255<br>OK |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | <rsrq>,<Lsinr>,<Lrrc>,<Rl>,<CQl>,<avg_ rsrp>,<totalPuschPwr>,<avgPucchPwr>, <drx>, <l2w>,<volte_mode> | |
| | | OK | |
| | | **Syntax in case <mode>= 2, <rat>= 5:** | +UCGED: 2 |
| | | +UCGED: 2 | 5,1 |
| | | 5,<svc> | OK |
| | | OK | |
| Test | AT+UCGED=? | +UCGED: (list of supported <mode>s) | +UCGED: (0,2) |
| | | OK | OK |

## 7.23.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | • 0: reporting disabled<br>• 2: short form reporting enabled<br>• 3: retrieve the short form text information report |
| <rat> | Number | Current Radio Access Technology:<br>• 2: 2G<br>• 3: 3G<br>• 4: 4G<br>• 5: unknown. The parameter is set to a 5 until a network information update is not successfully performed through +UCGED=2 or when the MT is set to minimum functionality (*+CFUN=4*, *+CFUN=19*). |
| <svc> | Number | Current service status:<br>• 0: not known or not detectable<br>• 1: radio off<br>• 2: searching<br>• 3: no service<br>• 4: registered |
| <MCC> | Number | Mobile Country Code; the range is 0-999 (3 digits), FFF if not known or not detectable. |
| <MNC> | Number | Mobile Network Code; the range is 0-999 (1 to 3 digits), FFF if not known or not detectable. |
| <arfcn> | Number | Absolute Radio Frequency Channel Number (ARFCN); the range is 0-1023, 65535 if not known or not detectable. |
| <band1900> | Number | Indicates whether the given <arfcn> in the range 512-810 is part of band 1900 or not, to avoid ambiguity between bands 1800 and 1900:<br>• 0: the given <arfcn> is not part of band 1900<br>• 1: the given <arfcn> is part of band 1900 |
| <GcellId> | Number | GERAN Cell Identifier (CI) in hexadecimal format; the range is 0h-FFFFh (2 octets). |
| <BSIC> | Number | Base Station Identity Code (BSIC) of the GERAN cell in hexadecimal format; the range is 0h-3Fh (6 bits), FF if not known or not detectable. |
| <Glac> | Number | Two bytes location area of the GERAN cell in hexadecimal format; FFFF if not known or not detectable. |
| <Grac> | Number | One byte routing area of the GERAN cell in hexadecimal format; FF if not known or not detectable. |
| <rxlev> | Number | GERAN cell Received Signal Strength Indicator (RSSI) index as defined in 3GPP TS 45.008 [*28*]:<br>• 0: less than -110 dBm<br>• 1..62: from -110 to -48 dBm with 1 dBm steps<br>• 63: -48 dBm or greater<br>• 255: not known or not detectable |
| <grr> | Number | Reserved for future use. |
| <t_adv> | Number | Reserved for future use. |
| <Gspeech_mode> | Number | Reports the latest obtained value of the GSM speech code. Allowed values:<br>• 0: GSM Enhanced Full Rate (12.2 kb/s)<br>• 1: GSM Full Rate (13.0 kb/s)<br>• 2: GSM Half Rate (5.6 kb/s) |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 3..10: AMR NB FR (from 4.75 kb/s to 12.2 kb/s) the value indicates the first codec type chosen from the DUT; see the corresponding value of <Wspeech_mode> parameter for the baud rate mapping<br>• 3..8: AMR NB HR (from 4.75 kb/s to 7.95 kb/s) the value indicates the first codec type chosen from the DUT; see the corresponding value of <Wspeech_mode> parameter for the baud rate mapping<br>• 11..13: AMR WB FR (from 6.60 kb/s to 12.65 kb/s) the value indicates the first codec type chosen from the DUT; see the corresponding value of <Wspeech_mode> parameter for the baud rate mapping<br>• 255: not known or not detectable<br>See 3GPP TS 26.201 [112] for more details on GSM codecs used during a voice call<br>In case a set of speech codecs is assigned by the network, then the parameter reports the lowest one and this one is not necessary the one used. |
| <uarfcn> | Number | UTRAN Absolute Radio Frequency Channel Number (UARFCN); the range is 1537-10838, 65535 if not known or not detectable. |
| <Wband> | Number | UTRAN band:<br>• 1: band 1 (2 GHz)<br>• 2: band 2 (1900 MHz)<br>• 4: band 4 (2100 MHz)<br>• 5: band 5 (800 MHz)<br>• 8: band 8 (900 MHz)<br>• 255: not known or not detectable |
| <WcellId> | Number | UTRAN CI (cell identifier) in hexadecimal format; the range is 0h-FFFFFFFh (28 bits), 0000000 if not known or not detectable. |
| <Wlac> | Number | Two bytes location area of the UTRAN cell in hexadecimal format; FFFF if not known or not detectable. |
| <Wrac> | Number | One byte routing area of the GERAN cell in hexadecimal format; FF if not known or not detectable. |
| <scrambling_code> | Number | Primary Scrambling Code; range 0-512, 0 if not known or not detectable. |
| <Wrrc> | Number | 3G RRC state:<br>• 0: idle<br>• 1: URA_PCH<br>• 2: CELL_PCH<br>• 3: CELL_FACH<br>• 4: CELL_DCH<br>• 255: not known or not detectable |
| <rssi> | Number | UTRAN cell Received Signal Strength Indicator as defined in 3GPP TS 25.133 [105]:<br>• 0: less than -100 dBm<br>• 1..75: from -100 to -25 dBm with 1 dBm steps<br>• 76: -25 dBm or greater<br>• 255: not known or not detectable |
| <ecn0_lev> | Number | UTRAN cell Ratio of received energy per PN chip to the total received power spectral density as defined in 3GPP TS 25.133 [105]:<br>• 0: less than -24 dB<br>• 1..48: from -24 dB to 0 dB with 0.5 dB steps<br>• 49: 0 dB or greater<br>• 255: not known or not detectable |
| <Wspeech_mode> | Number | Reports the latest obtained value of the UMTS speech code. Allowed values:<br>• 3: AMR NB (4.75 kb/s)<br>• 4: AMR NB (5.15 kb/s)<br>• 5: AMR NB (5.90 kb/s)<br>• 6: AMR NB (6.70 kb/s)<br>• 7: AMR NB (7.40 kb/s)<br>• 8: AMR NB (7.95 kb/s)<br>• 9: AMR NB (10.2 kb/s)<br>• 10: AMR NB (12.2 kb/s)<br>• 11: AMR WB (6.60 kb/s) |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 12: AMR WB (8.85 kb/s)<br>• 13: AMR WB (12.65 kb/s)<br>• 14: AMR WB (14.25 kb/s)<br>• 15: AMR WB (15.85 kb/s)<br>• 16: AMR WB (18.25 kb/s)<br>• 17: AMR WB (19.85 kb/s)<br>• 18: AMR WB (23.05 kb/s)<br>• 19: AMR WB (23.85 kb/s)<br>• 255: not known or not detectable<br>See 3GPP TS 26.201 [112] for more details on UMTS codecs used during a voice call.<br>In case a set of speech codecs is assigned by the network, then the parameter reports the lowest one and this one is not necessary the one used. |
| <earfcn> | Number | E-UTRAN Absolute radio frequency channel number; the range is 0-6449, 65535 if not known or not detectable. |
| <Lband> | Number | E-UTRAN band (see 3GPP TS 36.101 Table 5.5-1 [98]); the range is 0-44, 255 if not known or not detectable. |
| <ul_BW> | Number | Number of Uplink Resource Blocks (see 3GPP TS 36.101 Table 5.6-1 [98]), 255 if not known or not detectable. |
| <dl_BW> | Number | Number of Downlink Resource Blocks (see 3GPP TS 36.101 Table 5.6-1 [98]), 255 if not known or not detectable. |
| <tac> | Number | E-UTRAN cell Tracking area code in hexadecimal format; the range is 0h-FFFFh (2 octets), FFFF if not known or not detectable. |
| <LcellId> | Number | E-UTRAN CI (cell identifier) in hexadecimal format; the range is 0h-FFFFFFFh (28 bits), 0000000 if not known or not detectable. |
| <P-CID> | Number | E-UTRAN cell Physical Cell ID; the range is 0-503, 65535 if not known or not detectable. |
| <mTmsi> | Number | 4 bytes MME Temporary Mobile Subscriber Identity in hexadecimal format; 00000000 if not known or not detectable. |
| <mmeGrId> | Number | 2 bytes MME Group Identifier in hexadecimal format; FFFF if not known or not detectable. |
| <mmeCode> | Number | 1 byte MME Code in hexadecimal format; FF if not known or not detectable. |
| <rsrp> | Number | Reference Signal Received Power (RSRP) as defined in 3GPP TS 36.133 [104]:<br>• 0: less than -140 dBm<br>• 1..96: from -140 dBm to -44 dBm with 1 dBm steps<br>• 97: -44 dBm or greater<br>• 255: not known or not detectable |
| <rsrq> | Number | Reference Signal Received Quality (RSRQ) as defined in 3GPP TS 36.133 [104]:<br>• 0: less than -19.5 dB<br>• 1..33: from -19.5 dB to -3 dB with 0.5 dB steps<br>• 34: -3 dB or greater<br>• 255: not known or not detectable |
| <Lsinr> | Number | E-UTRAN Signal to Interference and Noise ratio in dB, 255 if not known or not detectable. |
| <Lrrc> | Number | 4G RRC state:<br>• 0: null<br>• 1: IDLE<br>• 2: ATTEMPT TO CONNECT<br>• 3: CONNECTED<br>• 4: LEAVING CONNECTED STATE<br>• 5: ATTEMPT LEAVING E-UTRA<br>• 6: ATTEMPT ENTERING E-UTRA<br>• 255: not known or not detectable |
| <RI> | Number | Rank Indicator value; 255 if not known or not detectable. It is updated every 480 ms with the value which has been most often reported to the network in the previous 480 ms period. See 3GPP TS 36.213 [129] section 7.2 and 3GPP TS 36.212 [130] section 5.2.2.6 for more details. |
| <CQI> | Number | Channel Quality Indicator value; 255 if not known or not detectable. It is updated every 480 ms with the value which has been most often reported to the network in the previous 480 ms period. See 3GPP TS 36.213 [129] section 7.2 for more details. |
| <avg_rsrp> | Number | Average value of last 10th Reference Signal Received Power (RSRP). |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| <totalPuschPwr> | Number | Mobile output power for PUSCH transmission averaged over 480 ms in dBm; 255 if not known or not detectable. |
| <avgPucchPwr> | Number | Mobile output power for PUCCH transmission averaged over 480 ms in dBm; 255 if not known or not detectable. |
| <drx> | Number | Discontinuous Reception "drx-Inactivity-Timer" value in ms; 0 if not known or not detectable. |
| <l2w> | Number | SIB3 LTE to WCDMA reselection criteria: (threshServingLow)x2 +(q-RxLevMin)x2; 255 if not known or not detectable. |
| <volte_mode> | Number | Reserved for future use. |

### 7.23.4 Notes

**TOBY-L201 / MPCI-L201**

- The values provided by the <Gspeech_mode> and <Wspeech_mode> parameters must not be considered.

**TOBY-L200-00S / TOBY-L210-00S / TOBY-L210-60S / TOBY-L280-00S / MPCI-L200-00S / MPCI-L210-00S / MPCI-L210-60S**

- The command is supported with partial functionality and a limited range for testing purposes only.
- The read command syntax not compatible.
- <mode>=3 is allowed only if short form reporting is enabled, i.e. <mode>=2 previously set.

## 7.24 Provide cell information +UCELLINFO

| +UCELLINFO | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | No | No | *< 5 s* | *+CME Error* |

### 7.24.1 Description

Provides some information about the serving and neighbour cells (both for 2G RAT and 3G RAT). This information can be:

- Periodic: it is performed enabling the URCs through the set command. If enabled, the URCs are periodically issued providing the status about the serving and neighbour cells.
- One-shot: it is performed issuing the read command.

### 7.24.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UCELLINFO=<mode> | OK | AT+UCELLINFO=1<br>OK |
| Read | AT+UCELLINFO? | **Syntax for 2G cells:**<br>+UCELLINFO: <mode>,<type>,<MCC>,<MNC>,<LAC>,<CI>,<RxLev>[,<t_adv>[,<ch_type>,<ch_mode>]]<br>OK | +UCELLINFO: 0,0,222,1,D5BD,5265,36,1,255,255<br>OK |
| | | **Syntax for 3G cells:**<br>+UCELLINFO: <mode>,<type>,<MCC>,<MNC>,<LAC>,<CI>,<scrambling_code>,<dl_frequency>,<rscp_lev>,<ecn0_lev>[,<rrc_state>]<br>OK | +UCELLINFO: 0,2,222,1,EF8D,52D2388,49,10638,16,38,"ID"<br>OK |
| Test | AT+UCELLINFO=? | +UCELLINFO: (list of supported <mode>s)<br>OK | +UCELLINFO: (0-1)<br>OK |
| URC | | **URC syntax for 2G cells:** | +UCELLINFO: 1,1,222,1,D5BD,5266,22 |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | +UCELLINFO: <mode>,<type>,<MCC>,<MNC>,<LAC>,<CI>,<RxLev>[,<t_adv>[,<ch_type>,<ch_mode>]] | |
| | | **URC syntax for 3G cells:**<br>+UCELLINFO: <mode>,<type>,<MCC>,<MNC>,<LAC>,<CI>,<scrambling_code>,<dl_frequency>,<rscp_lev>,<ecn0_lev>[,<rrc_state>] | +UCELLINFO: 1,2,222,1,EF8D,52D2388,49,10638,18,35,"ID" |

## 7.24.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | • 0: periodic reporting disabled<br>• 1: periodic reporting enabled |
| <type> | Number | For 2G cells:<br>• 0: 2G serving cell<br>• 1: neighbour 2G cell<br>For 3G cells:<br>• 2: 3G serving cell or cell belonging to the Active Set<br>• 3: cell belonging to the Virtual Active Set<br>• 4: detected cell |
| <MCC> | Number | See *+CGED* command description |
| <MNC> | Number | See *+CGED* command description |
| <LAC> | Number | See *+CGED* command description |
| <CI> | Number | See *+CGED* command description |
| <RxLev> | Number | See *+CGED* command description |
| <t_adv> | Number | See *+CGED* command description |
| <ch_type> | Number | See *+CGED* command description |
| <ch_mode> | Number | See *+CGED* command description |
| <scrambling_code> | Number | See *+CGED* command description |
| <dl_frequency> | Number | See *+CGED* command description |
| <rscp_lev> | Number | See *+CGED* command description |
| <ecn0_lev> | Number | See *+CGED* command description |
| <rrc_state> | String | See *+CGED* command description |

## 7.24.4 Notes

If the MT is 3G registered with an active radio connection (CELL_DCH):

- <MCC>, <MNC>, <LAC> and <CI> will be always invalid for 3G cells belonging to Active Set, Virtual Active Set, Detected Set
- The 3G serving cell data could be outdated. Use the Active Set data for any information regarding involved cells in the current radio connection

**LISA-U1 / LISA-U200-00S / LISA-U200-01S / LISA-U200-02S / LISA-U200-52S / LISA-U200-62S / LISA-U200-82S / LISA-U230 / LISA-U260 / LISA-U270 / SARA-U260-00S / SARA-U270-00S / SARA-U270-00X / SARA-U280-00S**

- The parameters <ch_type>, <ch_mode>, <rrc_state> are not supported.

Objective Specification

# 7.25 Lock on a specific cell +UCELLLOCK

| +UCELLLOCK | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U260-02S LISA-U270-02S LISA-U270-62S LISA-U270-63S LISA-U270-68S SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G100-07S LEON-G100-08S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 7.25.1 Description

Forces the module to lock on a:

- A specific GSM cell only (identified by its BCCH ARFCN)
- A specific UMTS cell only (identified by its UARFCN and PSC)
- A specific GSM or a specific UMTS cell
- A specific LTE cell only (identified by its EARFCN and P-CID)
- A specific GSM or a specific UTMS or a specific LTE cell
- A specific GSM or a specific LTE cell
- A specific UMTS or a specific LTE cell

The feature can work in idle-mode only (basic lock: the reselections are inhibited) and in both idle and connected-mode (extended lock: both the reselections and the handovers are inhibited).

Based on the specified cell(s):

- **GSM only** (set the module in 2G RAT with *AT+URAT=0*): the user only sets the ARFCN and the module enters a GSM only mode:
  - If any lock is set, the reselections are inhibited in idle-mode and if the specific BCCH ARFCN is not available, the module enters the Out Of Coverage (OOC) state
  - If the extended lock mode is set, the handovers are inhibited in connected-mode
  - Extended redirection lock mode is equivalent to the extended lock mode
- **UMTS only** (set the module in 3G RAT with *AT+URAT=2*): the user only sets the UARFCN+PSC pair and the module enters a UMTS only mode. The reselections are inhibited and if the specific UARFCN and PSC are not available, the module enters the OOC state
  - In the normal lock mode the UE can leave the locked cell due to the handovers and the radio reconfiguration by the network
  - In the extended lock mode, the handovers are inhibited. The reconfiguration via redirection IEs is still allowed
  - In extended redirection lock mode any reconfiguration via redirection IEs (see 3GPP TS 25.331 *[97]*) is rejected or ignored
- **LTE only** (set the module in 4G RAT with *AT+URAT=3*): the user only sets the EUARFCN+P-CID pair and the module enters a LTE only mode. The reselections are inhibited and if the specific EARFCN and P-CID are not available, the module enters the OOC state.
  - In normal lock mode, the UE can leave the locked cell due to the handovers and the radio reconfiguration by the network
  - In extended lock mode, the handovers are inhibited. The reconfiguration via redirection IEs is still allowed
  - In extended redirection lock mode, any reconfiguration via redirection IEs is rejected or ignored
- **GSM and UMTS** (set the module in the automatic 2G/3G RAT with *AT+URAT=1,2* or *AT+URAT=1,0*): the user sets both the ARFCN and the UARFCN, PSC pair to make the module enter dual mode. The module searches for any of the two locking cells and camps on the first cell found. Reselections in idle mode are allowed to the other locking cell only. In connected mode:
  - In normal lock mode, the UE can leave the locked cells due to the handovers and the radio reconfiguration by the network. The Ue cannot leave its RATs

Objective Specification

  - In extended lock mode, the handovers are inhibited. The reconfiguration via redirection IEs is still allowed
  - In extended redirection lock mode, any reconfiguration via redirection IEs is rejected or ignored
- **GSM and LTE** (set the module in automatic 2G/4G RAT with *AT+URAT=5,3* or *AT+URAT=5,0*): the user sets both the ARFCN and the EARFCN, P-CID pair to make the module enter dual mode. The module searches for any of the two locking cells and camps on the first cell found. Reselections in idle mode are allowed to the other locking cell only. In connected mode the behaviour is the same of the GSM and UMTS case
- **UMTS and LTE** (set the module in automatic 3G/4G RAT with *AT+URAT=6,2* or *AT+URAT=6,3*): the user sets both the UARFCN,PSC and the EARFCN, P-CID pairs to make the module enter dual mode. The module searches for any of the two locking cells and camps on the first cell found. Reselections in idle mode are allowed to the other locking cell only. In connected mode the behaviour is the same of the GSM and UMTS case
- **GSM, UMTS and LTE** (set the module in automatic 2G/3G/4G RAT with *AT+URAT=4,1* or *AT+URAT=4,2* or *AT+URAT=4,3*): the user sets the ARFCN, the UARFCN and PSC, the EARFCN and the P-CID pair to make the module enter tri mode. The module searches for any of the three locking cells and camps on the first cell found. Reselections in idle mode are allowed to the other locking cells only. In connected mode the behaviour is the same of the GSM and UMTS case

SARA-G / LEON-G
The UMTS and dual mode are not available.

LISA-U / SARA-U / SARA-G / LEON-G
LTE, tri mode and any dual mode involving LTE are not available.

The *+COPS=5* command can be used to determine the available BCCH ARFCN / UARFCN and PSC / EARFCN and P-CID numbers.

The set command can only be executed when the module is not registered and no registration attempt is in progress.

If the *+URAT* mode is not compatible with the requested cell(s) type then the command will return an error result code.

If the command is provided with an unsupported UARFCN then the command will return an error result code and the previous configuration will be restored unless the current *+URAT* mode is not compatible, in which case the cell lock will be disabled.

*+COPS=5* and *+COPS=?* shall not be used when the lock is enabled, because the results would be inconsistent.

## 7.25.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UCELLLOCK=<lock_mode>[,<BCCH_ARFCN>[,<band1900>[,<UARFCN>,<PSC>[,<EARFCN>,<P-CID>]]]] | OK | AT+UCELLLOCK=0<br>OK<br>AT+UCELLLOCK=2,90<br>OK<br>AT+UCELLLOCK=2,,,10750,100<br>OK<br>AT+UCELLLOCK=2,700,1,10750,100<br>OK<br>AT+UCELLLOCK=2,,,10750,100,300,1<br>OK |
| Read | AT+UCELLLOCK? | **GSM/GPRS modules**<br>+UCELLLOCK: [<lock_result>,]<lock_mode>[,<BCCH_ARFCN>,<band1900>]<br>OK<br>**HSPA modules** | +UCELLLOCK: 0<br>OK |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | +UCELLLOCK: [<lock_result>,<locked_RAT>,]<lock_mode>[,<BCCH_ARFCN>,<band1900>,<UARFCN>,<PSC>]<br>OK | |
| | | **LTE modules**<br>+UCELLLOCK: [<lock_result>,<locked_RAT>,]<lock_mode>[,<BCCH_ARFCN>,<band1900>,<UARFCN>,<PSC>[,<EARFCN>,<P-CID>]]<br>OK | +UCELLLOCK: 1,1,2,90,0,65535,65535<br>OK<br>+UCELLLOCK: 1,2,2,65535,0,10750,100<br>OK<br>+UCELLLOCK: 1,2,2,700,1,10750,100<br>OK<br>+UCELLLOCK: 1,2,2,700,107500,100,300,1<br>OK |
| Test | AT+UCELLLOCK=? | **GSM/GPRS modules**<br>+UCELLLOCK: (list of supported <lock>s),(list of supported <BCCH_ARFCN>s),(list of supported <band1900>s)<br>OK | +UCELLLOCK: (0,2-5),(0-1023),(0,1)<br>OK |
| | | **HSPA modules**<br>+UCELLLOCK: (list of supported <lock>s),(list of supported <BCCH_ARFCN>s),(list of supported <band1900>s),(list of supported <UARFCN>s),(list of supported <PSC>s)<br>OK | +UCELLLOCK: (0,2-7),(0-1023),(0,1),(1537-10838),(0-511)<br>OK |
| | | **LTE modules**<br>+UCELLLOCK: (list of supported <lock>s),(list of supported <BCCH_ARFCN>s),(list of supported <band1900>s),(list of supported <UARFCN>s),(list of supported <PSC>s),(list of supported <EARFCN>s),(list of supported <P-CID>s)<br>OK | +UCELLLOCK: (0,2-7),(0-1023),(0,1),(1537-10838),(0-511),(0-9919),(0-503)<br>OK |
| URC | | **GSM/GPRS modules**<br>+UCELLLOCK: <lock_result> | +UCELLLOCK: 1<br>OK |
| | | **HSDPA modules**<br>+UCELLLOCK: <lock_result>,<locked_RAT> | +UCELLLOCK: 1,1<br>OK |
| | | **LTE modules**<br>+UCELLLOCK: <lock_result>,<locked_RAT> | +UCELLLOCK: 1,1<br>OK |

## 7.25.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <lock_mode> | Number | Action configuration:<br>• 0: lock disabled<br>• 2: lock enabled without URC<br>• 3: lock enabled with URC<br>• 4: extended lock enabled without URC<br>• 5: extended lock enabled with URC<br>• 6: extended redirection lock enabled without URC<br>• 7: extended redirection lock enabled with URC |
| <BCCH_ARFCN> | Number | Indicates on which cell (BCCH ARFCN) to perform the lock (range 0-1023 if <band1900> is 0; 512-810 if <band1900> is 1). |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | A value of 65535 is invalid and it is present in the read output if the ARFCN has not been set. |
| <band1900> | Number | Indicates whether the given <BCCH_ARFCN> is part of band 1900 or not, to avoid ambiguity between bands 1800 and 1900:<br>• 0(default value): the given <BCCH_ARFCN> is not part of band 1900<br>• 1: the given <BCCH_ARFCN> is part of band 1900 |
| <UARFCN> | Number | Indicates the UARFCN to perform the lock on (range 1537-10838).<br>A value of 65535 is invalid and it is present in the read output if the UARFCN has not been set.<br>This parameter is equivalent to <dl_frequency> parameter in *+CGED* and *+UCELLINFO* commands. |
| <PSC> | Number | Indicates the Primary Scrambling Code of the locked cell (range 0-511).<br>A value of 65535 is invalid and it is present in the read output if the PSC has not been set. |
| <EARFCN> | Number | Indicates the EARFCN to perform the lock on (range is 0-9919).<br>A value of 65535 is invalid and it is present in the read output if the EARFCN has not been provided. |
| <P-CID> | Number | Indicates the Physical Cell Id of the locked cell (range 0-503).<br>A value of 65535 is invalid and it is present in the read output if the P-CID has not been provided. |
| <lock_result> | Number | Result of the last issued lock:<br>• 1: lock enabled and successful, camped on the requested cell<br>• 2: lock enabled but unsuccessful, the requested cell was not found |
| <locked_RAT> | Number | Current locked RAT:<br>• 1: GSM<br>• 2: UMTS<br>• 3: LTE |

## 7.25.4 Notes

- If <lock_mode>=0, the <BCCH_ARFCN>, <band1900>, <UARFCN> and <PSC>, <EARFCN> and <P-CID> parameters are not used.
- If <lock_mode> differs from 0, the <BCCH_ARFCN>, <UARFCN> + <PSC> or the <EARFCN> + <P-CID> parameters are mandatory.
- If <band1900> is issued, <BCCH_ARFCN> is mandatory.
- The printed list of supported <UARFCN> reports only the theoretical minimum and maximum UARFCN for readability sake. The supported band ranges and additional frequencies are product dependent. The supported UARFCN list is the following (based on 3GPP TS 25.101 *[64]* ch 5.4.4 - Table 5.2):

| Operating band | Frequency band | Min UARFCN | Max UARFCN | Additional UARFCNs |
|---|---|---|---|---|
| Band I | 2100 | 10562 | 10838 | - |
| Band II | 1900 | 9662 | 9938 | 412, 437, 462, 487, 512, 537, 562, 587, 612, 637, 662, 687 |
| Band IV | 1700 | 1537 | 1738 | 1887, 1912, 1937, 1962, 1987, 2012, 2037, 2062, 2087 |
| Band V | 850 | 4357 | 4458 | 1007, 1012, 1032, 1037, 1087 |
| Band VI | 800 | 4387 | 4413 | 1037, 1062 |
| Band VIII | 900 | 2937 | 3088 | - |

**Table 3: Supported UARFCN list**

- The printed list of supported <EARFCN>'s reports only the theoretical minimum and maximum EARFCN for readability's sake. The supported band ranges and additional frequencies are product dependent. The supported EARFCN list is the following (based on 3GPP TS 36.101 *[98]* ch 5.7.3 - Table 5.7.3-1):

| Operating band | Frequency band | Min EARFCN | Max EARFCN |
|---|---|---|---|
| Band 1 | 2100 | 0 | 599 |
| Band 2 | 1900 | 600 | 1199 |
| Band 3 | 1800 | 1200 | 1949 |
| Band 4 | 1700 | 1950 | 2399 |

Objective Specification

| Operating band | Frequency band | Min EARFCN | Max EARFCN |
|---|---|---|---|
| Band 5 | 850 | 2400 | 2649 |
| Band 7 | 2600 | 2750 | 3449 |
| Band 8 | 900 | 3450 | 3799 |
| Band 17 | 700 | 5730 | 5849 |
| Band 19 | 800 | 6000 | 6149 |
| Band 20 | 800 | 6150 | 6449 |
| Band 21 | 1500 | 6450 | 6599 |

**Table 4: Supported EARFCN list**

- If <lock_mode>=0, the read command's information text response only displays the <lock_mode> parameter.
- If <lock_result>=2, the module is not in normal mode of operation, and persist in OOC state until <lock_mode>=0 is set or camps on the selected <BCCH_ARFCN> or <UARFCN> and <PSC> or <EARFCN> and <P-CID> (in the latter case the URC with <lock_result>=2 is displayed).
- If <lock_result>=2 and if the lock has been set two or more RATs then the <locked_RAT> is meaningless and should not be considered.

**TOBY-L2 / MPCI-L2**

- <lock_mode>=4, 5, 6 and 7 are not supported.

**LISA-U / SARA-U**

- <EARFCN> and <P-CID> are not supported.
- <locked_RAT>=3 is not supported.

**SARA-G / LEON-G**

- <lock_mode>=6 and 7 are not supported.
- <locked_RAT>, <EARFCN> and <P-CID>, <UARFCN>, <PSC> are not supported.

# 7.26 Wireless service selection +WS46

| +WS46 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| | LISA-U SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 7.26.1 Description

Select the cellular service (Wireless Data Service; WDS) to operate with the MT according to PCCA STD-101 [*86*]. PCCA calls the WDS-Side Stack Selection. The command may be used when the MT is asked to indicate the wireless services in which it can operate.

u-blox cellular modules are certified according to all the capabilities and options stated in the Protocol Implementation Conformance Statement document (PICS) of the module. The PICS, according to 3GPP TS 51.010-2 [*83*], 3GPP TS 34.121-2 [*84*], 3GPP TS 36.521-2 [*114*] and 3GPP TS 36.523-2 [*115*], is a statement of the implemented and supported capabilities and options of a device. If the user changes the command settings during the certification process, the PICS of the application device integrating a u-blox cellular module must be changed accordingly.

## 7.26.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+WS46=[<n>] | OK | AT+WS46=25<br>OK |
| Read | AT+WS46? | +WS46: <n><br>OK | +WS46: 25<br>OK |

Objective specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| Test | AT+WS46=? | +WS46: (list of supported <n>s) | +WS46: (12,22,25) |
| | | OK | OK |

### 7.26.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <n> | Number | WDS-Side stack selection indication and may be:<br>• 12: GSM digital cellular (single mode GSM)<br>• 22: UTRAN only (single mode UMTS)<br>• 25 (factory-programmed value): 3GPP systems, both GERAN and UTRAN (dual mode stack)<br>• 28: E-UTRAN only<br>• 29: GERAN and UTRAN<br>• 30: GERAN and E-UTRAN<br>• 31: UTRAN and E-UTRAN |

### 7.26.4 Notes

- It is possible to configure the WDS-Side stack only when is not registered on the wireless service.
- The *+URAT* command provides extended functionalities with respect to +WS46 command.

**TOBY-L2 / MPCI-L2**

- The command returns the "OK" result code and the current values but no action is actually performed.

**LISA-U / SARA-U**

- <n>=28, 29, 30, 31 are not supported.

**SARA-U270-53S / SARA-U280**

- <n>=12, 25 is not supported.
- The factory-programmed value of <n> is 22.

## 7.27 Service specific access control restriction status +CSSAC

| +CSSAC | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L210-62S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 7.27.1 Description

Provides the current status of the parameters for SSAC, <BFVoice>, <BFVideo>, <BTVoice> and <BTVideo>. The AT command has no effect on the execution of SSAC. Refers to SSAC (Service Specific Access Control) related information which is used by MMTEL application (see 3GPP TS 24.173 *[100]*).

### 7.27.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | AT+CSSAC | +CSSAC: <BFVoice>,<BFVideo>,<BTVoice>,<BTVideo><br>OK | |
| Test | AT+CSSAC=? | OK | OK |

### 7.27.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <BFVoice> | Number | Shows the barring factor for MMTEL voice and it is mapped to the BarringFactorForMMTEL-Voice as in *Table 5*. |
| <BFVideo> | Number | Shows the barring factor for MMTEL video and it is mapped to the BarringFactorForMMTEL-Video as in *Table 6*. |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| <BTVoice> | Number | Shows the barring timer for MMTEL voice and it is mapped to the BarringTimeForMMTEL-Voice as in *Table 7*. |
| <BTVideo> | Number | Shows the barring timer for MMTEL video and it is mapped to the BarringTimeForMMTEL-Video as in *Table 8*. |

## 7.27.4 Notes

- | <BFVoice> | BarringFactorForMMTEL-Voice as specified in 3GPP TS 24.173 *[100]* |
|---|---|
| 0 | 0 |
| 1 | 0,05 |
| 2 | 0,1 |
| 3 | 0,15 |
| 4 | 0,2 |
| 5 | 0,25 |
| 6 | 0,3 |
| 7 | 0,4 |
| 8 | 0,5 |
| 9 | 0,6 |
| 10 | 0,7 |
| 11 | 0,75 |
| 12 | 0,8 |
| 13 | 0,85 |
| 14 | 0,9 |
| 15 | 0,95 |
| 16 | 1 |

**Table 5: Value of BFVoice and its interpretation by MMTEL application**

- | <BFVideo> | BarringFactorForMMTEL-Video as specified in 3GPP TS 24.173 *[100]* |
|---|---|
| 0 | 0 |
| 1 | 0,05 |
| 2 | 0,1 |
| 3 | 0,15 |
| 4 | 0,2 |
| 5 | 0,25 |
| 6 | 0,3 |
| 7 | 0,4 |
| 8 | 0,5 |
| 9 | 0,6 |
| 10 | 0,7 |
| 11 | 0,75 |
| 12 | 0,8 |
| 13 | 0,85 |
| 14 | 0,9 |
| 15 | 0,95 |
| 16 | 1 |

**Table 6: Value of BFVideo and its interpretation by MMTEL application**

- | <BTVoice> | BarringTimeForMMTEL-Voice as specified in 3GPP TS 24.173 *[100]* |
|---|---|
| 0 | 0 |
| 1 | 4 |
| 2 | 8 |
| 3 | 16 |
| 4 | 32 |

Objective Specification

| <BTVoice> | BarringTimeForMMTEL-Voice as specified in 3GPP TS 24.173 *[100]* |
|---|---|
| 5 | 64 |
| 6 | 128 |
| 7 | 256 |
| 8 | 512 |

**Table 7: Value of BTVoice and its interpretation by MMTEL application**

| <BTVideo> | BarringTimeForMMTEL-Video as specified in 3GPP TS 24.173 *[100]* |
|---|---|
| 0 | 0 |
| 1 | 4 |
| 2 | 8 |
| 3 | 16 |
| 4 | 32 |
| 5 | 64 |
| 6 | 128 |
| 7 | 256 |
| 8 | 512 |

**Table 8: Value of BTVideo and its interpretation by MMTEL application**

# 7.28 Home zone reporting +UHOMEZR

| +UHOMEZR | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 7.28.1 Description

Configures the home zone change event reporting. If reporting is enabled, the MT returns URC **+UHOMEZR: <label>** whenever the home zone is changed.

## 7.28.2 Syntax

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

## 7.28.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <onoff> | Number | • 0 (default value): disable home zone change event reporting<br>• 1: enable home zone change event reporting |
| <label> | String | Zone label indication<br>• "HOME": also possible as "home", dependent from network indication<br>• "CITY": zone label |

Objective Specification

# 7.29 Jamming detection +UCD

| +UCD | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | Yes | *NVM* | No | - | *+CME Error* |

## 7.29.1 Description

The feature consists in detecting, at radio resource level, an anomalous source of interference and signalling it to the client. The jamming condition occurs when simultaneously:

- The synchronization is lost (i.e. the MT is no longer camped on the serving cell and cannot select any other suitable cell)
- An interference is detected (i.e. the band scan reveals at least n carriers, with power level equal or higher than a specified threshold, on which no synchronization is possible)

If <op_code> is set to 5, 6 and 7 an additional constraint to verify a jamming condition occurrence is added:

- The synchronization is lost and the MT cannot select any other suitable cell of the "user-desired" PLMN. If the synchronization is lost due to the detected interference, and the MT camps and/or registers on a different PLMN, the jamming condition is not cleared as long as the "user-desired" PLMN is not detected or second condition (interference detected) is no longer true.

SARA-G / LEON-G
the "user-desired" PLMN is implicitly defined as:

- The manually selected PLMN (i.e. the <oper> parameter, of +COPS=1,<format>,<oper>), when +COPS=1 is used. After enabling the advanced 2G jamming detection, +COPS=0 must be used to switch back to the automatic network selection.
- The Home PLMN (as read from the IMSI), when +COPS=0 is used

The jamming condition is cleared when any of the above mentioned statements does not hold.

The command configures how jamming is reported. If activated, an unsolicited indication is issued when the jamming condition is entered or released. In particular, the set command configures the URC **+UCD: <active>.**

LISA-U1 / LISA-U200-00S / LISA-U200-01S / LISA-U230 / LISA-U260-01S / LISA-U270-01S / SARA-G / LEON-G100-06S
<desired_PLMN> is not supported.

<op_code>=2 returns the <active> value, if and only if the URC has been previously enabled. Otherwise an error result code is provided.

<op_code>=2 does not change the stored <op_code> value.

## 7.29.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| **General syntax** | | | |
| Set | AT+UCD=<op_code>[,<min_number_of_2G_carriers>,<rxlev_threshold>,<min_number_of_3G_carriers>,<rssi_threshold>[,<desired_PLMN>]] | [+UCD: <active>]<br>OK | AT+UCD=3,,,10,20<br>OK |
| Read | AT+UCD? | +UCD: <op_code>,<min_number_of_2G_carriers>,<rxlev_threshold>,<min_number_of_3G_carriers>,<rssi_threshold><br>OK | +UCD: 4,10,20,11,25<br>OK |
| **Jamming disabling** | | | |
| Set | AT+UCD=0 | OK | AT+UCD=0 |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | | OK |
| **2G jamming detection** | | | |
| Set | AT+UCD=1,<min_number_of_2G_carriers>,<rxlev_threshold> | OK | AT+UCD=1,10,60<br>OK |
| Read | AT+UCD? | +UCD: 1,<min_number_of_2G_carriers>,<rxlev_threshold><br>OK | +UCD: 1,10,20<br>OK |
| **Jamming status** | | | |
| Set | AT+UCD=2 | +UCD: <active><br>OK | AT+UCD=2<br>+UCD: 0<br>OK |
| **3G jamming detection** | | | |
| Set | AT+UCD=3,,,<min_number_of_3G_carriers>,<rssi_threshold> | OK | AT+UCD=3,,,10,20<br>OK |
| Read | AT+UCD? | +UCD: 3,,,<min_number_of_3G_carriers>,<rssi_threshold><br>OK | +UCD: 3,,,11,25<br>OK |
| **2G and 3G jamming detection** | | | |
| Set | AT+UCD=4,<min_number_of_2G_carriers>,<rxlev_threshold>,<min_number_of_3G_carriers>,<rssi_threshold> | OK | AT+UCD=4,12,18,10,25<br>OK |
| Read | AT+UCD? | +UCD: 4,<min_number_of_2G_carriers>,<rxlev_threshold>,<min_number_of_3G_carriers>,<rssi_threshold><br>OK | +UCD: 4,10,20,11,25<br>OK |
| **Advanced 2G jamming detection** | | | |
| Set | AT+UCD=5,<min_number_of_2G_carriers>,<rxlev_threshold>,,,<desired_PLMN> | OK | AT+UCD=5,30,35<br>OK |
| Read | AT+UCD? | +UCD: 5,<min_number_of_2G_carriers>,<rxlev_threshold>,<desired_PLMN><br>OK | +UCD: 5,10,20,"00115"<br>OK |
| **Advanced 3G jamming detection** | | | |
| Set | AT+UCD=6,,,<min_number_of_3G_carriers>,<rssi_threshold>,<desired_PLMN> | OK | AT+UCD=6,,,11,25,"22269"<br>OK |
| Read | AT+UCD? | +UCD: 6,,,<min_number_of_3G_carriers>,<rssi_threshold>,<desired_PLMN><br>OK | +UCD: 6,,,11,25,"22269"<br>OK |
| **Advanced 2G and 3G jamming detection** | | | |
| Set | AT+UCD=7,<min_number_of_2G_carriers>,<rxlev_threshold>,<min_number_of_3G_carriers>,<rssi_threshold>,<desired_PLMN> | OK | AT+UCD=7,10,20,11,25,"310456"<br>OK |
| Read | AT+UCD? | +UCD: 7,<min_number_of_2G_carriers>,<rxlev_threshold>,<min_number_of_3G_carriers>,<rssi_threshold>,<desired_PLMN><br>OK | +UCD: 7,10,20,11,25,"310456"<br>OK |
| Test | AT+UCD=? | +UCD: (list of supported <op_code>s),(list of supported <min_number_of_2G_carriers>s),(list of supported <rxlev_threshold>s),(list of supported <min_number_of_3G_carriers>s),(<list of | +UCD: (0-4),(1-172),(3-63),(1-136),(0-76)<br>OK |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | supported <rssi_threshold>s),(list of supported <desired_PLMN>s)<br><br>OK | |
| URC | | +UCD: <active> | +UCD: 3 |

## 7.29.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <op_code> | Number | Mode of operation of the jamming detection. When enabled, the +UCD URC may be generated:<br>• 0 (factory-programmed value): disabled<br>• 1: 2G jamming detection enabled<br>• 2: interrogation of the <active> value<br>• 3: 3G jamming detection enabled<br>• 4: 2G and 3G jamming detection enabled<br>• 5: advanced 2G jamming detection enabled<br>• 6: advanced 3G jamming detection enabled<br>• 7: advanced 2G and 3G jamming detection enabled |
| <min_number_of_2G_carriers> | Number | Number of minimum disturbing carriers. The range goes from 1 to 172. |
| <rxlev_threshold> | Number | Power level threshold for 2G carriers; see the 3GPP TS 05.08 [28]. The range goes from 3 to 63. The factory-programmed value is 63. |
| <min_number_of_3G_carriers> | Number | Number of minimum disturbing carriers. The range goes from 1 to 136. |
| <rssi_threshold> | Number | Power level threshold for 3G carriers. The range goes from 0 to 76. |
| <desired_PLMN> | String | "user-desired" PLMN in numeric format (MCC and MNC). |
| <active> | Number | Jamming detection status:<br>• 0: 2G jamming no longer detected<br>• 1: detected the 2G jamming<br>• 2: 3G jamming no longer detected<br>• 3: detected the 3G jamming |

## 7.29.4 Notes

### LISA-U / SARA-U

- The command setting is not stored in NVM.
- The jamming detection can be enabled / disabled only on one AT interface at a time. Once disabled on that AT interface, it can be enabled on a different one.
- The jamming detection can be independently enabled / disabled on 2G and 3G network.

### LISA-U1 / LISA-U200-00S / LISA-U200-01S / LISA-U230 / LISA-U260-01S / LISA-U270-01S

- <op_code>=5, <op_code>=6 and <op_code>=7 are not supported.

### SARA-G / LEON-G

- <op_code>=3, <op_code>=4, <op_code>=6 and <op_code>=7 are not supported (thus <min_number_of_3G_carriers>, <rssi_threshold> are also not present).
- The range of <min_number_of_2G_carriers> parameter is between 1 and 255. The factory-programmed value is 255.

### SARA-G300 / SARA-G310 / SARA-G340-00S / SARA-G340-01S / SARA-G350-00S / SARA-G350-00X / SARA-G350-01B / SARA-G350-01S / LEON-G

- The command setting is not stored in NVM.

Objective Specification

# 7.30 IMSI detach +UCSDETACH

| +UCSDETACH | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 7.30.1 Description

Dynamically performs an IMSI detach if the module is currently registered to the CS services.

CS services can be also disabled by using *+CEMODE* and *+CGCLASS* while in the module is not registered on the network.

## 7.30.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | AT+UCSDETACH | OK | AT+UCSDETACH<br>OK |
| Test | AT+UCSDETACH=? | OK | |

# 7.31 MNO configuration +UMNOCONF

| +UMNOCONF | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L201 TOBY-L280-02S MPCI-L201 MPCI-L280 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | *Up to 3 min* | *+CME Error* |

## 7.31.1 Description

Automatically configures the module to be compliant to the requirements of various Mobile Network Operators. For specific operators like Verizon, MNO requirements are enforced by an internal connection manager application. After setting a new configuration the module:

- deregisters from the network, actually entering the airplane mode;
- deletes the current PDP context configuration;
- reconfigures the PDP context settings (e.g. APN of the initial EPS bearer);
- configures the IMS service;
- if necessary, reconfigures the appropriate UE radio capabilities (e.g. HSDPA class, frequency bands).

When changing configuration from Verizon, check the current *+URAT* setting, that might have been silently changed by the OMA-DM client.

A reboot is mandatory only if the <MNO> parameter has changed; the <conf> bitmap is applied runtime. Automatic reboot after a change in the MNO derived from the SIM card can be optionally enabled.

When the <MNO> parameter is set to automatic, the modules derives the current MNO from the IMSI (<detected_MNO>) and, after the mandatory reboot triggered by the user, it:

- applies the configuration implied by the current <detected_MNO> value,
- starts the MNO detection algorithm, and
- issues a URC any time the <detected_MNO> value changes.

After the URC has been issued, depending on <conf> parameter (bit 0), the module reboot can be either automatic or manual:

- If the <detected_MNO> value is valid, and the automatic power cycle is enabled (bit 0 of <conf> parameter set to 1) then the module will autonomously reboot as if *AT+CFUN=16* were entered. In this case the URC simply warns the user that the module is about to power cycle.
- If automatic power cycle is disabled, the URC warns the user that a module reboot is required in order to have the correct configuration applied.

Objective Specification

If the <detected_MNO> value does not map to any of the pre-defined MNOs AT&T or Verizon, or Telstra, the configuration applied after the reboot is the regulatory one.

u-blox cellular modules are certified according to all the capabilities and options stated in the Protocol Implementation Conformance Statement document (PICS) of the module. The PICS, according to 3GPP TS 51.010-2 [83], 3GPP TS 34.121-2 [84], 3GPP TS 36.521-2 [114] and 3GPP TS 36.523-2 [115], is a statement of the implemented and supported capabilities and options of a device. If the user changes the command settings during the certification process, the PICS of the application device integrating a u-blox cellular module must be changed accordingly.

### 7.31.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UMNOCONF=<MNO>[,<conf>] | OK | AT+UMNOCONF=1<br>OK |
| Read | AT+UMNOCONF? | +UMNOCONF: <MNO>,<conf>[,<detected_MNO>]<br>OK | +UMNOCONF: 3,23<br>OK |
| Test | AT+UMNOCONF=? | +UMNOCONF: (list of supported <mode>s),(list of supported <conf>s)<br>OK | +UMNOCONF: (0-3),(0-31)<br>OK |
| URC | | +UMNOCONF: <MNO>,<conf>,<detected_MNO> | +UMNOCONF: 1,7,0 |

### 7.31.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <MNO> | Number | Mobile Network Operator (MNO) configuration:<br>• 0: regulatory. IMS service disabled, Verizon connection manager disabled, all 4G and 3G bands enabled, <conf> is ignored<br>• 1: automatic detection of MNO configuration based on IMSI.<br>• 2: AT&T configuration. IMS service disabled, all supported 4G bands enabled, HSDPA Category set to 14<br>• 3: Verizon. IMS enabled (SMS only), Verizon connection manager enabled , 4G bands 4 and 13. The Verizon connection manager will always ensure that the proper PDP contexts are defined and active.<br>• 4: Telstra. IMS service disabled, all supported 4G bands enabled. |
| <conf> | Number | Unsigned integer representing a bitmask. See Table 9 for for the meaning of each bit. |
| <detected_MNO> | Number | Current MNO detected in automatic mode. Allowed values:<br>• 0: test SIM/USIM (regulatory)<br>• 1: detection error: the module keeps the current configuration (factory configuration is regulatory) and automatic mode is disabled until the module is rebooted.<br>• 2: AT&T SIM/USIM<br>• 3: Verizon SIM/USIM<br>• 4: Telstra SIM/USIM |

### 7.31.4 Notes

- A module reboot is needed to enable to IMS test mode when the Verizon connection manager is disabled (<conf>=11).
- A module reboot is not needed if the value of <conf> parameter is set to 7, 15, 23, 39, 47 or 55 and it is configured with another one of these values.
- In Verizon configuration, it is necessary to set the correct date and time to be fully operational on the network (OMA-DM transactions originated by the network might fail otherwise). This can be done by means of +CCLK command or by enabling the automatic date and time zone update with +CTZU command.
-

| Bit | Bit description | Value | Remarks |
|---|---|---|---|
| 0 | Power cycle configuration, effective only if <MNO> = 1<br>A module reboot is not required to apply it. | 0 | Disabled |

Objective Specification

| Bit | Bit description | Value | Remarks |
|---|---|---|---|
| | | 1 | Automatic power cycle enabled (default and factory-programmed value) |
| 1 | Reserved. | | |
| 2 | Verizon connection manager configuration.<br>A module reboot is not required to apply it. The Verizon connection manager is required for the module operation. It can be disabled for debug purposes or if the DTE has its own external manager. A change in this bit, allowed only if <MNO> = 3 or <MNO> = 1 and <detected_MNO> = 3, automatically triggers the restart of the protocol stack.<br>The Verizon connection manager configuration must always be active if <MNO> = 0 or <MNO> = 3; otherwise the module cannot register with the network.<br>TOBY-L201-01S / MPCI-L201-01S<br>The default and factory-programmed value is 1. | 0 | Stop Verizon connection manager |
| | | 1 | Start Verizon connection manager. |
| 3 | IMS test mode configuration.<br>A module reboot is required to apply it. | 0 | Disabled (default and factory-programmed value) |
| | | 1 | Start IMS test mode |
| 4 | VZWINTERNET handling in Verizon connection manager.<br>The manager will set the PDP context with <CID>= 8 to VZWINTERNET and it will automatically activate it. Allowed only if <MNO> = 3 or <MNO> = 1 and <detected_MNO> = 3. A change in this bit automatically triggers the restart of the protocol stack. | 0 | Not handled (default and factory-programmed value). |
| | | 1 | Handled by Verizon connection manager. |
| 5 | UMTS handling configuration<br>The internal connection manager could try to activate the Verizon context also in 3G RAT leading to a potential issue with roaming. Allowed only if <MNO> = 3 or <MNO> = 1 and <detected_MNO> = 3. | 0 | Feature disabled (factory-programmed and default value): the UMTS is not handled. The Verizon configuration will be handled in LTE only. |
| | | 1 | Feature enabled: try to activate current Verizon configuration also on UMTS. |
| 6 | PLMN check<br>The PLMN check is performed before the LTE registration and the *+UCGDFLT* APN is configured based on the internal information:<br>o If PLMN is Verizon (based on *+UMNOPLMN* list) then the Verizon APN will be used based on the current bitmap<br>o If PLMN is not recognized then the roaming list is checked and APN is accordingly set<br>o Otherwise the Verizon APN will be used as default, and the user can manually override it with *+UCGDFLT* | 0 | Feature enabled (factory-programmed and default value) |
| | | 1 | Feature disabled. The PLMN check is not performed and it is assumed that each PLMN is Verizon. |
| 7 | IPv6 tethering configuration in router mode<br>Enabling the feature; the module will start IPv6 NDP (Neighbor Discovery Protocol) negotiations over the USB link for the IPv6 subnetwork assigned to VZWINTERNET by the network | 0 | IPv6 tethering enabled |
| | | 1 | IPv6 tethering disabled |
| 8 | BIP algorithm configuration<br>Configures the BIP client algorithm as regulatory independently from +UMNOCONF=3 | 0 | The regulatory algorithm is used (default and factory-programmed value) |
| | | 1 | The custom algorithm is used |

**Table 9: <conf> bitmask meaning**

**TOBY-L201 / MPCI-L201**

- The default and factory-programmed value of <MNO> is 2.
- The default and factory-programmed value of <conf> is 7.
- <MNO> and <detected_MNO> = 4 not supported.
- In Verizon configuration (<MNO>=3) the following configuration are not stored in NVM:

Objective Specification

- o Automatic power cycle (bit 0 of <conf> parameter)
- o Verizon connection manager enabled (bit 2 of <conf> parameter)

**TOBY-L280-02S / MPCI-L280**

- The default and factory-programmed value of <MNO> is 4.
- The default and factory-programmed value of <conf> is 1.
- <MNO> and <detected_MNO> = 2 and 3 not supported.
- The module boots in airplane mode (*+CFUN: 4*) after having set the module in regulatory configuration (<MNO>=0) and performed a silent reset (*AT+CFUN=16*).

# 7.32 PLMN list extensions +UMNOPLMN

| +UMNOPLMN | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L201 TOBY-L280-02S MPCI-L201 MPCI-L280 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

## 7.32.1 Description

Edit the PLMN list used by *AT+UMNOCONF*'s MNO detection algorithm during the IMSI identification phase in automatic MNO mode. It configures the mapping of the current detected MNO to one of the pre-defined MNO values. It is possible to extend the PLMN list of these MNO:

- AT&T
- Verizon
- Telstra

The following actions are allowed:

- Add a PLMN (or more) to the automatic MNO detection algorithm: this is possible only if it does not collide with the current setting (no ambiguity shall arise); if some collisions happen, restore the command setting to the factory-programmed configuration
- Revert the mapping of one of the pre-defined MNO to its factory-programmed value with AT+UMNOPLMN=<detectable_MNO>

The maximum number of the entries in the PLMN table is 40. The information text response of the read command provide one line for each allowed <detectable_MNO>.

For each set command at most 10 ranges can be defined. It is possible to issue some set commands until the PLMN list is filled.

## 7.32.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UMNOPLMN=<detectable_MNO>[,<plmn_list>] | OK | AT+UMNOPLMN=2,"310.050"<br>OK |
| Read | AT+UMNOPLMN? | +UMNOPLMN: <detectable_MNO>,<plmn_list><br>[....]<br>OK | +UMNOPLMN: 2,"310.030,310.150,310.170,310.280,310.380,310.410,310.560"<br>+UMNOPLMN: 3,"310.590,310.890,311.480"<br>OK |
| Test | AT+UMNOPLMN=? | +UMNOPLMN: (list of supported <detectable_MNO>s),<br>OK | +UMNOPLMN: (2,3),<br>OK |

Objective Specification

### 7.32.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <detectable_MNO> | Number | Detected MNO to be configured (see *AT+UMNOCONF*). Allowed values:<br>• 2: AT&T<br>• 3: Verizon<br>• 4: Telstra |
| <plmn_list> | String | PLMNs list. Same syntax of *AT+USIMLCK*'s <pers_data> when <facility> = "PN" (network personalization).<br>The parameter is optional. If omitted then the factory PLMN list for the requested <detectable_MNO> will be restored.<br>The parameter format is: "MCC1.MNC1min[-MNC2max][,MCC2.MNC2min[-MNC2max]...[,MCC10.MNC10min[-MNC10max]]". |

### 7.32.4 Notes

#### TOBY-L201 / MPCI-L201

- <detectable_MNO> = 4 not supported.
- If the detected MNO is Verizon, the PLMN list set with this command is also added to the internal connection manager home list. The internal connection manager, after having recognized it as home, will activate it.
- The factory-programmed value of <plmn_list> parameter for AT&T is "310.030,310.150,310.170,310.280,310.380,310.410,310.560".
- The factory-programmed value of <plmn_list> parameter for Verizon is "310.590,310.890,311.480".

#### TOBY-L280-02S / MPCI-L280

- <detectable_MNO> = 2 and 3 not supported.
- The factory-programmed value of <plmn_list> parameter for Telstra is "505.11,505.71,505.72,505.01,530.04".

## 7.33 LTE category configuration +ULTECAT

| +ULTECAT | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L280 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

### 7.33.1 Description

Sets the module LTE category.

For a description of LTE categories see http://www.3gpp.org/keywords-acronyms/1612-ue-category or 3GPP TS 36.306 [*103*].

The command is accepted only in normal operation mode, namely *+CFUN=1*. Reboot the module to apply the new configuration.

### 7.33.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+ULTECAT=<mode>[,<lte_category>] | OK | AT+ULTECAT=0,2<br>OK |
| Read | AT+ULTECAT? | +ULTECAT: <mode>,<lte_category><br>OK | +ULTECAT: 0,2<br>OK |
| Test | AT+ULTECAT=? | +ULTECAT: (list of supported <mode>s),(list of supported <lte_category>s)<br>OK | +ULTECAT: (0,1),(1-4)<br>OK |

Objective Specification

### 7.33.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | Configures how to apply the LTE category. Allowed values:<br>• 0 (factory-programmed value): use the factory-programmed LTE category configuration. <lte_category> is meaningless with this configuration<br>• 1: apply user category. The custom LTE category will be applied |
| <lte_category> | Number | LTE category. Allowed values:<br>• 1: LTE category 1<br>• 2: LTE category 2<br>• 3: LTE category 3<br>• 4 (default and factory-programmed values): LTE category 4 |

Objective Specification

# 8 IP Multimedia Subsystem (IMS)

## 8.1 Introduction

TOBY-L201 / MPCI-L201
The module has been certified for Verizon network operator with the required IMS configuration, automatically set by *AT+UMNOCONF* command.
The IMS configuration can be modified through the *+UIMSCONF* AT command described in this section; in this case certification of the application device integrating the module could be not more valid.

## 8.2 IMS configuration setting +UIMSCONF

| +UIMSCONF | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L201 TOBY-L210-62S MPCI-L201 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

### 8.2.1 Description

Access several configuration and settings related to IP Multimedia Subsystem (IMS).

### 8.2.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UIMSCONF=<key_name>[,<value>[,<more_values>]] | OK | AT+UIMSCONF="KEY_IMS_PDP_APN","IMS",1<br>OK<br>AT+UIMSCONF="KEY_MTU_SIZE",2500<br>OK |
| Test | AT+UIMSCONF=? | +UIMSCONF: (list of supported <key_name>s),,(list of supported <more_values>s)<br>OK | +UIMSCONF: ("KEY_IMS_PDP_APN","KEY_IMS_PDP_CID","KEY_IMS_PDP_TYPE","KEY_AUTH_TYPE_AKA","KEY_AUTH_TYPE_AKAV2","KEY_AUTH_TYPE_MD5","KEY_SEC_AGREE", "KEY_CONFIG_XDM_URL","KEY_PASSWORD","KEY_HOME_NETWORK_DOMAIN","KEY_PRIVATE_IDENTITY", "KEY_PUBLIC_IDENTITY","KEY_CONFIG_SOFT_SIM", "KEY_CONFIG_SOFT_SIM_K", "KEY_CONFIG_SOFT_SIM_OP","KEY_PCSCF_SERVER_ADDRESS","KEY_DNS_SERVER","KEY_SIP_TIMER_T1","KEY_SIP_TIMER_T2","KEY_SIP_TIMER_T4","KEY_SIP_TIMER_TF","KEY_MTU_SIZE", "KEY_IMS_CLIENT_PORT", "KEY_REG_EXPIRES","KEY_MAX_REG_EXPIRES", "KEY_RETRY_BASE_TIME","KEY_RETRY_MAX_TIME", "KEY_REG_BARRED_USER_ID","KEY_EXPLICIT_UNSUB_REG_EVENT", "KEY_PCSCF_BACKOFF_PREFERENCE","KEY_SMSC_NUMBER","KEY_SMSC_URI","KEY_MO_SMS_FORMAT","KEY_MO_SMS_ENCODING","KEY_QOS_PREFERENCE","KEY_PDP_BEARER_MODE", "KEY_DOMAIN_PREFERENCE", "KEY_SMS_PREFERENCE","KEY_IMS_SUPPORT", "KEY_IMS_MWI_SUPPORT","KEY_IMS_SIGCOMP_SUPPORT","KEY_CONFIGURE_MSRP_RELAY","KEY_XCAP_PDP_APN", "KEY_XCAP_PDP_TYPE","KEY_IMS_RAT","KEY_SMSC_URI_TYPE_PREFERENCE", "KEY_MO_SMS_OVER_IMS","KEY_IMS_SMS_DESTINATION","KEY_IMS_SHORT_ENCODING","KEY_CONF_FACTORY_URI","KEY_LOCAL_URI_FORMAT", "KEY_INTERNATIONAL_URI_FORMAT","KEY_IMS_IGNORE_VOPS_IND","KEY_IMS_VOICE_SUPPORT", "KEY_EMERG_PCSCF_SERVER_ADDRESS","KEY_EMERG_DNS_SERVER","KEY_EMERG_IMS_PDP_APN","KEY_EMERG_IMS_PDP_CID", "KEY_EMERG_ |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | | NUMBER","KEY_IMS_EARLY_MEDIA_SUPPORT", "KEY_IMS_MEDIA_AVPF_SUPPORT","KEY_IMS_AUDIOCODEC","KEY_IMS_AMR_MODE","KEY_IMS_AMRWB_MODE","KEY_IMS_AMR_FRAMING_PREF", "KEY_IMS_AMRWB_FRAMING_PREF","KEY_IMS_RTP_ALIVE_TIMER","KEY_IMS_RTCP_ALIVE_TIMER", "KEY_IMS_SESSION_REFRESH_TIMER","KEY_IMS_MIN_SE_TIMER","KEY_IMS_INITIAL_SDP_ANSWER", "KEY_IMS_UPDATE_FOR_UNCOND_MOD","KEY_XDM_SUPPORT","KEY_IMS_SESSION_ID_SUPPORT", "KEY_IMS_SESSION_REFRESHER","KEY_IMS_SET_TCP_MAXSEG","KEY_IMS_FORCE_SIGCOMP", "KEY_IMS_GRUU_SUPPORT","KEY_IMS_SMS_SEND_OK_WRITE_UICC","KEY_IMS_SMS_SEND_NOK_WRITE_UICC"),(0-3)<br><br>OK |

## 8.2.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <key_name> | String | Allowed configurations:<br>• "KEY_IMS_PDP_APN": IMS Access Point Name.<br><value> type is a string parameter. The factory-programmed and default value is "IMS".<br>• "KEY_IMS_PDP_CID": PDP context identifier to be used for IMS signalling protocols.<br><value> is a numeric parameter in range [0-8], where 0 indicates that the target will use any free PDP context identifier. The factory-programmed and default value is 0.<br>• "KEY_IMS_PDP_TYPE": IMS PDP type.<br><value> is a string parameter with these allowed values: "IPV4", "IPV6", "IPV4V6". The factory-programmed and default value is "IPV4V6".<br>• "KEY_AUTH_TYPE_AKA": configures the AKAv1 MD5 Digest Authentication. The Security Agreement must be explicitly enabled with the related <key_name>.<br><value> is a string parameter with these allowed values: "true", "false". The factory-programmed and default value is "true".<br>• "KEY_AUTH_TYPE_AKAV2": configures the AKAv2 MD5 Digest Authentication. The Security Agreement must be explicitly disabled with the related <key_name>.<br><value> is a string parameter with these allowed values: "true","false". The factory-programmed and default value is "false".<br>• "KEY_AUTH_TYPE_MD5": configures MD5 Digest Authentication. The Security Agreement must be explicitly disabled with the related <key_name>.<br><value> is a string parameter with these allowed values: "true","false". The factory-programmed and default value is "false".<br>• "KEY_SEC_AGREE": configures the Security Agreement and IPsec.<br><value> is a string parameter with these allowed values: "true","false". The factory-programmed and default value is "true".<br>• "KEY_CONFIG_XDM_URL": XDM/XCAP Server Root URL. The URL shall include the "http://" or the "https://" prefix.<br><value> is a string parameter. The factory-programmed and default value is an empty string.<br>• "KEY_PASSWORD": password for IMS MD5 Digest Authentication and XCAP Authentication.<br><value> is a string parameter. The factory-programmed and default value is an empty string.<br>• "KEY_HOME_NETWORK_DOMAIN": Home Domain/Realm. If not provided it will be read from the UICC.<br><value> is a string parameter. The factory-programmed and default value is an empty string.<br>• "KEY_PRIVATE_IDENTITY": private User ID for IMS Registration and XDM Authentication (IMPI). If not provided it will be read from UICC.<br><value> is a string parameter. The factory-programmed and default value is an empty string.<br>• "KEY_PUBLIC_IDENTITY": public User ID. It must be a SIP URI (IMPU). If not provided it will be read from the UICC.<br><value> is a string parameter. The factory-programmed and default value is an empty string.<br>• "KEY_CONFIG_SOFT_SIM": configures the Software SIM feature. If the UICC does not support the ISIM application, the feature will perform the AKA authentication with its own K and OP values.<br><value> is a string parameter with these allowed values: "true","false". The factory-programmed and default value is "false".<br>• "KEY_CONFIG_SOFT_SIM_K": Software SIM secret K.<br><value> is a hex encoded string. The factory-programmed and default value is an empty string. |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • "KEY_CONFIG_SOFT_SIM_OP": Software SIM secret OP.<br><value> is a hex encoded string. The factory-programmed and default value is an empty string.<br>• "KEY_PCSCF_SERVER_ADDRESS": P-CSCF IP Address/Domain[:port] where port is optional. If not provided it will read from PCO exchange during PDN creation, DHCP server or UICC in that order. The IP address can be either IPV4 or IPV6. In case of IPV6 it must be enclosed in square brackets []. E.g. [2001::1]:4060 where 2001::1 is the IPV6 address and 4060 is the port.<br><value> is a string parameter. The factory-programmed and default value is an empty string.<br>• "KEY_DNS_SERVER": DNS IP address[:port] where port is optional. If the address is not provided it will be read from PCO exchange during PDN creation, DHCP server or UICC in that order. In case of IPV6 it must be enclosed in square brackets []. E.g. [2001::1]:4060 where 2001::1 is the IPV6 address and 4060 is the port.<br><value> is a string parameter. The factory-programmed and default value is an empty string.<br>• "KEY_SIP_TIMER_T1": the Timer_T1 represents an estimate of the round trip time of the IMS traffic (UE <-> P-CSCF).<br><value> is a numeric parameter measured in milliseconds. The range is [1- 4294967295] while the factory-programmed and default value depend on the *+UMNOCONF* command: 2000 if the <MNO> parameter is set to 0 (regulatory MNO), 3000 if the <MNO> parameter is set to 3 (Verizon).<br>• "KEY_SIP_TIMER_T2": the Timer_T2 represents an estimate for the maximum retransmit interval for SIP non-INVITE requests and INVITE responses.<br><value> is a numeric parameter measured in milliseconds. The range is [1-4294967295] while factory-programmed and the default value is 16000.<br>• "KEY_SIP_TIMER_T4": the Timer_T4 represents an estimate for maximum lifetime of a SIP message.<br><value> is a numeric parameter measured in milliseconds. The range is [1-4294967295] while the factory-programmed and default value is 17000.<br>• "KEY_SIP_TIMER_TF": the Timer_TF represents the timeout of a SIP non INVITE transaction, defined in RFC3261.<br><value> is a numeric parameter measured in milliseconds. The range is [1-4294967295] and the default value 64000. Verizon typically uses a value of 30000.<br>• "KEY_MTU_SIZE": the Maximum Transmission Unit (MTU) size as expected by the network operators to control the IMS message fragmentation.<br><value> is a numeric parameter measured in bytes. The range is [0-65535] while the factory-programmed and default value is 1500.<br>• "KEY_IMS_CLIENT_PORT": port used by the UE's SIP application.<br><value> is a numeric parameter. The range is [200-65535]. The factory-programmed and default value is 5060.<br>• "KEY_REG_EXPIRES": IMS registration expiration time that will be requested.<br><value> is a numeric parameter measured in seconds. The range is [1-4294967295] while the factory-programmed and default value is 600000.<br>• "KEY_MAX_REG_EXPIRES": maximum IMS registration expiration time that will be requested. On receiving a "423 interval too brief" response to a REGISTER, the next REGISTER request will contain an expire value which will be the minimum between the input value and the received response.<br><value> is a numeric parameter measured in seconds. The range is [1-4294967295] while the factory-programmed and default value is 600000.<br>• "KEY_RETRY_BASE_TIME": Retry Base Time used for the backoff timer.<br><value> is a numeric parameter measured in seconds. The range is [1-2147483] while the factory-programmed and default value is 30.<br>• "KEY_RETRY_MAX_TIME": Retry Max Time used for the backoff timer.<br><value> is a numeric parameter measured in seconds. The range is [1-2147483] while the factory-programmed and default value is 1800.<br>• "KEY_REG_BARRED_USER_ID": configures the Use Barred User ID in Registration and De-Registration feature. If disabled the UE will use the default public user identity provided by the network (first entry of the P-ASSOCIATED-URI header).<br><value> is a string parameter with these allowed values: "true", "false". The factory-programmed and default value is "true".<br>• "KEY_EXPLICIT_UNSUB_REG_EVENT": controls the unsubscription of the Registration Event Package during deregistration. This feature is required by Verizon.<br><value> is a string parameter with these allowed values: "true", "false". The factory-programmed and default value is "false".<br>• "KEY_PCSCF_BACKOFF_PREFERENCE": Backoff on P-CSCF change due to server failure. The backoff is applied for each server of after the whole list has been tried.<br><value> is a string parameter with these allowed values: "LIST" or "INDIVIDUAL". The factory-programmed and default value is "LIST".<br>• "KEY_SMSC_NUMBER": SMSC phone number.<br><value> is a string parameter. The factory-programmed and default value is an empty string.<br>• "KEY_SMSC_URI": SMSC URI. It should be a SIP or telephonic URI. |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | <value> is a string parameter. The factory-programmed and default value is an empty string.<br>• "KEY_MO_SMS_FORMAT": SMS format to be used for Mobile Originated SMS.<br><value> is a string parameter with these allowed values: "3gpp" or "3gpp2". The factory-programmed and default value is "3gpp".<br>• "KEY_MO_SMS_ENCODING": SMS encoding to be used for Mobile Originated SMS.<br><value> is a string parameter with these allowed values: "gsm7", "ascii7", "ucs2". The factory-programmed and default value is "gsm7".<br>• "KEY_QOS_PREFERENCE": QoS Precondition during SIP call set-up.<br><value> is a string parameter with these allowed values: "AUTO" or "NONE". The factory-programmed and default value is "AUTO".<br>• "KEY_PDP_BEARER_MODE": QoS Allocation Mode determines whether the UE or the NW will request the QoS reservation.<br><value> is a string parameter with these allowed values: "UE", "NW","AUTO". The factory-programmed and default value is "AUTO". In "AUTO" mode the UE will initiate the QoS allocation only if the NW does not.<br>• "KEY_DOMAIN_PREFERENCE": Domain Preference for the IMS Service Continuity feature.<br><value> is a string parameter with these allowed values: "CS_ONLY", "PS_ONLY", "CS_PREF", "PS_PREF". The factory-programmed and default value is "PS_PREF".<br>• "KEY_SMS_PREFERENCE": preferred service used for MO SMS.<br><value> is a string parameter with these allowed values: "IMS_PREF", "CS_PREF", "CS_ONLY", "PS_ONLY". The factory-programmed and default value is "IMS_PREF".<br>• "KEY_IMS_SUPPORT": configures the IMS support and registration.<br><value> is a string parameter with the following allowed values: "true" or "false". The factory-programmed and default value is "true".<br>• "KEY_IMS_MWI_SUPPORT": configures the MWI Event Package Support for IMS.<br><value> is a string parameter with these allowed values: "true" or "false". The factory-programmed and default value is "true".<br>• "KEY_IMS_SIGCOMP_SUPPORT": configures the Signal Compression Support for IMS Signaling feature.<br><value> is a string parameter with these allowed values: "true" or "false". The factory-programmed and default value is "false".<br>• "KEY_IMS_RAT": configures the RAT allowed for IMS registration.<br><value> is a string parameter with these allowed values:<br>o "all": IMS will try to register on all the supported RATs<br>o "lteonly" (factory-programmed value): IMS will try to register on LTE RAT only<br>Since Verizon configuration is LTE only then this key must be set to "lteonly" to prevent useless VZWIMS registration tries when in 3G (roaming).<br>• "KEY_IMS_SMS_SEND_OK_WRITE_UICC": allows the storing of SMSes correctly sent.<br><value> is a string parameter with these allowed values: "true", "false". The factory-programmed and default value is "false".<br>• "KEY_IMS_SMS_SEND_NOK_WRITE_UICC": allows the storing of SMSes not sent due to network errors.<br><value> is a string parameter with these allowed values: "true", "false". The factory-programmed and default value is "false". |
| <more_values> | Numeric | Sets the configuration update:<br>• 0 (default value): the input configuration is immediately set and saved to NVM<br>• 1: the configuration is saved to NVM; the IMS client will wait for other parameters to take effect. When inputting the final configuration command then <more_values> should be set to zero for the whole configuration to take effect<br>• 2: the input configuration is immediately set but it is not saved to NVM<br>• 3: the configuration is volatile; the IMS client will wait for other parameters to take effect. When inputting the final configuration command then <more_values> should be set to zero for the whole configuration to take effect |

## 8.2.4 Notes

### TOBY-L201 / MPCI-L201

- The "KEY_MO_SMS_FORMAT" configuration is not stored in NVM.

Objective Specification

# 8.3 Read IMS configuration +UIMSRCONF

| +UIMSRCONF | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L201 TOBY-L210-62S MPCI-L201 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 8.3.1 Description

Read configuration parameters related to IMS.

## 8.3.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UIMSRCONF=<key_name> | +UIMSRCONF: <value><br>OK | AT+UIMSRCONF="KEY_MTU_SIZE"<br>+UIMSRCONF: 2500<br>OK |
| Test | AT+UIMSRCONF=? | +UIMSRCONF: (list of supported <key_name>s)<br>OK | +UIMSRCONF: ("KEY_IMS_PDP_APN","KEY_IMS_PDP_CID","KEY_IMS_PDP_TYPE","KEY_AUTH_TYPE_AKA","KEY_AUTH_TYPE_AKAV2","KEY_AUTH_TYPE_MD5","KEY_SEC_AGREE", "KEY_CONFIG_XDM_URL","KEY_PASSWORD","KEY_HOME_NETWORK_DOMAIN","KEY_PRIVATE_IDENTITY", "KEY_PUBLIC_IDENTITY","KEY_CONFIG_SOFT_SIM", "KEY_CONFIG_SOFT_SIM_K", "KEY_CONFIG_SOFT_SIM_OP","KEY_PCSCF_SERVER_ADDRESS","KEY_DNS_SERVER","KEY_SIP_TIMER_T1","KEY_SIP_TIMER_T2","KEY_SIP_TIMER_T4","KEY_SIP_TIMER_TF","KEY_MTU_SIZE", "KEY_IMS_CLIENT_PORT", "KEY_REG_EXPIRES","KEY_MAX_REG_EXPIRES", "KEY_RETRY_BASE_TIME","KEY_RETRY_MAX_TIME", "KEY_REG_BARRED_USER_ID","KEY_EXPLICIT_UNSUB_REG_EVENT", "KEY_PCSCF_BACKOFF_PREFERENCE","KEY_SMSC_NUMBER","KEY_SMSC_URI","KEY_MO_SMS_FORMAT","KEY_MO_SMS_ENCODING","KEY_QOS_PREFERENCE","KEY_PDP_BEARER_MODE", "KEY_DOMAIN_PREFERENCE", "KEY_SMS_PREFERENCE","KEY_IMS_SUPPORT", "KEY_IMS_MWI_SUPPORT","KEY_IMS_SIGCOMP_SUPPORT","KEY_CONFIGURE_MSRP_RELAY","KEY_XCAP_PDP_APN", "KEY_XCAP_PDP_TYPE","KEY_IMS_RAT","KEY_SMSC_URI_TYPE_PREFERENCE", "KEY_MO_SMS_OVER_IMS","KEY_IMS_SMS_DESTINATION","KEY_IMS_SHORT_ENCODING","KEY_CONF_FACTORY_URI","KEY_LOCAL_URI_FORMAT", "KEY_INTERNATIONAL_URI_FORMAT","KEY_IMS_IGNORE_VOPS_IND","KEY_IMS_VOICE_SUPPORT", "KEY_EMERG_PCSCF_SERVER_ADDRESS","KEY_EMERG_DNS_SERVER","KEY_EMERG_IMS_PDP_APN","KEY_EMERG_IMS_PDP_CID", "KEY_EMERG_NUMBER","KEY_IMS_EARLY_MEDIA_SUPPORT", "KEY_IMS_MEDIA_AVPF_SUPPORT","KEY_IMS_AUDIOCODEC","KEY_IMS_AMR_MODE","KEY_IMS_AMRWB_MODE","KEY_IMS_AMR_FRAMING_PREF", "KEY_IMS_AMRWB_FRAMING_PREF","KEY_IMS_RTP_ALIVE_TIMER","KEY_IMS_RTCP_ALIVE_TIMER", "KEY_IMS_SESSION_REFRESH_TIMER","KEY_IMS_MIN_SE_TIMER","KEY_IMS_INITIAL_SDP_ANSWER", "KEY_IMS_UPDATE_FOR_UNCOND_MOD","KEY_XDM_SUPPORT","KEY_IMS_SESSION_ID_SUPPORT", "KEY_IMS_SESSION_REFRESHER","KEY_IMS_SET_TCP_MAXSEG","KEY_IMS_FORCE_SIGCOMP", "KEY_IMS_GRUU_SUPPORT","KEY_IMS_SMS_SEND_OK_WRITE_UICC","KEY_IMS_SMS_SEND_NOK_WRITE_UICC") |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | | OK |

### 8.3.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <key_name> | String | See the *+UIMSCONF* parameter description |
| <value> | String | See the *+UIMSCONF* parameter description |

## 8.4 IMS registration information +CIREG

| +CIREG | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L201 TOBY-L210-62S MPCI-L201 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 8.4.1 Description

Configures the IMS registration information. Depending on the <n> parameter value a URC can be issued when the MT's IMS registration information changes:

- +CIREGU: <reg_info> if <n>=1
- +CIREGU: <reg_info>[,<ext_info>] if <n>=2

The read command provides the same information issued by the URC together with the current value of <n> parameter.

### 8.4.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CIREG=[<n>] | OK | AT+CIREG=1<br>OK |
| Read | AT+CIREG? | +CIREG: <n>,<reg_info>[,<ext_info>]<br>OK | +CIREG: 1,1<br>OK |
| Test | AT+CIREG=? | +CIREG: (list of supported <n>s)<br>OK | +CIREG: (0,1)<br>OK |
| URC | | +CIREGU: <reg_info>[,<ext_info>] | +CIREGU: 0 |

### 8.4.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <n> | Number | Configures the reporting of changes in the MT's IMS registration information:<br>• 0: reporting URC disabled<br>• 1: reporting URC +CIREGU: <reg_info> enabled<br>• 2: extended reporting URC +CIREGU: <reg_info>,<ext_info> enabled |
| <reg_info> | Number | Indicates the IMS registration status. The MT is seen as registered as long as one or more of its public user identities are registered with any of its contact addresses, see 3GPP TS 24.229 [*102*].<br>• 0: not registered<br>• 1: registered<br>The parameter shows whether one or more of the public user identities are registered |
| <ext_info> | Number | Numeric value in hexadecimal format. The range goes from 1 to FFFFFFFF. It is a sum of hexadecimal values, each representing a particular IMS capability of the MT. The MT can have IMS capabilities not covered by the below list. This parameter is not present if <reg_info>=0.<br>• 1: RTP-based transfer of voice according to MMTEL, see 3GPP TS 24.173 [*100*]. This functionality can not be indicated if the UE is not available for voice over PS, see 3GPP TS 24.229 [*102*]<br>• 2: RTP-based transfer of text according to MMTEL, see 3GPP TS 24.173 [*100*]<br>• 4: SMS using IMS functionality, see 3GPP TS 24.341 [*101*]<br>• 8: RTP-based transfer of video according to MMTEL, see 3GPP TS 24.173 [*100*] |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | The hexadecimal values 10, 20, 40 and 80000 are reserved.<br>It shows the status of the MT's IMS capabilities. For <ext_info>, all relevant values are always summarized and reported as a complete set of IMS capabilities in the URC. |

# 8.5 Availability for SMS using IMS +CASIMS

| +CASIMS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L201 TOBY-L210-62S MPCI-L201 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 8.5.1 Description

Informs the MT whether the UE is currently available for SMS using IMS (see 3GPP TS 24.229 [*102*]).

The information can be used by the MT to determine the need to remain attached for non-EPS services, as defined in 3GPP TS 24.301 [*87*].

## 8.5.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CASIMS=[<state>] | OK | AT+CASIMS=1<br>OK |
| Read | AT+CASIMS? | +CASIMS: <state><br>OK | +CASIMS: 1<br>OK |
| Test | AT+CASIMS=? | +CASIMS: (list of supported <state>'s)<br>OK | +CASIMS: (0,1)<br>OK |

## 8.5.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <state> | Number | Status configuration:<br>• 0 (default value): SMS using IMS is not available<br>• 1: SMS using IMS is available |

# 8.6 Availability for voice calls with IMS +CAVIMS

| +CAVIMS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L210-62S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 8.6.1 Description

Informs the MT whether the UE is currently available for voice calls with the IMS (see 3GPP TS 24.229 [*102*]). The information can be used by the MT to determine "IMS voice not available" as defined in 3GPP TS 24.301 [*87*], and for mobility management for IMS voice termination, see 3GPP TS 24.008 [*12*].

## 8.6.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CAVIMS=[<state>] | OK | AT+CAVIMS=0<br>OK |
| Read | AT+CAVIMS? | +CAVIMS: <state><br>OK | +CAVIMS: 1<br>OK |
| Test | AT+CAVIMS=? | +CAVIMS: (list of supported <state>s)<br>OK | +CAVIMS: (0,1)<br>OK |

Objective Specification

### 8.6.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <state> | Number | Provides information about the UEs IMS voice call availability status<br>• 0 (default value): voice calls with the IMS are not available<br>• 1: voice calls with the IMS are available |

## 8.7 Dial URI +CDU

| +CDU | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L210-62S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 8.7.1 Description

Allows the following actions depending on the <op_code> value:

- **<op_code>=0**: it queries which clients are supported for the supported URI types. The URI types are provided by means of the +CDUT: <URI_scheme>[,<client>]
- **<op_code>=1**: it dials a URI for initiating communication using the specified communication client with the specified media profile. If the dialling succeeds the command is terminated by +CDU: <ccidx> and the OK final result code. The parameters <CLIR_OIR> and <CUG_pointer> are used to set the per call basis values of the supplementary services CLIR / OIR and CUG.

The +CDUU URC can be subsequently provided to give further basic information about the call as it progresses. The value of the <ccidx> is kept until the call is released. See command *+CMCCS* and unsolicited result code +CMCCSI for provision of additional information about the call setup. If "Call control by USIM" (see 3GPP TS 31.111 [*118*] subclause 4.5 is activated by the USIM), it is the responsibility of the communication client to perform any required call control verification according to the procedures defined in 3GPP TS 31.111 [*118*] subclause 7.3 prior to the execution of the call setup. When call control by USIM is applicable, the communication client shall perform the call control (for example by using the Commands for USIM application toolkit, see clause 12) and act upon the result of the call control as follows:

- if call control by USIM performs no modifications to the call request, the call setup shall be executed without any changes to the data
- if call control by USIM modifies the call request, the call setup shall be executed using the modified data as provided by the call control
- if call control by USIM modifies the call request to a different service, the appropriate AT command(s) for that service shall be executed
- if call control by USIM rejects the call request, the call setup shall not be executed

If the attempt to dial does not succeed, the command is terminated by ERROR / CME ERROR or +CDUI: <cause> and OK. Refer subclause 9.2 for possible <err> values.

### 8.7.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| **Generic syntax** | | | |
| Set | AT+CDU=<op_code>[,<URI>[,<client>[,<mpidx>[,<CLIR_OIR>[,<CUG_pointer>]]]]] | .....<br>OK | AT+CDU=0<br>OK |
| **Query supported communication clients** | | | |
| Set | AT+CDU=0 | [+CDUT: <URI_scheme>[,<client>]<br>[+CDUT: <URI_scheme>[,<client>]<br>[...]]]<br>OK | AT+CDU=0<br>OK |
| **Dial <URI>** | | | |
| Set | AT+CDU=1[,<URI>[,<client>[,<mpidx>[,<CLIR_OIR>[,<CUG_pointer>]]]]] | [+CDU: <ccidx>]<br>OK | AT+CDU=0<br>OK |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| Test | AT+CDU=? | +CDU: (list of supported <URI_scheme>s) | +CDU: ("sip","tel","urn") |
| | | OK | OK |
| URC | | +CDUU: <ccidx>,<code> | +CDU: ("sip","tel","urn") |
| | | OK | OK |

## 8.7.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <op_code> | Number | Allowed actions:<br>• 0: query supported communication clients for the supported URI types. A +CDUT IRC is issued for every supported <URI_scheme><br>• 1: dial <URI> using the indicated communication client with the indicated media profile |
| <URI> | String | URI including the prefix specifying the URI type. The URI may include URI parameters. The used character set should be the one selected with *+CSCS* AT command |
| <CLIR_OIR> | Number | Indicates per call basis changes provided to the supplementary service CLIR / OIR. See *+CLIR* for further information of the related parameters.<br>• 0 (default value): no per call based changes to CLIR / OIR, the settings with *+CLIR* is applied<br>• 1: restricts the CLI presentation for the current call (CLIR / OIR invocation)<br>• 2: allows the CLI presentation for the current call (CLIR / OIR suppression) |
| <CUG_pointer> | Number | Indicates per call basis changes provided to the supplementary service closed user group<br>• 0 (default value): no per call basis changes to CUG<br>• 1-0x7fffffff: indicates the CUG index to use for this call. The CUG index and corresponding values used as set with command +CECUG (enable CUG temporary mode)<br>This parameter is not supported; use the default value 0. |
| <URI_scheme> | String | Identifies the supported URI scheme represented with IRA characters. This parameter is not subject to conventional character conversion as per *+CSCS*.<br>• "sip": Internet Assigned Number Authority (IANA) registry as per RFC 3969 [*119*], used with Session Initiation Protocol (SIP), see RFC 3261 [*120*].<br>• "tel": Internet Assigned Number Authority (IANA) registry as per RFC 5341 [*121*], used with SIP, see RFC 3966 [*122*].<br>• "urn": Internet Assigned Number Authority (IANA) registry according to RFC 2141 [*123*], only used with SIP in combination with a suitable uniform resource name (URN) namespace.<br>The URN namespace "service" listed in the Internet Assigned Number Authority (IANA) registry according to RFC 3406 [*124*] is an example of a namespace that can be used in SIP in combination with the URI scheme "urn". Not all top-level service labels listed in the Internet Assigned Number Authority (IANA) registry according to RFC 5031 [*125*] need to be supported in combination with the URN namespace "service" |
| <client> | Number | Communication client indication. The default value is implementation specific.<br>• 1 (default value): MMTel. The UE procedures in 3GPP TS 24.173 [*100*] apply<br>• 128 - 255: reserved for vendor specific communication clients |
| <mpidx> | Number | Media profile identification number. The parameter is local to the TE-MT interface. When +CDU is used for dialling (i.e. with <op_code>=1) this number can be provided to point to a particular media profile. The MT shall use the indicated SDP media description for the <mpidx> in the initial SDP offer for a call setup. The range goes from 0 to 19. The default value is 0.<br>This parameter is not supported; use the default value 0. |
| <ccidx> | Number | Call identification number as described in 3GPP TS 22.030 [*5*] subclause 6.5.5.1. This number can be used in *+CHLD* command operations. The range goes from 1 to 5.<br>When +CMCCS is supported, the call identification number is not reset until the unsolicited result code +CMCCSI has indicated that the <ccstatus>=1 (Idle). |
| <code> | String | Cause codes giving main call state information represented with IRA characters. Intermediate call status responses can be reported using the URC +CMCCSI (see command *+CMCCS*). This parameter is not subject to conventional character conversion as per *+CSCS*. Allowed strings:<br>• "BUSY": busy signal detected<br>• "ANSWERED": remote party has answered and the connection between A and B has been established<br>• "NO ANSWER": connection completion timeout<br>• "CONNECTION TERMINATED": the connection is terminated from either the remote party or the network, or the attempt to establish the call setup is unsussessful. This cause code also |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | covers all other situations where a call is unsuccessfully terminated. Examples of this are all types of network congestion or lack of radio coverage. |
| <cause> | Number | Reason code providing further details why the call setup fails in the terminal before signalling towards the network is initiated<br>• 0: outgoing call attempt rejected by (U)SIM/ME, unspecified<br>• 1: outgoing call attempt rejected by barring services in the SIM/ME |

# 8.8 UE's voice domain preference UTRAN +CVDP

| +CVDP | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L210-62S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

## 8.8.1 Description

Sets the MT to operate according to the specified voice domain preference for UTRAN.

The read command returns the setting, independent of the current serving cell capability and independent of the current serving cell's access technology.

See 3GPP TS 24.167 *[109]*, subclause 5.30 for the definition for the UE's voice domain preference for UTRAN.

## 8.8.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CVDP=[<setting>] | OK | AT+CVDP=1<br>OK |
| Read | AT+CVDP? | +CVDP: <setting><br>OK | +CVDP: 1<br>OK |
| Test | AT+CVDP=? | +CVDP: (list of supported <setting>s)<br>OK | +CVDP: (1-3)<br>OK |

## 8.8.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <setting> | Number | UE voice domain preference. Allowed values:<br>• 1 (factory-programmed and default value): CS voice only<br>• 2: CS voice preferred, IMS PS voice as secondary<br>• 3: IMS PS voice preferred, CS voice as secondary |

# 8.9 UE's voice domain preference E-UTRAN +CEVDP

| +CEVDP | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L210-62S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

## 8.9.1 Description

Sets the MT to operate according to the specified voice domain preference for E-UTRAN. The read command returns the setting, independent of the current serving cell capability and independent of the current serving cell's access technology.

See 3GPP TS 24.167 *[109]*, subclause 5.27 for the definition for the UE's voice domain preference for E-UTRAN.

Objective Specification

### 8.9.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | +CEVDP=[<setting>] | OK | AT+CEVDP=2<br>OK |
| Read | AT+CEVDP? | +CEVDP: <setting> | +CEVDP: 3<br>OK |
| Test | AT+CEVDP=? | +CEVDP: (list of supported <setting>s)<br>OK | +CEVDP: (1-4)<br>OK |

### 8.9.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <setting> | Number | UE voice domain preference. Allowed values:<br>• 1: CS voice only<br>• 2: CS voice preferred, IMS PS voice as secondary<br>• 3 (factory-programmed and default value): IMS PS voice preferred, CS voice as secondary<br>• 4: IMS PS voice only |

Objective Specification

# 9 Security

## 9.1 Enter PIN +CPIN

| +CPIN | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | *< 10 s* | *+CME Error* |

### 9.1.1 Description

Enter PIN. If no PIN request is pending, the corresponding error code is returned. If a wrong PIN is given three times, the PUK must be inserted in place of the PIN, followed by the <newpin> which replaces the old pin in the SIM.

### 9.1.2 Syntax

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

### 9.1.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <pin>, <newpin> | String | 4-to-8 characters long string of decimal digits.<br>If only PIN is required, <newpin> is not to be entered.<br>If PUK is required, <pin> must be the PUK and <newpin>, the new PIN code, must be entered as well. |
| <code> | String | • READY: MT is not pending for any password<br>• SIM PIN: MT is waiting SIM PIN to be given<br>• SIM PUK: MT is waiting SIM PUK to be given<br>• SIM PIN2: MT is waiting SIM PIN2 to be given<br>• SIM PUK2: MT is waiting SIM PUK2 to be given<br>• PH-NET PIN: MT is waiting network personalization password to be given<br>• PH-NETSUB PIN: MT is waiting network subset personalization password to be given<br>• PH-SP PIN: MT is waiting service provider personalization password to be given<br>• PH-CORP PIN: MT is waiting corporate personalization password to be given<br>• PH-SIM PIN: MT is waiting phone to SIM/UICC card password to be given |

### 9.1.4 Notes

- The command needs the SIM module to work correctly
- 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

Objective Specification

ERROR

- To change the PIN the user must use the AT+CPWD="SC",<old_pin>,<new_pin> command (see *Chapter 9.4* for details).
  Example:

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

# 9.2 Read remaining SIM PIN attempts +UPINCNT

| +UPINCNT | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 9.2.1 Description

Reads the remaining attempts for SIM PIN, SIM PIN2, SIM PUK and SIM PUK2.

## 9.2.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | AT+UPINCNT | +UPINCNT: <PIN attempts>,<PIN2 attempts>,<PUK attempts>,<PUK2 attempts><br>OK | +UPINCNT: 3,3,10,10<br>OK |
| Test | AT+UPINCNT=? | OK | OK |

## 9.2.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <PIN attempts> | Number | Number of remaining attempts to enter PIN |
| <PIN2 attempts> | Number | Number of remaining attempts to enter PIN2 |
| <PUK attempts> | Number | Number of remaining attempts to enter PUK |
| <PUK2 attempts> | Number | Number of remaining attempts to enter PUK2 |

# 9.3 Facility lock +CLCK

| +CLCK | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | Yes | *Up to 3 min* | *+CME Error* |

## 9.3.1 Description

Locks, unlocks or interrogates an MT or a network facility <fac>. A 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 the service is not active for any <class>. The command can be aborted 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.

## 9.3.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CLCK=<fac>,<mode>[,<passwd>[,<class>]] | OK | AT+CLCK="SC",1,"0933" |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | or<br>+CLCK: <status>[,<class1><br>[+CLCK: <status>[,<class1><br>[...]] | OK |
| Test | AT+CLCK=? | +CLCK: (list of supported <fac>s)<br>OK | +CLCK: ("SC","PN","PU","PP","PC","PS","FD","AO","OI","OX","AI","IR","AB","AG","AC")<br>OK |

## 9.3.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <fac> | String | Facility values<br>• "SC": SIM (PIN enabled/disabled)<br>• "PN": Network Personalisation (see the 3GPP TS 22.022 [31])<br>• "PU": network sUbset Personalisation (see the 3GPP TS 22.022 [31])<br>• "PP": service Provider Personalisation (see the 3GPP TS 22.022 [31])<br>• "PC": Corporate Personalisation (see the 3GPP TS 22.022 [31])<br>• "PS": SIM/USIM Personalisation (see the 3GPP TS 22.022 [31])<br>• "FD": SIM fixed dialling phonebook feature<br>o TOBY-L2 / MPCI-L2 - PIN2 is required as <passwd><br>o LISA-U / SARA-U / SARA-G / LEON-G - PIN2 is required if the PIN2 authentication has not been done during the current session<br>• "AO": BAR (Bar All Outgoing Calls)<br>• "OI": BOIC (Bar Outgoing International Calls)<br>• "OX": BOIC-exHC(Bar Outgoing International Calls except to Home Country)<br>• "AI": BAIC (Bar All Incoming Calls)<br>• "IR": BIC-Roam (Bar Incoming Calls when Roaming outside the home country)<br>• "AB": All Barring services (applicable only for <mode>=0)<br>• "AG": All outGoing barring services (applicable only for <mode>=0)<br>• "AC": All inComing barring services (applicable only for <mode>=0)<br>• "CS": CNTRL (lock CoNTRoL surface (e.g. phone keyboard)) (see the 3GPP TS 27.007 [2])<br>• "PF": Lock Phone to the very First inserted SIM/UICC card (see the 3GPP TS 27.007 [2])<br>• "NT": Barr incoming calls from numbers Not stored to TA memory (see the 3GPP TS 27.007 [2])<br>• "NM": Barr incoming calls from numbers Not stored to MT memory (see 3GPP TS 27.007 [2])<br>• "NS": Barr incoming calls from numbers Not stored to SIM/UICC memory (see the 3GPP TS 27.007 [2])<br>• "NA": Barr incoming calls from numbers Not stored in any memory (see the 3GPP TS 27.007 [2]) |
| <mode> | Number | • 0: unlock<br>• 1: lock<br>• 2: query status |
| <status> | Number | • 0: not active<br>• 1: active |
| <passwd> | String | Shall be the same as password specified for the facility from the MT user interface or with the *+CPWD* command |
| <class> | Number | Sum of numbers each representing a class of information. The default value is 7 (voice + data + fax)<br>• 1: voice<br>• 2: data<br>• 4: FAX<br>• 8: short message service<br>• 16: data circuit sync<br>• 32: data circuit async<br>• 64: dedicated packet access<br>• 128: dedicated PAD access |

Objective Specification

### 9.3.4 Notes

**TOBY-L2 / MPCI-L2**

- Reboot the module to make effective the unlock configuration.

**TOBY-L200 / TOBY-L210-62S / TOBY-L220 / MPCI-L200**

- The FDN check for PS data calls is not supported.

**TOBY-L200-00S / TOBY-L201 / TOBY-L210-00S / TOBY-L280-00S / MPCI-L200-00S / MPCI-L201 / MPCI-L210-00S**

- The FDN check for SMS is not supported.

**TOBY-L201 / MPCI-L201**

- In AT&T configuration (see the *+UMNOCONF* AT command) the FDN check for PS data calls is not supported.

**TOBY-L210-60S / MPCI-L210-60S**

- <fac>="AO", "OI", "OX", "AI", "IR", "AB", "AG", "AC" and "NS" are not supported.

**TOBY-L210-62S**

- <fac>="AO", "OI", "OX", "AI", "IR" are not allowed if the VoLTE service is not available.

**LISA-U / SARA-U / SARA-G / LEON-G**

- <fac>="CS", "PF", "NT", "NM", "NS", "NA" are not supported.

## 9.4 Change password +CPWD

| +CPWD | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | Yes | *Up to 3 min* | *+CME Error* |

### 9.4.1 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.

### 9.4.2 Syntax

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

### 9.4.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <fac> | String | "P2" SIM PIN2; see the *+CLCK* command description for other values |
| <oldpwd> | String | Old password |
| <newpwd> | String | New password |
| <pwdlength> | Number | Length of password (digits) |

### 9.4.4 Notes

- If the PIN is blocked, an error result code will be provided when attempting to change the PIN code if the PIN check is disabled through *AT+CLCK* command.

Objective Specification

**TOBY-L210-62S**

- <fac>="AO", "OI", "OX", "AI", "IR" are not supported if the VoLTE service is not available (see *+CIREG* AT command).

**TOBY-L210-60S**

- <fac>="AO", "OI", "OX", "AI", "IR", "AB", "AG", "AC" and "NS" are not supported.

**LISA-U / SARA-U / SARA-G / LEON-G**

- The PIN insertion is not mandatory before the command execution.

# 9.5 Custom SIM lock +USIMLCK

| +USIMLCK | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U SARA-U | | | | | |
| | SARA-G LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 9.5.1 Description

Allows locking the module to work only with user-defined sets of SIM cards (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
- Service Provider (not supported)
- Corporate (not supported)

The module is locked according to user needs even if the SIM card is not inserted or the PIN code is not provided. At most 10 personalizations can be simultaneously configured.

## 9.5.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+USIMLCK=<facility>,<pers_data>, <pwd>,<status> | OK | AT+USIMLCK="PN","222.01", "12345678",1<br>OK |
| Test | AT+USIMLCK=? | +USIMLCK: (list of supported <facility>s), ,,(list of supported <status>)<br>OK | +USIMLCK: ("PN","PU","PS"),,,(0-1)<br>OK |

## 9.5.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <facility> | String | Personalization type, which can be:<br>• "PN" Network personalization<br>• "PU" Networks subset personalization<br>• "PS" SIM/USIM personalization |
| <pers_data> | String | Data for device personalization. The contents depend on the selected <facility>.<br>• If <facility> is "PN":<br><pers_data> is in the format:<br>"MCC1.MNC1min[-MNC2max][,MCC2.MNC2min[-MNC2max]... [,MCC10.MNC10min[-MNC10max]]"<br>It contains a list of comma-separated pairs of MCCs and MNC ranges<br>• If <facility> is "PU":<br><pers_data> is in the format: |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | "MCC1.MNC1min[-MNC2max][,MCC2.MNC2min[-MNC2max]... [,MCC10.MNC10min[-MNC10max]]:MSIN1[,MSIN2...[,MSIN10]]"<br><br>It contains a list of comma-separated pairs of MCCs+MNC ranges as above; a list of comma-separated MSIN(s) or ranges of MSINs is appended after the MCC/MNC range using a ':' as separator.<br><br>MSINs can be written with wildcards ('*') with the syntax: [*[*]]D1[D2[...]] (one wildcard for each MSIN digit to skip) followed by one or more digits.<br><br>It is possible to use ranges of MSIN digits; in this case the minimum and maximum values should have the same number of wildcard and the same number of digits.<br><br>In addition it is possible to concatenate more MSIN ranges with the comma separator (example: "123.456:56,**70-**72"). In this case all ranges must create a non empty set since MSIN comma separator behavior is an AND operator: an empty set means that any SIM is accepted<br>• If <facility> is "PS":<br><pers_data> contains a list of at most 10 IMSIs; the format of the string is: "IMSI1:IMSI2:...:IMSIn"<br><br>LISA-U200-00S / SARA-G / LEON-G<br>• If <facility> is "PN":<br><pers_data> contains at most 10 pairs of MCC and MNC in the following format: "MCC.MNC" separated by colon: "MCC1.MNC1:MCC2.MNC2:...:MCCn.MNCn"<br>• If <facility> is "PU":<br><pers_data> contains MCC + MNC + a list of at most 10 pairs of the digits 6 and 7 of IMSI; the format of the string is: "MCC.MNC:DD1:DD2:...:DDn" where DDx represent the sixth and seventh digits of IMSI<br>• If <facility> is "PS":<br><pers_data> contains a list of at most 10 IMSIs; the format of the string is: "IMSI1:IMSI2:...:IMSIn" |
| <pwd> | String | Password to enable/disable the personalization. The password length goes from 6 to 16 digits. |
| <status> | Number | • 0: feature set but disabled<br>• 1: feature set and enabled |

## 9.5.4 Notes

- The current personalization status can be queried using the *AT+CLCK* command with the proper facilities <fac> and the query status mode <mode>=2.
- At the end of command execution, the module is deregistered from network, reset and rebooted.
- A maximum of 5 attempts are allowed if a wrong password is inserted during an unlock operation with *+CLCK* command; after that, further unlock operations are blocked. The ME can still be used with the right SIM.
- The following error result codes could be provided:

| Verbose string | Numeric code | Meaning |
|---|---|---|
| +CME ERROR: invalid characters in text string | 25 | An error is present in the <pers_data> format |
| +CME ERROR: operation not allowed | 3 | The user attempted the module personalization with an already active facility. An unlock operation must be performed before. Alternatively, an internal driver error occurred |
| +CME ERROR: incorrect password | 16 | The password format or length is wrong |

- If the SIM lock is disabled it is possible to enable the lock 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.

Objective Specification

# 10 Phonebook

## 10.1 Select phonebook memory storage +CPBS

| +CPBS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | *< 35 s* | *+CME Error* |

### 10.1.1 Description

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

The information text response of the test command depends on SIM dependent parameters (e.g. "EC").

### 10.1.2 Syntax

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

### 10.1.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <storage> | String | Phonebook memory storage; the following values are allowed:<br>• "SM": SIM phonebook (depending on SIM card, it may not be available when the FDN is enabled)<br>• "FD": SIM fixed dialling phonebook (only valid with PIN2)<br>• "LD": SIM last-dialling phonebook<br>• "BN": SIM barred-dialling-number phonebook (only valid with PIN2)<br>• "SN": SIM service-dialling-number phonebook (read only)<br>• "EC": SIM emergency-call-codes phonebook (read only)<br>• "ON": Own number phone-book (read/write); the content is also shown by *+CNUM*<br>• "BL": Blacklist phonebook (delete only); only the position 0 is valid |
| <password> | String | PIN2-code required when selecting PIN2-code locked <storage>s above (e.g. "FD"), if the 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 |

### 10.1.4 Notes

#### TOBY-L2 / MPCI-L2

- The <storage> parameter cannot be set to "BL".
- The <password> parameter is required only for updating the PIN2-code <storage>s (see the *+CPBW* AT command) not for reading them (see the *+CPBR* or *+CPBF* AT commands).

Objective Specification

## 10.2 Read phonebook entries +CPBR

| +CPBR | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | Yes | No | No | *< 35 s* | *+CME Error* |

### 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)
- <hidden> indicating if the entry is hidden (if the selected phonebook supports hidden entries)
- <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)

No text lines are returned for empty (but available) locations.

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

### 10.2.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CPBR=<index1>[,<index2>] | [+CPBR: <index1>,<number>, <type>,<text>[,<hidden>][,<group>[, <adnumber>[,<adtype>[,<secondtext>[, <email>[,<sip_uri>[,<tel_uri>]]]]]] | AT+CPBR=1,4 |
| | | [...] | +CPBR: 1,"040123456",129, "RossiCarlo" |
| | | [+CPBR: <index2>,<number>, <type>,<text>[,<hidden>][,<group>[, <adnumber>[,<adtype>[,<secondtext>[, <email>[,<sip_uri>[,<tel_uri>]]]]]]] | +CPBR: 2,"040123457",129, "RossiMario" |
| | | OK | +CPBR: 4,"040123458",129, "RossiGiuseppe" |
| | | | OK |
| Test | AT+CPBR=? | +CPBR: (list of supported <index>s), <nlength>,<tlength>[,<glength>[, <alength>[,<slength>[,<elength>[, <siplength>[,<tellength>]]]]]] | +CPBR: (1-100),20,18 |
| | | OK | OK |

### 10.2.3 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 (see the 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> |
| <hidden> | Number | Indicates if the entry is hidden or not<br>• 0 (default value): phonebook entry not hidden<br>• 1: phonebook entry hidden |
| <adnumber> | String | Additional phone number of format <adtype> |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| <adtype> | Number | Type of address octet (see the 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> |
| <sip_uri> | String | Field of maximum length <siplength>; character set as specified by the *+CSCS* AT command |
| <tel_uri> | String | Phone number of maximum length <tellength>; character set as specified by the *+CSCS* AT command |
| <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> |
| <siplength> | Number | Maximum length of field <sip_uri> |
| <tellength> | Number | Maximum length of field <tel_uri> |

### 10.2.4 Notes

- The <sip_uri>, <tel_uri>, <siplength> and <tellength> parameters are not supported.
- The <hidden> parameter is not applicable, since "AP" phonebook is not supported by *+CPBS* command (see the 3GPP TS 27.007 *[2]*).

**SARA-G340 / SARA-G350 / LEON-G**

- <group>, <adnumber>, <adtype>, <secondtext>, <email>, <glength>, <alength>, <slength>, <elength> are not supported.

## 10.3 Find phonebook entries +CPBF

| +CPBF | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | Yes | No | No | *< 35 s* | *+CME Error* |

### 10.3.1 Description

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

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)
- <hidden> indicating if the entry is hidden (if the selected phonebook supports hidden entries)
- <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)

The string <findtext> is case sensitive.

### 10.3.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CPBF=<findtext> | [+CPBF: <index1>,<number>, <type>,<text>[,<hidden>][,<group>[, | AT+CPBF="u-blox"<br>OK |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | <adnumber>[,<adtype>[,<secondtext>[,<email>[,<sip_uri>[,<tel_uri>]]]]]]<br>[...]<br>[+CPBF: <index2>,<number>,<type>,<text>[,<hidden>][,<group>[,<adnumber>[,<adtype>[,<secondtext>[,<email>[,<sip_uri>[,<tel_uri>]]]]]]]]<br>OK | |
| Test | AT+CPBF=? | +CPBF: [<nlength>],[<tlength>][,<glength>[,<alength>[,<slength>[,<elength>[,<siplength>[,<tellength>]]]]]]<br>OK | +CPBF: 40,18<br>OK |

## 10.3.3 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 (see the 3GPP TS 24.008 *[30]* subclause 10.5.4.7) |
| <findtext>,<text> | String | Maximum length <tlength> |
| <group> | String | Group the phonebook entry may belong to, of maximum length <glength> |
| <hidden> | Number | Indicates if the entry is hidden or not:<br>• 0 (default value): phonebook entry not hidden<br>• 1: phonebook entry hidden |
| <adnumber> | String | Additional phone number of format <adtype> |
| <adtype> | Number | Type of address octet (see the 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> |
| <sip_uri> | String | Field of maximum length <siplength>; character set as specified by the *+CSCS* AT command |
| <tel_uri> | String | Phone number of maximum length <tellength>; character set as specified by the *+CSCS* AT command |
| <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> |
| <siplength> | Number | Maximum length of field <sip_uri> |
| <tellength> | Number | Maximum length of field <tel_uri> |

## 10.3.4 Notes

- The <sip_uri>, <tel_uri>, <siplength> and <tellength> parameters are not supported.
- The <hidden> parameter is not applicable, since "AP" phonebook is not supported by *+CPBS* command (see the 3GPP TS 27.007 *[2]*).

**SARA-G340 / SARA-G350 / LEON-G**

- <group>, <adnumber>, <adtype>, <secondtext>, <email>, <glength>, <alength>, <slength>, <elength> are not supported.

Objective Specification

## 10.4 Write phonebook entry +CPBW

| +CPBW | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | Yes | No | No | *< 35 s* | *+CME Error* |

### 10.4.1 Description

Stores the 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 the 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 information text response of the test command will be +CPBW: 0 <CR><LF>OK

The (?) wildcard character in the phone number is allowed in the FD phonebook only.

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

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

The 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.

### 10.4.2 Syntax

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

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | OK | |

## 10.4.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <index> | Number | Location numbers of phonebook memory |
| <number> | String | Phone number of format <type> |
| <type> | Number | Type of address; default is 145 when dialling string includes '+', otherwise 129 |
| <text> | String | Text associated with the number. The maximum length is <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; default is 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> |
| <hidden> | Number | Indicates if the entry is hidden or not:<br>• 0 (default value): phonebook entry not hidden<br>• 1: phonebook entry hidden |
| <sip_uri> | String | Field of maximum length <siplength>; character set as specified by the *+CSCS* AT command |
| <tel_uri> | String | Phone number of maximum length <tellength>; character set as specified by the *+CSCS* AT command |
| <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> |
| <siplength> | Number | Maximum length of field <sip_uri> |
| <tellength> | Number | Maximum length of field <tel_uri> |
| <written_index> | Number | Last location number <index> of the written phonebook entry |

## 10.4.4 Notes

- The <sip_uri>, <tel_uri>, <siplength> and <tellength> parameters are not supported.
- The <hidden> parameter is not applicable, since "AP" phonebook is not supported by *+CPBS* command (see the 3GPP TS 27.007 [*2*]).

**TOBY-L2 / MPCI-L2**

- The <group> parameter is not saved in SIM.

**TOBY-L200-00S / TOBY-L201 / TOBY-L210-00S / TOBY-L210-60S / TOBY-L280-00S / MPCI-L200-00S / MPCI-L201 / MPCI-L210-00S / MPCI-L210-60S**

- An error result code is returned when trying to delete an empty entry.

**LISA-U / SARA-U**

- <written_index> is not supported.

**SARA-G340 / SARA-G350 / LEON-G**

- <group>, <adnumber>, <adtype>, <secondtext>, <email>, <glength>, <alength>, <slength>, <elength> and <written_index> are not supported.

Objective Specification

# 11 Short Messages Service

## 11.1 Introduction

For a complete overview of SMS, see 3GPP TS 23.040 *[8]* and 3GPP TS 27.005 *[16]*.

In case of errors all the SMS related AT commands return an error result code as defined in *Appendix A.2*.

### 11.1.1 Class 0 SMS

The storing of a class 0 SMS depends on the module series:

- TOBY-L200-02S / TOBY-L210-02S / TOBY-L210-62S / TOBY-L220 / TOBY-L280-02S / MPCI-L200-02S / MPCI-L210-02S / MPCI-L280 - stored in <mem3> (preferred memory for storing the received SMS, see *+CPMS*).
- TOBY-L200-00S / TOBY-L201 / TOBY-L210-00S / TOBY-L210-60S / TOBY-L280-00S / MPCI-L200-00S / MPCI-L201 / MPCI-L210-00S / MPCI-L210-60S - not stored.
- LISA-U / SARA-U / SARA-G / LEON-G - stored in RAM (the last received SMS, <index> parameter value 0).

### 11.1.2 <index> parameter range

The <index> parameter range depends on the memory storage type:

**ME** (ME message), **SM** ((U)SIM message) **MT** (ME + SM):

- TOBY-L200-02S / TOBY-L210-02S / TOBY-L210-62S / TOBY-L220 / TOBY-L280-02S / MPCI-L200-02S / MPCI-L210-02S / MPCI-L280 / LISA-U / SARA-U / SARA-G340 / SARA-G350 / LEON-G
  - Values between 1 and 300: SMS stored in ME.
  - Values between 301 and (301 + (n-1)): SMS stored in SIM (n depends on SIM card used).
- TOBY-L200-00S / TOBY-L201 / TOBY-L210-00S / TOBY-L210-60S / TOBY-L280-00S / MPCI-L200-00S / MPCI-L201 / MPCI-L210-00S / MPCI-L210-60S / SARA-G300 / SARA-G310 - values between 1 and n (n depends on SIM card used).

**BM** (Broadcast Message):

- TOBY-L200-02S / TOBY-L210-02S / TOBY-L210-62S / TOBY-L220 / TOBY-L280-02S / MPCI-L200-02S / MPCI-L210-02S / MPCI-L280 / LISA-U / SARA-U - values between 1 and 300: Cell Broadcast messages are stored only if there is at least an empty location available in the BM memory (that is located in the file system).
- TOBY-L200-00S / TOBY-L201 / TOBY-L210-00S / TOBY-L210-60S / TOBY-L280-00S / MPCI-L200-00S / MPCI-L201 / MPCI-L210-00S / MPCI-L210-60S - not stored.
- SARA-G / LEON-G series - values between 1 and 5: Cell Broadcast messages are stored using a circular buffer so they are always saved even if the BM memory (that is located in RAM) is full. Since the Cell Broadcast messages are stored in RAM, they will be lost after a power-off or reset of the module.

**SR** (Status Report)

- TOBY-L200-02S / TOBY-L210-02S / TOBY-L210-62S / TOBY-L220 / TOBY-L280-02S / MPCI-L200-02S / MPCI-L210-02S / MPCI-L280 / LISA-U / SARA-U - values between 1 and 300: Status Report messages are stored only if there is at least an empty location available in the SR memory (that is located in the file system).
- TOBY-L200-00S / TOBY-L201 / TOBY-L210-00S / TOBY-L210-60S / TOBY-L280-00S / MPCI-L200-00S / MPCI-L201 / MPCI-L210-00S / MPCI-L210-60S / SARA-G / LEON-G - not stored.

### 11.1.3 Limitations

The following limitations apply related to the 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"

Objective Specification

**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 as the "8-bit reference number" type, but are decreased by one unit.

A concatenated SMS can have as many as 255 parts.

## 11.2 Select message service +CSMS

| +CSMS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CMS Error* |

### 11.2.1 Description

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

### 11.2.2 Syntax

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

### 11.2.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <service> | Number | • 0: Refer to 3GPP TS 23.040 *[8]* and 3GPP TS 23.041 *[9]*; syntax of AT commands is compatible with 3GPP TS 27.005 *[16]* phase 2; phase 2+ features may be supported if no new command syntax is required<br>• 1: Refer to 3GPP TS 23.040 *[8]* and 3GPP TS 23.041 *[9]*; syntax of AT commands is compatible with 3GPP TS 27.005 *[16]* phase 2+ |
| <mt> | Number | Mobile terminated messages<br>• 0: not supported<br>• 1: supported |
| <mo> | Number | Mobile originated messages<br>• 0: not supported<br>• 1: supported |
| <bm> | Number | Broadcast messages<br>• 0: not supported<br>• 1: supported |

### 11.2.4 Notes

- Set <service> to 1 to acknowledge an incoming message (either SMS or Status Report) with +CNMA command.
- If <service> is changed from 1 to 0 and one or more parameters of the +CNMI command are in phase 2+, switch the +CNMI parameters to phase 2 specific values before entering phase 2.

Objective Specification

## 11.3 Preferred message storage +CPMS

| +CPMS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | Yes | *NVM* | No | *Up to 3 min* | *+CMS Error* |

### 11.3.1 Description

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

See the test command for the supported memory types for each memory storage.

### 11.3.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CPMS=<mem1>[,<mem2>[,<mem3>]] | AT+CPMS: <used1>,<total1>,<used2>,<total2>,<used3>,<total3><br>OK | AT+CPMS="BM","SM","SM"<br>+CPMS: 0,5,0,50,0,50<br>OK |
| Read | AT+CPMS? | +CPMS: <mem1>,<used1>,<total1>,<mem2>,<used2>,<total2>,<mem3>,<used3>,<total3><br>OK | +CPMS: "MT",4,350,"MT",4,350,"MT",4,350<br>OK |
| Test | AT+CPMS=? | +CPMS: (list of supported <mem1>s),(list of supported <mem2>s),(list of supported <mem3>s)<br>OK | +CPMS: ("MT","ME","SM","BM","SR"),("MT","ME","SM"),("MT","ME","SM")<br>OK |

### 11.3.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mem1> | String | Memory used to read and delete messages. The supported values may vary:<br>• "ME": ME message storage<br>• "SM": (U)SIM message storage<br>• "MT" (factory-programmed value): "ME"+"SM", "ME" preferred<br>• "BM": Broadcast Message storage<br>• "SR": Status Report storage<br>The default value is the currently set value. |
| <mem2> | String | Memory used to write and send SMS. The supported values may vary:<br>• "ME": ME message storage<br>• "SM": (U)SIM message storage<br>• "MT" (factory-programmed value): "ME"+"SM", "ME" preferred<br>The default value is the currently set value. |
| <mem3> | String | Memory preferred to store the received SMS. The supported values may vary:<br>• "ME": ME message storage<br>• "SM": (U)SIM message storage<br>• "MT" (factory-programmed value): "ME"+"SM", "ME" preferred<br>The default value is the currently set value. |
| <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> |

Objective Specification

### 11.3.4 Notes

**TOBY-L200-00S / TOBY-L201 / TOBY-L210-00S / TOBY-L210-60S / TOBY-L280-00S / MPCI-L200-00S / MPCI-L201 / MPCI-L210-00S / MPCI-L210-60S**

- Only "SM" message storage is supported.
- The factory-programmed value is "SM", "SM" and "SM".

**SARA-G**

- <mem1> = "SR" (Status Report storage) is not supported.

**SARA-G300 / SARA-G310**

- "ME" and "MT" message storages are not supported.
- The factory-programmed value is "SM", "SM" and "SM" .

**LEON-G**

- <mem1> = "SR" (Status Report storage) is not supported.

## 11.4 Preferred message format +CMGF

| +CMGF | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | *Profile* | No | - | *+CMS Error* |

### 11.4.1 Description

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

### 11.4.2 Syntax

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

### 11.4.3 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 SMSes messages:<br>• 0 (default and factory-programmed value): PDU mode<br>• 1: text mode |

### 11.4.4 Notes

**TOBY-L201 / MPCI-L201**

- The default value is 1 when the module is configured in Verizon mode (*+UMNOCONF=3*).

Objective Specification

# 11.5 Save settings +CSAS

| +CSAS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CMS Error* |

## 11.5.1 Description

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

## 11.5.2 Syntax

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

## 11.5.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <profile> | Number | Specific SMS profile index where to store the active message settings. The factory-programmed value is 0. |

# 11.6 Restore settings +CRES

| +CRES | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | *< 10 s* | *+CMS Error* |

## 11.6.1 Description

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

## 11.6.2 Syntax

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

## 11.6.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <profile> | Number | Specific SMS profile index from where to read the message service settings |

Objective Specification

## 11.7 Show text mode parameters +CSDH

| +CSDH | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CMS Error* |

### 11.7.1 Description

Controls whether detailed SMS header information is shown in text mode (see the *+CMGF=1* command description).

This affects the responses of the *+CMGR*, *+CMGL*, *+CSMP*, *+CSCA* AT commands and the +CMT, +CMTI, +CDS, +CDSI, +CBM, +CBMI (see *+CNMI*) URCs.

### 11.7.2 Syntax

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

### 11.7.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <show> | Number | • 0 (default and factory-programmed value): do not show detailed SMS header information<br>• 1: show detailed SMS header information |

## 11.8 New message indication +CNMI

| +CNMI | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | Yes | *Profile* | No | - | *+CMS Error* |

### 11.8.1 Description

Selects the procedure to indicate the reception of a new SMS in case of the MT is active (the DTR signal is ON). If the MT is inactive (the DTR signal is OFF), the message reception should be done as specified in 3GPP TS 23.038 *[7]*.

The SMSes of 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 to read the SMS via *AT+CMGR=0*).

The <tooa>, <fo>, <pid>, <dcs>, <sca>, <tosca>, <length> parameters in the text mode +CMT URC are displayed only if *+CSDH=1* is set.

The +UCMT URC notifies the SMS-DELIVER status for 3GPP2 Mobile Terminated SMSes; it is equivalent to +CMT but valid only for 3GPP2 SMS (i.e. 3GPP2 SMS over IMS received on Verizon MNO).

### 11.8.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CNMI=[<mode>[,<mt>[,<bm>[,<ds>[,<bfr>]]]]] | OK | AT+CNMI=1,1<br>OK |
| Read | AT+CNMI? | +CNMI: <mode>,<mt>,<bm>,<ds>,<bfr> | +CNMI: 0,0,0,0,0<br>OK |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | 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)<br>OK | +CNMI: (0-2),(0-3),(0-3),(0-2),(0-1)<br>OK |
| URC | | +CMTI: <mem>,<index> | +CMTI: "SM",5 |
| URC | | **Text mode (+CMGF=1):**<br>+CMT: <oa>,[<alpha>],<scts>[,<tooa>,<fo>,<pid>,<dcs>,<sca>,<tosca>,<length>]<CR><LF><data> | +CMT: "+393475234652",,"14/11/21,11:58:23+01"<br>Hello world |
| | | **PDU mode (+CMGF=0):**<br>+CMT: ,<length><CR><LF><pdu> | |
| URC | | **Text mode (+CMGF=1):**<br>+UCMT: <message_id>,<oa>,<scts>,[<priority>],[<privacy>],[<callback_number>],<encoding>,[<status>],[<num_sms>,<part>,<reference>],<length><CR><LF><text> | +UCMT: 1,+1231241241,"18:02:28+08",,,,2,,,,,6<br>Hello! |
| | | **PDU mode (+CMGF=0):**<br>+UCMT: <pdu_length><CR><LF><pdu> | |
| URC | | +CBMI: <mem>,<index> | +CBMI: "BM",48 |
| URC | | **Text mode (+CMGF=1):**<br>+CBM: <sn>,<mid>,<dcs>,<page>,<pages><CR><LF><data> | +CBM: 271,1025,1,1,1<br>The quick brown fox jumps over the lazy dog 0123456789 |
| | | **PDU mode (+CMGF=0):**<br>+CBM: <length><CR><LF><pdu> | |
| URC | | +CDSI: <mem>,<index> | +CDSI: "MT",2 |
| URC | | **Text mode (+CMGF=1):**<br>+CDS: <fo>,<mr>,[<ra>],[<tora>],<scts>,<dt>,<st> | +CDS: 6,202,"+393492323583",145,"14/07/25,13:07:16+02","14/07/25,16:35:44+02",0 |
| | | **PDU mode (+CMGF=0):**<br>+CDS: <length><CR><LF><pdu> | |

## 11.8.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | Controls the processing of URCs specified within this command:<br>• 0 (default value): 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)<br>• 1 (factory-programmed value): discard indication and reject new received message URCs when MT-DTE link is reserved; otherwise forward them directly to the DTE<br>• 2: buffer URCs in the MT when the serial link is busy (e.g. data-transfer); otherwise forward them directly to the DTE<br>• 3: forward URCs directly to the TE. TA-TE link specific inband technique used to embed result codes and data when MT is in on-line data mode |
| <mt> | Number | Specifies the rules for managing the received SMS according the message's Data Coding Scheme (DCS):<br>• 0 (default and factory-programmed value): No SMS-DELIVER indications are routed to the TE<br>• 1: if SMS-DELIVER is stored in the MT, indication of the memory location is routed to the DTE using the +CMTI URC<br>• 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 +CMT URC. 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 |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 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 |
| <bm> | Number | Specifies the rules for managing the received Cell Broadcast messages (CBM):<br>• 0 (default and factory-programmed value): no CBM indications to the DTE<br>• 1: if the CBM is stored in the MT, an indication of the used memory location is routed to DTE using the +CBMI URC<br>• 2: new CBMs are routed directly to the DTE using the +CBM URC<br>• 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 | Specifies the rules for managing the Status Report messages:<br>• 0 (default and factory-programmed value): no SMS-STATUS-REPORTs are routed to the DTE<br>• 1: SMS-STATUS-REPORTs are routed to the DTE using the +CDS URC<br>• 2: if SMS-STATUS-REPORT is stored in the MT, the indication of the memory location is routed to the DTE using the +CDSI URC |
| <bfr> | Number | Controls the buffering of URCs:<br>• 0 (default and factory-programmed value): MT buffer of URCs defined within this command is flushed to the DTE when <mode> 1...3 is entered (OK final result code shall be given before flushing the codes).<br>• 1: MT buffer of URCs defined within this command is cleared when <mode> 1...3 is entered |
| <mem> | String | Same as defined in *+CPMS Defined Values* |
| <index> | Number | Storage position |
| <length> | Number | Two meanings:<br>• in text mode: number of characters<br>• in PDU mode: PDU's length in octets without the Service Center's address. In example: 0 39121430100038166F6000004E374F80D: 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, see the <dt> |
| <data> | String | In the case of SMS: 3GPP TS 23.040 *[8]* TP-User-Data in text mode responses; format:<br>• if <dcs> indicates that 3GPP TS 23.038 *[7]* GSM 7 bit default alphabet is used and <fo> indicates that 3GPP TS 23.040 *[8]* TP-User-Data-Header-Indication is not set:<br>o if TE character set other than "HEX" (see the *+CSCS* command in 3GPP TS 27.007 *[2]*): ME/TA converts GSM alphabet into current TE character set according to rules of Annex A<br>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 TODO: what character should go here? ( (GSM 7 bit default alphabet 23) is presented as 17 (IRA 49 and 55))<br>• if <dcs> indicates that 8-bit or UCS2 data coding scheme is used, or <fo> indicates that 3GPP TS 23.040 *[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))<br>In the case of CBS: 3GPP TS 23.041 *[9]* CBM Content of Message in text mode responses; format:<br>• if <dcs> indicates that 3GPP TS 23.038 *[7]* GSM 7 bit default alphabet is used:<br>o if TE character set other than "HEX" (see the *+CSCS* in 3GPP TS 27.007 *[2]*): ME/TA converts GSM alphabet into current TE character set according to rules of Annex A<br>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<br>• 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 | Data Coding Scheme |
| <page> | Number | CBM Page Parameter bits 4-7 in integer format as described in 3GPP TS 23.041 *[9]* |
| <pages> | Number | CBM Page Parameter bits 0-3 in integer format as described in 3GPP TS 23.041 *[9]* |
| <fo> | Number | First octet of the SMS TPDU (see 3GPP TS 23.040 *[8]*) |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| <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. The range goes from -48 to +56 |
| <st> | Number | Status of a SMS STATUS-REPORT |
| <message_id> | Number | Message-ID of the 3GPP2 SMS |
| <priority> | Number | 3GPP2 priority:<br>• 0: normal<br>• 1: interactive<br>• 2: urgent<br>• 3: emergency |
| <privacy> | Number | 3GPP2 privacy<br>• 0: not restricted<br>• 1: restrictive<br>• 2: confidential<br>• 3: secret |
| <callback_number> | String | Callback number |
| <encoding> | Number | Text encoding<br>• 2: ASCII7<br>• 3: IA5<br>• 4: UCS2<br>• 8: ISO 8859-1<br>• 9: GSM7 |
| <num_sms> | Number | Total number of SMS |
| <part> | Number | Fragment part number |
| <reference> | Number | 3GPP2 reference ID |

## 11.8.4 Notes

- The incoming SMS/CBM URC indications will be displayed only on the AT interface where the last +CNMI command was set. As a general rule, the command should be issued by the DTE:
  - After start-up
  - After using the *Z* and *&F* command (which reset the command configuration)
  - Whenever the incoming SMS URCs indications are requested on a different AT interface
- When <mt> is not set to 0 the arrival of an SMS is notified by switching the RI line from OFF to ON for 1 s. This is done in respect to the RI line of all the AT interfaces.
- The behaviour described in the note above can be configured via the *+UDCONF=82* AT command (where this command is supported).
- <mode> = 3 is not supported.

**TOBY-L2 / MPCI-L2**

- The RI line switches from OFF to ON state for 1 s both on the AT interface (USB, UART or MUX virtual channel) and on the UART interface (regardless the selected AT command interface) when the +CNMI AT command is issued (with <mt> not set to 0).

**TOBY-L200-00S / TOBY-L201 / TOBY-L210-00S / TOBY-L210-60S / TOBY-L280-00S / MPCI-L200-00S / MPCI-L201 / MPCI-L210-00S / MPCI-L210-60S**

- The RI line switching from OFF to ON for 1 s is only performed on the AT interface where the +CNMI command is issued (with <mt> not set to 0).
- <bm> = 1 and <bm> = 3 are not supported.
- <ds> = 2 is not supported.

**LISA-U / SARA-U / SARA-G / LEON-G**

- The +UCMT URC is not supported.

Objective Specification

# 11.9 Incoming SMS/CBM indication via different AT interfaces +UDCONF=82

| +UDCONF=82 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U201 SARA-U260-03S SARA-U270-03S SARA-U270-53S SARA-U280-03S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 11.9.1 Description

Allows the module to provide SMS/CBM indications on different AT command interfaces: the incoming SMS/CBM URC indications will be displayed on each AT command interface where the command *+CNMI* is issued.

When the URC indications are disabled, that is <mode> parameter of *+CNMI* equals to 0 or one (or more) of the +CNMI parameters <mt>, <bm>, <ds> equals 0, they are removed from all the AT terminals

The behaviour regarding the *+CNMI* values loaded from the module *Profile*, during start-up phase and by using *Z*/*&F* AT commands, remains unchanged.

## 11.9.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UDCONF=82,<CNMI_conf_status> | OK | AT+UDCONF=82,0<br>OK |
| Read | AT+UDCONF=82 | +UDCONF: 82,<CNMI_conf_status><br>OK | AT+UDCONF=82<br>+UDCONF: 82,1<br>OK |

## 11.9.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <CNMI_conf_status> | Number | Enables / disables the incoming SMS/CBM indication via different AT command interfaces.<br>Allowed values:<br>• 0 (factory-programmed value): the incoming SMS/CBM URC indications will be displayed only on the AT interface where the last *+CNMI* command was issued<br>• 1: the incoming SMS/CBM indications via different AT interfaces is enabled. The URC about the incoming SMS/CBM indications will be displayed on each AT interface where the command *+CNMI* was issued. |

# 11.10 Select service for MO SMS messages +CGSMS

| +CGSMS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

## 11.10.1 Description

Specifies the service (PS or CS) or service preference that the MT will use to send MO SMS messages.

In particular:

- in 2G RAT, PS service means GPRS and CS service means transmission on GSM dedicated channels;
- in 3G RAT, PS service means transmission on PS domain SRB (Signalling Radio Bearer) and CS service means transmission on CS domain SRB; SRB can be mapped to several UMTS transport channels, e.g. RACH/FACH or DCH;
- in 4G RAT, PS service means IMS messaging on EPS bearers and CS service means transmission on SGs (Signalling Gateways).

Objective Specification

### 11.10.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CGSMS=[<service>] | OK | AT+CGSMS=1<br>OK |
| Read | AT+CGSMS? | +CGSMS: <service><br>OK | +CGSMS: 1<br>OK |
| Test | AT+CGSMS=? | +CGSMS: (list of supported <service>s)<br>OK | +CGSMS: (0-3)<br>OK |

### 11.10.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <service> | Number | Service or service preference to be used:<br>• 0 (default value): PS<br>• 1 (factory-programmed value): CS<br>• 2: PS preferred (use CS if PS is not available)<br>• 3: CS preferred (use PS if CS is not available) |

### 11.10.4 Notes

**TOBY-L2 / MPCI-L2**

- The PIN insertion is mandatory before the command execution.

**TOBY-L201 / MPCI-L201**

- The command setting is not stored in NVM.

## 11.11 Read message +CMGR

| +CMGR | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | *Up to 3 min (<1 s for prompt ">" when present)* | *+CMS Error* |

### 11.11.1 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 "+CMS ERROR: invalid memory index" error result code is returned.

### 11.11.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | **Text mode (+CMGF=1):**<br>AT+CMGR=<index> | **(SMS-DELIVER)**<br>+CMGR: <stat>,<oa>,[<alpha>],<scts>[,<tooa>,<fo>,<pid>,<dcs>,<sca>,<tosca>,<length>]<br><data><br>OK<br>**(SMS-SUBMIT)** | AT+CMGR=303<br>+CMGR: "REC READ","+393488535999",,"07/04/05,18:02:28+08",145,4,0,0,"+393492000466",145,93<br>You have a missed called. Free information provided by your operator.<br>OK |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | +CMGR: <stat>,<da>,[<alpha>][,<toda>,<fo>,<pid>,<dcs>,[<vp>],<sca>,<tosca>,<length>]<br><data><br>OK | |
| | | **(SMS-STATUS-report)**<br>+CMGR: <stat>,<fo>,<mr>,[<ra>],[<tora>],<scts>,<dt>,<st><br>OK | |
| | | **(SMS-COMMAND)**<br>+CMGR: <stat>,<fo>,<ct>[,<pid>,[<mn>],[<da>],[<toda>],<length><br>[<cdata>]]<br>OK | |
| | | **(CBM storage)**<br>+CMGR: <stat>,<sn>,<mid>,<dcs>,<page>,<pages><br><data><br>OK | |
| | **PDU mode (+CMGF=0):**<br>AT+CMGR=<index> | +CMGR: <stat>,[<alpha>],<length><br><pdu><br>OK | AT+CMGR=1<br>+CMGR: 1,,40<br>0791934329002000040C91932309826614000080703280452180 18D4F29CFE06B5CBF379F87C4EBF41E434082E7FDBC3<br>OK |
| Test | AT+CMGR=? | OK | |

## 11.11.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <index> | Number | Storage position |
| <stat> | Number | • 0: in PDU mode or "REC UNREAD" in text mode: received unread SMS<br>• 1: in PDU mode or "REC READ" in text mode: received read SMS<br>• 2: in PDU mode or "STO UNSENT" in text mode: stored unsent SMS<br>• 3: in PDU mode or "STO SENT" in text mode: stored sent SMS |
| <oa> | String | Originator address |
| <alpha> | String | Alphanumeric representation of <da> or <a> corresponding to the entry found in the phonebook 3GPP TS 24.008 *[12]*. The parameter is not managed. |
| <scts> | String | Service center time stamp in time-string format, see <dt> |
| <tooa> | Number | Type of address of <oa> - octet |
| <fo> | Number | First octet of the SMS TPDU (see 3GPP TS 23.040 *[8]*) |
| <pid> | Number | TP-Protocol-Identifier (default 0); see the 3GPP TS 23.040 *[8]* |
| <dcs> | Number | Data Coding Scheme |
| <sca> | String | Service center address field |
| <tosca> | Number | Type of address of <sca> - octet in Number format (for more details see the 3GPP TS 24.008 *[12]*); default 145 when string includes '+', otherwise default 129 |
| <length> | Number | Two meanings:<br>• in text mode: number of characters<br>• in PDU mode: PDU's length in octets without the Service Center's address. In example 0 39121430100038166F6000004E374F80D: 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: 3GPP TS 23.040 *[8]* TP-User-Data in text mode responses; format:<br>• if <dcs> indicates that 3GPP TS 23.038 *[7]* GSM 7 bit default alphabet is used and <fo> indicates that 3GPP TS 23.040 *[8]* TP-User-Data-Header-Indication is not set: |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | o if TE character set other than "HEX" (see +CSCS command description): ME/TA converts GSM alphabet into current TE character set according to rules of Annex A<br>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 TODO: what character should go here? (GSM 7 bit default alphabet 23) is presented as 17 (IRA 49 and 55))<br>• if <dcs> indicates that 8-bit or UCS2 data coding scheme is used, or <fo> indicates that 3GPP TS 23.040 [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))<br>In the case of CBS: 3GPP TS 23.041 [9] CBM Content of Message in text mode responses; format:<br>• if <dcs> indicates that 3GPP TS 23.038 [7] GSM 7 bit default alphabet is used:<br>o if TE character set other than "HEX" (see +CSCS command description): ME/TA converts GSM alphabet into current TE character set according to rules of Annex A<br>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<br>• 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:<br>• Relative format: validity period starting from when the SMS is received by the SMSC, in range 0-255 (default value 167); for more details see the 3GPP TS 23.040 [8]<br><vp> \| Validity period value<br>0 to 143 \| (TP-VP + 1) x 5 minutes (i.e. 5 minutes intervals up to 12 hours)<br>144 to 167 \| 12 hours + ((TP-VP -143) x 30 minutes)<br>168 to 196 \| (TP-VP - 166) x 1 day<br>197 to 255 \| (TP-VP - 192) x 1 week<br>• Absolute format: absolute time of the validity period termination in string format ("yy/MM/dd,hh:mm:ss+zz") (see the 3GPP TS 23.040 [8]); the time zone is expressed in steps of 15 minutes. The range goes from -48 to +56 |
| <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. The range goes from -48 to +56 |
| <st> | Number | Status of an SMS STATUS-REPORT |
| <ct> | Number | TP-Command-Type (default 0) |
| <mn> | Number | See the 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) |

Objective Specification

# 11.12 New message acknowledgement to MT +CNMA

| +CNMA | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | *< 150 s* | *+CMS Error* |

## 11.12.1 Description

Confirms the reception of a new message (SMS-DELIVER or SMS-STATUS-REPORT) which is routed directly to the TE (see the *+CNMI* command). This acknowledgement command shall be used when *+CSMS* parameter <service> equals 1. The MT shall not send another +CMT or +CDS (see the *+CNMI* command) unsolicited result codes to the TE before the previous one is acknowledged. If the MT does not get acknowledgement within required time (network timeout), the MT should respond as specified in 3GPP TS 24.011 *[13]* to the network. The MT shall automatically disable routing to the TE by setting both <mt> and <ds> values of *+CNMI* to zero. If the command is executed, but no acknowledgement is expected, or some other MT related error occurs, the final result code +CMS ERROR: <err> is returned.

In PDU mode, it is possible to send either positive (RP-ACK) or negative (RP-ERROR) acknowledgement to the network. The <n> parameter defines which one will be sent. Optionally (when <length> is greater than zero) an acknowledgement TPDU (SMS-DELIVER-REPORT for RP-ACK or RP-ERROR) may be sent to the network. The entering of PDU is done similarly as specified in *+CMGS* command, except that the format of <ackpdu> is used instead of <pdu> (i.e. SMSC address field is not present). The PDU shall not be bounded by double quotes.

## 11.12.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | Text mode (+CMGF=1):<br>AT+CNMA | OK | AT+CNMA<br>OK |
| | PDU mode (+CMGF=0):<br>AT+CNMA[=<n>[,<length> [PDU is given<Ctrl-Z>/<ESC>]]] | OK | AT+CNMA=1,5<br>>0007000000 <Ctrl-Z><br>OK |
| Test | AT+CNMA=? | Text mode (+CMGF=1):<br>OK | OK |
| | | PDU mode (+CMGF=0):<br>+CNMA: (list of supported <n>s)<br>OK | +CNMA: (0-2)<br>OK |

## 11.12.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <n> | Number | • 0: the command operates similarly as defined for the text mode<br>• 1: sends RP-ACK (or buffered result code received correctly)<br>• 2: sends RP-ERROR (if PDU is not given, ME/TA shall send SMS-DELIVER-REPORT with 3GPP TS 23.040 *[8]* TP-FCS value set to 'FF' (unspecified error cause)) |
| <length> | Number | PDU's length in octets without the Service Center's address |

Objective Specification

# 11.13 List message +CMGL

| +CMGL | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | *Up to 3 min (<1 s for prompt ">" when present)* | *+CMS Error* |

## 11.13.1 Description

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

## 11.13.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | Text mode (+CMGF=1): | Command successful and SMS-DELIVERs: | AT+CMGL |
| | AT+CMGL[=<stat>] | +CMGL: <index>,<stat>,<oa>,[<alpha>],[<scts>][,<tooa>,<length>] | +CMGL: 303,"REC READ","+39340 1234999",,"08/08/06,10:01:38+08" |
| | | <data> | You have a missed called. Free information provided by your operator. |
| | | [+CMGL: <index>,<stat>,<oa>,[<alpha>],[<scts>][,<tooa>,<length>]<data>[...]] | OK |
| | | OK | |
| | | Command successful and SMS-SUBMITs: | |
| | | +CMGL: <index>,<stat>,<da>,[<alpha>],[<toda>, <length>] | |
| | | <data> | |
| | | [+CMGL: <index>,<stat>,<da>,[<alpha>],[<toda>, <length>]<data>[...]] | |
| | | OK | |
| | | 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): | Command successful: | AT+CMGL=1 |
| | AT+CMGL[=<stat>] | +CMGL: <index>,<stat>,[<alpha>],<length> | +CMGL: 305,1,,57 079193432900 1185440ED0D637396C7EBBCB000090 9092708024802A050003000303DEA0 |
| | | <pdu> | |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | [+CMGL: <index>,<stat>,[<alpha>], <length>]<br><pdu> [...] | 584CE60205D974791994769BDF3A90DB759687E9F534FD0DA2C9603419<br>OK |
| Test | AT+CMGL=? | +CMGL: (list of supported <stat>s)<br>OK | +CMGL: ("REC UNREAD","REC READ","STO UNSENT","STO SENT","ALL")<br>OK |

## 11.13.3 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<br>• 0: in PDU mode or "REC UNREAD" in text mode: received unread SMS messages<br>• 1: in PDU mode or "REC READ" in text mode: received read SMS messages<br>• 2: in PDU mode or "STO UNSENT" in text mode: stored unsent SMS messages<br>• 3: in PDU mode or "STO SENT" in text mode: stored sent SMS messages<br>• 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 3GPP TS 24.008 *[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 | Two meanings:<br>• in text mode: number of characters<br>• in PDU mode: PDU's length in octets without the Service Center's address. In example 0 39121430100038166F6000004E374F80D: 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 3GPP TS 23.040 *[8]*; format:<br>• if DCS indicates that 3GPP TS 23.038 *[7]* GSM 7 bit default alphabet is used and FO indicates that 3GPP TS 23.040 *[8]* TP-User-Data-Header-Indication is not set:<br>o if TE character set other than "HEX" (refer command Select TE Character Set +CSCS in 3GPP TS 27.007 *[2]*): ME/TA converts GSM alphabet into current TE character set according to rules of Annex A<br>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 TODO: what character should go here? (GSM 7 bit default alphabet 23) is presented as 17 (IRA 49 and 55))<br>• if DCS indicates that 8-bit or UCS2 data coding scheme is used, or FO indicates that 3GPP TS 23.040 *[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))<br>In the case of CBS: 3GPP TS 23.041 *[9]* CBM Content of Message in text mode responses; format:<br>• if DCS indicates that 3GPP TS 23.038 *[7]* GSM 7 bit default alphabet is used:<br>o if TE character set other than "HEX" (refer command +CSCS in 3GPP TS 27.007 *[2]*): ME/TA converts GSM alphabet into current TE character set according to rules of Annex A<br>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<br>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 the SMS TPDU (see 3GPP TS 23.040 *[8]*) |
| <mr> | Number | Message reference |
| <ra> | String | Recipient address field |
| <tora> | Number | Type of address of <ra> - octet |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| <dt> | String | Discharge time in format "yy/MM/dd,hh:mm:ss+zz"; the time zone is expressed in steps of 15 minutes. The range goes from -48 to +56 |
| <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 |
| <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 | Data Coding Scheme |

# 11.14 Send message +CMGS

| +CMGS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | *Up to 3 min (<1 s for prompt ">" when present)* | *+CMS Error* |

## 11.14.1 Description

Sends a message from a DTE to the network (SMS-SUBMIT). The message reference value <mr> is returned to the DTE for a successful message delivery. <Ctrl-Z> indicates that the SMS shall be sent, while <ESC> indicates aborting of the edited SMS.

The entered text/PDU is preceded by a ">" (Greater-Than sign) character, and this indicates that the interface is in "text/PDU enter" mode. The DCD signal shall be in ON state while the text/PDU is entered.

## 11.14.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | Text mode (+CMGF=1):<br>AT+CMGS=<da>[,<toda>]<CR><br>text is entered<Ctrl-Z/ESC> | +CMGS: <mr><br>OK | AT+CMGS="0171112233"<CR><br>> This is the text<Ctrl-Z><br>+CMGS:2<br>OK |
| | PDU mode (+CMGF=0):<br>AT+CMGS=<length><CR><br>PDU is given<Ctrl-Z/ESC> | +CMGS: <mr><br>OK | AT+CMGS=13<CR><br>> 0391214301000381 66F6000004E374F80D<Ctrl-Z><br>+CMGS:2<br>OK |
| Test | AT+CMGS=? | OK | |

## 11.14.3 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:<br>• in text mode: number of characters<br>• in PDU mode: PDU's length in octets without the Service Center's address. In example 0 39121430100038166F6000004E374F80D: is a PDU with Service Center's number +1234, that generates the address 03912143 (4 octets). Thus in this case <length>=13. |

Objective Specification

| 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) |

# 11.15 Write message to memory +CMGW

| +CMGW | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | *<10 s* | *+CMS Error* |

## 11.15.1 Description

Stores a message (SMS-DELIVER or SMS-SUBMIT) to memory storage <mem2> and returns the memory location <index> of the stored message. <Ctrl-Z> indicates that the SMS shall be stored, while <ESC> indicates aborting of the edited SMS.

The entered text/PDU is preceded by a ">" (Greater-Than sign) character, and this indicates that the interface is in "text/PDU enter" mode. The DCD signal shall be in ON state while the text/PDU is entered.

## 11.15.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | **Text mode (+CMGF=1):**<br>AT+CMGW[=<oa/da>[,<tooa/toda>[,<stat>]]]<CR><br>text is entered<Ctrl-Z/ESC> | +CMGW: <index><br>OK | AT+CMGW="091137880"<CR><br>> This is the text<Ctrl-Z><br>+CMGW: 303<br>OK |
| | **PDU mode (+CMGF=0):**<br>AT+CMGW=<length>[,<stat>]<CR><br>PDU is given<Ctrl-Z/ESC> | +CMGW: <index><br>OK | AT+CMGW=13<CR><br>> 0391214301000381 66F600000 4E374F80D<Ctrl-Z><br>+CMGW: 303<br>OK |
| Test | AT+CMGW=? | OK | |

## 11.15.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <da> | String | TP-Destination-Address Address-Value field (see the 3GPP TS 23.040 *[8]*); BCD numbers (or GSM 7 bit default alphabet characters) are converted to characters of the currently selected TE character set (see the *+CSCS* AT command); type of address given by <toda> |
| <oa> | String | TP-Originating-Address Address-Value field (see the 3GPP TS 23.040 *[8]*); BCD numbers (or GSM 7 bit default alphabet characters) are converted to characters of the currently selected TE character set (see the *+CSCS* AT command); type of address given by <tooa> |
| <tooa> | Number | TP-Originating-Address Type-of-Address octet (see the 3GPP TS 24.011 *[13]*); see the <toda> parameter for the default value |
| <toda> | Number | TP-Destination-Address Type-of-Address octet (see the 3GPP TS 24.011 *[13]*); when the first character of <da> is + (IRA 43) the default value is 145, otherwise it is 129) |
| <stat> | Number or String | Number type in PDU mode (default value: 2), or string type in text mode (default value: "STO UNSENT"); it indicates the message status in memory:<br>• 0: in PDU mode or "REC UNREAD" in text mode: received unread SMS messages<br>• 1: in PDU mode or "REC READ" in text mode: received read SMS messages<br>• 2: in PDU mode or "STO UNSENT" in text mode: stored unsent SMS messages<br>• 3: in PDU mode or "STO SENT" in text mode: stored sent SMS messages |
| <text> | String | SMS string |
| <index> | Number | Storage position |
| <length> | Number | The parameter meaning depends on the message format:<br>• In text mode: number of characters |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • In PDU mode: PDU's length in octets without the Service Center's address. In example: 0 39121430100038166F6000004E374F80D 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. an octet with integer value 42 must be written as two characters 2A (IRA 50 and 65) |

### 11.15.4 Notes

#### TOBY-L2 / MPCI-L2

- The <stat> parameter is not supported.

## 11.16 Send message from storage +CMSS

| +CMSS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | *Up to 3 min (<1 s for prompt ">" when present)* | *+CMS Error* |

### 11.16.1 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.

### 11.16.2 Syntax

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

### 11.16.3 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 |

## 11.17 Set text mode parameters +CSMP

| +CSMP | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | *< 10 s* | *+CMS Error* |

### 11.17.1 Description

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

Objective Specification

### 11.17.2 Syntax

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

### 11.17.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <fo> | Number | First octet of the SMS TPDU (see 3GPP TS 23.040 *[8]*) |
| <vp> | Number | Format depending on the values of the bit3/bit4 of the <fo> (SMS-SUBMIT case): |

| bit 3 | bit 4 | Format |
|---|---|---|
| 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 (the default value is 167); for more details see the 3GPP TS 23.040 *[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") (see the 3GPP TS 23.040 *[8]*); the time zone is expressed in steps of 15 minutes. The range goes from -48 to +56

| | | |
|---|---|---|
| <pid> | Number | TP-Protocol-Identifier (default value: 0); see the 3GPP TS 23.040 *[8]* |
| <dcs> | Number | Data Coding Scheme. The default value is 0 |

### 11.17.4 Notes

#### TOBY-L2 / MPCI-L2

- The absolute format of the validity period is not supported.

## 11.18 Delete message +CMGD

| +CMGD | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | Yes | No | No | *< 55 s* | *+CMS Error* |

### 11.18.1 Description

Deletes the message from the 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 module returns the "OK" final result code.

If the <index> value is out of range (it depends on *AT+CPMS* command setting), then the "+CMS ERROR: invalid memory index" error result code is returned.

Objective Specification

### 11.18.2 Syntax

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

### 11.18.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <index> | Number | Storage position |
| <flag> | Number | Deletion flag. If present, and different from 0, the <index> parameter is ignored:<br>• 0 (default value): delete the message specified in <index><br>• 1: delete all the read messages from the preferred message storage, leaving unread messages and stored mobile originated messages (whether sent or not) untouched<br>• 2: delete all the read messages from the preferred message storage and sent mobile originated messages, leaving unread messages and unsent mobile originated messages untouched<br>• 3: delete all the read messages from the preferred message storage, sent and unsent mobile originated messages leaving unread messages untouched<br>• 4: delete all the messages from the preferred message storage including unread messages |

### 11.18.4 Notes

#### SARA-G / LEON-G

- The "BM" memory entries cannot be deleted.

## 11.19 Primary notification event reporting +CPNER

| +CPNER | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 11.19.1 Description

Configures the reporting of primary notification events when received from the network. Primary notification events are used for Public Warning Systems like ETWS (Earthquake and Tsunami Warning Systems).

The UE will discard the duplicate primary notification.

The notification is considered a duplicate of the previous if it has equal <message_identifier> and <serial_number> and arrives from the same PLMN. A primary notification message stored to detect duplication is automatically cleared after three hours of not receiving any message.

### 11.19.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CPNER=<reporting> | OK | AT+CPNER=1<br>OK |
| Read | AT+CPNER? | +CPNER: <reporting><br>OK | +CPNER: 1<br>OK |
| Test | AT+CPNER=? | +CPNER: (list of supported <reporting>s)<br>OK | +CPNER: (0-1)<br>OK |
| URC | | +CPNERU: <message_identifier>,<serial_number>,<warning_type> | |

Objective Specification

### 11.19.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <reporting> | Number | Configures the reporting of primary notification events:<br>• 0 (factory-programmed value): primary notification events disabled<br>• 1: primary notification events enabled |
| <message_identifier> | String | Hexadecimal character format. It contains the message identifier (2 bytes) of the primary notification |
| <serial_number> | String | Hexadecimal character format. It contains the serial number (2 bytes) of the primary notification |
| <warning_type> | String | Contains the warning type (2 bytes) of the primary notification. |

## 11.20 Service center address +CSCA

| +CSCA | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | *< 10 s* | *+CMS Error* |

### 11.20.1 Description

Updates the SMSC address, through which mobile originated SMSes 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.

### 11.20.2 Syntax

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

### 11.20.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <sca> | String | Service center address |
| <tosca> | String | Type of address of <sca> (for more details refer to 3GPP TS 24.008 *[12]*); default 145 when string includes '+', otherwise default 129 |

## 11.21 Select cell broadcast message types +CSCB

| +CSCB | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | *< 10 s* | *+CMS Error* |

### 11.21.1 Description

Selects which types of CBM's are to be received by the MT.

### 11.21.2 Syntax

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

Objective Specification

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

## 11.21.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | • 0: message types specified in <mids> and <dcss> accepted<br>• 1: message types specified in <mids> and <dcss> not accepted |
| <mids> | String | Contains all possible combinations of CBM message identifiers (<mid>). See the 3GPP TS 23.041 [9], chapter 9.4. When RAT is UMTS up to 2048 message identifiers can be set; defining an exceeding combination will not cause an error result code and exceeding values will be ignored. |
| <dcss> | String | Contains all possible combinations of CBM data coding schemes (<dcs>). See the 3GPP TS 23.038 [7], chapter 5 |

## 11.21.4 Notes

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

**TOBY-L2 / MPCI-L2**

- The modules read on boot the files below from the USIM and they configure the CBM reception accordingly:
  - $EF_{CBMID}$ (Cell Broadcast Message Identifier for Data Download): this EF contains the message identifier parameters which specify the type of content of the cell broadcast messages which are to be passed to the USIM.
  - $EF_{CBMI}$ (Cell Broadcast Message identifier selection): this EF contains the Message Identifier Parameters which specify the type of content of the cell broadcast messages that the subscriber wishes the UE to accept.
  - $EF_{CBMIR}$ (Cell Broadcast Message Identifier Range selection): this EF contains ranges of cell broadcast message identifiers that the subscriber wishes the UE to accept.
- The maximum number of <mids> is 30.
- These commands perform these actions:
  - AT+CSCB=0 enables all the indications
  - AT+CSCB=1 disables all the indications
- To activate a custom range of mids perform the following actions:
  1. Power on the module, insert a valid SIM and insert its PIN (if needed).
  2. Read the current SIM configuration with AT+CSCB read command
  3. Modify the configuration by adding or removing some <mids> and/or <dcss> ranges.
  4. Enabling or disabling the reception of all <mids> and <dcss> will be stored in NVM, but not in SIM due to SIM data storage limitations.
  5. If the list must be modified after having enabled or disabled everything add or remove a <mids> or <dcss>, re-read the configuration with the AT+CSCB read command and then set it as needed.

**LISA-U1**

- When RAT is UMTS up to 1024 message identifiers can be set.

Objective Specification

# 11.22 Read concatenated message +UCMGR

| +UCMGR | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | *Up to 3 min* | *+CMS Error* |

## 11.22.1 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.

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 "+CMS ERROR: invalid memory index" error result code is returned.

## 11.22.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UCMGR=<index> | (SMS-DELIVER)<br>+UCMGR: <stat>,<oa>,[<alpha>],<scts>[,<tooa>, <fo>,<pid>,<dcs>,<sca>,<tosca>,<length>][,<seq>,<max>,<iei>,<ref>]<br><data><br>OK<br>(SMS-SUBMIT)<br>+UCMGR: <stat>,<da>,[<alpha>][<toda>,<fo>,<pid>,<dcs>,[<vp>],<sca>,<tosca>,<length>][,<seq>,<max>,<iei>,<ref>]<br><data><br>OK<br>(SMS-STATUS-report)<br>+UCMGR:<stat>,<fo>,<mr>,[<ra>],[<tora>]<scts><dt>,<st><br>OK<br>(SMS-COMMAND)<br>+UCMGR: <stat>,<fo>,<ct>[,<pid>,[<mn>],[<da>],[<toda>],<length><br>[<cdata>]]<br>OK | AT+UCMGR=1<br>+UCMGR:"REC READ","+393488535999",,"07/04/05,18:02:28+08",145,4,0,0,"+393492000466",145,153,1,2,0,127<br>u-blox reserves all rights to this document and the information contained herein. Reproduction, use or disclosure to third parties without express permis<br>OK |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | (CBM storage)<br>+UCMGR: <stat>,<sn>,<mid>,<dcs>,<br><page>,<pages><br><data><br>OK | |
| Test | AT+UCMGR=? | OK | |

## 11.22.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <index> | Number | Storage position |
| <stat> | String | Indicates the status of message in memory:<br>• "REC UNREAD": received unread SMS<br>• "REC READ": received read SMS<br>• "STO UNSENT": stored unsent SMS<br>• "STO SENT": stored sent SMS |
| <oa> | String | Originator address |
| <alpha> | String | Alphanumeric representation of <da> or <oa> corresponding to the entry found in the phonebook 3GPP TS 24.008 *[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 the SMS TPDU (see 3GPP TS 23.040 *[8]*) |
| <pid> | Number | TP-Protocol-Identifier (default 0); refer to 3GPP TS 23.040 *[8]* |
| <dcs> | Number | Data Coding Scheme |
| <sca> | String | Service center address field |
| <tosca> | Number | Type of address of <sca> - octet in Number format (for more details refer to 3GPP TS 24.008 *[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:<br>• 0: Concatenated short messages, 8-bit reference number<br>• 8: Concatenated short messages, 16-bit reference number |
| <ref> | Number | Concatenated short message reference number:<br>• 0-255: Concatenated short messages, 8-bit reference number case<br>• 0-65535: Concatenated short messages, 16-bit reference number case |
| <data> | String | In the case of SMS: 3GPP TS 23.040 *[8]* TP-User-Data in text mode responses; format:<br>• if <dcs> indicates that 3GPP TS 23.038 *[7]* GSM 7 bit default alphabet is used and <fo> indicates that 3GPP TS 23.040 *[8]* TP-User-Data-Header-Indication is not set:<br>o if TE character set other than "HEX" (refer command Select TE Character Set +CSCS *Chapter 4.10*): ME/TA converts GSM alphabet into current TE character set according to rules of 3GPP TS 27.005 *[16]* Annex A<br>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 TODO: what character should go here? (GSM 7 bit default alphabet 23) is presented as 17 (IRA 49 and 55))<br>• if <dcs> indicates that 8-bit or UCS2 data coding scheme is used, or <fo> indicates that 3GPP TS 23.040 *[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))<br>In the case of CBS: 3GPP TS 23.041 *[9]* CBM Content of Message in text mode responses; format:<br>• if <dcs> indicates that 3GPP TS 23.038 *[7]* GSM 7 bit default alphabet is used:<br>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 3GPP TS 27.005 *[16]* Annex A |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | 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<br>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:<br>• Relative format: validity period starting from when the SMS is received by the SMSC, in range 0-255 (default value 167); for more details refer to 3GPP TS 23.040 *[8]*<br><vp> \| Validity period value<br>0 to 143 \| (TP-VP + 1) x 5 minutes (i.e. 5 minutes intervals up to 12 hours)<br>144 to 167 \| 12 hours + ((TP-VP -143) x 30 minutes)<br>168 to 196 \| (TP-VP - 166) x 1 day<br>197 to 255 \| (TP-VP - 192) x 1 week<br>Absolute format: absolute time of the validity period termination in string format ("yy/MM/dd,hh:mm:ss+zz") (refer to 3GPP TS 23.040 *[8]*); the time zone is expressed in steps of 15 minutes. The range goes from -48 to +56 |
| <mr> | Number | Message reference |
| <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. The range goes from -48 to +56 |
| <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 |

# 11.23 List concatenated message +UCMGL

| +UCMGL | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | *Up to 3 min (<1 s for prompt ">" when present)* | *+CMS Error* |

## 11.23.1 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.

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).

Objective Specification

## 11.23.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UCMGL[=<stat>] | SMS-DELIVERs:<br>+UCMGL: <index>,<stat>,<oa>,[<alpha>],[<scts>][,<tooa>,<length>][,<seq>,<max>,<iei>,<ref>]<br><data><br>[+UCMGL: <index>,<stat>,<oa>,[<alpha>],[<scts>][,<tooa>,<length>][,<seq>,<max>,<iei>,<ref>]<data>[...]]<br>OK | AT+UCMGL<br>+UCMGL: 304,"REC READ","+39340 1234999",,"08/08/06,10:01:38+08",145,152,1,2,8,32767<br>u-blox reserves all rights to this document and the information contained herein. Reproduction, use or disclosure to third parties without express permi<br>+UCMGL: 305,"REC READ","+39340 1234999",,"08/08/06,10:01:40+08",145,29,2,2,8,32767<br>ssion is strictly prohibited.<br>OK |
| | | SMS-SUBMITs:<br>+UCMGL: <index>,<stat>,<da>,[<alpha>],[<toda>, <length>][,<seq>,<max>,<iei>,<ref>]<br><data><br>[+UCMGL: <index>,<stat>,<da>,[<alpha>],[<toda>,<length>][,<seq>,<max>,<iei>,<ref>]<data>[...]]<br>OK | |
| | | SMS-STATUS-REPORTs:<br>+UCMGL: <index>,<stat>,<fo>,<mr>,[<ra>],[<tora>],<scts>,<dt>,<st><br>[+UCMGL: <index>,<stat>,<fo>,<mr>,[<ra>],[<tora>],<scts>,<dt>,<st> [...]]<br>OK | |
| | | SMS-COMMANDs:<br>+UCMGL: <index>,<stat>,<fo>,<ct><br>[+UCMGL: <index>,<stat>,<fo>,<ct>[...]]<br>OK | |
| | | CBM storage:<br>+UCMGL: <index>,<stat>,<sn>,<mid>,<page>,<pages><data><br>[+UCMGL: <index>,<stat>,<sn>,<mid>,<page>,<pages>,<data>[...]]<br>OK | |
| Test | AT+UCMGL=? | +UCMGL: (list of supported <stat>s)<br>OK | +UCMGL: ("REC UNREAD","REC READ","STO UNSENT","STO SENT","ALL ")<br>OK |

## 11.23.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <stat> | String | Indicates the status of message in memory:<br>• "REC UNREAD": received unread SMS messages<br>• "REC READ": received read SMS messages<br>• "STO UNSENT": stored unsent SMS messages<br>• "STO SENT": stored sent SMS messages<br>• "ALL": all SMS messages (default value) |
| <index> | Number | Storage position |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| <oa> | String | Originator address |
| <alpha> | String | Alphanumeric representation of <da> or <oa> corresponding to the entry found in the phonebook 3GPP TS 24.008 *[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 |
| <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:<br>• 0: Concatenated short messages, 8-bit reference number<br>• 8: Concatenated short messages, 16-bit reference number |
| <ref> | Number | Concatenated short message reference number:<br>• 0-255: Concatenated short messages, 8-bit reference number case<br>• 0-65535: Concatenated short messages, 16-bit reference number case |
| <data> | String | In the case of SMS: 3GPP TS 23.040 *[8]* TP-User-Data in text mode responses; format:<br>• if <dcs> indicates that 3GPP TS 23.038 *[7]* GSM 7 bit default alphabet is used and <fo> indicates that 3GPP TS 23.040 *[8]* TP-User-Data-Header-Indication is not set:<br>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 3GPP TS 27.005 Annex A *[16]*<br>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 TODO: what character should go here? (GSM 7 bit default alphabet 23) is presented as 17 (IRA 49 and 55))<br>• if <dcs> indicates that 8-bit or UCS2 data coding scheme is used, or <fo> indicates that 3GPP TS 23.040 *[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))<br>In the case of CBS: 3GPP TS 23.041 *[9]* CBM Content of Message in text mode responses; format:<br>• if <dcs> indicates that 3GPP TS 23.038 *[7]* GSM 7 bit default alphabet is used:<br>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 3GPP TS 27.005 *[16]*Annex A<br>• 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<br>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 the SMS TPDU (see 3GPP TS 23.040 *[8]*) |
| <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. The range goes from -48 to +56 |
| <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 | Data Coding Scheme |

Objective Specification

# 11.24 Send concatenated message +UCMGS

| +UCMGS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | *Up to 3 min (<1 s for prompt ">" when present)* | *+CMS Error* |

## 11.24.1 Description

Sends one segment of a concatenated message from a DTE to the network (SMS-SUBMIT). The message reference value <mr> is returned to the DTE for a successful message delivery. <Ctrl-Z> indicates that the SMS shall be sent, while <ESC> indicates aborting of the edited SMS.

The command is supported only for 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 the text is entered.

## 11.24.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UCMGS=<da>,[<toda>],<seq>, <max>,<iei>,<ref><CR><br>text is entered<Ctrl-Z/ESC> | +UCMGS: <mr><br>OK | AT+UCMGS="0171112233",,1,2,0, 127<CR><br>> u-blox reserves all rights to this document and the information contained herein. Reproduction, use or disclosure to third parties without express permis<Ctrl-Z><br>+UCMGS:2<br>OK<br>AT+UCMGS="0171112233",,2,2,0, 127<CR><br>> sion is strictly prohibited.<Ctrl-Z><br>+UCMGS:3<br>OK |
| Test | AT+UCMGS=? | OK | |

## 11.24.3 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:<br>• 0: Concatenated short messages, 8-bit reference number<br>• 8: Concatenated short messages, 16-bit reference number |
| <ref> | Number | Concatenated short message reference number:<br>• 0-255: Concatenated short messages, 8-bit reference number case<br>• 0-65535: Concatenated short messages, 16-bit reference number case |
| <text> | String | SMS String |
| <mr> | Number | Message reference |

Objective Specification

# 11.25 Write concatenated message to memory +UCMGW

| +UCMGW | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | *< 10 s* | *+CMS Error* |

## 11.25.1 Description

Stores one segment of a concatenated message (SMS-DELIVER or SMS-SUBMIT) to memory storage <mem2> and returns the memory location <index> of the stored message. <Ctrl-Z> indicates that the SMS shall be stored, while <ESC> indicates aborting of the edited SMS.

The command is supported only for 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 the text is entered.

## 11.25.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UCMGW=[<oa/da>],[<tooa/toda>],[<stat>],<seq>,<max>,<iei>,<ref><CR><br>text is entered<Ctrl-Z/ESC> | +UCMGW: <index><br>OK | AT+UCMGW="091137880",,,1,2,8,32767<CR><br>> u-blox reserves all rights to this document and the information contained herein. Reproduction, use or disclosure to third parties without express permi<Ctrl-Z><br>+UCMGW:302<br>OK<br>AT+UCMGW="091137880",,,2,2,8,32767<CR><br>> ssion is strictly prohibited.<Ctrl-Z><br>+UCMGW:303<br>OK |
| Test | AT+UCMGW=? | OK | |

## 11.25.3 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 *[2]*); 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 *Chapter 4.10*); type of address given by <tooa> |
| <tooa> | Number | 3GPP TS 24.011 *[13]* TP-Originating-Address Type-of-Address octet in integer format (default refer <toda>) |
| <toda> | Number | 3GPP TS 24.011 *[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:<br>• "REC UNREAD": received unread SMS messages<br>• "REC READ": received read SMS messages<br>• "STO UNSENT": stored unsent SMS messages<br>• "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:<br>• 0: Concatenated short messages, 8-bit reference number |

Objective Specification

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

# 11.26 More messages to send +CMMS

| +CMMS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CMS Error* |

## 11.26.1 Description

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

## 11.26.2 Syntax

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

## 11.26.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | • 0 (default value): disabled<br>• 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 s, then close the link and switch <mode> automatically back to 0<br>• 2: keep permanently enabled. The link is closed after each send sequence, but <mode> is not switched back to 0 |

# 11.27 Peek message +UCMGP

| +UCMGP | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | *Up to 3 min* | *+CMS Error* |

## 11.27.1 Description

Returns the message with location value <index> from message storage <mem1> to the DTE, the same as *+CMGR* does.

The SMS message is only 'peeked', i.e. its status is not forced to "received read SMS mode" after reading.

The syntax, defined values and remarks are the same as described for *+CMGR*.

Objective Specification

The PIN verification is not required when the preferred memory storage is "ME".

## 11.27.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | **Text mode (+CMGF=1):**<br>AT+UCMGP=<index> | **(SMS-DELIVER)**<br>+UCMGP: <stat>,<oa>,[<alpha>],<scts>[,<tooa>,<fo>,<pid>,<dcs>,<sca>,<tosca>,<length>]<br><data><br>OK<br>**(SMS-SUBMIT)**<br>+UCMGP: <stat>,<da>,[<alpha>][,<toda>,<fo>,<pid>,<dcs>,[<vp>],<sca>,<tosca>,<length>]<br><data><br>OK<br>**(SMS-STATUS-report)**<br>+UCMGP: <stat>,<fo>,<mr>,[<ra>],[<tora>],<scts>,<dt>,<st><br>OK<br>**(SMS-COMMAND)**<br>+UCMGP: <stat>,<fo>,<ct>[,<pid>,[<mn>],[<da>],[<toda>],<length><br>[<cdata>]]<br>OK<br>**(CBM storage)**<br>+UCMGP: <stat>,<sn>,<mid>,<dcs>,<page>,<pages><br><data><br>OK | AT+UCMGP=303<br>+UCMGP: "REC UNREAD","+393488535999",,"07/04/05,18:02:28+08",145,4,0,0,"+393492000466",145,93<br>You have a missed called. Free information provided by your operator.<br>OK |
| | **PDU mode (+CMGF=0):**<br>AT+UCMGP=<index> | +UCMGP: <stat>,[<alpha>],<length><br><pdu><br>OK | AT+UCMGP=1<br>+UCMGP: 0,,40<br>07919343290020000 40C9193230982<br>66140000807032804521 8018D4F29CF<br>E06B5CBF379F87C4EBF41E434082E7F<br>DBC3<br>OK |
| Test | AT+UCMGP=? | OK | |

## 11.27.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <index> | Number | Storage position |

Objective Specification

# 11.28 Message waiting indication +UMWI

| +UMWI | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 11.28.1 Description

Provides information regarding the Message Waiting Indication (MWI) third level method (3GPP defined in 3GPP TS 23.040 *[8]*) and CPHS method *[66]* following AT&T Device Requirements *[61]*.

The set command enables / disables the URC presentation. The URCs are by default enabled.

MWI is based on specific EFs not present in all SIM cards. In case these EFs are not present, the information text response is an error result code ("+CME ERROR: operation not allowed" if *+CMEE* is set to 2) and no URCs will be displayed.

The URCs are displayed in groups of variable number which depends on the EFs present in the SIM card 3GPP TS 31.102 *[19]* and Common PCN Handset Specification *[66]*.

## 11.28.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UMWI=<mode> | OK | AT+UMWI=1<br>OK |
| Read | AT+UMWI? | +UMWI: <mode>,<status>,<type>[,<count>]<br>[+UMWI: <mode>,<status>,<type>[,<count>][...]]<br>OK | +UMWI: 1,0,1<br>+UMWI: 1,0,2<br>+UMWI: 1,1,3,255<br>+UMWI: 1,0,4<br>OK |
| Test | AT+UMWI=? | +UMWI: (list of supported <mode>s)<br>OK | +UMWI: (0-1)<br>OK |
| URC | | +UMWI: <status>,<type>[,<count>]<br>[+UMWI: <status>,<type>[,<count>]<br>[...]] | +UMWI: 1,1,3<br>+UMWI: 1,2,5<br>+UMWI: 1,3,255<br>+UMWI: 0,4 |

## 11.28.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | Indicates whether the +UMWI URC is enabled or not:<br>• 0: disable the +UMWI URC<br>• 1 (factory-programmed value): enable the +UMWI URC |
| <status> | Number | Indicator the status for the respective <type>:<br>• 0: clear; no messages waiting<br>• 1: set; messages waiting |
| <type> | Number | Indicates the basic message indication type:<br>• 1: Voice Message Waiting (third level method) or Voice Message Waiting on Line 1 (CPHS method)<br>• 2: Fax Message Waiting<br>• 3: Electronic Mail Message Waiting<br>• 4: Extended Message Type Waiting (i.e. see the 3GPP TS 23.038 *[7]*)<br>• 5: Video Message Waiting |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 6: Voice Message Waiting on Line 2 (CPHS method)<br>• 7: reserved for future use |
| <count> | Number | Number of messages waiting for the respective <type>, range 1-255. 255 means that the number of waiting messages is unknown. |

## 11.28.4 Notes

- If <status>=0, the <count> parameter is omitted.

Objective Specification

# 12 Supplementary services

## 12.1 Call forwarding +CCFC

| +CCFC | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | Yes | *Up to 3 min* | *+CME Error* |

### 12.1.1 Description

Controls the call forwarding supplementary service. Registration, erasure, activation, deactivation and status query are supported.

### 12.1.2 Syntax

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

### 12.1.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <reason> | Number | • 0: unconditional<br>• 1: mobile busy<br>• 2: no reply<br>• 3: not reachable<br>• 4: all call forwarding<br>• 5: all conditional call forwarding |
| <mode> | Number | • 0: disable<br>• 1: enable<br>• 2: query status<br>• 3: registration<br>• 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)<br>• 1: voice<br>• 2: data<br>• 4: FAX<br>• 8: SMS<br>• 16: data circuit sync<br>• 32: data circuit async<br>• 64: dedicated packet access |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 128: dedicated PAD access |
| <time> | Number | Time in seconds to wait before call is forwarded (default 60), but only when <reason>=2 (no reply) is enabled; the range goes from 5 to 30 s |
| <status> | Number | • 0: not active<br>• 1: active |

### 12.1.4 Notes

**TOBY-L2**

- In some cases on voice capable devices, it is not possible to disable call forwarding <reason> by means of <mode>=0. In this case use <mode>=4.

**TOBY-L210-62S**

- The set command is not allowed if the VoLTE service is not available.

**TOBY-L210-60S**

- The set command is not allowed.

## 12.2 Call waiting +CCWA

| +CCWA | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | Yes | No | Yes | *Up to 3 min* | *+CME Error* |

### 12.2.1 Description

Controls the Call Waiting supplementary service according to 3GPP TS 22.083 *[33]*. The 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>.

It is possible to abort the status query sending a character to the DCE during the command execution. If enabled by <n> a URC is presented on TE when a call is signalled.

### 12.2.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CCWA=[<n>[,<mode>[,<class>]]] | OK | AT+CCWA=1,1,32 |
| | | | OK |
| | AT+CCWA=[<n>[,<mode>]] | +CCWA: <status>,<class1> | AT+CCWA=1,2 |
| | | [+CCWA: <status>,<class2> | +CCWA: 1,1 |
| | | [...]] | +CCWA: 1,4 |
| | | OK | +CCWA: 1,16 |
| | | | +CCWA: 1,32 |
| | | | OK |
| Read | AT+CCWA? | +CCWA: <n> | +CCWA: 0 |
| | | OK | OK |
| Test | AT+CCWA=? | +CCWA: (list of supported <n>s) | +CCWA: (0-1) |
| | | OK | OK |
| URC | | +CCWA: <number>,<type>,<class>,[<alpha>][,<CLI validity>[,<subaddr>,<satype>[,<priority>]]] | +CCWA: "+393290286612",145,1,,0 |

### 12.2.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <n> | Number | URC configuration: |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 0 (default value): disabled<br>• 1: enabled |
| <mode> | Number | If <mode> is not set, none request is sent to the network:<br>• 0: disabled<br>• 1 (default value): enabled<br>• 2: query status |
| <classx> | Number | Sum of numbers each representing an information class:<br>• 1: voice<br>• 2: data; it comprises all those <classx> values between 16 and 128, that are supported both by the network and the MS. This means, a setting made for <classx> to 2 applies to all remaining data classes (if supported). In addition, it is possible to assign a different setting to a specific class. For example, call waiting can be deactivated only for a specific data class. To understand which classes were actually activated AT+CCWA=1,2 command should be executed<br>• 4: FAX<br>• 8: SMS<br>• 16: data circuit sync<br>• 32: data circuit async<br>• 64: dedicated packet access<br>• 128: dedicated PAD access<br>If <classx> is not set and <mode> is 0 or 1 the default value is 3<br>The default value is 255 if <classx> is not set and <mode> is 2 e.g. it reports all active classes if any. If no class is active only classes 1 and 2 are reported as inactive:<br>• +CCWA: 0,1<br>• +CCWA: 0,2 |
| <status> | Number | • 0: not active<br>• 1: active |
| <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<br>• 1: CLI has been withheld by the originator<br>• 2: CLI is not available |
| <subaddr> | String | Subaddress of format specified by <satype> |
| <satype> | Number | Subaddress octet (refer to 3GPP TS 24.008 subclause 10.5.4.8 *[30]*) |
| <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 *[59]*. |

## 12.2.4 Notes

- The call waiting is not handled in uniform mode among all the 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.
- If a sum class is provided in the <classx> parameter the classes will be activated or deactivated in cardinal order (minimum to maximum). If a class is not supported then the procedure ends and any remaining class is not processed. To check which classes were actually activated AT+CCWA=1,2 command should be done.

**TOBY-L210-62S**

- The set command is not allowed if the VoLTE service is not available (see *+CIREG* AT command).

**TOBY-L210-60S**

- The set command is not supported.

**SARA-G / LEON-G**

- If <classx> is not set and <mode> is 0 or 1 the default value is 1.
- if no class is active only class 1 is reported as inactive.

Objective Specification

# 12.3 Calling line identification restriction +CLIR

| +CLIR | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | Yes | *Up to 3 min (<1 s for prompt ">" when present)* | *+CME Error* |

## 12.3.1 Description

Controls the Calling Line Identification Restriction (CLIR) supplementary service (3GPP TS 22.081 *[34]*).

## 12.3.2 Syntax

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

## 12.3.3 Defined values

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

## 12.3.4 Notes

### TOBY-L210-62S

- The set and read commands are not allowed if the VoLTE service is not available (see *+CIREG* AT command).

### TOBY-L210-60S

- The set and read commands are not supported.

# 12.4 Calling line identification presentation +CLIP

| +CLIP | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | Yes | *Up to 3 min (<1 s for prompt ">" when present)* | *+CME Error* |

## 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. The URC is displayed after RING if the CLI presentation at the TE is enabled.

Objective Specification

### 12.4.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CLIP=[<n>] | OK | AT+CLIP=1<br>OK |
| Read | AT+CLIP? | +CLIP: <n>,<m><br>OK | +CLIP: 0,2<br>OK |
| Test | AT+CLIP=? | +CLIP: (list of supported <n>s)<br>OK | +CLIP: (0-1)<br>OK |
| URC | | +CLIP: <number>,<type>[,<subaddr>,<satype>[,<alpha>[,<CLI validity>]]] | |

### 12.4.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <n> | Number | Optional parameter sets/shows the result code presentation in the TA<br>• 0: disable (default value)<br>• 1: enable |
| <m> | Number | Shows the subscriber CLIP service status in the network<br>• 0: CLIP not provisioned<br>• 1: CLIP provisioned<br>• 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<br>• 1: CLI has been withheld by the originator<br>• 2: CLI is not available |

### 12.4.4 Notes

- 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 3GPP TS 22.081 *[34]* and 3GPP TS 23.081 *[35]*), <number> and <type> is provided. Otherwise, TA shall return the same setting for <number> and <type> as if the CLI was not available.

**TOBY-L210-62S**

- The set and read commands are not allowed if the VoLTE service is not available (see *+CIREG* AT command).

**TOBY-L210-60S**

- The set and read commands are not supported.

## 12.5 Connected line identification presentation +COLP

| +COLP | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | Yes | *< 20 s* | *+CME Error* |

### 12.5.1 Description

Controls the connected line identification presentation supplementary service (see the 3GPP TS 22.081 *[34]*), useful in case of call forwarding of the connected line. It enables a calling subscriber to get the connected line

Objective Specification

identity (COL) of the called party, after setting up a mobile originated call. The command enables or disables the presentation of the COL at the TE. It has no effect on the execution of the supplementary service COLR in the network.

When enabled (and called subscriber allows), the intermediate result code is sent from TA to TE before any +CR or V.25ter responses.

Read command provides the status of < n >, and also triggers an interrogation of the provision status of the COLP service according 3GPP TS 22.081 *[34]* (given in < m >).

### 12.5.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+COLP=[<n>] | OK | AT+COLP=1<br>OK |
| Read | AT+COLP? | +COLP: <n>,<m><br>OK | +COLP: 0,2<br>OK |
| Test | AT+COLP=? | +COLP: (list of supported <n>s)<br>OK | +COLP: (0-1)<br>OK |
| IRC | | +COLP: <number>,<type>[,<subaddr>,<satype>[,<alpha>]] | |

### 12.5.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <n> | Number | Optional parameter sets/shows the result code presentation status to the TE<br>• 0 (default value): disable<br>• 1: enable |
| <m> | Number | Shows the subscriber COLP status in the network<br>• 0: COLP not provisioned<br>• 1: COLP provisioned<br>• 2: unknown (e.g. no network, etc.) |
| <number>, <type>, <subaddr>, <satype>, <alpha> | | See +CLIP (*Chapter 12.4*) |

### 12.5.4 Notes

#### TOBY-L210-60S

- The set and read commands are not supported.

## 12.6 Connected line identification restriction +COLR

| +COLR | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | Yes | *< 20 s* | *+CME Error* |

### 12.6.1 Description

Enables the 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).

### 12.6.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Read | AT+COLR? | +COLR: <status> | +COLR: 2 |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | OK | OK |
| Test | AT+COLR=? | OK | |

### 12.6.3 Defined values

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

### 12.6.4 Notes

**TOBY-L210-60S**

- The read command is not supported.

## 12.7 Advice of charge +CAOC

| +CAOC | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200 TOBY-L201 TOBY-L210-00S TOBY-L210-02S TOBY-L220 TOBY-L280 MPCI-L2 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | Yes | No | No | *< 10 s* | *+CME Error* |

### 12.7.1 Description

Allows the subscriber to get the information about the call costs in home units using the advice of charge supplementary service (3GPP TS 22.024 *[37]* and 3GPP TS 22.086 *[36]*). If it is enabled, the TE periodically receives the URC containing the corresponding information.

### 12.7.2 Syntax

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

### 12.7.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | • 0: queries the CCM value<br>• 1: deactivates the unsolicited reporting of CCM value<br>• 2: activates the unsolicited reporting of CCM value |
| <ccm> | Number | Current call meter indicated as a string in hexadecimal format |

### 12.7.4 Notes

**TOBY-L210-62S**

- The set command is not allowed if the VoLTE service is not available.

**TOBY-L210-60S**

- The set command is not allowed.

Objective Specification

**LISA-U1 / LISA-U2x0-x1S / LEON-G100-06S**

- If the SIM card does not support the AoC, the CCM value is not updated and no URC is displayed.

# 12.8 Accumulated call meter +CACM

| +CACM | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200 TOBY-L201 TOBY-L210-00S TOBY-L210-02S TOBY-L210-60S TOBY-L220 TOBY-L280 MPCI-L2 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | *< 10 s* | *+CME Error* |

## 12.8.1 Description

Resets the advice of charge related accumulated call meter value in the SIM file $EF_{ACM}$. The ACM contains the total number of home units for both the current and preceding calls. The SIM PIN2 is required to reset the value.

If the EF is not available, the read command returns +CME ERROR: SIM failure (verbose result code).

## 12.8.2 Syntax

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

## 12.8.3 Defined values

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

## 12.8.4 Notes

- The command needs the SIM module to work correctly

# 12.9 Call meter maximum event +CCWE

| +CCWE | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 12.9.1 Description

Allows sending the +CCWV URC to the DTE, when enabled. The URC syntax 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.

## 12.9.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CCWE=<mode> | OK | AT+CCWE=1<br>OK |
| Read | AT+CCWE? | +CCWE: <mode> | +CCWE: 0 |

Objective Specification

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

### 12.9.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | • 0: call meter warning event disabled<br>• 1: call meter warning event enabled |

## 12.10 Accumulated call meter maximum +CAMM

| +CAMM | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | *< 10 s* | *+CME Error* |

### 12.10.1 Description

Sets the advice of charge related accumulated call meter maximum value in the SIM file $EF_{ACMmax}$. The ACMmax contains the maximum number of home units allowed to be consumed by the subscriber. When the ACM reaches ACMmax, the calls are prohibited. The SIM PIN2 is required to set the value.

If the EF is not available, the read command returns +CME ERROR: SIM failure (verbose result code).

### 12.10.2 Syntax

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

### 12.10.3 Defined values

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

### 12.10.4 Notes

- The command needs the SIM module to work correctly

## 12.11 Price per unit and currency table +CPUC

| +CPUC | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | *< 10 s* | *+CME Error* |

### 12.11.1 Description

Sets the parameters of advice of charge related price per unit and the currency table in the SIM file $EF_{PUCT}$. The PUCT information can be used to convert the home units into the currency units. The PIN2 is required to set the parameters.

Objective Specification

If the EF is not available, the read command returns +CME ERROR: SIM failure (verbose result code).

### 12.11.2 Syntax

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

### 12.11.3 Defined values

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

## 12.12 Call related supplementary services +CHLD

| +CHLD | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | Yes | No | No | *< 20 s* | *+CME Error* |

### 12.12.1 Description

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

### 12.12.2 Syntax

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

### 12.12.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <n> | Number | • 0: release all the held calls or set User Determined User Busy for a waiting call; if both exists then only the waiting call will be rejected<br>• 1: release all the active calls and accepts the other (held or waiting)<br>• 1x: release a specific call (x specific call number as indicated by *+CLCC*)<br>• 2: place all the active calls (if exist) on hold and accepts the other call (held or waiting, if exist)<br>• 2x: place all the active calls on hold except the call x with which communication is supported<br>• 3: adds a held call to the conversation<br>• 4: connects the two calls and disconnects the subscriber from both calls (Explicit Call Transfer)<br>• 4*: call deflection (proprietary feature)<br>• 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<br>• 6: puts an active call on hold or an held call to active, while another call is waiting<br>• 7: disconnect the users in multiparty without accepting incoming call<br>• 8: release all the calls (active and held) |

Objective Specification

### 12.12.4 Notes

**TOBY-L2 / MPCI-L2**

- The <n> parameter cannot be set to 4*.
- The <n> parameter is mandatory.

**TOBY-L210-62S**

- <n>=2 and 2x are not supported if the VoLTE service is not available (see *+CIREG* AT command).

**TOBY-L210-60S**

- The set command is not supported.

**LEON-G100-06S**

- In the set command the '=' character is not mandatory.

## 12.13 Call deflection +CTFR

| +CTFR | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | *Up to 3 min* | *+CME Error* |

### 12.13.1 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).

### 12.13.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CTFR=<number>[,<type>[,<subaddr>[,<satype>]]] | OK | AT+CTFR="09113788"<br>OK |
| Test | AT+CTFR=? | OK | |

### 12.13.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <number> | String | Phone number |
| <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 |

### 12.13.4 Notes

**TOBY-L210-60S**

- The set command is not supported.

**LISA-U / SARA-U / SARA-G / LEON-G**

- <type>, <subaddr>, <satype> parameters are not supported.

Objective Specification

# 12.14 List current calls +CLCC

| +CLCC | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

## 12.14.1 Description

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

## 12.14.2 Syntax

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

## 12.14.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <idx> | Number | Indicates the call identification (see +CHLD x) |
| <dir> | Number | Direction<br>• 0: mobile originated (MO) call<br>• 1: mobile terminated (MT) call |
| <stat> | Number | State of the call<br>• 0: active<br>• 1: held<br>• 2: dialling (Mobile Originated call)<br>• 3: alerting (Mobile Originated cal)<br>• 4: incoming (Mobile Terminated call)<br>• 5: waiting (Mobile Terminated call) |
| <mode> | Number | Teleservice<br>• 0: voice<br>• 1: data<br>• 2: FAX<br>• 9: unknown |
| <mpty> | Number | • 0: call is not one of multiparty (conference) call parties<br>• 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 |
| <priority> | Number | Indicates the eMLPP priority level of the call, values specified in 3GPP TS 22.067 *[59]*. |
| <CLI_validity> | Number | Provide details why <number> does not contain a calling party BCD number (refer 3GPP TS 24.008 *[30]* subclause 10.5.4.30). The parameter is not present for MO call types:<br>• 0: CLI valid<br>• 1: CLI has been withheld by the originator (refer 3GPP TS 24.008 *[30]* table 10.5.135a/3GPP TS 24.008 code "Reject by user") |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 2: CLI is not available due to interworking problems or limitations of originating network (refer 3GPP TS 24.008 *[30]* table 10.5.135a/3GPP TS 24.008 code "Interaction with other service")<br>• 3: CLI is not available due to calling party being of type payphone (refer 3GPP TS 24.008 *[30]* table 10.5.135a/3GPP TS 24.008 code "Coin line/payphone")<br>• 4: CLI is not available due to other reasons (refer 3GPP TS 24.008 *[30]* table 10.5.135a/3GPP TS 24.008 code "Unavailable")<br>When the CLI is not available (<CLI_validity>=2, <CLI_validity>=3 or <CLI_validity>=4), the <number> parameter shall be an empty string ("") and <type> value will not be significant. Nevertheless, the MT may return the recommended value 128 for <type> (TON/NPI unknown in accordance with 3GPP TS 24.008 *[30]* subclause 10.5.4.7). When the CLI has been withheld by the originator, (<CLI_validity>=1) and the CLIP is provisioned with the "override category" option (refer 3GPP TS 22.081 *[34]* and 3GPP TS 23.081 *[35]*), <number> and <type> is provided. Otherwise, the MT shall return the same setting for <number> and <type> as if the CLI was not available |

### 12.14.4 Notes

#### LISA-U / SARA-U / SARA-G / LEON-G

- The <priority> and <CLI_validity> parameters are not supported.

## 12.15 Supplementary service notifications +CSSN

| +CSSN | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 12.15.1 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 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 is sent.

### 12.15.2 Syntax

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

### 12.15.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <n> | Number | Sets/shows the +CSSI result code presentation status<br>• 0: disabled (default value)<br>• 1: enabled |
| <m> | Number | Sets/shows the +CSSU result code presentation status<br>• 0: disabled (default value)<br>• 1: enabled |
| <code1> | Number | • 0: unconditional call forwarding is active |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 1: some of the conditional call forwardings are active<br>• 2: call has been forwarded<br>• 3: call is waiting<br>• 4: this is a CUG call (<index> parameter is provided)<br>• 5: outgoing calls are barred<br>• 6: incoming calls are barred<br>• 7: CLIR suppression rejected<br>• 8: calls has been deflected |
| <index> | Number | Refer +CCUG (*Chapter 12.18*) |
| <code2> | Number | • 0: this is a forwarded call (MT call setup)<br>• 1: this is a CUG call (<index> parameter is provided) (MT call setup)<br>• 2: call has been put on hold (during a voice call)<br>• 3: call has been retrieved (during a voice call)<br>• 4: multiparty call entered (during a voice call)<br>• 5: call on hold has been released - this is not an SS notification - (during a voice call)<br>• 6: forward check SS message received (can be received whenever)<br>• 7: call is being connected (alerting) with the remote party in alerting state in explicit call transfer operation (during a voice call)<br>• 8: call has been connected with the other remote party in explicit call transfer operation (during a voice call or MT call setup)<br>• 9: this is a deflected call (MT call setup)<br>• 10: additional incoming call forwarded |
| <number> | String | Phone number, format specified by <type> |
| <type> | Number | Type of address octet |
| <subaddr>, <satype> | String | Not used |

### 12.15.4 Notes

#### TOBY-L210-60S

- The set command is not supported.

## 12.16 User to user signalling service 1 +CUUS1

| +CUUS1 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| | SARA-G LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

### 12.16.1 Description

Allows the control of the User-to-User Signalling Supplementary Sevice 1 (UUS1) according to 3GPP TS 22.087 *[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-to-User 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.

Objective Specification

## 12.16.2 Syntax

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

## 12.16.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <n> | Number | Sets/shows the +CUUS1I result code presentation status in the MT<br>• 0: disable<br>• 1: enable |
| <m> | Number | Sets/shows the +CUUS1U result code presentation status in MT<br>• 0: disable<br>• 1: enable |
| <message> | Number | Type of message containing the outgoing User-to-User Information Element<br>• 0: ANY<br>• 1: SETUP<br>• 2: ALERT<br>• 3: CONNECT<br>• 4: DISCONNECT<br>• 5: RELEASE<br>• 6: RELEASE_COMPLETE |
| <messageI> | Number | Type of message containing the intermediate User-to-User Information Element<br>• 0: ANY<br>• 1: ALERT<br>• 2: PROGRESS<br>• 3: CONNECT (sent after +COLP if enabled)<br>• 4: RELEASE |
| <messageU> | Number | Type of message containing the unsolicited User-to-User Information Element<br>• 0: ANY<br>• 1: SETUP (returned after +CLIP if presented, otherwise after every RING or +CRING (refer to *+CRC*))<br>• 2: DISCONNECT<br>• 3: RELEASE_COMPLETE |
| <UUIE> | Number | The User-to-User Information Element (as defined in 3GPP TS 24.008 *[12]*) in hexadecimal character format (for hexadecimal format, refer to *+CSCS*). |

## 12.16.4 Notes

- 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.

**TOBY-L210-60S**

- The set command is not supported.

Objective Specification

# 12.17 Unstructured supplementary service data +CUSD

| +CUSD | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | Yes | *Up to 3 min* | *+CME Error* |

## 12.17.1 Description

Control of Unstructured Supplementary Service Data (USSD) is according to 3GPP TS 22.090 *[6]*. Both network and mobile initiated operations are supported. The parameter <n> disables/enables the URC presentation. Value <n>=2 is used to cancel an ongoing USSD session. 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.

## 12.17.2 Syntax

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

## 12.17.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <n> | Number | • 0 (default value): result code presentation disabled<br>• 1: result code presentation enabled<br>• 2: session cancelled (not applicable to the read command response) |
| <str> | String | USSD-string converted in the current character set in use (see the *+CSCS* command) |
| <dcs> | Number | Data coding scheme (see 3GPP TS 23.038 *[7]*) used for sending the USSD string. 1 byte in decimal format; valid values are 0-255. The default value is 15. |
| <m> | Number | • 0: no further user action required<br>• 1: further user action required<br>• 2: USSD termination by network<br>• 4: operation not supported<br>• 5: network time out |

## 12.17.4 Notes

- Aborting the command is equivalent to send AT+CUSD=2, that ends the current USSD session.
- When issuing a set command with <n>=1, the module waits for SS transaction to finish before issuing the final result code (e.g. "OK").
- After having sent a +CUSD request, it is recommended to refrain from sending another +CUSD request until the URC of the first one has been received.
- On all modules except SARA-U series, when starting a USSD transaction or replying to an incoming USSD, the encoded USSD string cannot exceed 112 bytes; this implies that the input USSD string in e.g. default charset "IRA" (see the *+CSCS* command) and default coding scheme =15 cannot exceed 128 characters

Objective Specification

**TOBY-L2 / MPCI-L2 / LISA-U1 / LISA-U200-00S / LISA-U200-01S / LISA-U200-02S / LISA-U200-52S / LISA-U200-62S / LISA-U200-82S / LISA-U230 / LISA-U260 / LISA-U270 / SARA-U260-00S / SARA-U270-00S / SARA-U270-00X / SARA-U280-00S / SARA-G3 / LEON-G**

- When starting a USSD transaction or replying to an incoming USSD, the encoded USSD string cannot exceed 112 bytes; this implies that the input USSD string in e.g. default charset "IRA" (see the *+CSCS* command) and default coding scheme =15 cannot exceed 128 characters

**TOBY-L2 / MPCI-L2**

- When issuing a set command with <n>=1, the "OK" result code is usually returned before the URC (if any) is issued.

**TOBY-L210-60S**

- The set command is not supported.

# 12.18 Closed user group +CCUG

| +CCUG | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

## 12.18.1 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

## 12.18.2 Syntax

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

## 12.18.3 Defined values

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

Objective Specification

### 12.18.4 Notes

**TOBY-L2 / MPCI-L2**

- The response to the test command is "OK".
- If the set command with <n>=0 is sent the read command provides the default values.
- The default value of <index> parameter is 10.

**TOBY-L210-60S**

- The set command is not supported.

## 12.19 Calling name presentation +CNAP

| +CNAP | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | Yes | *< 20 s* | *+CME Error* |

### 12.19.1 Description

This command refers to the GSM/UMTS supplementary service CNAP (Calling Name Presentation, refer to 3GPP TS 22.096 *[39]*) that enables a called subscriber to get a calling name indication (CNI) of the calling party when receiving a mobile terminated call. The set command enables or disables the CNI presentation. It has no effect on the execution of the supplementary service CNAP in the network. When the presentation of the CNI is enabled (and CNI is provided), the URC +CNAP: <name>,<CNI_validity> response is returned.

### 12.19.2 Syntax

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

### 12.19.3 Defined values

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

### 12.19.4 Notes

**TOBY-L210-60S**

- The set and read commands are not supported.

Objective Specification

# 12.20 eMLPP priority registration and interrogation +CAEMLPP

| +CAEMLPP | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U201 SARA-U260-03S SARA-U270-03S SARA-U270-53S SARA-U280-03S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | *< 20 s* | *+CME Error* |

## 12.20.1 Description

Changes the default priority level of the user in the network. The requested priority level is checked against the eMLPP subscription of the user stored on the SIM card in $EF_{eMLPP}$ (see the 3GPP TS 51.011 *[18]* and 3GPP TS 31.102 *[19]*). If the user does not have subscription for the requested priority level an error result code is returned. The read command triggers an interrogation of the provision of the maximum priority level which the service subscriber is allowed to use and default priority level activated by the user. If the service is not provisioned, a result code including the SS-Status parameter is returned.

## 12.20.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CAEMLPP=<priority> | OK | AT+CAEMLPP=1<br>OK |
| Read | AT+CAEMLPP? | +CAEMLPP: <default_priority>,<max_priority><br>OK | |
| Test | AT+CAEMLPP=? | OK | OK |

## 12.20.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <priority> | Number | Indicates the default eMLPP priority level priority level to be activated in the network. The priority level values are defined in eMLPP specification 3GPP TS 22.067 *[59]* |
| <default_priority> | Number | Indicates the default eMLPP priority level priority level which is activated in the network. The priority level values are defined in eMLPP specification 3GPP TS 22.067 *[59]* |
| <max_priority> | Number | Indicates the maximum eMLPP priority level for which the service subscriber has a subscription in the network. The priority level values are defined in eMLPP specification 3GPP TS 22.067 *[59]* |

# 12.21 eMLPP subscriptions +CPPS

| +CPPS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U201 SARA-U260-03S SARA-U270-03S SARA-U270-53S SARA-U280-03S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

## 12.21.1 Description

Returns all eMLPP priority subscriptions of the user stored on the SIM card in $EF_{eMLPP}$ (see the 3GPP TS 51.011 *[18]* and the 3GPP TS 31.102 *[19]*). If no explicit priority level subscription is stored in $EF_{eMLPP}$ the final result code OK is returned.

## 12.21.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | AT+CPPS | [+CPPS: <priority>[,<priority>[...]]]<br>OK | AT+CPPS<br>OK |
| Test | AT+CPPS=? | OK | |

Objective Specification

### 12.21.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <priority> | Number | eMLPP subscription to priority level {0,1,..,4} as defined in defined in eMLPP specification 3GPP TS 22.067 *[59]* |

## 12.22 Automatic answer for eMLPP service +CAAP

| +CAAP | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U201 SARA-U260-03S SARA-U270-03S SARA-U270-53S SARA-U280-03S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

### 12.22.1 Description

Edits the status of the priority level for the automatic answering for eMLPP stored on the SIM card in $EF_{AAeM}$ (see the 3GPP TS 51.011 *[18]* and 3GPP TS 31.102 *[19]*). If the user has no subscription to the priority level status he wants to edit, an error result code is returned. The read command returns all enabled priority levels for automatic answering for eMLPP stored on the SIM card or in $EF_{AAeM}$. If no priority level is enabled for automatic answering for eMLPP, the OK final result code is returned.

### 12.22.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CAAP=<priority>,<status> | OK | AT+CAAP=0,1<br>OK |
| Read | AT+CAAP? | [+CAAP: <priority>[,<priority>[...]]]<br>OK | AT+CAAP?<br>OK |
| Test | AT+CAAP=? | +CAAP: (list of supported <priority>s),(list of supported <status>s)<br>OK | +CAAP: (0-4),(0-1)<br>OK |

### 12.22.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <priority> | Number | eMLPP fast call set-up priority level {A,B,0,1,..,4} as defined in eMLPP specification 3GPP TS 22.067 *[59]* |
| <status> | Number | • 0: <priority> for automatic answering disabled<br>• 1: <priority> for automatic answering enabled |

Objective Specification

# 13 Circuit switched data services

## 13.1 Introduction

For CSD services, it is advised to enable the XID negotiation using the configuration +CRLP=61,61,48,7.

## 13.2 Select bearer service type +CBST

| +CBST | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U SARA-U | | | | | |
| | SARA-G LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | *Profile* | No | - | *+CME Error* |

### 13.2.1 Description

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

### 13.2.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CBST=[<speed>[,<name>[,<ce>]]] | OK | AT+CBST=5,0,1<br>OK |
| Read | AT+CBST? | +CBST: <speed>,<name>,<ce><br>OK | +CBST: 14,0,1<br>OK |
| Test | AT+CBST=? | +CBST: (list of supported <speed>s),(list of supported <name>s),(list of supported <ce>s)<br>OK | +CBST: (0,4-7,12,14-16,68,70-71,75,79-81,83-84,115-116,130-131,133-134),(0,1),(0-3)<br>OK |

### 13.2.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <speed> | Number | • 0: autobauding<br>• 4: 2400 b/s (V.22bis) (RAT GSM only)<br>• 5: 2400 b/s (V.26ter) (RAT GSM only)<br>• 6: 4800 b/s (V.32)<br>• 7: 9600 b/s (V.32)<br>• 12: 9600 b/s (V.34) (only for UMTS RAT)<br>• 14: 14400 b/s (V.34) (only for UMTS RAT)<br>• 15: 19200 b/s (V.34) (only for UMTS RAT)<br>• 16: 28800 b/s (V.34) (only for UMTS RAT)<br>• 68: 2400 b/s (V110 or X.31 flag stuffing) (RAT GSM only)<br>• 70: 4800 b/s (V110 or X.31 flag stuffing)<br>• 71 (default and factory-programmed value): 9600 b/s (V110 or X.31 flag stuffing)<br>• 75: 14400 b/s (V110 or X.31 flag stuffing) (only for UMTS RAT)<br>• 79: 19200 b/s (V110 or X.31 flag stuffing) (only for UMTS RAT)<br>• 80: 28800 b/s (V110 or X.31 flag stuffing) (only for UMTS RAT)<br>• 81: 38400 b/s (V110 or X.31 flag stuffing) (only for UMTS RAT)<br>• 83: 56000 b/s (V110 or X.31 flag stuffing) (only for UMTS RAT)<br>• 84: 64000 b/s (X.31 flag stuffing) (only for UMTS RAT)<br>• 115: 56000 b/s (bit transparent) (only for UMTS RAT)<br>• 116: 64000 b/s (bit transparent) (only for UMTS RAT)<br>• 130: 28800 b/s (multimedia) (only for UMTS RAT)<br>• 131: 32000 b/s (multimedia) (only for UMTS RAT)<br>• 133: 56000 b/s (multimedia) (only for UMTS RAT)<br>• 134: 64000 b/s (multimedia) (only for UMTS RAT) |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| <name> | Number | Bearer service name<br>• 0 (default and factory-programmed value): data circuit asynchronous (UDI or 3.1 kHz modem)<br>• 1: data circuit synchronous (UDI or 3.1 kHz modem) |
| <ce> | Number | Connection element<br>• 0: transparent<br>• 1 (default and factory-programmed value): non-transparent<br>• 2: both, transparent preferred (RAT GSM only)<br>• 3: both, non-transparent preferred (RAT GSM only) |

### 13.2.4 Notes

- Several <speed> values are allowed in GSM or UMTS RAT only: see the parameter's description for correct settings.
- The modules do not support all the parameter combinations listed in 3GPP TS 22.002 *[58]*.

**LISA-U / SARA-U**

- See *Table 12* (in the *+UDCONF=32* command description) for a more detailed list of the parameter combinations supported.

**SARA-G**

- The default and factory-programmed value of <speed> is 7.
- These values of <speed> are not supported: 12, 14, 15, 16, 75, 79, 80, 81, 83, 84, 115, 116, 130, 131, 133 and 134.
- See *Table 10* for a more detailed list of the parameter combinations supported.

**LEON-G**

- The default and factory-programmed value of <speed> is 7.
- These values of <speed> are not supported: 12, 14, 15, 16, 75, 79, 80, 81, 83, 84, 115, 116, 130, 131, 133 and 134.
- See *Table 10* for a more detailed list of the parameter combinations supported.

**SARA-G / LEON-G**

| Connection type | Transfer capability type | AT+CBST | Rate (bit/s) | Type |
|---|---|---|---|---|
| Async transparent | Audio 3.1 kHz | 4,0,0 | 2400 | V22 bis |
| | | 5,0,0 | 2400 | V26 ter |
| | | 6,0,0 | 4800 | V32 |
| | | 7,0,0 | 9600 | V32 |
| | UDI Data | 68,0,0 | 2400 | V110 |
| | | 70,0,0 | 4800 | V110 |
| | | 71,0,0 | 9600 | V110 |
| Async non transparent | Audio 3.1 kHz | 0,0,1 | Autobauding | Autobauding |
| | | 6,0,1 | 4800 | V32 |
| | | 7,0,1 | 9600 | V32 |
| | UDI Data | 70,0,1 | 4800 | V110 |
| | | 71,0,1 | 9600 | V110 |
| Async transparent preferred | Audio 3.1 kHz | 0,0,2 | Autobauding | Autobauding |
| | | 6,0,2 | 4800 | V32 |
| | | 7,0,2 | 9600 | V32 |
| | UDI Data | 70,0,2 | 4800 | V110 |
| | | 71,0,2 | 9600 | V110 |
| Async non transparent preferred | Audio 3.1 kHz | 0,0,3 | Autobauding | Autobauding |
| | | 6,0,3 | 4800 | V32 |
| | | 7,0,3 | 9600 | V32 |
| | UDI Data | 70,0,3 | 4800 | V110 |

Objective Specification

| Connection type | Transfer capability type | AT+CBST | Rate (bit/s) | Type |
|---|---|---|---|---|
| | | 71,0,3 | 9600 | V110 |

**Table 10: AT+CBST parameter combinations**

# 13.3 Connection type groups configuration +UDCONF=32

| +UDCONF=32 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | *NVM* | No | - | *+CME Error* |

## 13.3.1 Description

Enables/disables the connection type groups.

The new setting is saved in NVM and will be effective at the next power on.

## 13.3.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UDCONF=32,<conn_type_groups_bitmap> | OK | AT+UDCONF=32,1<br>OK |
| Read | AT+UDCONF=32 | +UDCONF: 32,<active_conn_type_groups_bitmap>,<configured_conn_type_groups_bitmap><br>OK | AT+UDCONF=32<br>+UDCONF: 32,1,1<br>OK |

## 13.3.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <conn_type_groups_bitmap> | Number | Bitmask representing the list of "connection type groups" supported after the reboot.<br>Valid range is 0-127 (equivalent to bits 0000000-1111111). The factory-programmed bitmask is 127 (all the groups are supported).<br>See the *Table 11* for the meaning of each bit.<br>See the note below for the meaning of each group. |
| <active_conn_type_groups_bitmap> | Number | The currently active connection type groups, in the format described for <conn_type_groups_bitmap> |
| <configured_conn_type_groups_bitmap> | Number | The list of the connection type groups that is supported after reboot, in the format described for <conn_type_groups_bitmap> |

## 13.3.4 Notes

| Bit | Connection type group |
|---|---|
| 0 | UDI multimedia |
| 1 | UDI data |
| 2 | RDI |
| 3 | Audio 3.1 kHz |
| 4 | All sync transparent |
| 5 | All async transparent |
| 6 | All async non transparent |

**Table 11: Connection type group bit description**

The connection type groups 4, 5 and 6 partially include the groups 1, 2 and 3. Enabling a super-group forces all sub-groups to be enabled; enabling a sub-group is possible even if the super-group is disabled. The meaning of each data connection super-group is defined as follows:

Objective Specification

| Group | Transfer capability group | AT+CBST | Rate (bit/s) | Type | 2G | 3G |
|---|---|---|---|---|---|---|
| Async transparent | Audio 3.1 kHz | 4,0,0 | 2400 | V22 bis | • | |
| | | 5,0,0 | 2400 | V26 ter | • | |
| | | 6,0,0 | 4800 | V32 | • | |
| | | 7,0,0 | 9600 | V32 | • | |
| | | 16,0,0 | 28800 | V34 | | • |
| | UDI Data | 68,0,0 | 2400 | V110 | • | |
| | | 70,0,0 | 4800 | V110 | • | |
| | | 71,0,0 | 9600 | V110 | • | |
| Async non transparent | Audio 3.1 kHz | 0,0,1 | Autobauding | Autobauding | • | • |
| | | 4,0,1 | 2400 | V22 bis | • | |
| | | 5,0,1 | 2400 | V26 ter | • | |
| | | 6,0,1 | 4800 | V32 | • | • |
| | | 7,0,1 | 9600 | V32 | • | • |
| | | 12,0,1 | 9600 | V34 | | • |
| | | 14,0,1 | 14400 | V34 | | • |
| | | 15,0,1 | 19200 | V34 | | • |
| | | 16,0,1 | 28800 | V34 | | • |
| | UDI Data | 68,0,1 | 2400 | V110 | • | |
| | | 70,0,1 | 4800 | V110 | • | • |
| | | 71,0,1 | 9600 | V110 | • | • |
| | | 75,0,1 | 14400 | V110 | | • |
| | | 79,0,1 | 19200 | V110 | | • |
| | | 80,0,1 | 28800 | V110 | | • |
| | | 81,0,1 | 38400 | V110 | | • |
| | RDI Data | 83,0,1 | 56000 | V110 | | • |
| | UDI Data | 84,0,1 | 64000 | FTM | | • |
| Sync transparent | Audio 3.1 kHz | 16,1,0 | 28800 | V34 | | • |
| | UDI Data | 83,1,0 | 56000 | V110 | | • |
| | RDI Data | 115,1,0 | 56000 | bit transparent | | • |
| | UDI Data | 116,1,0 | 64000 | bit transparent | | • |
| | UDI Multimedia | 130,1,0 | 64000 | multimedia | | • |
| | | 131,1,0 | 64000 | multimedia | | • |
| | | 133,1,0 | 64000 | multimedia | | • |
| | | 134,1,0 | 64000 | multimedia | | • |

**Table 12: Data connection groups: meaning, availability and relationship with AT+CBST parameters**

If a call class is disabled then:

- The outgoing calls are rejected when the ATD command is invoked (NO CARRIER is printed)
- The incoming calls are rejected by the stack and the user will receive no notification (e.g. no RING)

# 13.4 Circuit switched data (CSD) configuration +UCSD

| +UCSD | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

## 13.4.1 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 PSD 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.

Objective Specification

In the set command, if only the first two parameters are issued, the module returns the current setting of the corresponding remaining parameter. Otherwise only the "OK" result code is returned.

In the set command, if only the first parameter is issued, the module returns all the parameters of the given PSD profile, and lists them in separated lines.

### 13.4.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | Set command<br>AT+UCSD=<profile_id>,<param_tag>,<param_val> | OK | AT+UCSD=2,1,0<br>OK |
| Get | CSD Get command<br>AT+UCSD=<profile_id>,<param_tag><br>CSD Get All command<br>AT+UCSD=<profile_id> | +UCSD: <profile_id>,<param_tag>,<param_val><br>OK<br>+UCSD: <profile_id>,0,<param_val0><br>.....<br>OK | AT+UCSD=2,1<br>+UCSD: 2,1,0<br>OK<br>AT+UCSD=0<br>+UCSD: 0,0,"8001234564"<br>+UCSD: 0,1,0<br>+UCSD: 0,2,"username"<br>+UCSD: 0,4,"0.0.0.0"<br>+UCSD: 0,5,"0.0.0.0"<br>+UCSD: 0,6,0<br>OK |

### 13.4.3 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". The factory-programmed value is an empty string.<br>• 1: Call type - <param_val> may be:<br>o 0 (factory-programmed value): analog<br>o 1: ISDN<br>• 2: Username - <param_val> is the user name text string for the authentication phase. The factory-programmed value is an empty string.<br>• 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<br>• 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"). The factory-programmed value is "0.0.0.0".<br>• 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"). The factory-programmed value is "0.0.0.0".<br>• 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. The factory-programmed value is 0. |

## 13.5 Circuit switched data (CSD) action +UCSDA

| +UCSDA | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | *Up to 3 min* | *+CME Error* |

### 13.5.1 Description

Performs the requested action for the specified CSD profile.

Objective Specification

### 13.5.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UCSDA=<profile_id>,<action> | OK | AT+UCSDA=3,0<br>OK |
| URC | | +UUCSDD: <profile_id> | |

### 13.5.3 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 factory-programmed values<br>• 1: (Store) saves all parameters of the specified profile in NVM for future retrieval<br>• 2: (Load) reads all parameters of the specified profile from NVM<br>• 3: (Activate) performs end-to-end connection establishment for the specified CSD profile, using its pre-defined parameters (i.e. service provider number)<br>• 4: (Deactivate) releases the GSM data call associated with the specified CSD profile |

### 13.5.4 Notes

- 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 is sent to the TE to inform the user, otherwise the user is in charge of connection release after usage.

## 13.6 Circuit switched network-assigned data +UCSND

| +UCSND | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 13.6.1 Description

Returns the current (dynamic) network-assigned value of the specified parameter of the active GSM data call associated with the specified CSD profile.

### 13.6.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UCSND=<profile_id>,<param_tag> | +UCSND: <profile_id>,<param_tag>,<dynamic_param_val><br>OK | AT+UCSND=2,0<br>+UCSND: 2,0,"151.9.78.170"<br>OK |

### 13.6.3 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<br>• 1: DNS1: dynamic primary DNS address<br>• 2: DNS2: dynamic secondary DNS address |
| <dynamic_param_val> | String | Value of the specified <param_tag> |

Objective Specification

# 13.7 Service class selection and identification +FCLASS

| +FCLASS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | No | No | - | *+CME Error* |

## 13.7.1 Description

Configures the operation mode (voice, data or FAX) of the MT.

## 13.7.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+FCLASS=<class> | OK | AT+FCLASS=2.0<br>OK |
| Read | AT+FCLASS? | <n><br>OK | 0<br>OK |
| Test | AT+FCLASS=? | (list of supported <class>s)<br>OK | (0,8)<br>OK |

## 13.7.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <class> | Number | Operation mode:<br>• 0 (default value): data<br>• 2.0: reserved<br>• 8: voice |

## 13.7.4 Notes

**TOBY-L2**

- <class>=8 (voice) is the unique supported value and it is the default value.

**TOBY-L200-00S / TOBY-L201 / TOBY-L210-00S / TOBY-L210-60S / TOBY-L280-00S / MPCI-L200-00S / MPCI-L201 / MPCI-L210-00S / MPCI-L210-60S**

- The set command is not allowed while the read and the test command only return the "OK" final result code.

**LISA-U / SARA-U**

- The selected operation mode is only set for the following CS call.

**LISA-U100 / LISA-U110 / LISA-U200-00S**

- <class>=8 is not supported.

**SARA-G340 / SARA-G350**

- <class>=2.0 is dedicated to FAX (service class 2).

**SARA-G300 / SARA-G310**

- <class>=8 is not supported.

**LEON-G**

- <class>=2.0 is dedicated to FAX (service class 2).

Objective Specification

## 13.8 Service reporting control +CR

| +CR | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U SARA-U | | | | | |
| | SARA-G LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *Profile* | No | *< 10 s* | *+CME Error* |

### 13.8.1 Description

Controls whether the intermediate result code is returned or not. If enabled, the intermediate result code is transmitted when, during the connection negotiation, 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.

### 13.8.2 Syntax

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

### 13.8.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | • 0 (default value and factory-programmed value): disables reporting<br>• 1: enables reporting |
| <serv> | String | Service name<br>• ASYNC: asynchronous transparent<br>• REL ASYNC: asynchronous non-transparent (reliable)<br>• REL SYNC: synchronous non-transparent (reliable)<br>• SYNC: synchronous transparent |

### 13.8.4 Notes

- <serv>=REL ASYNC applies only for incoming or outgoing data calls.

## 13.9 Cellular result codes +CRC

| +CRC | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | *Profile* | No | - | *+CME Error* |

### 13.9.1 Description

Enables the detailed ring indication for the incoming calls. Instead of RING, the **+CRING: <type>** URC is displayed.

### 13.9.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CRC=[<mode>] | OK | AT+CRC=0<br>OK |
| Read | AT+CRC? | +CRC: <mode> | |

Objective Specification

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

### 13.9.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | • 0 (default value and factory-programmed setting): extended format disabled<br>• 1: extended format enabled |
| <type> | String | Ring indication description:<br>• ASYNC: asynchronous transparent<br>• REL ASYNC: asynchronous non-transparent (reliable)<br>• SYNC: synchronous transparent<br>• REL SYNC: synchronous non-transparent (reliable)<br>• FAX: facsimile (TS62)<br>• VOICE: normal voice (TS11)<br>• ALT VOICE / FAX: alternating voice/FAX, voice first (TS61)<br>• ALT FAX / VOICE: alternating voice/FAX, FAX first (TS61)<br>• GPRS <PDP_type>,<PDP_addr>,<L2P>,<APN>: GPRS network request for the PDP context activation |

### 13.9.4 Notes

#### LISA-U / SARA-U

- <type>="FAX", "ALT VOICE / FAX", "ALT FAX / VOICE", "GPRS" are not supported.

#### LISA-U200-62S

- <type>=GPRS is supported. <PDP_type>,<PDP_addr>,<L2P>,<APN> are described in *Chapter 18.1*.

#### SARA-G

- The <mode> parameter is mandatory.

#### SARA-G300 / SARA-G310

- <type>="FAX", "ALT VOICE / FAX", "ALT FAX / VOICE", "GPRS" are not supported.

#### LEON-G

- The <mode> parameter is mandatory.
- <type>=GPRS is not supported.

## 13.10 Radio link protocol +CRLP

| +CRLP | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U SARA-U | | | | | |
| | SARA-G LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | *Profile* | No | - | *+CME Error* |

### 13.10.1 Description

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

The advised configuration for an optimal IOT performance is AT+CRLP=61,61,48,7.

### 13.10.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CRLP=[<iws>[,<mws>[,<T1>[,<N2>]]]] | OK | AT+CRLP=61,61,48,6 |

Objective Specification

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

## 13.10.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <iws> | Number | IWF (Interworking Function) to MT window size, range 0 - 61 (default and factory-programmed value: 61) |
| <mws> | Number | MT to IWF (Interworking Function) window size, range 0 - 61 (default and factory-programmed value: 61) |
| <T1> | Number | Acknowledgement timer T1, expressed in dozen of msec, range 39 - 255 (default and factory-programmed value: 48) |
| <N2> | Number | Retransmission attempts, range 1 - 255 (default and factory-programmed value: 7) |

## 13.10.4 Notes

### LISA-U / SARA-G300 / SARA-G310 / SARA-G340-00S / SARA-G350-00S / SARA-G350-00X / LEON-G100-06S

- The default and factory-programmed value of <N2> is 6.

### SARA-G / LEON-G

- The PIN insertion is not mandatory.

Objective Specification

# 14 FAX class 2

## 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

| +FAA | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

### 14.2.1 Description

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

### 14.2.2 Syntax

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

### 14.2.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <value> | Number | • 0: the DCE shall answer only as a Class 2 facsimile device<br>• 1: the DCE can automatically determine whether to answer as a facsimile DCE (in case of FAX call or alternate speech/fax call is detected) 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

| +FAP | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

### 14.3.1 Description

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

### 14.3.2 Syntax

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

Objective Specification

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

### 14.3.3 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

| +FBS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

### 14.4.1 Description

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

### 14.4.2 Syntax

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

### 14.4.3 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

| +FBO | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

### 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

### 14.5.2 Syntax

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

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | OK | OK |

### 14.5.3 Defined values

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

## 14.6 HDLC frame reporting +FBU

| +FBU | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

### 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.

### 14.6.2 Syntax

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

### 14.6.3 Defined values

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

## 14.7 DS capabilities parameters +FCC

| +FCC | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

### 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.

### 14.7.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+FCC=[[[[[[[[[<vr>],<br>],<wd>],<ln>],<br><df>],<ec>],<bf>],<st>],<jp>] | OK | |
| Read | AT+FCC? | <vr>,<br>,<wd>,<ln>,<df>,<ec>,<bf>,<br><st>,<jp> | |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | OK | |
| Test | AT+FCC=? | (range of <vr>s),(range of <br>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)<br>OK | (0-1),(0-3),(0),(0-2),(0),(0),(0),(0-7),(0)<br>OK |

### 14.7.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <vr> | Number | Resolution in range 0-1 |
| <br> | 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

| +FCQ | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

### 14.8.1 Description

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

### 14.8.2 Syntax

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

### 14.8.3 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

| +FCR | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

### 14.9.1 Description

Sets the capability to receive message data.

Objective Specification

### 14.9.2 Syntax

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

### 14.9.3 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

| +FCS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

### 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.

### 14.10.2 Syntax

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

### 14.10.3 Defined values

See +FCC.

## 14.11 DTE phase C response timeout +FCT

| +FCT | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

### 14.11.1 Description

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

### 14.11.2 Syntax

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

Objective Specification

### 14.11.3 Defined values

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

## 14.12 Receive data +FDR

| +FDR | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

### 14.12.1 Description

Initiates data reception.

### 14.12.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | AT+FDR | OK | |

## 14.13 Transmit Data +FDT

| +FDT | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

### 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.

### 14.13.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | AT+FDT | OK | |

## 14.14 Phase C received EOL alignment +FEA

| +FEA | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

### 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.

### 14.14.2 Syntax

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

Objective Specification

### 14.14.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <value> | Number | • 0: determines that T.4 EOL patterns are bit aligned (as received)<br>• 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

| +FFC | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

### 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 or conversion is supported.

### 14.15.2 Syntax

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

### 14.15.3 Defined values

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

Objective specification

# 14.16 Report file transfer diagnostic frame +FFD

| +FFD | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

## 14.16.1 Description

This command has no parameters.

## 14.16.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | AT+FFD | OK | |

# 14.17 Call termination status +FHS

| +FHS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

## 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.

## 14.17.2 Syntax

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

## 14.17.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <value> | Number | • 0x00: undefined<br>• 0x02: fax call cleared by the remote modem or the DTE<br>• 0x 11: Fax modem timed out in phase B<br>• 0x20: Unspecified transmitting phase B error<br>• 0x23: Invalid command received in transmitting phase B<br>• 0x40: Unspecified transmitting phase C error<br>• 0x43: Send fax data underflow<br>• 0x70: Unspecified receiving phase B error<br>• 0x50: Unspecified transmitting phase D error<br>• 0xA0: Unspecified receiving phase D error |

# 14.18 Procedure interrupt enable +FIE

| +FIE | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

## 14.18.1 Description

Controls the procedure of interrupt handling.

Objective Specification

### 14.18.2 Syntax

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

### 14.18.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <value> | Number | • 0: procedure interrupt requests from the remote station are ignored and not reported to DTE<br>• 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<br>• 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<br>• 1: End Of Message - to indicate the end of a complete page of facsimile information and return to phase B<br>• 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<br>• 3: same as 0, with return to phase B if operator intervention is accomplished<br>• 4: same as 1, with return to phase B if operator intervention is accomplished<br>• 5: same as 2, with return to phase B if operator intervention is accomplished |

## 14.19 Initialize facsimile parameters +FIP

| +FIP | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

### 14.19.1 Description

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

### 14.19.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+FIP=[<value>] | OK | |
| Read | AT+FIP? | 0 | |
| | | OK | |
| Test | AT+FIP=? | (list of supported <value>s) | (0) |
| | | OK | OK |

### 14.19.3 Defined values

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

Objective Specification

# 14.20 Current session parameters +FIS

| +FIS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

## 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.

## 14.20.2 Syntax

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

## 14.20.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <vr> | Number | Resolution, range 0-1 |
| <br> | 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

| +FIT | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

## 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.

## 14.21.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+FIT=[<time>[,<action>]] | OK | |
| Read | AT+FIT? | <time>,<action><br>OK | |

Objective Specification

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

### 14.21.3 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

| +FK | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

### 14.22.1 Description

Causes the DCE to terminate the session in an orderly manner: if the DCE has an active, non-transmitting FAX call, it will send a DCN message and hang up.

### 14.22.2 Syntax

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

## 14.23 Local ID string +FLI

| +FLI | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

### 14.23.1 Description

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

### 14.23.2 Syntax

| 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) | (20-7E) |
| | | OK | OK |

### 14.23.3 Defined values

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

Objective Specification

# 14.24 Set flow control +FLO

| +FLO | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

## 14.24.1 Description

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

## 14.24.2 Syntax

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

## 14.24.3 Defined values

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

# 14.25 Indicate document to poll +FLP

| +FLP | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

## 14.25.1 Description

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

## 14.25.2 Syntax

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

## 14.25.3 Defined values

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

Objective Specification

# 14.26 Request manufacturer identification +FMI

| +FMI | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 14.26.1 Description

Text string identifying the manufacturer.

## 14.26.2 Syntax

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

## 14.26.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <manufacturer> | String | manufacturer name |

# 14.27 Request model identification +FMM

| +FMM | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 14.27.1 Description

Text string identifying the model identification.

## 14.27.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | AT+FMM | <model> | SARA-G350 |
| | | OK | OK |
| Test | AT+FMM=? | OK | |

## 14.27.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <model> | String | Name of model |

# 14.28 Request revision identification +FMR

| +FMR | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 14.28.1 Description

Gives the firmware version of the module.

## 14.28.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | AT+FMR | <version> | 07.11.00 |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | OK | OK |
| Test | AT+FMR=? | OK | |

### 14.28.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <version> | String | Firmware version |

## 14.29 Minimum phase C speed +FMS

| +FMS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

### 14.29.1 Description

Limits the lowest negotiable speed for a fax session.

### 14.29.2 Syntax

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

### 14.29.3 Defined values

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

## 14.30 Negotiation reporting +FNR

| +FNR | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

### 14.30.1 Description

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

### 14.30.2 Syntax

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

Objective Specification

### 14.30.3 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

| +FNS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

### 14.31.1 Description

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

### 14.31.2 Syntax

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

### 14.31.3 Defined values

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

## 14.32 NSF message data indication +FND

| +FND | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

### 14.32.1 Description

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

### 14.32.2 Syntax

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

### 14.32.3 Defined values

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

Objective Specification

# 14.33 Selective polling address +FPA

| +FPA | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

## 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 a zero string. The command is not currently used.

## 14.33.2 Syntax

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

## 14.33.3 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

| +FPI | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

## 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.

## 14.34.2 Syntax

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

## 14.34.3 Defined values

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

Objective Specification

# 14.35 Packet protocol control +FPP

| +FPP | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

## 14.35.1 Description

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

## 14.35.2 Syntax

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

## 14.35.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <value> | Number | only value 0 allowed |

# 14.36 Page status +FPS

| +FPS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

## 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.

## 14.36.2 Syntax

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

## 14.36.3 Defined values

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

Objective Specification

# 14.37 Password parameter +FPW

| +FPW | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

## 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.

## 14.37.2 Syntax

| 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>) | "1234" |
| | | OK | OK |

## 14.37.3 Defined values

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

# 14.38 Receive quality thresholds +FRQ

| +FRQ | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

## 14.38.1 Description

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

## 14.38.2 Syntax

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

## 14.38.3 Defined values

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

Objective Specification

# 14.39 Error correction mode retry count +FRY

| +FRY | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

## 14.39.1 Description

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

## 14.39.2 Syntax

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

## 14.39.3 Defined values

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

# 14.40 SubAddress parameter +FSA

| +FSA | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

## 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.

## 14.40.2 Syntax

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

## 14.40.3 Defined values

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

Objective Specification

# 14.41 Request to poll +FSP

| +FSP | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

## 14.41.1 Description

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

## 14.41.2 Syntax

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

Objective Specification

# 15 V24 control and V25ter

## 15.1 Introduction

These commands, unless specifically stated, do not implement set syntax using "=", read ("?"), or test ("=?"). If such commands are used, the "+CME ERROR: unknown" error result code is provided (if *+CMEE* is set to 2).

SARA-G / LEON-G
If the set, read or test syntax is used the "+CME ERROR: operation not supported" error result code is provided (if *+CMEE* is set to 2).

## 15.2 Circuit 109 behavior &C

| &C | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *Profile* | No | - | *+CME Error* |

### 15.2.1 Description

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

### 15.2.2 Syntax

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

### 15.2.3 Defined values

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

### 15.2.4 Notes

- See the corresponding module system integration manual for the DCD behavior during the initialization phase of the module.

**TOBY-L200-00S / TOBY-L210-00S / MPCI-L200-00S / MPCI-L210-00S**

- The command has not effect.

## 15.3 Circuit 108/2 behavior &D

| &D | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *Profile* | No | - | *+CME Error* |

### 15.3.1 Description

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

Objective Specification

### 15.3.2 Syntax

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

### 15.3.3 Defined values

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

### 15.3.4 ~+++ behavior in PSD &D

TOBY-L200-00S / TOBY-L210-00S / MPCI-L200-00S / MPCI-L210-00S
The ~+++ behavior in PSD &D is not supported.

- 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 (the +++ return to on-line command mode is provided for each &D value during a CSD data call)
- A different implementation for the ~+++ is done with the &D1 value: the PSD data transfer is escaped and system returns in the on-line command state. The *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)

For more details see the ITU-T Recommendation V250 *[20]*, ITU-T V.25ter Recommendation *[21]* and ITU-T V.32 Recommendation *[22]*.

See the corresponding module system integration manual for the DTR behavior during the initialization phase of the module.

### 15.3.5 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 13: 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 14: PSD data mode**

### 15.3.6 Notes

- 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. See the *Table 15* for more information.

Objective Specification

**TOBY-L200-00S / TOBY-L210-00S / MPCI-L200-00S / MPCI-L210-00S**

- The command has not effect.

**SARA-G340-02S / SARA-G350-02A / SARA-G350-02S**

- On the AUX UART interface, the DTR line is always considered to ON state (even if the AUX UART does not support the DTR line).

# 15.4 DSR override &S

| &S | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-60S TOBY-L210-62S TOBY-L220 TOBY-L280 MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L210-60S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *Profile* | No | - | *+CME Error* |

## 15.4.1 Description

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

## 15.4.2 Syntax

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

## 15.4.3 Defined values

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

## 15.4.4 Notes

- See the corresponding module system integration manual for the DSR behavior during the initialization phase of the module.

**MPCI-L2**

- The command has no effect.

# 15.5 Flow control &K

| &K | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-60S TOBY-L210-62S TOBY-L220 TOBY-L280 MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L210-60S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *Profile* | No | - | *+CME Error* |

## 15.5.1 Description

Controls the flow control mechanism. The following settings are allowed:

- no flow control
- HW flow control also referred with RTS / CTS flow control
- SW flow control also referred with XON / XOFF flow control

Objective Specification

### 15.5.2 Syntax

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

### 15.5.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <value> | Number | • 0: disable DTE flow control<br>• 3 (default and factory-programmed value): enable the RTS/CTS DTE flow control<br>• 4: enable the XON/XOFF DTE flow control<br>• 5: enable the XON/XOFF DTE flow control<br>• 6: enable the XON/XOFF DTE flow control |

### 15.5.4 Notes

- The command handling is the same for <value> parameter 4, 5 or 6.
- Set the <value> parameter of AT&K command to 0 (flow control disabled) or 4, 5 or 6 (software flow control) when the RTS and CTS lines are not physically connected.
- The software flow control (XON/XOFF) setting is not allowed on the USB interfaces, on the SPI interface and on a multiplexer channel. See the *Multiple AT command interfaces* for all the behavior differences in respect to the supported interfaces.
- The SW flow control (XON/XOFF) activation is only allowed in case of the text transmission: the binary data cannot be transmitted because it may contain the special flow control characters (XON/XOFF).
- When the 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 not be input).
  Since the DTE-DCE communication relies on the correct reception of DC1/DC3 characters, the UART power saving should be disabled on the module when the SW flow control is used. If the UART power saving is active, the DC1/DC3 characters could be used to wake up the module's UART, and therefore lost. In case a DC3 character (XOFF) is correctly received by module's UART and some data is waiting to be transmitted, the module is forced to stay awake until a subsequent DC1 character (XON) is received.
- On the UART interface, in case of *+UPSV=2*, only &K0 (no flow control) is allowed.

**TOBY-L2**

- The command setting is not displayed in the *AT&V* information text response.

**TOBY-L200-02S / TOBY-L210-02S / TOBY-L280-02S**

- On the UART interface, in case of *+UPSV=1*, the SW flow control shall not be set (<value>=4, 5 and 6 shall not be used).
- On the UART interface, in case of *+UPSV=2*, the SW flow control is also supported (<value>=4, 5 and 6 are allowed), but the HW flow control is still forbidden (<value>=3 is not allowed).

**TOBY-L201 / TOBY-L210-60S / TOBY-L280-00S**

- The SW flow control is not supported (<value>=4, 5 and 6 are not allowed).

**TOBY-L200-00S / TOBY-L210-00S / MPCI-L2**

- The command has no effect.

**SARA-G340-02S / SARA-G350-02A / SARA-G350-02S**

- On the AUX UART interface, the HW flow control is not supported (<value>=3 is not allowed).
- On the AUX UART interface, the default and factory-programmed value for <value> is 0.

### 15.5.5 SW flow control enhancement for PSD data transfer with PPP L2 protocol

The software flow control enhancement is only supported on the UART interface.

LISA-U1 / LISA-U200-01S / LISA-U230 / LISA-U260-01S / LISA-U270-01S / SARA-G / LEON-G
The SW flow control enhancement is not supported.

Objective Specification

The standard implementation of the UART XON/XOFF flow control is limited to DTE-DCE communications where the ASCII non-printable control characters are not transferred. This is an important limitation, since it is not possible to use it in case of the generic binary data transfer. An extension to a PPP L2 protocol data transfer has been done by exploiting the PPP octet stuffing procedure.

***PPP Octet-stuffed framing and transparency***

The PPP protocol implements an escape mechanism specified to allow control data such as XON/XOFF to be transparently transmitted over the link, and to remove spurious control data which may be injected into the link by intervening hardware and software.

The control escape octet is defined as binary 01111101 (hexadecimal 0x7d), most significant bit first. As a minimum, sending implementations must escape the flag sequence and control escape octets.

After Frame Check Sequence (FCS) computation, the transmitter examines the entire frame between the two flag sequences. Each flag sequence, control escape octet, and any octet which is flagged in the sending Async-Control - Character-Map (ACCM), is replaced by a two octet sequence consisting of the control escape octet followed by the original octet exclusive-or'd with hexadecimal 0x20.

The receiving implementations must correctly process all the control escape sequences. On the reception, prior to FCS computation, each octet with value less than hexadecimal 0x20 is checked. If it is flagged in the receiving ACCM, it is simply removed (it may have been inserted by intervening data communications equipment). Each control escape octet is also removed, and the following octet is exclusive-or'd with hexadecimal 0x20, unless it is the flag sequence (which aborts a frame).

***ACCM negotiation for XON/XOFF chars during PPP LCP negotiation***

The ACCM is negotiated in a LCP (Link Control Protocol, part of PPP protocol) configuration request. In particular the LCP Option 02 is used.

This option is described in the RFC 1662 and has the following format.

| *02* | *06* | *Async Control Character Map* |

This configuration option provides a method to negotiate the use of control character transparency on asynchronous links.

The module by default would start in any case requesting an ACCM sets to 0x00000000, which is incompatible with XON/XOFF flow control.

To overcome this situation, the ACCM negotiation handler should combine the value received in a Configure-Nak via a logical bitwise OR operation with the last configure-request value it sent. This result should then be sent in the next Configure-Request message. If a configure-request is received whose bit mask includes cleared bits for characters that the local implementation knows to be problematic (perhaps by way of an administrative option or some kind of hardware information), then it should send a Configure-Nak with the prior value modified to have these bits set.

***Application to XON/XOFF flow control implementation in the module***

The flow control characters DC1 and DC3 appears at arbitrary locations in the data stream received by the module. The module with software flow control active during a PPP session, discards these characters after modifying the flow control state (stopping or starting its own transmit process) and does not include them in any part of the received data or CRC calculation; in the transmitted data the module escapes the XON/XOFF characters if they appear in the transmitted PPP frame. They are transmitted on the link as follows:

*0x11 is encoded as 0x7d, 0x31. (XON)*

*0x13 is encoded as 0x7d, 0x33. (XOFF)*

PPP ACCM negotiation in the module firmware is implemented in the following way:

- If the XON/XOFF flow control is active on the UART when the PPP is invoked, the requested ACCM is 0x000A0000

Objective Specification

- If the XON/XOFF flow control is not active on the UART when the PPP is invoked, the requested ACCM is 0x00000000

As soon as the LCP configuration phase is completed, the IPCP protocol (the network control protocol for establishing and configuring Internet Protocol over a Point-to-Point Protocol link) can start; from this point forward the negotiated ACCM are applied.

If SW flow control is enabled on the module, but the DTE requests a wrong ACCM setting (ACCM differs than 0x0A0000) the SW flow control is anyway effective during the data mode, that is the 0x11 and 0x13 is detected during data mode even if the ACCM is not properly set by the DTE during LCP configuration.

# 15.6 DTE-DCE character framing +ICF

| +ICF | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | *Profile* | No | - | *+CME Error* |

## 15.6.1 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).

The following restrictions must be reminded:

- 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 read command (and displayed by *AT&V*) but it has no meaning
- The command setting is ignored when the AT command interface runs on the USB or on the SPI interface

## 15.6.2 Syntax

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

## 15.6.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <format> | Number | • 0: auto detect<br>• 1: 8 data 2 stop<br>• 2: 8 data 1 parity 1 stop<br>• 3: 8 data 1 stop<br>• 4: 7 data 2 stops<br>• 5: 7 bit, 1 parity, 1 stop<br>• 6: 7 bit, 1 stop |
| <parity> | Number | • 0: odd<br>• 1: even |

## 15.6.4 Notes

**TOBY-L200-00S / TOBY-L210-00S / MPCI-L2**

- The command has no effect.

Objective Specification

**TOBY-L200-02S / TOBY-L201 / TOBY-L210-02S / TOBY-L210-60S / TOBY-L220 / TOBY-L280**

- Automatic frame recognition is not supported (<format> cannot be set to 0).

**LISA-U2 / SARA-U**

- The <format> parameter cannot be set to 4 and 6.
- If the parameters are omitted they are set to <format> = 3 and <parity> = 1.
- The factory-programmed values are <format> = 3 and <parity> = 1.
- **Automatic frame recognition**

  If automatic baud rate detection (*+IPR* is set to 0) is enabled in the profile, the +ICF setting is not applied at start-up, and the read command returns the current detected frame format only after detection.
  - Automatic frame recognition is present together with automatic baud rate recognition
  - Since automatic frame recognition is implemented as "one shot", the AT+ICF=0 answers OK as final result code but does not switch the system to the automatic frame recognition and it does not take any actions. The read command always returns the current value of the frame format and the value of +ICF in the active profile is not changed
  - If automatic frame recognition is enabled, the read command returns the current (detected) frame setting even if the current active profile provides +ICF=0. To change the frame format at the next module power on issue the set command with the new setting and save it in the profile
  - The detectable frame configurations are: 7E1, 7O1, 8N1, 8E1, 8O1
  - 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, the system can behave unpredictably

**LISA-U200-00S**

- Automatic frame recognition is not supported (<format> cannot be set to 0).

**SARA-G / LEON-G**

- The <format> parameter cannot be set to 4 and 6.
- If the parameters are omitted they are set to <format> = 0 and <parity> = 0.
- The factory-programmed values are <format> = 0 and <parity> = 0.
- **Automatic frame recognition**

  Frame recognition can only be present in conjunction with autobauding recognition, i.e. the AT+ICF=0 command is effective only if *AT+IPR* is set to 0. In this case the AT+ICF? returns a 0 value.
  - Outside the autobauding conditions the AT+ICF=0 answers OK as final result code but does not switch the system to automatic frame recognition and it does not take any actions. In this scenario the AT +ICF? command returns the current value of the frame format. The AT+IPR=0 command instead forces the AT+ICF to 0
  - Under autobauding conditions, the AT+ICF command provided with a value different than 0 provides an error result code since it is not possible to specify a frame type in these 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 an 1 stop bit frame is provided at the serial port, the system can behave unpredictably

**SARA-G340-02S / SARA-G350-02A / SARA-G350-02S**

- On the AUX UART interface, automatic frame recognition is not supported (<format> cannot be set to 0).
- On the AUX UART interface: the default and factory-programmed value for <format> is 3; the default and factory-programmed value for <parity> is 1.

Objective Specification

# 15.7 DTE-DCE local flow control +IFC

| +IFC | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *Profile* | No | - | *+CME Error* |

## 15.7.1 Description

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

The SW flow control (XON/XOFF) activation is only allowed in case of the text transmission: the binary data cannot be transmitted because it may contain the special flow control characters (XON/XOFF). For the SW flow control enhancement, allowing its usage during a PSD call with PPP L2 protocol, see *SW flow control enhancement for PSD data transfer with PPP L2 protocol* in the *AT&K* command description.

When the 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 not be input).

Since the DTE-DCE communication relies on the correct reception of DC1/DC3 characters, the UART power saving should be disabled on the module when SW flow control is used. If the UART power saving is active, the DC1/DC3 characters could be used to wake up the module's UART, and therefore lost. In case a DC3 character (XOFF) is correctly received by module's UART and some data is waiting to be transmitted, the module is forced to stay awake until a subsequent DC1 character (XON) is received.

The software flow control (XON/XOFF) setting is not allowed on the USB interfaces, on the SPI interface and on a multiplexer channel. See the *Multiple AT command interfaces* for all the behavior differences in respect to the supported interfaces.

On the UART interface, in case of *+UPSV=2*, only +IFC=0,0 (no flow control) is allowed.

## 15.7.2 Syntax

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

## 15.7.3 Defined values

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

## 15.7.4 Notes

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

Objective Specification

**TOBY-L200-02S / TOBY-L210-02S / TOBY-L280-02S**

- On the UART interface, in case of *+UPSV=1*, the SW flow control shall not be set (<DCE_by_DTE> and <DTE_by_DCE> shall not be set to 1).
- On the UART interface, in case of *+UPSV=2*, the SW flow control is also supported (<DCE_by_DTE> and <DTE_by_DCE> can be set to 1), but the HW flow control is still forbidden (<DCE_by_DTE> and <DTE_by_DCE> cannot be set to 2).

**TOBY-L201 / TOBY-L210-60S / TOBY-L280-00S**

- The SW flow control is not supported (<DCE_by_DTE> and <DTE_by_DCE> cannot be set to 1).

**TOBY-L200-00S / TOBY-L210-00S / MPCI-L2**

- The command has no effect.

**SARA-G340-02S / SARA-G350-02A / SARA-G350-02S**

- On the AUX UART interface, the HW flow control is not supported (<DCE_by_DTE> and <DTE_by_DCE> cannot be set to 2).
- On the AUX UART interface, the default and factory-programmed value for <DCE_by_DTE> and <DTE_by_DCE> is 0.

# 15.8 Set flow control \Q

| \Q | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-60S TOBY-L210-62S TOBY-L220 TOBY-L280 MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L210-60S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 15.8.1 Description

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

The SW flow control (XON/XOFF) activation is only allowed in case of the text transmission: the binary data cannot be transmitted because it may contain the special flow control characters (XON/XOFF). For the SW flow control enhancement, allowing its usage during a PSD call with PPP L2 protocol, see the *SW flow control enhancement for PSD data transfer with PPP L2 protocol* in the *AT&K* command description.

When the 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 not be input).

Since the DTE-DCE communication relies on the correct reception of DC1/DC3 characters, the UART power saving should be disabled on the module when SW flow control is used. If the UART power saving is active, the DC1/DC3 characters could be used to wake up the module's UART, and therefore lost. In case a DC3 character (XOFF) is correctly received by module's UART and some data is waiting to be transmitted, the module is forced to stay awake until a subsequent DC1 character (XON) is received.

The software flow control (XON/XOFF) setting is not allowed on the USB interfaces, on the SPI interface and on a multiplexer channel. See the *Multiple AT command interfaces* for all the behavior differences in respect to the supported interfaces.

On the UART interface, in case of *+UPSV=2*, only \Q0 (no flow control) is allowed.

## 15.8.2 Syntax

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

Objective Specification

### 15.8.3 Defined values

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

### 15.8.4 Notes

**TOBY-L200-02S / TOBY-L210-02S / TOBY-L280-02S**

- On the UART interface, in case of *+UPSV=1*, the SW flow control shall not be set (<value> shall not be set to 1).
- On the UART interface, in case of *+UPSV=2*, the SW flow control is also supported (<value> can be set to 1), but HW flow control is still forbidden (<value> cannot be set to 3).

**TOBY-L201 / TOBY-L210-60S / TOBY-L280-00S**

- The SW flow control is not supported (<value> cannot be set to 1).

**TOBY-L200-00S / TOBY-L210-00S / MPCI-L2**

- The command has no effect.

**SARA-G340-02S / SARA-G350-02A / SARA-G350-02S**

- On the AUX UART interface, the HW flow control is not supported (<value> cannot be set to 3).
- On the AUX UART interface, the default value for <value> is 0.

## 15.9 UART data rate configuration +IPR

| +IPR | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | *Profile* | No | - | *+CME Error* |

### 15.9.1 Description

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

When supported, the autobauding feature allows baud rate recognition by the DCE when it operates in command mode.

The command settings are ignored when the AT command interface runs either on the USB or on the SPI interface. The DCE sends the "OK" final result code but the command will have no effect.

### 15.9.2 Syntax

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

### 15.9.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <rate> | Number | Baud rate<br>• 0 (factory-programmed value): autobauding |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 (default value), 230400, 460800, 921600 |

## 15.9.4 Notes

- On the UART AT interface, after the reception of the "OK" result code for the +IPR command, the DTE shall wait for at least 100 ms before issuing a new AT command; this is to guarantee a proper baud rate reconfiguration.

**TOBY-L2 / MPCI-L2**

- <rate>= 1200, 2400, 4800 b/s are not supported.

**TOBY-L200-00S / TOBY-L210-00S / MPCI-L200-00S / MPCI-L210-00S**

- The command has no effect.

**LISA-U1 / LISA-U200-00S**

- Automatic baud rate detection is not implemented (<rate>=0 is not supported).
- The factory-programmed value for <rate> is 115200.
- <rate>= 921600 cannot be set as fixed rate.

**SARA-G / LEON-G**

- <rate>= 1200, 230400, 460800, 921600 b/s are not supported.
- The default value for <rate> is 0.

**SARA-G340-02S / SARA-G350-02A / SARA-G350-02S**

- On the AUX UART interface, the automatic baud rate detection is not implemented (<rate>=0 is not supported).
- On the AUX UART interface, the factory-programmed value for <rate> is 115200.

## 15.9.5 Autobauding description

**TOBY-L2 / MPCI-L2**

Only one shot automatic baud rate detection is implemented. If enabled, the module provides autobauding capability only at module start-up, and keeps it active until a first recognition is completed. Later on, it works at the fixed baud rate (the detected one).

- If automatic baud rate detection is set in the active memory profile, the baud rate is detected once at the module power on.
- Since autobauding is implemented as "one shot" autobauding, any setting of +IPR=0 should be avoided; the only exception is in case the autobauding setting has been replaced by a fixed rate setting in the stored profile. In this case the module has started without autobauding and the host needs to reactivate it.
- If the module starts with the autobauding active, after the detection, the +IPR read command returns the detected baud rate, while the +IPR value in the active profile (displayed as result of *AT&V*) does not change (it continues to be 0, otherwise the +IPR setting should be changed every time an AT command setting is changed and the profile saved in the NVM via the *AT&W* command). As a result, the only way to change the +IPR value in the profile is by issuing an +IPR set command (e.g. AT+IPR=115200 sets a fixed rate on the UART and determines a start-up at a fixed rate of 115200 b/s in case the active profile is saved via *AT&W*).
- After AT+IPR=0, the run-time configuration of the AT interface is updated (*AT&V* shows the new setting in the active profile), but the setting is effective only at the next start-up (if and only if the active configuration is saved in the stored AT profile).
- As a consequence of the previous point, if AT+IPR=0 is issued the +IPR read command continues to return the current set baud rate (and not the 0 value). This is an exception and it creates a discrepancy between the value in the profile and the value returned by the +IPR read command, but it allows autobauding re-activation and a coherent result of the +IPR read command.

Objective Specification

- Autobauding values which can be detected are 9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600 b/s. This range is the same of fixed rates baud rates. AT commands provided with a baud rate other than values declared, cannot be properly acquired and recognized by the module, and are discarded.
- If the system starts in autobauding (i.e. the +IPR is 0) the first "a" or "A" character provided to the module detects the baud rate. For example the first command sent from the DTE at any rate can be: *AT+CPIN="1234"*. Characters different than "a" or "A" are ignored (even if they could be used for the detection), the detection is considered failed, and it is retriggered. In this situation, all the data received before autobauding retriggering is flushed (that is, completely ignored). Every two characters' string starting with 'A' or 'a' can be used for the baud rate detection. But this is not a requirement violation, since it makes sense assuming that a DTE application starts every communication with an "AT" or "at".
  - The echo is produced or not according to *ATE* configuration. The echo is only produced for a valid detection sequence.
  - The module generates a response for the DTE once the autobauding detection is successful, the command has been accepted and the command response is available. Therefore, even if the detection was actually successful a certain amount of time before, it is only possible to assume that the detection phase was successful after a response.
  - If no response is received by the DTE after some time, it must retry (the timeout value should be adjustable inside the DTE application). In any case it is suggested to use a very simple command as the first command, for which the execution time is short and almost constant (e.g. *ATE*).
- If automatic baud rate detection is active, greeting messages or URCs before baud rate detection are not sent but buffered. They are sent as first data at the detected baud rate as soon as detection is completed (before any echo of the command or response). The greeting message is sent at the specified baud rate only when the baud rate setting in the profile is other than autobauding.
- <rate>=0 does not affect the *AT+ICF* command (character framing configuration), since the automatic frame recognition is not supported.

**LISA-U / SARA-U**

Only one shot automatic baud rate detection is implemented. If enabled, the module provides autobauding capability only at module start-up, and keeps it active until a first recognition is completed. Later on, it works at the fixed baud rate (the detected one).

- If automatic baud rate detection is set in the active memory profile, the baud rate is detected once at the module power on
- Since autobauding is implemented as "one shot" autobauding, any setting of +IPR=0 should be avoided; the only exception is in case the autobauding setting has been replaced by a fixed rate setting in the stored profile. In this case the module has started without autobauding and the host needs to reactivate it
- If the module starts with the autobauding active, after the detection, the +IPR read command returns the detected baud rate, while the +IPR value in the active profile (displayed as result of *AT&V*) does not change (it continues to be 0, otherwise the +IPR setting should be changed every time an AT command setting is changed and the profile saved in the NVM via the *AT&W* command). As a result, the only way to change the +IPR value in the profile is by issuing an +IPR set command (e.g. AT+IPR=115200 sets a fixed rate on the UART and determines a start-up at a fixed rate of 115200 b/s in case the active profile is saved via *AT&W*)
- After AT+IPR=0, the run-time configuration of the AT interface is updated (*AT&V* shows the new setting in the active profile), but the setting is effective only at the next start-up (if and only if the active configuration is saved in the stored AT profile)
- As a consequence of the previous point, if AT+IPR=0 the +IPR read command continues to return the current set baud rate (and not the 0 value). This is an exception and it creates a discrepancy between the value in the profile and the value returned by the +IPR read command, but it allows autobauding re-activation and a coherent result of the +IPR read command
- Autobauding values which can be detected are 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400 b/s. This means that baud rate 460800 and 921600 b/s cannot be automatically detected by DCE and must only be set as a fixed rate (via +IPR AT command). AT commands provided with a baud rate other than values declared, cannot be properly acquired and recognized by the module, and are discarded

Objective Specification

- If the system starts in autobauding (i.e. the <rate> parameter of +IPR is 0) the first "at" sequence provided to the module detects the baud rate. 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: both detection characters must be small or capital:
  - The echo is produced or not according to *ATE* configuration. The echo is only produced for a valid detection string and only after the detection completion, that is there will be a one character delay between the received characters and the echo generation (the echo will start only after "at" or "AT" reception)
  - The echo is always "AT" regardless of the detection string sent by DTE
  - The module generates a response for the DTE once autobauding detection is successful, the command has been accepted and the command response is available. Therefore, even if the detection was actually successful a certain amount of time before, it is only possible to assume that the detection phase was successful after a response
  - If no response is received by the DTE after some time, it must retry (the timeout value should be adjustable inside the DTE application). In any case it is suggested to use a very simple command as the first command, for which the execution time is short and almost constant (e.g. *ATE*)
- If the UART power saving is enabled, the command for the baud rate detection should be sent to the DTE before the module enters idle mode for the first time
- Autobauding result can be unpredictable with spurious characters if 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 wake up can be granted by the DTE and power saving can be exited correctly. Disable the power saving if no hardware flow control is set at start up
- If automatic baud rate detection is active, greeting messages or URCs before baud rate detection are not sent but buffered. They are sent as first data at the detected baud rate as soon as detection is completed (before any echo of the command or response). The greeting message is sent at the specified baud rate only when the baud rate setting in the profile is other than autobauding
- <rate>=0 affects the *AT+ICF* command (character framing configuration). See the *AT+ICF* command description for further limitations.

**SARA-G / LEON-G**

The following notes related to autobauding must be reminded:

- At the module power on the autobauding can be by default enabled (necessary to program the stored AT profile with the baud rate parameter set to 0) or set 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. AT commands provided with a baud rate other than values declared, cannot be properly acquired and recognized by the module, and are discarded
- If the system starts in autobauding (i.e. the <rate> parameter of +IPR is 0) the first "at" sequence provided to the module detects the baud rate. 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 characters must be small or capital
- Power saving is exited at the 'A' (or 'a') character 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') character does not reset the power saving timer; as a result if the detection completion character is sent outside power save condition, it does not force to stay out of power saving state for the number of frames of power saving timer
- Autobauding result can be unpredictable with spurious characters if the power saving is entered and the flow control is disabled (*AT&K0*). If the hardware flow control is present, the DTE can be synchronized with the

Objective Specification

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

- <rate>=0 affects the *AT+ICF* command (character framing configuration) too which <format> and <parity> parameters are automatically switched to the 0 value. See the *AT+ICF* command description for further limitations
- When autobauding and echo are enabled (+IPR=0, *ATE1*), there is an hardware loopback between UART TXD and RXD lines until a "AT" (or "at") sequence detection. This means that all the characters before and including the "AT" (or "at") sequence will be retransmitted on the RXD line also if hardware flow control is enabled and the RTS line is OFF.

# 15.10 Return to on-line data state O

| O | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

## 15.10.1 Description

Causes the DCE to return to online data state and issue a CONNECT or CONNECT <text> (based on *ATX* command) intermediate 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 *Chapter 15.3.5*) 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.

## 15.10.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | ATO | <response> | ATO<br>CONNECT |

## 15.10.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <response> | String | • CONNECT<br>• NO CARRIER: the online data state cannot be resumed |

## 15.10.4 Notes

- The command provides an error result code ("+CME ERROR: operation not allowed" if *+CMEE* is set to 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
- In case of PSD call, any data from the network (downlink data) received by the DCE during the on-line command state is discarded. This means that after the O command and on-line data state resume, any possible data loss has to be recovered by upper layer protocols (e.g. TCP).

**TOBY-L200-00S / TOBY-L210-00S / MPCI-L200-00S / MPCI-L210-00S**

- The command has not effect since the online command mode is not supported.

**SARA-G340-02S / SARA-G350-02A / SARA-G350-02S**

- On the AUX UART interface, the command is not supported.

Objective Specification

# 15.11 Escape character S2

| S2 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | *Profile* | No | - | *+CME Error* |

## 15.11.1 Description

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

## 15.11.2 Syntax

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

## 15.11.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <value> | Number | Range 1 to 255. The answer to the read command is in "xxx" format. The default and the factory-programmed value is 43 (ASCII '+'). |

## 15.11.4 Notes

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

| Data call command | L2 protocol | Description | ATS2 behavior |
|---|---|---|---|
| AT+CGDATA="M-HEX",1 | HEX | u-blox specific | 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.<br>There is not a timing constraint (see S12 command, *Chapter 15.19*) 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 |

**Table 15: ATS2 handling for different data call scenarios**

### SARA-G / LEON-G

- The <value> parameter is not mandatory.

### TOBY-L200-00S / TOBY-L210-00S / MPCI-L200-00S / MPCI-L210-00S

- The command has not effect.

Objective Specification

# 15.12 Command line termination character S3

| S3 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | *Profile* | No | - | *+CME Error* |

## 15.12.1 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.

## 15.12.2 Syntax

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

## 15.12.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <value> | Number | Range 0 to 127. The answer to the read command is in "xxx" format. The default and the factory-programmed value is 13 (ASCII carriage return (CR, IRA5 0/13)). |

## 15.12.4 Notes

### SARA-G / LEON-G

- The <value> parameter is not mandatory.

# 15.13 Response formatting character S4

| S4 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | *Profile* | No | - | *+CME Error* |

## 15.13.1 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.

## 15.13.2 Syntax

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

## 15.13.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <value> | Number | Range 0 to 127. The answer to the read command is in "xxx" format. The default and the factory-programmed value is 10 (line feed (LF, IRA5 0/10)). |

Objective Specification

### 15.13.4 Notes

**SARA-G / LEON-G**

- The <value> parameter is not mandatory.

## 15.14 Command line editing character S5

| S5 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | *Profile* | No | - | *+CME Error* |

### 15.14.1 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.

### 15.14.2 Syntax

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

### 15.14.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <value> | Number | Range 0 to 127. The answer to the read command is in "xxx" format. The default and the factory-programmed value is 8 (ASCII backspace (BS, IRA5 0/8)). |

### 15.14.4 Notes

**SARA-G / LEON-G**

- The <value> parameter is not mandatory.

## 15.15 Pause before blind dialling S6

| S6 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | No | No | - | *+CME Error* |

### 15.15.1 Description

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

### 15.15.2 Syntax

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

### 15.15.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <value> | Number | Range 2 - 10. The answer to the read command is in "xxx" format. The default value is 2 s. |

Objective Specification

### 15.15.4 Notes

**SARA-G / LEON-G**

- The <value> parameter is not mandatory.

## 15.16 Connection completion timeout S7

| S7 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | *Profile* | No | - | *+CME Error* |

### 15.16.1 Description

Specifies the 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.

### 15.16.2 Syntax

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

### 15.16.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <value> | Number | Range 1 - 255. The answer to the read command is in "xxx" format. The default and the factory-programmed value is 60 s. |

### 15.16.4 Notes

**SARA-G / LEON-G**

- The <value> parameter is not mandatory.

## 15.17 Command dial modifier time S8

| S8 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | No | No | - | *+CME Error* |

### 15.17.1 Description

Specifies the amount of time, in seconds, that the DCE shall pause during dialling, when a ',' (comma) dial modifier is encountered in a dial string.

The command has no effect.

### 15.17.2 Syntax

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

Objective Specification

### 15.17.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <value> | Number | Range 0 - 255. The answer to the read command is in "xxx" format. The default value is 2. |

### 15.17.4 Notes

**SARA-G / LEON-G**

- The <value> parameter is not mandatory.

## 15.18 Automatic disconnect delay S10

| S10 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | No | No | - | *+CME Error* |

### 15.18.1 Description

Specifies the 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 the OK response is returned.

### 15.18.2 Syntax

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

### 15.18.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <value> | Number | Range 1 - 254. Default: 1 |

### 15.18.4 Notes

**SARA-G / LEON-G**

- The <value> parameter is not mandatory.

## 15.19 Escape prompt delay (EPD) S12

| S12 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | No | No | - | *+CME Error* |

### 15.19.1 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 a 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

Objective Specification

- 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

### 15.19.2 Syntax

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

### 15.19.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <value> | Number | Range 0 - 255. The answer to the read command is in "xxx" format. The default value is 50 (1 s) |

### 15.19.4 Notes

**SARA-G / LEON-G**

- The <value> parameter is not mandatory.

**TOBY-L200-00S / TOBY-L210-00S / MPCI-L200-00S / MPCI-L210-00S**

- The command has not effect.

## 15.20 Command echo E

| E | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *Profile* | No | - | *+CME Error* |

### 15.20.1 Description

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

### 15.20.2 Syntax

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

### 15.20.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <value> | Number | • 0: echo off<br>• 1 (default and the factory-programmed value): echo on |

## 15.21 Result code suppression Q

| Q | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *Profile* | No | - | *+CME Error* |

### 15.21.1 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.

Objective Specification

### 15.21.2 Syntax

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

### 15.21.3 Defined values

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

## 15.22 DCE response format V

| V | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *Profile* | No | - | *+CME Error* |

### 15.22.1 Description

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

Format for information text response:
- 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>

### 15.22.2 Syntax

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

### 15.22.3 Defined values

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

## 15.23 Result code selection and call progress monitoring control X

| X | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U SARA-U | | | | | |
| | SARA-G LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *Profile* | No | - | *+CME Error* |

### 15.23.1 Description

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

Objective Specification

### 15.23.2 Syntax

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

### 15.23.3 Defined values

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

## 15.24 Reset to default configuration Z

| Z | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 15.24.1 Description

Resets the DCE configuration into a known state; the reset includes the loading of the settings stored in the profile identified by the <value> parameter, into the current profile, and the application of the settings.

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

For more details on the settings stored in the profiles, see the *Appendix B.1*.

### 15.24.2 Syntax

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

### 15.24.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <value> | Number | Profile index, possible values 0-1; optional parameter, the default value is 0 |

## 15.25 Set to factory defined configuration &F

| &F | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 15.25.1 Description

Resets the current profile to factory-defined defaults. Other NVM settings, not included in the profiles, are not affected.

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 profile. The other DCE settings are applied after the response has been sent.

For more details on the settings stored in the profiles, refer to *Appendix B.1*.

Objective Specification

### 15.25.2 Syntax

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

### 15.25.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <value> | Number | Only 0 allowed |

## 15.26 Store current configuration &W

| &W | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 15.26.1 Description

Stores into one of the two RAM profile mirrors the current AT 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, refer to *Appendix B.1*.

The 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 5.2*).

### 15.26.2 Syntax

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

### 15.26.3 Defined values

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

## 15.27 Display current configuration &V

| &V | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 15.27.1 Description

Reports a summary of the current configuration and of the stored user profiles.

Since not all configuration items are listed with this command, see the example below for the list of the displayed configuration items. *Appendix B.1* provides the complete list of the configuration items stored in the profiles.

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

### 15.27.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | AT&V | ACTIVE PROFILE:<br>List of commands stored in the active profile with the related values | 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, 00 |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | STORED PROFILE 0:<br>List of commands stored in the profile 0 with the related values<br>STORED PROFILE 1:<br>List of commands stored in the profile 1 with the related values<br>OK | 6, +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<br>STORED PROFILE 0: &C1, &D1, &S1, &K3, E1, Q0, V1, X4, S00:000, S02:043, S03:0 13, S04:010, S05:008, S07:060, +CBST:0 07, 000, 001, +CRLP:061, 061, 048, 00 6, +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<br>STORED PROFILE 1: &C1, &D1, &S1, &K3, E1, Q0, V1, X4, S00:000, S02:043, S03:0 13, S04:010, S05:008, S07:060, +CBST:0 07, 000, 001, +CRLP:061, 061, 048, 00 6, +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<br>OK |

### 15.27.3 Notes

#### TOBY-L2 / MPCI-L2

- The command shows the stored profiles that were used at boot. The RAM profile mirrors updated with *AT&W* cannot be retrieved with this command.
- The current setting and the values stored in user profiles of *+UPSV* AT command are not present in the information text response.

## 15.28 Designate a default reset profile &Y

| &Y | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

### 15.28.1 Description

Selects which profile will be loaded at the next power on. 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 *Appendix B.1*. An error is returned if <value> is greater then 2, or NVM is not installed or is not operational.

For more details on the commands stored in the profiles, refer to *Appendix B.1*.

### 15.28.2 Syntax

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

### 15.28.3 Defined values

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

Objective Specification

# 15.29 Parity bit transmission over the air +UTPB

| +UTPB | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U260-02S LISA-U270-02S LISA-U270-62S LISA-U270-63S LISA-U270-68S SARA-U | | | | | |
| | SARA-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *Profile* | No | - | *+CME Error* |

## 15.29.1 Description

Configures the parity bit transmission over the air, for the data received from the DTE during a data call, when the UART interface is programmed for 7-bit data format.

The parity bit transmission can only work if the 7 bit data, 1 parity bit, 1 stop bit character framing is set (and thus applies only to UART AT interfaces; see the *+ICF* command description).

The +UTPB command, like the *+ICF* command, is only effective on UART AT interface. On USB/SPI/MUX AT interfaces the set command always returns the "OK" final result code and the read command always returns 0. Furthermore, the command setting on USB/SPI/MUX AT interfaces has no effect on the UART AT interface and on the AT profiles.

On AUX UART AT interface, the set command always returns the "OK" final result code and the read command always returns 0. Furthermore, the command setting on the AUX UART AT interface has no effect on the UART AT interface and on the AT profiles.

The transmission of the parity bit only applies to Circuit Switched data calls or Socket Direct Link; in all the other cases (e.g. PSD dial-up, file write in module FS, any other direct data transmission modes), the parity information is always filtered out.

LISA-U2 / SARA-U
The transmission of the parity bit is furtherly restricted to only Circuit Switched data calls (no Socket Direct Link).

The 7-bit UART configuration has not to be set if the MUX protocol over UART must be activated. Enabling the parity bit transmission during MUX mode does not influence the data transfer, since the assumption is that 7-bit format (7O1, 7E1) is not active. The module does not check if incompatible settings are requested.

## 15.29.2 Syntax

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

## 15.29.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <n> | Number | • 0 (factory-programmed value): the parity bit is not transmitted over the air (MSB of the transmitted byte is always 0)<br>• 1: the DCE transmits the parity bit over the air (MSB of the transmitted byte is left untouched) |

Objective Specification

### 15.29.4 Notes

- It is possible to enable the transmission of the parity bit even if the frame format on the UART interface is not 7 bit data, 1 parity bit; in such a case the configuration is only applied after the 7-bit format is set on UART (via automatic recognition or *+ICF* command).
- When the DCE's UART detects a parity error in the received data (received parity bit is different from the calculated one) no specific action is taken, i.e. the data are always transmitted over the air.
- When the parity bit over the air is enabled and the UART character format is 7O1, the default escape character "+" (decimal value of ASCII character is 043) has the parity bit set to 1. This prevents DUT on detecting the escape sequence. The user should change the value of escape character with *ATS2* command to a value with parity bit set to 0 (for example character "#", ASCII decimal value 035).
- In case of UART 7O1, 7E1 configuration, the data from the network to the DTE must be in the 7-bit format (each byte is binary data in the range 0x00.0x7F); any information carried in the bit at position 7 (bit 0 is LSB, bit 7 is MSB) is ignored by the module, and in any case not transmitted to the DTE since it is replaced by parity information.

### 15.29.5 AT+UTPB=0 case diagram

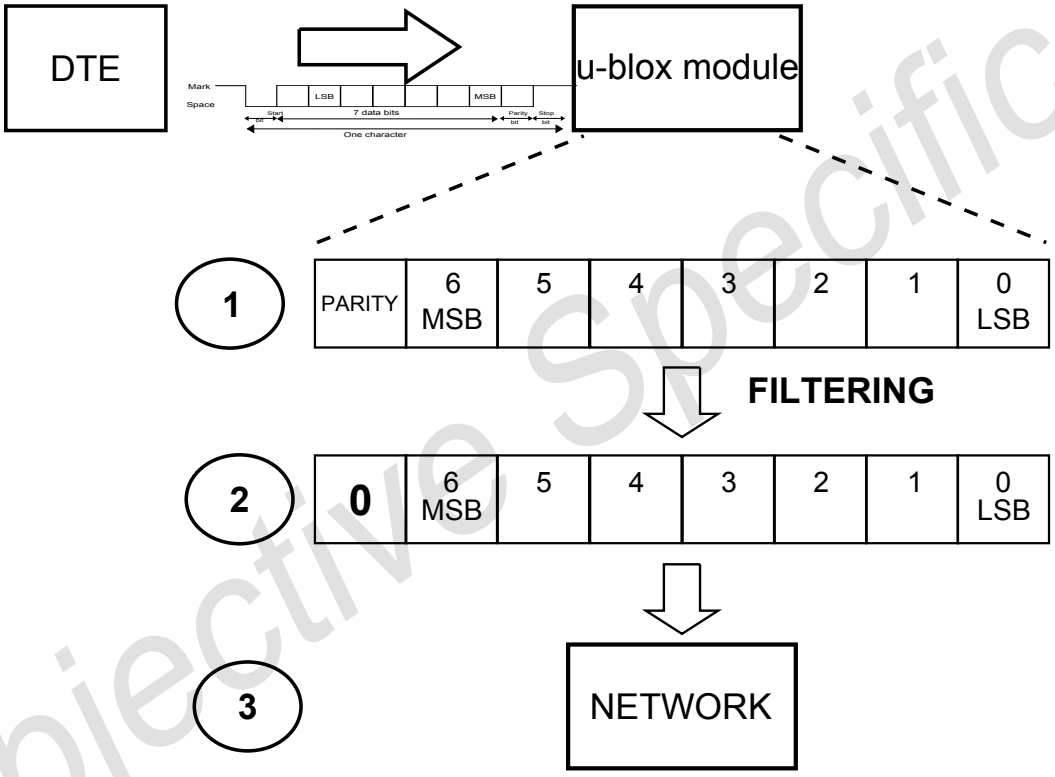



**Figure 2: AT+UTPB=0 case diagram**

Objective Specification

### 15.29.6 AT+UTPB=1 case diagram

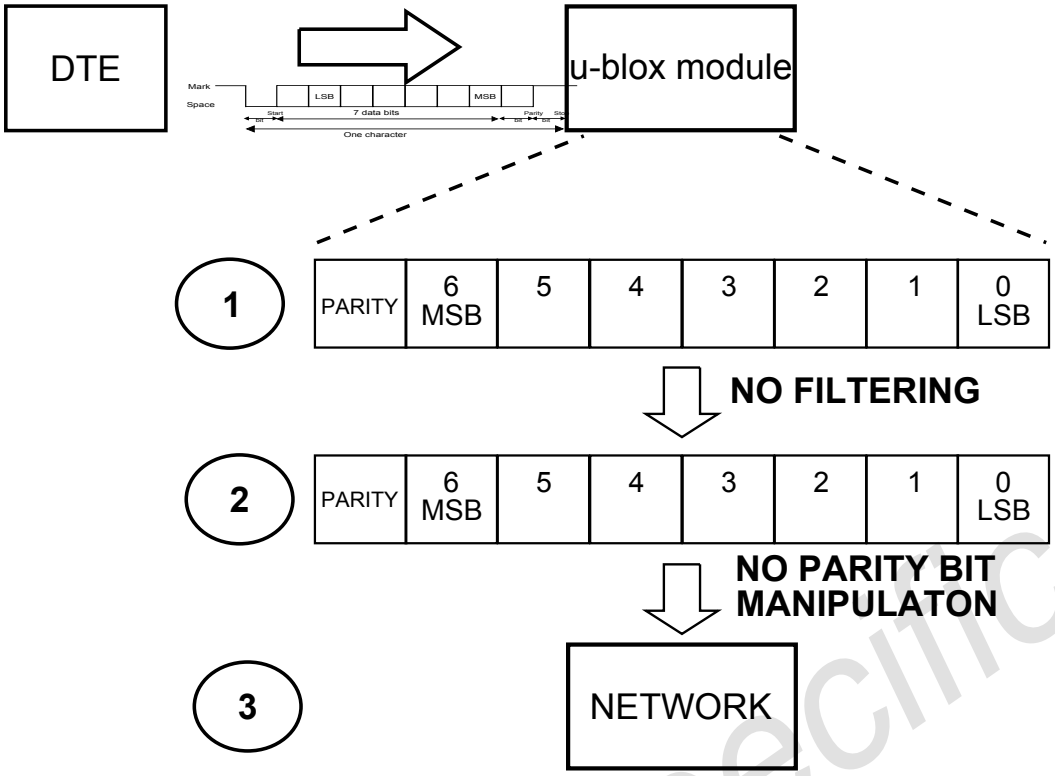



**Figure 3: AT+UTPB=1 case diagram**

Objective Specification

# 16 SIM management

## 16.1 Generic SIM access +CSIM

| +CSIM | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 16.1.1 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.

The command needs the SIM module to work correctly.

It is recommended to wait some seconds after boot (or reset) before using the command.

LISA-U / SARA-U / SARA-G / LEON-G
The PIN insertion is mandatory before the command execution.

### 16.1.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CSIM=<length>,<command> | +CSIM: <length>,<response><br>OK | AT+CSIM=14,"A0A40000027F20"<br>+CSIM: 4,"6E00"<br>OK |
| Test | AT+CSIM=? | OK | OK |

### 16.1.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <length> | Number | Length of the characters sent to the TE in <command> or <response> parameters |
| <command> | String | Command passed on by MT to SIM in hex format; see the 3GPP TS 51.011 *[18]* and ETSI TS 102 221 *[50]* |
| <response> | String | Response to the command passed on by the SIM to the MT (3GPP TS 51.011 *[18]* and ETSI TS 10 2 221 *[50]*) |

## 16.2 Restricted SIM access +CRSM

| +CRSM | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | *< 10 s* | *+CME Error* |

### 16.2.1 Description

Allows easy access to the SIM database. The set command transmits the SIM command and its required parameters to the MT. The MT handles internally all SIM-MT interface locking and file selection routines. As response to the command, the MT sends the actual SIM information parameters and response data. An error result code 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.

The command needs the SIM module to work correctly.

LISA-U / SARA-U / SARA-G / LEON-G
The PIN insertion is mandatory before the command execution.

Objective Specification

### 16.2.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CRSM=<command>[,<fileid>[,<P1>,<P2>,<P3>[,<data> [,<pathid>]]]] | +CRSM: <sw1>,<sw2>[,<response>]<br>OK | AT+CRSM=176,28471,0,0,3<br>+CRSM: 144,0,"989301770020594178F2"<br>OK |
| Test | AT+CRSM=? | OK | OK |

### 16.2.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <command> | Number | • 176: read binary<br>• 178: read record<br>• 192: get response<br>• 214: update binary<br>• 220: update record<br>• 242: status |
| <fileid> | Number | Identifies elementary datafile on SIM. Mandatory for each command except STATUS (e.g. 28423: meaning IMSI file (6F07)) |
| <P1>, <P2>, <P3> | Number | Defines the request. These parameters are mandatory for each command, except GET RESPONSE and STATUS. The values are described in GSM TS 11.11 *[18]* and ETSI TS 102 221 *[50]*. |
| <data> | String | Information which shall be written to the SIM (hexadecimal character format; see the *+CSCS* - 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]* and ETSI TS 102 221 *[50]*):<br>• 0x90 0x00: normal ending of the command<br>• 0x9F 0xXX: length XX of the response data<br>• 0x92 0x0X: command successful but after using an internal retry routine X times<br>• 0x92 0x40: memory problem<br>• 0x94 0x00: no EF selected<br>• 0x94 0x02: out of range (invalid address)<br>• 0x94 0x04: file ID not found; pattern not found<br>• 0x94 0x08: file is inconsistent with the command<br>• 0x98 0x02: no CHV initialized<br>• 0x98 0x04: access condition not fullfiled / unsucc. CHV verify / authent.failed<br>• 0x98 0x08: in contradiction with CHV status<br>• 0x98 0x10: in contradiction with invalidation status<br>• 0x98 0x40: unsucc. CHV-verif. or UNBLOCK CHV-verif. / CHV blocked /UNBL.blocked<br>• 0x98 0x50: increase cannot be performed. Max. value reached<br>• 0x67 0xXX: incorrect parameter P3<br>• 0x6A 0x81: function not supported<br>• 0x6A 0x82: file not found<br>• 0x6B 0xXX: incorrect parameter P1 or P2<br>• 0x6D 0xXX: unknown instruction code given in the command<br>• 0x6E 0xXX: wrong instruction class given in the command<br>• 0x6F 0xXX: technical problem with no diagnostic given |
| <response> | String | The response of successful completion of the command previously issued (hexadecimal character format; see the *+CSCS*). STATUS and GET RESPONSE return data, which gives information about the current elementary datafield. This information includes the type of file and its size (see the GSM TS 11.11 *[18]* and the ETSI TS 102 221 *[50]*). 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. |

Objective Specification

## 16.3 Read the SIM language +CLAN

| +CLAN | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| | LISA-U SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 16.3.1 Description

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.

### 16.3.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Read | AT+CLAN? | +CLAN: <code> | +CLAN: "en" |
| | | OK | OK |
| Test | AT+CLAN=? | OK | |

### 16.3.3 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 |

## 16.4 Check for UICC card +UUICC

| +UUICC | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| | LISA-U SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 16.4.1 Description

Returns the type of application which is present on the ICC or UICC.

### 16.4.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Read | AT+UUICC? | +UUICC: <state> | +UUICC: 1 |
| | | OK | OK |

### 16.4.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <state> | Number | • 0: 2G SIM (SIM application present)<br>• 1: 3G SIM (USIM application present) |

Objective Specification

## 16.5 Customer service profile +UCSP

| +UCSP | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| | LISA-U SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

### 16.5.1 Description

Reads the customer service profile (CSP) from the SIM. The CSP indicates the services that are user accessible.

The syntax +UCSP (if the <service_group> parameter is not issued) displays all the service groups.

If CSP information is not available on the SIM, the "+CME ERROR: SIM Failure" error result code is returned when trying to interrogate all or one of the service groups.

### 16.5.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UCSP[=<service group>] | +UCSP: <service_group>,<services> | AT+UCSP=6 |
| | | [+UCSP: <service_group>,<services> | +UCSP=6,10000000 |
| | | [...]] | OK |
| | | OK | |
| Test | AT+UCSP=? | +UCSP: (list of supported <service group>s) | +UCSP: (1-9,c0,d5) |
| | | OK | OK |

### 16.5.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <service_group> | Number | Service group (1-9, c0, d5) |
| <services> | Number | Services of one service group in bit-format beginning with the most significant bit of the service byte |

## 16.6 SIM hot insertion configuration +UDCONF=50

| +UDCONF=50 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

### 16.6.1 Description

Configures the SIM hot insertion feature. If enabled, the module is able to monitor the electric line which signals the insertion and removal of a SIM card and behaves accordingly, triggering registration and deregistration.

The command setting is saved in NVM and will be effective at the next power on.

For the correct behavior of the SIM hot insertion feature, the SIM card detection feature (configurable through the *+UGPIOC* AT command where supported) must be enabled too.

### 16.6.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UDCONF=50,<sim_hot_insertion> | OK | AT+UDCONF=50,1 |
| | | | OK |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| Read | AT+UDCONF=50 | +UDCONF: 50,<sim_hot_insertion><br>OK | AT+UDCONF=50<br>+UDCONF: 50,1<br>OK |

### 16.6.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <sim_hot_insertion> | Number | SIM hot insertion setting. Allowed values:<br>• 0 (factory-programmed value): SIM hot insertion disabled<br>• 1: SIM hot insertion enabled |

### 16.6.4 Notes

**TOBY-L2**

- If the SIM hot insertion feature is disabled, the SIM detection feature (see the *+UGPIOC* command) is available and, if enabled, reports the URC in relation to the bare level of the SIM detection pin.

## 16.7 UICC application discovery +CUAD

| +CUAD | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U201 SARA-U260-03S SARA-U270-03S SARA-U270-53S SARA-U280-03S | | | | | |
| | SARA-G340-02S SARA-G350-02A SARA-G350-02S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 16.7.1 Description

Asks the MT to discover what applications are available for selection on the UICC. According to ETSI TS 102.221 *[92]*, the ME shall access and read the $EF_{DIR}$ file in the UICC and return the values that are stored in its records. Each record contains the AID and optionally application parameters of one of the applications available on the UICC.

If the optional parameter(s) are requested and the $EF_{DIR}$ file is not present in the UICC, the <response> parameter shall be empty.

### 16.7.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CUAD[=<option>]<br>OK | +CUAD: <response>[,<active_application>[,<AID>]]<br>OK | AT+CUAD=1<br>+CUAD: 61124F10A000000 0871002FFFFFFFF89060400 FFFFFFFFFFFFFFFFFFFFFFFFFFFF9000,2,A0000 000871002FFFFFFFF89060400FF<br>OK |
| Test | AT+CUAD=? | +CUAD: (list of supported <option>s)<br>OK | +CUAD: (0,1)<br>OK |

### 16.7.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <option> | Number | • 0 (default value): no parameters requested in addition to <response><br>• 1: include <active_application> |
| <response> | String | Content of the $EF_{DIR}$ in hexadecimal format |
| <active_application> | Number | Active application:<br>• 0: no SIM or USIM active<br>• 1: active application is SIM |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 2: active application is USIM, followed by <AID> |
| <AID> | String | AID of active USIM in hexadecimal format |

# 16.8 Open logical channel +CCHO

| +CCHO | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U201 SARA-U260-03S SARA-U270-03S SARA-U270-53S SARA-U280-03S | | | | | |
| | SARA-G340-02S SARA-G350-02A SARA-G350-02S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 16.8.1 Description

Causes the MT to return <sessionid> to allow the TE to identify a channel that is being allocated by the currently selected UICC, which is attached to ME. The currently selected UICC will open a new logical channel, select the application identified by the <dfname> received with this command and return a session Id as the response. The ME shall restrict the communication between the TE and the UICC to this logical channel.

This <sessionid> is to be used when sending commands with *+CRLA* or *+CGLA* commands.

## 16.8.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CCHO=<dfname> | +CCHO: <sessionid><br>OK | AT+CCHO="A0000000871004FF49FF0589"<br>+CCHO: 11791<br>OK |
| Test | AT+CCHO=? | OK | |

## 16.8.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <dfname> | Number | DF name, coded on 1 to 16 bytes, identifying the UICC application. |
| <sessionid> | Number | Session Id to be used to target a specific application on the smart card using logical channel mechanism. |

# 16.9 Close logical channel +CCHC

| +CCHC | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U201 SARA-U260-03S SARA-U270-03S SARA-U270-53S SARA-U280-03S | | | | | |
| | SARA-G340-02S SARA-G350-02A SARA-G350-02S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 16.9.1 Description

Asks the ME to close a communication session with the active UICC. The ME shall close the previously opened logical channel. The TE will no longer be able to send commands on this logical channel. The UICC will close the logical channel when receiving this command.

## 16.9.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CCHC=<sessionid> | +CCHC<br>OK | AT+CCHC=11791<br>+CCHC |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | | OK |
| Test | AT+CCHC=? | OK | |

### 16.9.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <sessionid> | Number | Session Id to be used to target a specific application on the smart card using logical channel mechanism. |

## 16.10 Generic UICC logical channel access +CGLA

| +CGLA | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U201 SARA-U260-03S SARA-U270-03S SARA-U270-53S SARA-U280-03S | | | | | |
| | SARA-G340-02S SARA-G350-02A SARA-G350-02S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 16.10.1 Description

Transmits to the MT the <command> that shall be sent as it is to the selected UICC. In the same manner the UICC <response> shall be sent back by the MT to the TA as it is.

The command allows a direct control of the currently selected UICC by an application on the TE. The TE shall then take care of processing UICC information within the frame specified by GSM/UMTS networks.

Although the command allows the TE to take control over the UICC-MT interface, there are some functions of the UICC-MT interface that logically do not need to be accessed from outside the TA/MT. Moreover, for security reason the GSM network authentication should not be handled outside the TA/MT.

Compared to the *+CRLA* command, the definition of +CGLA allows TE to take more control over the UICC-MT interface. The locking and unlocking of the interface may be done by a special <command> value or automatically by TA/MT (by interpreting <command> parameter). If the TE application does not use the unlock command (or does not send a <command> causing automatic unlock) in a certain timeout value, the MT may release the locking.

### 16.10.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CGLA=<sessionid>,<length>,<command> | +CGLA: <length>,<response><br>OK | |
| Test | AT+CGLA=? | OK | |

### 16.10.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <sessionid> | Number | Identifier of the session to be used to send the APDU commands to the UICC. It is mandatory to send the commands to the UICC when targeting applications on the smart card using a logical channel other than the default channel (channel "0") |
| <length> | Number | Length of the characters that are sent to TE in <command> or <response> (two times the actual length of the command or response) |
| <command> | String | Command passed on by the MT to the UICC in the format as described in 3GPP TS 31.101 *[91]* (hexadecimal character format; see *Chapter 4.10*) |
| <response> | String | Response to the command passed on by the UICC to the MT in the format as described in 3GPP TS 31.101 *[91]* (hexadecimal character format; see *Chapter 4.10*) |

Objective Specification

# 16.11 Restricted UICC logical channel access +CRLA

| +CRLA | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U201 SARA-U260-03S SARA-U270-03S SARA-U270-53S SARA-U280-03S | | | | | |
| | SARA-G340-02S SARA-G350-02A SARA-G350-02S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 16.11.1 Description

By using this command instead of *+CGLA*, the TE application has easier but more limited access to the UICC database. The set command transmits to the MT the UICC <command> and its required parameters. The MT internally handles, for the selected UICC, all the UICC-MT interface locking and file selection routines. As response to the command, the MT sends the actual UICC information parameters and response data. An MT error result code may be returned when the command cannot be passed to the UICC, but the failure in the execution of the command in the UICC is reported in <sw1> and <sw2> parameters.

## 16.11.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CRLA=<sessionid>,<command>[,<fileid>[,<P1>,<P2>,<P3>[,<data>[,<pathid>]]]] | +CRLA: <sw1>,<sw2>[,<response>]<br>OK | AT+CRLA=11791,176,28419,0,0,256<br>+CRLA: 144,0,800<br>D746573742E33677070<br>2E636F6DFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF<br>OK |
| Test | AT+CRLA=? | OK | |

## 16.11.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <sessionid> | Number | Identifier of the session to be used to send the APDU commands to the UICC. It is mandatory to send commands to the UICC when targeting applications on the smart card using a logical channel other than the default channel (channel "0"). |
| <command> | Number | Command passed on by the MT to the UICC, refer to 3GPP TS 31.101 *[91]*:<br>• 176: READ BINARY<br>• 178: READ RECORD<br>• 192: GET RESPONSE<br>• 214: UPDATE BINARY<br>• 220: UPDATE RECORD<br>• 242: STATUS<br>• 203: RETRIEVE DATA<br>• 219: SET DATA |
| <fileid> | Number | Identifier of an elementary datafile on UICC. Mandatory for every command except STATUS. The values are described in ETSI TS 102.221 *[92]*. The range depends on the actual UICCand is defined in 3GPP TS 31.101 *[91]*. |
| <P1> | Number | Parameter passes on by the MT to the UICC. The values are described in 3GPP TS 31.101 *[91]*. Mandatory for every command except GET RESPONSE and STATUS. |
| <P2> | Number | Parameter passes on by the MT to the UICC. The values are described in 3GPP TS 31.101 *[91]*. Mandatory for every command except GET RESPONSE and STATUS. |
| <P3> | Number | Parameter passes on by the MT to the UICC. The values are described in 3GPP TS 31.101 *[91]*. Mandatory for every command except GET RESPONSE and STATUS. |
| <data> | String | Information which shall be written to the SIM (hexadecimal character format; see *Chapter 4.10*) |
| <pathid> | String | Contains the path of an elementary file on the UICC in hexadecimal format. This parameter shall only be used in the mode "select by path from current DF" as defined in ETSI TS 102.221 *[92]*. |
| <sw1> | Number | Information from the UICC about the execution of the actual command. This parameter is delivered to the TE in both cases, on successful or failed execution of the command. |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| <sw2> | Number | Additional information depending on <sw1>. This parameter is delivered to the TE in both cases, on successful or failed execution of the command. |
| <response> | String | Response of a successful completion of the command previously issued (hexadecimal character format; see *Chapter 4.10*). The STATUS and GET RESPONSE return data, which gives information about the current elementary datafield. This information includes the type of file and its size (see 3GPP TS 31.101 *[91]*). After the READ BINARY, READ RECORD or RETRIEVE DATA command the requested data will be returned. The parameter is not returned after a successful UPDATE BINARY, UPDATE RECORD or SET DATA command. |

# 16.12 SIM states reporting +USIMSTAT

| +USIMSTAT | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U201 SARA-U260-03S SARA-U270-03S SARA-U270-53S SARA-U280-03S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

## 16.12.1 Description

Configures the +UUSIMSTAT URC presentation. Based on the configuration, the URC is able to report the SIM card initialization status, the phonebook initialization status and the REFRESH proactive command execution result.

If <state> 9 and 10 are reported, update all SIM card related parameters cached in the DTE's application (e.g. the IMSI retrieved with *+CIMI* command).

## 16.12.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+USIMSTAT=<mode> | OK | AT+USIMSTAT=3<br>OK |
| Read | AT+USIMSTAT? | +USIMSTAT: <mode><br>OK | +USIMSTAT: 3<br>OK |
| Test | AT+USIMSTAT=? | +USIMSTAT: (list of supported <mode>s)<br>OK | +USIMSTAT: (0-7)<br>OK |
| URC | | +UUSIMSTAT: <state> | +UUSIMSTAT: 8 |

## 16.12.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | Bitmask representing which indications the +UUSIMSTAT URC is allowed to report.<br>See *Table 16* for the meaning of each bit. The factory-programmed value is 0. |
| <state> | Number | • 0: SIM card not present<br>• 1: PIN needed<br>• 2: PIN blocked<br>• 3: PUK blocked<br>• 4: (U)SIM not operational<br>• 5: (U)SIM in restricted use (FDN or BDN active)<br>• 6: (U)SIM operational (registration may be initiated)<br>• 7: SIM phonebook ready to be used (when the SIM application is active)<br>• 8: USIM phonebook ready to be used (when the USIM application is active)<br>• 9: (U)SIM toolkit REFRESH proactive command successfully concluded<br>• 10: (U)SIM toolkit REFRESH proactive command unsuccessfully concluded<br>• 11: PPP connection active, (U)SIM toolkit REFRESH proactive command delayed till PPP deactivation<br>• 12: voice call active, (U)SIM toolkit REFRESH proactive command delayed till call release<br>• 13: CSD call active, (U)SIM toolkit REFRESH proactive command delayed till call release |

Objective Specification

### 16.12.4 Notes

- <state>=9 and 10 will not be reported when dedicated (*+CFUN=6*) or raw (*+CFUN=9*) mode is active.
- *Table 16* provides the meaning of each bit with the corresponding state:

| Bit | States reported |
|---|---|
| 0 | Reports the (U)SIM initialization status (<state>'s from 0 to 6 may be reported) |
| 1 | Reports the (U)SIM phonebook initialization status (<state>'s from 7 to 8 may be reported) |
| 2 | Reports the (U)SIM toolkit REFRESH proactive command execution result (<state>'s from 9 to 10 may be reported) |

**Table 16: <mode> bitmask meaning**

**LISA-U200-03S / LISA-U200-83S / LISA-U201 / SARA-U260-03S / SARA-U270-03S / SARA-U270-53S / SARA-U280-03S**

- <state>=11, 12 and 13 are not reported.

## 16.13 Answer To Reset contents +USIMATR

| +USIMATR | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-U201 SARA-U270-53S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 16.13.1 Description

Returns the actual content of the ATR (Answer To Reset).

### 16.13.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | AT+USIMATR | +USIMATR: <atr><br>OK | +USIMATR: "3B9E96803FC3A08031E073FE211B630801140F9000D3"<br>OK |

### 16.13.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <atr> | String | ATR contents, see the ETSI TS 102.221 *[92]*. |

### 16.13.4 Notes

- The command needs of the SIM to correctly work.

Objective Specification

# 17 SIM toolkit

## 17.1 Introduction

SIM Application Toolkit (STK) is the 3GPP standard feature that allows the Subscriber Identity Module (SIM) to handle the DCE, also by giving commands such as displaying menus and/or asking for user input, and control its access to the network.

Once the SIM toolkit interface has been enabled via *AT+CFUN* command, the DTE is notified SIM toolkit commands and events and can interact with the SIM through appropriate STK AT commands.

SIM toolkit processing supports two modes: dedicated and raw. In dedicated mode, the DTE is notified of STK commands and events after decoding; in raw mode the DTE receives the raw data as received from the SIM. Only one mode can be enabled and function at a time.

The activation of the SIM toolkit interface can be done with:

- AT+CFUN=6 for enabling dedicated mode,
- AT+CFUN=9 for enabling raw mode.

For more details on the command description and parameters, see 3GPP TS 51.014 *[44]*.

After the activation of the SIM toolkit interface, the setup menu may be displayed via URC (*+STKPRO*, *+UCATPROI* or *+URCATI* depending on module and mode) when available from the SIM (immediately at SIM initialization or after PIN insertion).

The setup menu fetched from the SIM card may vary with the terminal profile supported by the MT, which is affected by the capabilities of the module itself (e.g. speech): this implies that different u-blox modules may display different setup menus with the same SIM card.

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

If an AT command related to the dedicated mode is used when the raw mode is enabled (and vice versa), an error result code ("+CME ERROR: operation not allowed" if *+CMEE* is set to 2) is returned.

The STK commands related to the Bearer Independent Protocol, i.e. Open Channel, Close Channel, Receive Data, Send Data, Get Channel Status and the events Data Available and Channel Status, are autonomously managed by the device without the intervention from the TE, unless the dedicated mode is active and the Open Channel command requires the user intervention (see ETSI TS 102 223 *[51]*).

In dedicated mode, if the Alpha Identifier is present in the STK command, the *+STKPRO* or *+UCATPRON* URC will be issued, depending on module.

In dedicated mode, when the user intervention is required, the terminal response shall be entered via *+STKTR* or *+UCATTR* command in order to proceed with or to terminate the proactive session.

Where supported, the *+UUBIP* URC may be enabled to monitor the BIP session.

## 17.2 Terminal profile +STKPROF

| +STKPROF | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U SARA-U | | | | | |
| | SARA-G LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

### 17.2.1 Description

Allows reading and changing the terminal profile (list of SIM Application Toolkit facilities supported by the terminal, see ETSI TS 102 223 *[51]*) data stored in NVM and used only at the SIM initialization. The SIM card

Objective Specification

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.

The command can be used only if the SIM toolkit interface is enabled in dedicated mode.

### 17.2.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+STKPROF=<length>,<data> | OK | AT+STKPROF=2,"1F7F"<br>OK |
| Read | AT+STKPROF? | +STKPROF: <length>,<data><br>OK | +STKPROF:17,"FFFFFFFF7F0300DF7F00000000010A0003"<br>OK |
| Test | AT+STKPROF=? | OK | |

### 17.2.3 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 |

### 17.2.4 Notes

- <length> set to 0 forces a reset to the default terminal profile stored in the MT.

## 17.3 Proactive command in dedicated mode +STKPRO

| +STKPRO | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U SARA-U | | | | | |
| | SARA-G LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | Yes | No | No | - | - |

### 17.3.1 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.

During the STK transactions, if the STK interface has been activated in dedicated mode, the URC +STKPRO displays every proactive command.

### 17.3.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Test | AT+STKPRO=? | +STKPRO: (list of supported <proactive_cmd>s)<br>OK | +STKPRO: (01,05,16,17,18,19,20,32,33,34,35,36,37,38,40,52,53)<br>OK |
| **Generic syntax** | | | |
| URC | | +STKPRO: <proactive_cmd>,... | |
| **Refresh** | | | |
| URC | | +STKPRO: 01,<type>,<number of files>,<files> | |
| **Set up event list** | | | |
| URC | | +STKPRO: 05,<event_list> | |
| **Set up call** | | | |
| URC | | +STKPRO: 16,<number>,<subaddr>,<type>,<alpha_1>,<icon_id1>,<alpha_2>,<icon_id2> | |
| **Send SS** | | | |
| URC | | +STKPRO: 17,<ss_data>,<alpha>,<icon_id>,<ref_number> | |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| **Send USSD** | | | |
| URC | | +STKPRO: 18,<dcs>,<hex_string>,<alpha>,<icon_id>,<ref_number> | |
| **Send SMS** | | | |
| URC | | +STKPRO: 19,<alpha>,<icon_id>,<ref_number> | |
| **Send DTMF** | | | |
| URC | | +STKPRO: 20,<alpha>,<icon_id>,<dtmf_string> | |
| **Play tone** | | | |
| URC | | +STKPRO: 32,<tone>,<unit>,<interval>,<alpha>,<icon_id> | |
| **Display text** | | | |
| URC | | +STKPRO: 33,<type>,<dcs>,<hex_string>,<icon_id>,<imm_resp> | |
| **Get inkey** | | | |
| URC | | +STKPRO: 34,<type>,<dcs>,<hex_string>,<icon_id> | |
| **Get input** | | | |
| URC | | +STKPRO: 35,<type>,<dcs>,<hex_string>,<max_rsp_len>,<min_rsp_len>,<default_text>,<icon_id> | |
| **Select item** | | | |
| URC | | +STKPRO: 36,<type>,<alpha>,<item_id>,<total_items>,<item_text>,<next_action>,<default_item>,<icon_id>,<icon_id_list_element> | |
| **Set up menu** | | | |
| URC | | +STKPRO: 37,<type>,<alpha>,<item_id>,<total_items>,<item_text>,<next_action>,<icon_id>,<icon_id_list_element> | |
| **Provide local info** | | | |
| URC | | +STKPRO: 38,<type> | |
| **Set up idle mode text** | | | |
| URC | | +STKPRO: 40,<dcs>,<hex_string>,<icon_id> | |
| **Run AT command** | | | |
| URC | | +STKPRO: 52,<type>,<alpha>,<icon_id>,<at_command> | |
| **Language notification** | | | |
| URC | | +STKPRO: 53,<language> | |
| **Open channel** | | | |
| URC | | +STKPRO: 64,<type>,<alpha>,<icon_id>,<bearer_type>,<bearer_parameters>,<buffer_size>,<network_access_name>,<login_dcs>,<login_text>,<password_dcs>,<password_text>,<transport_type>,<transport_port>,<destination_address_type>,<destination_address> | |
| **Close channel** | | | |
| URC | | +STKPRO: 65,<type>,<channel_id>,<alpha>,<icon_id> | |
| **Receive data** | | | |
| URC | | +STKPRO: 66,<type>,<channel_id>,<alpha>,<icon_id>,<channel_data_length> | |
| **Send data** | | | |
| URC | | +STKPRO: 67,<type>,<channel_id>,<alpha>,<icon_id>,<channel_data> | |

### 17.3.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <proactive_cmd> | Number | Proactive command (see ETSI TS 102 223 [51]) |
| <alpha>, <alpha_1>, <alpha_2> | String | Alpha identifier (used in several proactive commands, see ETSI TS 102 223 [51]) |
| <default_text> | String | Default text for the GET INPUT command (see ETSI TS 102 223 [51]) |
| <dcs> | Number | Data coding scheme |
| <default_item> | Number | Indication of the default item (see ETSI TS 102 223 [51]) |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| <dtmf_string> | String | DTMF tones coded in BCD (same format as the dialling number string defined for $EF_{ADN}$ in 3GPP TS 51.011 [18]) |
| <event list> | Number | Bitmask representing the list of events. See the Table 17 for the meaning of each bit. |
| <hex_string> | String | Hexadecimal string (the coding is specified in the <dcs> parameter) |
| <icon_id>,<icon_id1>, <icon_id2> | Number | Icon identifier |
| <icon_id_list_element> | Number | Item icon identifier |
| <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 | Two bytes string indicating the language |
| <max rsp len> | Number | Maximum response length |
| <min rsp len> | Number | Minimum response length |
| <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 ETSI TS 102 223 [51]) |
| <number> | String | Called party number |
| <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<br>• 02: call subscriber busy<br>• 03: congestion<br>• 04: radio path acknowledge<br>• 05: radio path not available<br>• 06: error / special information<br>• 07: call waiting tone<br>• 08: ringing tone<br>• 10: general beep<br>• 11: positive acknowledgement tone<br>• 12: negative acknowledgement or error tone |
| <total_items> | Number | Total number of the menu items |
| <unit> | Number | • 0: minutes<br>• 1: seconds<br>• 2: tenth of seconds |
| <at_command> | String | AT command string |
| <bearer_type> | Number | Bearer type (see ETSI TS 102 223 [51]) |
| <bearer_parameters> | String | Bearer parameters (see ETSI TS 102 223 [51]) |
| <buffer_size> | Number | Buffer size (see ETSI TS 102 223 [51]) |
| <network_access_ name> | String | Network access name (see ETSI TS 102 223 [51]) |
| <transport_type> | Number | Transport protocol type (see ETSI TS 102 223 [51]) |
| <transport_port> | Number | Port number type (see ETSI TS 102 223 [51]) |
| <destination_address_ type> | Number | Type of address (see ETSI TS 102 223 [51]) |
| <destination_address> | String | Address (see ETSI TS 102 223 [51]) |
| <channel_id> | Number | Channel identifier (see ETSI TS 102 223 [51]) |
| <channel_data_length> | Number | Channel data length (see ETSI TS 102 223 [51]) |
| <channel_data> | String | Channel data (see ETSI TS 102 223 [51]) |

## 17.3.4 Notes

| Bit | Event description |
|---|---|
| 0 | MT call |
| 1 | Call connected |

Objective Specification

| Bit | Event description |
|---|---|
| 2 | Call disconnected |
| 3 | Location status |
| 4 | User activity |
| 5 | Idle screen available |
| 6 | Card reader status |
| 7 | Language selection |
| 8 | Browser termination |
| 9 | Data available |
| 10 | Channel status |
| 11 | Access Technology Change |
| 12 | Display parameters changed |
| 13 | Local connection |
| 14 | Network Search Mode Change |
| 15 | Browsing status |

**Table 17: Event list bit description**

### SARA-G / LEON-G

- <proactive_cmd>=52 is not supported.

# 17.4 Terminal response in dedicated mode +STKTR

| +STKTR | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U SARA-U | | | | | |
| | SARA-G LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | Yes | No | No | *< 20 s* | *+CME Error* |

## 17.4.1 Description

In dedicated mode, it allows entering response to a SIM Toolkit proactive command displayed by the *+STKPRO* URC.

If no response is entered, after a timeout of duration may range from 180 to 300 s, the module sends an autonomous terminal response to the SIM 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 3GPP TS 51.014 *[44]*).

The command must be always entered, to terminate the pending STK session at the MT-DTE interface, and to be able to enter additional STK commands.

The set command syntax depends on the <proactive_cmd> value.

## 17.4.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| **Generic syntax** | | | |
| Set | AT+STKTR=<proactive_cmd>[,<type>][,<result>,<add_result>[,<reference_number>][,<last_cmd>][,<dcs>][,<hex string>]] | OK | AT+STKTR=1,0<br>OK |
| **Refresh** | | | |
| Set | AT+STKTR=01,<result>[,<add_result>] | OK | |
| **Set up event list** | | | |
| Set | AT+STKTR=05,<result> | OK | |
| **Set up call** | | | |
| Set | AT+STKTR=16,<result>[,<add_result>] | OK | |
| **Send SS** | | | |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+STKTR=17,<result>,<add_result>[,<reference_number>] | OK | |
| **Send USSD** | | | |
| Set | AT+STKTR=18,<result>,<add_result>[,<reference_number>] | OK | |
| **Send SMS** | | | |
| Set | AT+STKTR=19,<result>,<add_result>[,<reference_number>] | OK | |
| **Send DTMF** | | | |
| Set | AT+STKTR=20,<result>[,<add_result>] | OK | |
| **Play tone** | | | |
| Set | AT+STKTR=32,<result>,<add_result> | OK | |
| **Display text** | | | |
| Set | AT+STKTR=33,<result>,<add_result> | OK | |
| **Get inkey** | | | |
| Set | AT+STKTR=34,<result>,<add_result>,0,<dcs>,<hex_string> | OK | |
| **Get input** | | | |
| Set | AT+STKTR=35,<result>,<add_result>,0,<dcs>,<hex_string> | OK | |
| **Select item** | | | |
| Set | AT+STKTR=36,<result>,<add_result>,0,<dcs>,<hex_string> | OK | |
| **Set up menu** | | | |
| Set | AT+STKTR=37,<result>,<add_result> | OK | |
| **Provide local info (language setting)** | | | |
| Set | AT+STKTR=38,<result>,<language> | OK | |
| **Set up idle mode text** | | | |
| Set | AT+STKTR=40,<result>,<add_result> | OK | |
| **Run AT command** | | | |
| Set | AT+STKTR=52,<result>,<add_result>,0,<dcs>,<hex_string> | OK | |
| **Language notification** | | | |
| Set | AT+STKTR=53,<result>,<add_result> | OK | |
| **Open channel** | | | |
| Set | AT+STKTR=64,<result> | OK | |
| Test | AT+STKTR=? | +STKTR: (list of supported <proactive_cmd> values)<br>OK | +STKTR: (01,05,16,17,18,19,20,32,33,34,35,36,37,38,40,52,53)<br>OK |

## 17.4.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <proactive_cmd> | Number | Proactive command (see ETSI TS 102 223 *[51]*) |
| <result> | Number | • 0: command successfully performed<br>• 1: command performed with partial comprehension<br>• 2: command performed with missing information<br>• 3: REFRESH performed with additional EFs read<br>• 4: command successfully performed, but the requested icon could not be displayed<br>• 5: command performed but modified by call control by SIM<br>• 6: command successfully performed, limited service<br>• 7: command performed with modification<br>• 16: proactive SIM session terminated by the user<br>• 17: backward move in the proactive SIM session requested by the user<br>• 18: no response from user<br>• 19: help information required by the user<br>• 20: USSD or SS transaction terminated by the user |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 32: MT currently unable to process command<br>• 33: network currently unable to process command<br>• 34: user did not accept call set-up request<br>• 35: user cleared down call before connection or network release<br>• 36: action in contradiction to the current timer state<br>• 37: interaction with call control by SIM, temporary problem<br>• 48: command beyond MT's capabilities<br>• 49: command type not understood by MT<br>• 50: command data not understood by MT<br>• 51: command number not known by MT<br>• 52: run AT command<br>• 53: SMS RP-ERROR<br>• 54: error, required values are missing<br>• 55: USSD return error<br>• 56: MultipleCard commands error, if class 'a' is supported<br>• 57: interaction with call control by SIM or MO short message control by SIM, permanent problem<br>• 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 | 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). The value depends on the indicated <dcs> value. The meaning of the parameter depends on the proactive command:<br>• Get input: the response string<br>• Get inkey: the response character<br>• Select item: identifier of an item within a list<br>• Run AT command: the response to the AT command requested by the SIM |
| <language> | String | Decimal value of the ISO 639 language code. E.g. German language is coded as "de" in ISO 639. Thus 0x6465 has to be converted in decimal: <language>=25701 |
| <last_cmd> | Number | Obsolete parameter, to be set to 0 |

### 17.4.4 Notes

- *0 stands for the obsolete parameter <last_cmd>.

**LISA-U / SARA-U**

- <reference_number> is not supported.

**SARA-G / LEON-G**

- <proactive_cmd>=53 is not supported; in this case, the terminal response is automatically sent by the MT.

## 17.5 Proactive session status in dedicated mode +STKCNF

| +STKCNF | |
|---|---|
| **Modules** | LISA-U SARA-U |
| | SARA-G LEON-G |

### 17.5.1 Description

In dedicated mode, the URC +STKCNF displays the SIM card's toolkit application reply to a Terminal Response command or an Envelope command.

### 17.5.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| URC | | +STKCNF: <proactive_cmd>,<result>,<add_result>,<sw1> | +STKCNF: 37,0,255,144 |

Objective Specification

### 17.5.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <proactive_cmd> | Number | • 01: refresh<br>• 05: set up event list<br>• 16: set up call<br>• 17: send SS<br>• 18: send USSD<br>• 19: send SMS<br>• 20: send DTMF<br>• 32: play tone<br>• 33: display text<br>• 34: get inkey<br>• 35: get input<br>• 36: select item<br>• 37: set up menu<br>• 38: provide local info<br>• 40: set up idle mode text<br>• 52: run AT command<br>• 53: language notification<br>• 64: open channel<br>• 65: close channel<br>• 66: receive data<br>• 67: send data |
| <result> | Number | General result code (see ETSI TS 102 223 [51]) |
| <add_result> | Number | Additional information code (see ETSI TS 102 223 [51]). If no additional information is available 255 is returned |
| <sw1> | Number | Byte indicating the status of the UICC/SIM at the end of a command.<br>• 144: command executed successfully<br>• For other responses see 3GPP TS 51.011 [18] |

## 17.6 Bearer Independent Protocol status indication +UBIP

| +UBIP | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U201 SARA-U260-03S SARA-U270-03S SARA-U270-53S SARA-U280-03S | | | | | |
| | SARA-G340-02S SARA-G350-02A SARA-G350-02S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

### 17.6.1 Description

Configures the Bearer Independent Protocol status indication, i.e. the +UUBIP URC presentation.

Verify that the BIP related proactive commands and events are supported (see the *+STKPROF* command).

### 17.6.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UBIP=<mode> | OK | AT+UBIP=1<br>OK |
| Read | AT+UBIP? | +UBIP: <mode><br>OK | +UBIP: 0<br>OK |
| Test | AT+UBIP=? | +UBIP: (list of supported <mode>'s)<br>OK | +UBIP: (0,1)<br>OK |
| URC | | +UUBIP: <ev_cmd>,<val> | +UUBIP: 10,261 |

Objective Specification

### 17.6.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | Indicates whether the +UUBIP URC is enabled or not:<br>• 0 (factory-programmed value): BIP status indication disabled<br>• 1: BIP status indication enabled |
| <ev_cmd> | Number | Indicates the event download's tag or proactive command's tag. Allowed values:<br>• 10: Channel status event<br>• 64: Open channel proactive command<br>• 65: Close channel proactive command<br>• 66: Receive data proactive command<br>• 67: Send data proactive command |
| <val> | Number | Indicates the channel status (in case of the event download channel status) or result in case of a proactive command (see ETSI TS 102 223 *[51]*) |

## 17.7 Default BIP APN configuration +UBIPAPN

| +UBIPAPN | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-U201 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

### 17.7.1 Description

Configures the default BIP APN which will be used when the Open Channel command does not include the Network Access Name parameter or when the Network Access Name parameter is null.

### 17.7.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UBIPAPN=<APN> | OK | AT+UBIPAPN="APN_name"<br>OK |
| Read | AT+UBIPAPN? | +UBIPAPN: <APN><br>OK | +UBIPAPN: "APN_name"<br>OK |

### 17.7.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <APN> | String | Default Access Point Name for BIP service. The factory-programmed value is an empty string. |

## 17.8 Envelope in dedicated mode +STKENV

| +STKENV | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U SARA-U | | | | | |
| | SARA-G LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | *< 20 s* | *+CME Error* |

### 17.8.1 Description

With the SIM toolkit interface enabled in dedicated mode, it allows encoding and sending an STK envelope command to the SIM.

### 17.8.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+STKENV=<envelope_cmd>,<opt_ENV_data1>,<opt_ENV_data2> | OK | AT+STKENV=211,01<br>OK |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| Test | AT+STKENV=? | +STKENV: (list of supported <envelope_cmd>)<br>OK | +STKENV: 211,214<br>OK |

### 17.8.3 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)<br>• 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:<br>• If <envelope_cmd>=211, "item identifier"<br>• If <envelope_cmd>=214 (event list),<br>o 4: user activity<br>o 5: idle screen available<br>o 7: language selection<br>o 8: browser termination |
| <opt_ENV_data2> | Number | Meaning depends on the chosen envelope command:<br>• If <envelope_cmd>=211, "help requested" with the following encoding:<br>o 0: help is not requested<br>o 1: help is requested<br>• If <envelope_cmd>=214 and <opt_ENV_data1>=7, "currently used language in the DTE" (see AT+STKTR=38) |

## 17.9 Call and short message control in dedicated mode +STKCC

| +STKCC | |
|---|---|
| **Modules** | LISA-U SARA-U |
| | SARA-G LEON-G |

### 17.9.1 Description

In dedicated mode, the URC +STKCC reports indications of the call control and short message control by SIM (see 3GPP TS 51.014 [44]).

### 17.9.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| URC | | +STKCC: <cc_command>,<res_val>,<alpha>,<param1>[,<sc_addr>,<ton_npi>,<dest_addr>] | +STKCC: 1,0,"Calling","+3913456890" |

### 17.9.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <cc_command> | Number | • 1: set up call<br>• 2: send SS<br>• 3: send USSD<br>• 4: send SMS |
| <res_val> | Number | Call control result value<br>• 00: Allowed, no modification<br>• 01: Not allowed<br>• 02: Allowed with modification |
| <alpha> | String | |
| <param1> | String | • Called party number if <cc_command>=1<br>• Supplementary service string if <cc_command>=2 |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • USSD control string if <cc_command>=3<br>• Type of number and numbering plan if <cc_command>=4 |
| <sc_addr> | String | Service center address |
| <ton_npi> | Number | Type of number and numbering plan |
| <dest_addr> | String | Destination address |

# 17.10 Proactive command indication in raw mode +SATI

| +SATI | |
|---|---|
| **Modules** | LISA-U SARA-U |

## 17.10.1 Description

Communicates to the user the proactive command, in raw mode, coming from the SIM.

The module expects a terminal response to be sent; the user shall respond with *AT+SATR* for sending the terminal response.

## 17.10.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| URC | | +SATI: <text> | +SATI: "D020810301250082028182050C53544B2D4A617661436172648F030141411E020001" |

## 17.10.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <text> | String | Raw proactive command data expressed in Hex value |

# 17.11 Proactive command notification in raw mode +SATN

| +SATN | |
|---|---|
| **Modules** | LISA-U SARA-U |

## 17.11.1 Description

Sends the proactive command in raw mode to the user in case the module handles the proactive command.

For this URC, the module does not expect any terminal response from the user, since the terminal response to SIM is autonomously sent by the device.

## 17.11.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| URC | | +SATN: <text> | +SATN: "D01A8103011000820281830 50A63616C6C696E672E2E2E860 38121F3" |

## 17.11.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <text> | String | Raw proactive command data expressed in Hex value |

Objective Specification

# 17.12 Send terminal response in raw mode +SATR

| +SATR | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | *< 20 s* | *+CME Error* |

## 17.12.1 Description

In raw mode only, it is used to send the terminal response to the SIM after the URC *+SATI* has been received by the user.

## 17.12.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+SATR=<text> | OK | AT+SATR="810301240082028281830100900101"<br>OK |

## 17.12.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <text> | String | Raw terminal response data expressed in Hex value |

# 17.13 Terminal response confirmation in raw mode +SATF

| +SATF | |
|---|---|
| **Modules** | LISA-U SARA-U |

## 17.13.1 Description

In raw mode, it provides the response to a terminal response (sent by the user or automatically by the module) from the SIM.

## 17.13.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| URC | | +SATF: <sw1>,<sw2> | +SATF: 144,0 |

## 17.13.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <sw1> | Number | Status of the last response<br>• 144 (0x90): command successfully executed<br>• 0: command to SIM was suppressed because of multiple terminal response or wrong client<br>For other responses see 3GPP TS 51.011 [*18*]. |
| <sw2> | Number | The second status byte specifies additional information depending on <sw1> |

# 17.14 User confirmation for setup call in raw mode +SATD

| +SATD | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | *< 20 s* | *+CME Error* |

## 17.14.1 Description

In raw mode only, the set command is used for the user confirmation required by the SET UP CALL proactive command. The user can accept the call or reject the call.

The set command is used as response to the *+SATN* URC sent to the user for SET UP CALL Proactive command.

Objective Specification

### 17.14.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+SATD=<user_confirmation> | OK | AT+SATD=1<br>OK |
| Test | AT+SATD=? | +SATD: (list of supported <user_confirmation>'s)<br>OK | +SATD: (0,1)<br>OK |

### 17.14.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <user_confirmation> | Number | • 0: reject the call<br>• 1: accept the call |

## 17.15 Envelope download in raw mode +SATE

| +SATE | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | *< 20 s* | *+CME Error* |

### 17.15.1 Description

In raw mode, it sends the raw envelope data to the SIM.

### 17.15.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+SATE=<text> | +SATE: <sw1>,<sw2>,<envelope_type>,<event_type><br>OK | AT+SATE="d30782020181900101"<br>+SATE: 145,111,211,255<br>OK |

### 17.15.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <text> | String | Raw envelope data expressed in Hex value |
| <sw1> | Number | Status of the last response:<br>• 0: command to SIM was suppressed because of multiple terminal response or wrong client<br>• 144 (0x90): command successfully executed<br>For other responses see 3GPP TS 51.011 *[18]*. |
| <sw2> | Number | Specifies the additional information depending on <sw1> |
| <envelope_type> | Number | • 211 (0xD3): menu selection<br>• 214 (0xD6): event download |
| <event_type> | Number | If <envelope_type>=214 (event list):<br>• 4: user activity<br>• 5: idle screen available<br>• 7: language selection |

## 17.16 Call and Short Message Control in Raw Mode +STKCTRLIND

| +STKCTRLIND | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | - |

### 17.16.1 Description

The test command lists the supported call and SMS control types.

Objective Specification

In raw mode, the URC +STKCTRLIND is an unsolicited indication for control actions performed by the SIM on mobile originated calls and short messages.

## 17.16.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Test | AT+STKCTRLIND=? | +STKCTRLIND: (range of supported <type>)<br>OK | +STKCTRLIND: (0-3)<br>OK |
| URC | | "set up call" type:<br>+STKCTRLIND: 0,<result>,<alpha_id>, <destination_address>,<destination_ address_type><br>"send SS" type:<br>+STKCTRLIND: 1,<result>,<alpha_id>, <destination_address>,<destination_ address_type><br>"send USSD" type:<br>+STKCTRLIND: 2,<result>,<alpha_id>, <dcs>, <data><br>"send SMS" type:<br>+STKCTRLIND: 3,<result>,<alpha_id>, <destination_address>,<destination_ address_type>,<service_center_address>, <service_center_address_type> | |

## 17.16.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <type> | Number | • 0: setup call<br>• 1: send SS<br>• 2: send USSD<br>• 3: send SMS |
| <result> | Number | • 0: the request is allowed without modifications<br>• 1: the request is not allowed. No action shall be performed<br>• 2: the request is modified, but allowed. The modified values shall be used<br>• 254: the toolkit is busy. The request shall be repeated later without taking any action in between<br>• 255: error happened |
| <alpha_id> | String | Alpha identifier |
| <destination_address> | String | Dialling number |
| <destination_address_ type> | Number | Type of number and numbering plan |
| <service_center_ address> | String | Service center address |
| <service_center_ address_type> | Number | Type of number and numbering plan |
| <dcs> | Number | Data Coding Scheme |
| <data> | String | USSD string |

Objective Specification

# 17.17 Terminal profile +UCATPROF

| +UCATPROF | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

## 17.17.1 Description

Allows reading and changing the current terminal profile (i.e. the list of SIM Application Toolkit facilities supported by the terminal, see ETSI TS 102 223 [*51*]) sent to the SIM card; if the terminal profile has changed, it is downloaded to the SIM card. Changes in the terminal profile are not persistent after reboot. 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.

## 17.17.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UCATPROF=<length>,<data> | OK | AT+UCATPROF=2,"1F7F"<br>OK |
| Read | AT+UCATPROF? | +UCATPROF: <length>,<data><br>OK | +UCATPROF:17,"FFFFFFFF7F0300DF7F00000000010A0003"<br>OK |
| Test | AT+UCATPROF=? | OK | |

## 17.17.3 Defined values

See *+STKPROF Defined values*.

# 17.18 Proactive command indication in dedicated mode +UCATPROI

| +UCATPROI | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

## 17.18.1 Description

In dedicated mode, during the STK transactions, the +UCATPROI URC displays proactive commands coming from the SIM that require a response from the user via *+UCATTR* command.

The test command displays the list of such proactive commands. Only the test command syntax is allowed.

## 17.18.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Test | AT+UCATPROI=? | +UCATPROI: (list of supported <proactive_cmd>s)<br>OK | +UCATPROI: (01,05,16,32,33,34,35,36,37,38,40,52,53,64)<br>OK |
| **Generic syntax** | | | |
| URC | | +UCATPROI: <proactive_cmd>,... | |
| **Refresh** | | | |
| URC | | +UCATPROI: 01,<type>,<number of files>,<files> | |
| **Set up event list** | | | |
| URC | | +UCATPROI: 05,<event_list> | |
| **Set up call** | | | |
| URC | | +UCATPROI: 16,<number>,<subaddr>,<type>,<alpha_1>, <icon_id1>,<alpha_2>,<icon_id2> | |
| **Play tone** | | | |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| URC | | +UCATPROI: 32,<tone>,<unit>,<interval>,<alpha>, <icon_id> | |
| **Display text** | | | |
| URC | | +UCATPROI: 33,<type>,<dcs>,<hex_string>,<icon_id>, <imm_resp> | |
| **Get inkey** | | | |
| URC | | +UCATPROI: 34,<type>,<dcs>,<hex_string>,<icon_id> | |
| **Get input** | | | |
| URC | | +UCATPROI: 35,<type>,<dcs>,<hex_string>, <max_rsp_len>,<min_rsp_len>,<default_text>,<icon_id> | |
| **Select item** | | | |
| URC | | +UCATPROI: 36,<type>,<alpha>,<item_id>,<total_items>, <item_text>,<next_action>,<default_item>, <icon_id>,<icon_id_list_element> | |
| **Set up menu** | | | |
| URC | | +UCATPROI: 37,<type>,<alpha>,<item_id>,<total_items>, <item_text>,<next_action>,<icon_id>,<icon_id_list_element> | |
| **Provide local info** | | | |
| URC | | +UCATPROI: 38,<type> | |
| **Set up idle mode text** | | | |
| URC | | +UCATPROI: 40,<dcs>,<hex_string>,<icon_id> | |
| **Run AT command** | | | |
| URC | | +UCATPROI: 52,<type>,<alpha>,<icon_id>,<at_command> | |
| **Language notification** | | | |
| URC | | +UCATPROI: 53,<language> | |
| **Open channel** | | | |
| URC | | +UCATPROI: 64,<alpha> | |

### 17.18.3 Defined values

See *+STKPRO*.

### 17.18.4 Notes

**TOBY-L200-00S / TOBY-L210-00S / TOBY-L210-60S / TOBY-L280-00S / MPCI-L200-00S / MPCI-L210-00S**

- <proactive_cmd>=64 is not supported.

## 17.19 Proactive command notification in dedicated mode +UCATPRON

| +UCATPRON | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

### 17.19.1 Description

In dedicated mode, during the STK transactions, the +UCATPRON URC displays proactive commands coming from the SIM that do not require a response from the user.

The test command displays the list of such proactive commands. Only the test command syntax is allowed.

### 17.19.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Test | AT+UCATPRON=? | +UCATPRON: (list of supported <proactive_cmd>s) | +UCATPRON: (17,18,19,20,37) |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | OK | OK |
| **Send SS** | | | |
| URC | | +UCATPRON: 17,<ss_data>,<alpha>,<icon_id> | |
| **Send USSD** | | | |
| URC | | +UCATPRON: 18,<dcs>,<hex_string>,<alpha>,<icon_id> | |
| **Send SMS** | | | |
| URC | | +UCATPRON: 19,<alpha>,<icon_id> | |
| **Send DTMF** | | | |
| URC | | +UCATPRON: 20,<alpha>,<icon_id>,<dtmf_string> | |
| **Set up menu** | | | |
| URC | | +UCATPRON: 37,<type>,<alpha>,<item_id>,<total_items>,<item_text>,<next_action>,<icon_id>,<icon_id_list_element> | |

### 17.19.3 Defined values

See *+STKPRO*.

## 17.20 Terminal response in dedicated mode +UCATTR

| +UCATTR | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | *< 20 s* | *+CME Error* |

### 17.20.1 Description

In dedicated mode, it allows entering the response to a SIM Toolkit proactive command displayed by the *+UCATPROI* URC.

If no response is entered, after a timeout whose duration may range from 180 to 300 s, the module sends an autonomous terminal response to the SIM 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 3GPP TS 51.014 [*44*]).

The command must be always entered, to terminate the pending STK session at the MT-DTE interface, and to be able to enter additional STK commands.

The set command syntax depends on the <proactive_cmd> value.

### 17.20.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| **Generic syntax** | | | |
| Set | AT+UCATTR=<proactive_cmd>[,<type>][,<result>,<add_result>[,<reference_number>][,<last_cmd>][,<dcs>][,<hex string>]] | OK | AT+UCATTR=1,0<br>OK |
| **Refresh** | | | |
| Set | AT+UCATTR=01,<result>[,<add_result>] | OK | |
| **Set up event list** | | | |
| Set | AT+UCATTR=05,<result> | OK | |
| **Set up call** | | | |
| Set | AT+UCATTR=16,<result>[,<add_result>] | OK | |
| **Play tone** | | | |
| Set | AT+UCATTR=32,<result>,<add_result> | OK | |
| **Display text** | | | |
| Set | AT+UCATTR=33,<result>,<add_result> | OK | |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| **Get inkey** | | | |
| Set | AT+UCATTR=34,<result>,<add_result>,0,<dcs>,<hex_string> | OK | |
| **Get input** | | | |
| Set | AT+UCATTR=35,<result>,<add_result>,0,<dcs>,<hex_string> | OK | |
| **Select item** | | | |
| Set | AT+UCATTR=36,<result>,<add_result>,0,<dcs>,<hex_string> | OK | |
| **Set up menu** | | | |
| Set | AT+UCATTR=37,<result>,<add_result> | OK | |
| **Provide local info (language setting)** | | | |
| Set | AT+UCATTR=38,<type>,<language> | OK | |
| **Set up idle mode text** | | | |
| Set | AT+UCATTR=40,<result>,<add_result> | OK | |
| **Run AT command** | | | |
| Set | AT+UCATTR=52,<result>,<add_result>,0,<dcs>,<hex_string> | OK | |
| **Language notification** | | | |
| Set | AT+UCATTR=53,<result>,<add_result> | OK | |
| **Open channel** | | | |
| Set | AT+UCATTR=64,<result>,<add_result> | OK | |
| Test | AT+UCATTR=? | +UCATTR: (list of supported <result>s)<br>OK | +UCATTR: (01,05,16,32,33,34,35,36,37,38,40,52,53,64)<br>OK |

### 17.20.3 Defined values

See *+STKTR Defined values*.

### 17.20.4 Notes

**TOBY-L200-00S / TOBY-L210-00S / TOBY-L210-60S / TOBY-L280-00S / MPCI-L200-00S / MPCI-L210-00S**

- <proactive_cmd>=64 is not supported.

## 17.21 Proactive Session Status in Dedicated Mode +UCATCNF

| +UCATCNF | |
|---|---|
| **Modules** | TOBY-L2 MPCI-L2 |

### 17.21.1 Description

In dedicated mode, the status of the STK proactive session is displayed using the +UCATCNF URC. The URC comes out after the *AT+UCATTR* or the *AT+UCATENV* command has been issued.

### 17.21.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| URC | | +UCATCNF: <proactive_cmd>,<result>,<add_result>,<sw1> | +UCATCNF: 37,0,255,144 |

### 17.21.3 Defined values

See *+STKCNF Defined values*.

Objective Specification

# 17.22 Envelope in Dedicated Mode +UCATENV

| +UCATENV | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | *< 20 s* | *+CME Error* |

## 17.22.1 Description

In dedicated mode, it allows encoding and sending an STK envelope command to the SIM.

## 17.22.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UCATENV=<envelope_cmd>,<opt_ENV_data1>,<opt_ENV_data2> | OK | AT+UCATENV=211,01<br>OK |
| Test | AT+UCATENV=? | +UCATENV: (list of supported <envelope_cmd><br>OK | +UCATENV: 211,214<br>OK |

## 17.22.3 Defined values

See *+STKENV Defined values*.

# 17.23 Call and Short Message Control in Dedicated Mode +UCATCC

| +UCATCC | |
|---|---|
| **Modules** | TOBY-L2 MPCI-L2 |

## 17.23.1 Description

In dedicated mode, the indication of the call control and short message control by SIM (see 3GPP TS 51.014 [*44*]) is performed using the +UCATCC URC.

## 17.23.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| URC | | +UCATCC: <cc_command>,<res_val>,<alpha>,<param1>[,<sc_addr>,<ton_npi>,<dest_addr>] | +UCATCC: 1,0,"Calling","+3913456890" |

## 17.23.3 Defined values

See *+STKCC Defined values*.

# 17.24 Proactive Command Indication in Raw Mode +URCATI

| +URCATI | |
|---|---|
| **Modules** | TOBY-L2 MPCI-L2 |

## 17.24.1 Description

During the STK transactions, the +URCATI URC displays proactive commands coming from the SIM that require a response from the user in raw mode.

The module expects a terminal response to be sent; the user shall respond with *AT+URCATR* for sending the terminal response.

This URC may be issued only if the SIM toolkit interface is enabled in raw mode.

Objective Specification

### 17.24.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| URC | | +URCATI: <text> | +URCATI: "D020810<br>301250082028182050<br>C53544B2D4A617661436172648F030<br>141411E020001" |

### 17.24.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <text> | String | Raw proactive command data expressed in Hex value |

## 17.25 Proactive Command Notification in Raw Mode +URCATN

| +URCATN | |
|---|---|
| **Modules** | TOBY-L2 MPCI-L2 |

### 17.25.1 Description

Notifies the proactive command in raw mode to the user when the module autonomously handles the proactive command.

For this URC, the module does not expect any terminal response from the user, since the terminal response to the SIM is built within the module and automatically sent.

### 17.25.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| URC | | +URCATN: <text> | +URCATN: "D01A810<br>301100082028183050<br>A63616C6C696E672E2E2E86038121F3" |

### 17.25.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <text> | String | Raw proactive command data expressed in Hex value |

## 17.26 Terminal response in Raw Mode +URCATR

| +URCATR | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | *< 20 s* | *+CME Error* |

### 17.26.1 Description

In raw mode, it allows entering the response to a SIM Toolkit proactive command displayed by the *+URCATI* URC.

If no response is entered, after a timeout whose duration may range from 180 to 300 s, the module sends an autonomous terminal response to the SIM 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 3GPP TS 51.014 *[44]*).

The command must be always entered, to terminate the pending STK session at the MT-DTE interface, and to be able to enter additional STK commands.

The set command syntax depend on the <proactive_cmd> value.

Objective Specification

### 17.26.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+URCATR=<text> | OK | AT+URCATR="810301240082028281830100900101"<br>OK |

### 17.26.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <text> | String | Raw terminal response data expressed in Hex value |

## 17.27 Proactive Session Status in Raw Mode +URCATF

| +URCATF | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | *< 20 s* | *+CME Error* |

### 17.27.1 Description

In raw mode, it provides the response received from the SIM to a terminal response (sent by the user or automatically by the module) .

### 17.27.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| URC | | +URCATF: <sw1>,<sw2> | +URCATF: 144,0 |

### 17.27.3 Defined values

See *+SATF*.

## 17.28 Envelope in Raw Mode +URCATE

| +URCATE | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | *< 20 s* | *+CME Error* |

### 17.28.1 Description

In raw mode, it sends the raw envelope data to the SIM and returns the result of the SIM instruction.

### 17.28.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+URCATE=<text> | +URCATE: <sw1>,<sw2>,<envelope_type>,<event_type><br>OK | AT+URCATE="d30782020181900101"<br>+URCATE: 145,111,211,255<br>OK |

### 17.28.3 Defined values

See *+SATE*.

Objective Specification

# 17.29 Call and Short Message Control in Raw Mode +URCATCC

| +URCATCC | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 17.29.1 Description

In raw mode, +URCATCC is the unsolicited indication of Call Control and SMS Control carried out by the SIM on mobile originated service requests.

## 17.29.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Test | AT+URCATCC=? | +URCATCC: (range of supported <type>) | +URCATCC: (0-3) |
| | | OK | OK |
| URC | | "set up call" type:<br>+URCATCC: 0,<result>,<alpha_id>,<destination_address>,<destination_address_type> | |
| | | "send SS" type:<br>+URCATCC: 1,<result>,<alpha_id>,<destination_address>,<destination_address_type> | |
| | | "send USSD" type:<br>+URCATCC: 2,<result>,<alpha_id>,<dcs>,<data> | |
| | | "send SMS" type:<br>+URCATCC: 3,<result>,<alpha_id>,<destination_address>,<destination_address_type>,<service_center_address>,<service_center_address_type> | |

## 17.29.3 Defined values

See *+STKCTRLIND*.

# 17.30 User setting for proactive DTMF tone generation +UDTMF

| +UDTMF | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U120 LISA-U130 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | *NVM* | No | - | *+CME Error* |

## 17.30.1 Description

On a request from the SIM toolkit of proactive DTMF tone generation (SEND DTMF), the <mode> parameter controls whether the request of DTMF tone generation is performed or it is not.

TOBY-L2 / MPCI-L2
The read command is not supported.

## 17.30.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UDTMF=<mode> | OK | AT+UDTMF=1 |

Objective Specification

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

### 17.30.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | Indicates the working mode in relation to DTMF tone generation via SIM-TK. Allowed values:<br>• 0: disable the DTMF tone generation (the terminal response is "Proactive SIM session terminated by user")<br>• 1 (factory-programmed value): enable the DTMF tone generation (the terminal response is encoded according to the result) |

## 17.31 Refresh delay events management +UDCONF=54

| +UDCONF=54 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-U201 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

### 17.31.1 Description

If a REFRESH command is received while in a state where execution of the command would be unacceptable, upsetting the current user operation (e.g. notification during a call that the IMSI has changed), the terminal should inform the UICC using a negative TERMINAL RESPONSE (e.g. terminal currently unable to process command).

In some cases it may be preferred to delay the command execution instead of sending a negative TR. For example, if dedicated (*+CFUN=6*) / raw (*+CFUN=9*) is not enabled, when a REFRESH is fetched no indication is sent to the DTE, and thus if the DCE is in connected state, the command will not be executed.

The <delay_events> setting with the addition of *+USIMSTAT* reporting permits the DTE to take action, e.g. release a voice call, and consequently execute the REFRESH command.

☞ During the certification process, the default configuration <delay_events>=8 is recommended.

### 17.31.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UDCONF=54,<delay_events> | OK | AT+UDCONF=54,8 |
| | | | OK |
| Read | AT+UDCONF=54 | +UDCONF: 54,<delay_events> | +UDCONF: 54,8 |
| | | OK | OK |

### 17.31.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <delay_events> | Number | Bitmap representing the events which will delay a REFRESH command instead of sending a negative TERMINAL RESPONSE (e.g. terminal currently unable to process command). See *Table 18* for the meaning of each bit.<br>The factory-programmed value is 8. |

### 17.31.4 Notes

- 

| Bit | Delay events |
|---|---|
| 0 | PPP connection active, (U)SIM toolkit REFRESH proactive command delayed till PPP deactivation |
| 1 | Voice call ongoing, (U)SIM toolkit REFRESH proactive command delayed till call release |

Objective Specification

| Bit | Delay events |
|---|---|
| 2 | CSD call ongoing, (U)SIM toolkit REFRESH proactive command delayed till call release |
| 3 | ENVELOPE, SMS-PP download |

**Table 18: <delay_events> bitmap meaning**

- If a PPP connection is active, and its delay bit is not set, the REFRESH command will be executed instead of sending a negative TR.

Objective Specification

# 18 Packet switched data services

## 18.1 Introduction and common parameters definition

**TOBY-L2 / MPCI-L2**

After the PDP context activation, the information text response to the read command of these commands provide the configuration negotiated with the network (similarly to *+CGTFTRDP* and *+CGCONTRDP* AT commands):

- *+CGDCONT*
- *+CGDSCONT*
- *+CGTFT*
- *+CGQREQ*
- *+CGEQREQ*
- *+CGEQOS*

### 18.1.1 <APN>

The Access Point Name (APN) 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. The APN can be omitted: this is the so-called "blank APN" setting that may be suggested by network operators (e.g. to roaming devices); in this case the APN string is not included in the message sent to the network.

An optional special code placed at the beginning of <APN> indicates the type of authentication handling between the module and the network and may be:

- CHAP: challenge handshake authentication protocol
- PAP: personal authentication protocol
- NOAUTH: authentication protocol not used
- code omitted: authentication protocol not used

An example for the usage of <APN> is:

AT+CGDCONT=1,"IP","CHAP:internet.t-d1.de"

+CGDCONT?'s response does not include the PAP: and CHAP: prefixes in the APN string.

The maximum length of the parameter is 99 characters (the maximum length of coded APN is 100 octets, see 3GPP TS 23.003 [*116*], subclause 9.1).

TOBY-L2 / MPCI-L2
The optional authentication special code is not supported. The *+UAUTHREQ* command should be used after the context definition.
"Blank APN" is not supported in Verizon configuration (see *+UMNOCONF*) except for LTE attach. In other RATs and for additional default EPS bearer activations, a non-empty APN shall be configured.

### 18.1.2 <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 and active PDP contexts depend on the product version:

| Product | Max number of definable PDP contexts | Max number of active PDP contexts |
|---|---|---|
| TOBY-L2 / MPCI-L2 | 8 | 8 |
| LISA-U200-02S / LISA-U200-03S / LISA-U200-52S / LISA-U200-82S / LISA-U200-83S / LISA-U201 / LISA-U260-02S / LISA-U270-02S / LISA-U270-62S / LISA-U270-63S / LISA-U270-68S / SARA-U | 11 | 3 |
| LISA-U1 / LISA-U200-00S / LISA-U200-01S / LISA-U230 / LISA-U260-01S / LISA-U270-01S / SARA-G / LEON-G | 3 | 3 |

Objective Specification

| Product | Max number of definable PDP contexts | Max number of active PDP contexts |
|---|---|---|
| LISA-U200-62S | 10 | 3 |

TOBY-L2 / MPCI-L2
When the local dial-up feature is available, it can be enabled using the PDP context identifier 100. This PDP context identifier is not related with the cellular network PDP contexts/EPS bearers.

### 18.1.3 <d_comp>

Numeric parameter specifying the PDP data compression; it can have the values:

- 0 (default value): off
- 1: on (predefined compression type i.e. V.42bis data compression)
- 2 : V.42bis data compression

SARA-G / LEON-G
<d_comp>=1 and <d_comp>=2 are not supported (<d_comp>=1 may be accepted, but no compression is performed).

### 18.1.4 <delay>

Numeric parameter which specifies the delay class according to 3GPP TS 24.008 [12] (QoS) (for the description see the *+UPSD* command description).

### 18.1.5 <Delivery_of_erroneous_SDUs>

Numeric parameter indicating whether SDUs (Service Data Unit) detected as erroneous shall be delivered or not (see the 3GPP TS 24.008 [12], subclause 10.5.6.5):

- 0: no
- 1: yes
- 2: no detect
- 3 (default value): subscribed value

### 18.1.6 <Delivery_order>

Numeric parameter that indicates whether the UMTS bearer shall provide in-sequence SDU (Service Data Unit) delivery or not (see the 3GPP TS 24.008 [12], subclause 10.5.6.5):

- 0: no
- 1: yes
- 2: subscribed value

### 18.1.7 <destination_port_range>

String parameter given as dot-separated numbers on the form "f.t" that specifies the destination port range attribute of a valid packet filter:

- Range: 0-65535

### 18.1.8 <evaluation_precedence_index>

Numeric parameter that 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)

### 18.1.9 <Guaranteed_bitrate_DL>

Numeric parameter that indicates the maximum number of kb/s delivered to UMTS (DL) at an application processor (see the 3GPP TS 24.008 [12], subclause 10.5.6.5):

Objective Specification

- 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
- Range 17000-128000 in steps of 1000
- Range 130000-256000 in steps of 2000

### 18.1.10 <Guaranteed_bitrate_UL>

Numeric parameter indicating the maximum number of kb/s delivered to UMTS (UL) at an application processor (see the 3GPP TS 24.008 [12], 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
- Range 17000-128000 in steps of 1000
- Range 130000-256000 in steps of 2000

### 18.1.11 <h_comp>

Numeric parameter specifying the PDP header compression; it can have the values:

- 0 (default value): off
- 1: on (predefined compression type, i.e. RFC1144)
- 2: RFC1144
- 3: RFC2507
- 4: RFC3095

SARA-G / LEON-G
<h_comp>= 2, 3 and 4 are not supported.

### 18.1.12 <ipsec_security_parameter_index_(spi)>

Numeric parameter that specifies the IPSec SPI attribute of a valid packet filter which is a 32-bit field.

- Range: 0x00000000 - 0xFFFFFFFF

### 18.1.13 <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"
- LISA-U200-62S only - "M-PPP-RELAY"

TOBY-L2 / MPCI-L2
Only the "PPP" value is supported. There is no support for IPv6 over PPP (PPPv6).

SARA-G / LEON-G
<L2P>= "M-OPT-PPP" is not supported.

### 18.1.14 <Maximum_bitrate_DL>

Numeric parameter indicating the maximum number of kb/s delivered to UMTS (DL) at an application processor (see the 3GPP TS 24.008 [12], subclause 10.5.6.5):

- Range 1-63 in steps of 1

Objective Specification

- Range 64-568 in steps of 8
- Range 576-8640 in steps of 64
- Range 8700-16000 in steps of 100
- Range 17000-128000 in steps of 1000
- Range 130000-256000 in steps of 2000

### 18.1.15 <Maximum_bitrate_UL>

Numeric parameter indicating the maximum number of kb/s delivered to UMTS (UL) at an application processor (see the 3GPP TS 24.008 [12], 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
- Range 17000-128000 in steps of 1000
- Range 130000-256000 in steps of 2000

### 18.1.16 <Maximum_SDU_size>

Numeric parameter that indicates the maximum allowed SDU (Service Data Unit) size in octets (see the 3GPP TS 24.008 [12], subclause 10.5.6.5):

- 0: subscribed value
- Range 10-1500 in steps of 10 octets
- 1502
- 1510
- 1520

### 18.1.17 <mean>

Numeric parameter specifying the mean throughput class (for the description see the *+UPSD* command description)

### 18.1.18 <p_cid>

Numeric parameter that 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.

### 18.1.19 <packet_filter_identifier>

Numeric parameter that identifies a packet filter:

- Range: 1 - 8

### 18.1.20 <peak>

Numeric parameter specifying the peak throughput class (for the description see the *+UPSD* command description)

### 18.1.21 <PDP_addr>

String parameter identifying the MT in the IP-address space applicable to the PDP service. If the value is null or omitted (dynamic IP addressing), then a value may be provided by the DTE during the PDP startup procedure or, failing that, a dynamic address will be requested via DHCP. It can be read with the command *AT+CGPADDR* or *AT+CGDCONT* read command.

To request a static IP address, a fixed IP address shall be specified for the <PDP_addr> paramater of the *+CGDCONT* set command and the user shall not rely on PPP negotiation via IPCP CONFREQ option.

Objective Specification

Depending on the IP-version, the <PDP_addr> consists of 4 octets (IPv4) or 16 octets (IPv6):

- IPv4: "ddd.ddd.ddd.ddd"
- IPv4v6: "ddd.ddd.ddd.ddd ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd"
- IPv6: "ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd"

LISA-U1 / LISA-U200-00S / LISA-U200-01S / LISA-U200-02S / LISA-U200-52S / LISA-U200-62S / LISA-U200-82S / LISA-U230 / LISA-U260 / LISA-U270 / SARA-G300 / SARA-G310 / SARA-G340-00S / SARA-G340-01S / SARA-G350-00S / SARA-G350-00X / SARA-G350-01B / SARA-G350-01S / LEON-G
The IPv6 stack for an external context is not supported: hence the IP-addresses for IPv4v6 and IPv6 protocols are not supported.

### 18.1.22 <PDP_type>

The Packet Data Protocol (PDP) type is a string parameter which specifies the type of packet data protocol:

- "IP" (default value): Internet Protocol (IETF STD 5)
- "IPV4V6": virtual <PDP_type> introduced to handle dual IP stack UE capability (see the 3GPP TS 24.301 [87])

  TOBY-L201 / MPCI-L201
  The "IPV4V6" configuration is allowed only if the <MNO> parameter of *AT+UMNOCONF* command is set to Verizon or regulatory only.

  TOBY-L200 / MPCI-L200 / LISA-U1 / LISA-U200-00S / LISA-U200-01S / LISA-U200-02S / LISA-U200-52S / LISA-U200-62S / LISA-U200-82S / LISA-U230 / LISA-U260 / LISA-U270 / SARA-G300 / SARA-G310 / SARA-G340-00S / SARA-G340-01S / SARA-G350-00S / SARA-G350-00X / SARA-G350-01B / SARA-G350-01S / LEON-G
  The IPv6 stack for an external context is not supported: hence the "IPV4V6" value is not supported.
- "IPV6": Internet Protocol, version 6 (see RFC 2460)

  TOBY-L201 / MPCI-L201
  The "IPV6" configuration is allowed only if the <MNO> parameter of *AT+UMNOCONF* command is set to Verizon or regulatory only.

  TOBY-L200 / MPCI-L200 / LISA-U1 / LISA-U200-00S / LISA-U200-01S / LISA-U200-02S / LISA-U200-52S / LISA-U200-62S / LISA-U200-82S / LISA-U230 / LISA-U260 / LISA-U270 / SARA-G300 / SARA-G310 / SARA-G340-00S / SARA-G340-01S / SARA-G350-00S / SARA-G350-00X / SARA-G350-01B / SARA-G350-01S / LEON-G
  The IPv6 stack for an external context is not supported: hence the "IPV6" value is not supported.
- LISA-U200-62S only - "PPP": Point to Point Protocol

TOBY-L210-62S
Only a single data PDP context (both internal and external) is allowed: the parameter can be set to "IPV4" only.

### 18.1.23 <precedence>

Numeric parameter specifying the precedence class (for the description see the *+UPSD* command description), it can assume the values:

- 0: network subscribed
- 1: high priority
- 2: normal priority
- 3: low priority

### 18.1.24 <reliability>

Numeric parameter specifying the reliability class (see the *+UPSD* command description)

### 18.1.25 <state>

Indicates the state of GPRS attachment

Objective Specification

- 0: detached
- 1 (default value): attached

### 18.1.26 <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.

### 18.1.27 <Traffic_class>

Indicates the application type for which the UMTS bearer service is optimized (see the 3GPP TS 24.008 [12], 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.

### 18.1.28 <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 (see the 3GPP TS 24.008 [12], 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

### 18.1.29 <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 (see the 3GPP TS 24.008 [12], 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": $1*10^{-3}$

Objective Specification

- "5E2": $5*10^{-2}$
- "1E2": $1*10^{-2}$
- "0E0": subscribed value

### 18.1.30 <Transfer_delay>

Indicates the target time, in milliseconds, between a request to transfer an SDU (Service Data Unit) at an application processor and its delivery at the other application processor (see the 3GPP TS 24.008 [12], 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

### 18.1.31 <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 (see the 3GPP TS 24.008 [12], subclause 10.5.6.5):

- 0: subscribed
- 1: priority level 1
- 2: priority level 2
- 3: priority level 3

### 18.1.32 <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

LISA-U1 / LISA-U200-00S / LISA-U200-01S / LISA-U200-02S / LISA-U200-52S / LISA-U200-62S / LISA-U200-82S / LISA-U230 / LISA-U260 / LISA-U270 / SARA-G300 / SARA-G310 / SARA-G340-00S / SARA-G340-01S / SARA-G350-00S / SARA-G350-00X / SARA-G350-01B / SARA-G350-01S / LEON-G
The IPv6 stack for an external context is not supported: hence the source address for IPv6 is not supported.

### 18.1.33 <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

LISA-U1 / LISA-U200-00S / LISA-U200-01S / LISA-U200-02S / LISA-U200-52S / LISA-U200-62S / LISA-U200-82S / LISA-U230 / LISA-U260 / LISA-U270 / SARA-G300 / SARA-G310 / SARA-G340-00S / SARA-G340-01S / SARA-G350-00S / SARA-G350-00X / SARA-G350-01B / SARA-G350-01S / LEON-G
The IPv6 stack for an external context is not supported: hence the IPv6 version is not supported.

### 18.1.34 <source_port_range>

String parameter given as dot-separated numbers on the form "f.t" that specifies the source port range attribute of a valid packet filter:

- Range: 0-65535

### 18.1.35 <type_of_service_(tos)_(ipv4)_and_mask-traffic_class_(ipv6)_and_mask>

String parameter given as dot-separated numbers on the form "t.m" that 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.

Objective Specification

- Range: 0-65535

LISA-U1 / LISA-U200-00S / LISA-U200-01S / LISA-U200-02S / LISA-U200-52S / LISA-U200-62S / LISA-U200-82S / LISA-U230 / LISA-U260 / LISA-U270 / SARA-G300 / SARA-G310 / SARA-G340-00S / SARA-G340-01S / SARA-G350-00S / SARA-G350-00X / SARA-G350-01B / SARA-G350-01S / LEON-G
The IPv6 stack for an external context is not supported: hence the IPv6 version is not supported.

### 18.1.36 <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

LISA-U1 / LISA-U200-00S / LISA-U200-01S / LISA-U200-02S / LISA-U200-52S / LISA-U200-62S / LISA-U200-82S / LISA-U230 / LISA-U260 / LISA-U270 / SARA-G300 / SARA-G310 / SARA-G340-00S / SARA-G340-01S / SARA-G350-00S / SARA-G350-00X / SARA-G350-01B / SARA-G350-01S / LEON-G
The IPv6 stack for an external context is not supported: hence the IPv6 version is not supported.

### 18.1.37 <Source_Statistic_Descriptor>

Specifies the characteristics of the source of the submitted SDUs for a PDP context.

- 0 (default value): characteristics of the SDUs unknown
- 1: characteristics of the SDUs correspond to a speech source

### 18.1.38 <Signaling_Indication>

Specifies signaling content of submitted SDUs for a PDP context. This parameter should be provided if the Traffic Class is set to interactive.

LISA-U1 / SARA-G / LEON-G
The <Signaling_Indication> parameter is not supported.

### 18.1.39 <direction>

Specifies the transmission direction in which the packet filter shall be applied:

- 0: Pre Release 7 TFT Filter (see 3GPP TS 24.008 [12], table 10.5.162)
- 1: uplink
- 2: downlink
- 3: bidirectional (used for uplink and downlink)

### 18.1.40 <IM_CN_Signalling_Flag_Ind>

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

- 0: PDP context is not for IM CN subsystem-related signalling only
- 1: PDP context is for IM CN subsystem-related signalling only

## 18.2 PPP LCP handshake behaviour

When a data call is initiated using the *+CGDATA* command (specifying "PPP" as *<L2P>* protocol) or with the *D** command, the module switches to PPP mode just after the CONNECT intermediate result code. The first step of the PPP procedure is the LCP handshake, in this phase the behaviour of 2G products (i.e. LEON-G and SARA-G) differs from 3G products (LISA-U and SARA-U) and 4G products (TOBY-L2 and MPCI-L2).

Entering OnLine Command Mode (OLCM) during LCP handshake phase is strongly discouraged because the handshake procedure could be broken and should be restarted from the beginning.

Objective Specification

**SARA-G / LEON-G**
By default the module starts PPP in silent mode, waiting the first LCP packet coming from the TE. If a valid LCP packet is received the module continues the LCP handshake by its side, otherwise it remains in wait state. If the module is in wait state, it is possible to make it switch back to the AT command mode toggling the DTR line.

It is possible to disable the PPP silent mode by means of the *+UDCONF=0* command. When the silent mode is disabled, the module will start sending the LCP configuration packets (up to 10 retries every 6 s) just after the CONNECT intermediate result code. If none valid LCP response packet is received from the TE, the module will act like in silent mode.

**LISA-U / SARA-U**
The module starts in PPP silent mode (wait the first LCP packet): if the TE does not starts the LCP handshake in between 1 s, the module starts sending the LCP configuration packets by its side (up to 10 retries every 1 s). If none valid LCP response packet is received from the TE, the module drops the PDP context and returns the NO CARRIER final result code.

**TOBY-L2 / MPCI-L2**
The module starts sending the LCP configuration packets by its side (up to 10 retries every 1 s). If none valid LCP response packet is received from the TE, the module drops the PDP context and returns the NO CARRIER final result code.

# 18.3 Printing IP address format +CGPIAF

| +CGPIAF | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 18.3.1 Description

Defines the printing format of IPv6 address parameters of the other AT commands. See RFC 4291 *[93]* for details of the IPv6 address format.

The affected parameters are:

- In *+CGTFT* and *+CGTFTRDP* the <remote_address_and_subnet_mask> parameter
- In *+CGDCONT* the <PDP_addr> parameter
- In *+CGPADDR* the <PDP_addr_1> and <PDP_addr_2> parameters
- In *+CGCONTRDP*, the <local_address_and_subnet_mask>, <dns_prim_addr>, <dns_sec_addr>, <P_CSCF_prim_addr> and <P_CSCF_sec_addr> parameters
- In *+CRC* the <PDP_addr> parameter of URC GPRS <PDP_type>,<PDP_addr>[,<L2P>[,<APN>]]

## 18.3.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CGPIAF=[<IPv6_AddressFormat>[,<IPv6_SubnetNotation>[,<IPv6_LeadingZeros>[,<IPv6_CompressZeros>]]]] | OK | AT+CGPIAF=1,1,1,1<br>OK |
| Read | AT+CGPIAF? | +CGPIAF: <IPv6_AddressFormat>,<IPv6_SubnetNotation>,<IPv6_LeadingZeros>,<IPv6_CompressZeros><br>OK | +CGPIAF: 0,0,0,0<br>OK |
| Test | AT+CGPIAF=? | +CGPIAF: (list of supported <IPv6_AddressFormat>s),(list of supported <IPv6_SubnetNotation>s),(list of supported <IPv6_LeadingZeros>s),(list of supported <IPv6_CompressZeros>s)<br>OK | +CGPIAF: (0-1),(0-1),(0-1),(0-1)<br>OK |

Objective Specification

### 18.3.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <IPv6_AddressFormat> | Number | Defines the IPv6 address format:<br>• 0 (default value): IPv4-like dot-notation used. IP address and subnetwork mask if applicable, are dot-separated<br>• 1: IPv6-like colon-notation used. IP address and subnetwork mask if applicable and when given explicitly, are separated by a space |
| <IPv6_SubnetNotation> | Number | Defines the subnet-notation for <remote_address_and_subnet_mask>. The setting does not apply if <IPv6_AddressFormat>=0:<br>• 0 (default value): both IP address and subnet mask are explicitly stated, separated by a space<br>• 1: the printout format is applying / (forward slash) subnet-prefix Classless Inter-Domain Routing (CIDR) |
| <IPv6_LeadingZeros> | Number | Defines whether leading zeros are omitted or not. The setting does not apply if <IPv6_AddressFormat>=0:<br>• 0 (default value): leading zeros omitted<br>• 1: leading zeros included |
| <IPv6_CompressZeros> | Number | Defines whether 1-n instances of 16-bit-zero-values are replaced by only "::". This applies only once. The setting does not apply if <IPv6_AddressFormat>=0:<br>• 0 (default value): no zero compression<br>• 1: use zero compression |

## 18.4 PDP context definition +CGDCONT

| +CGDCONT | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | Yes | *NVM* | No | - | *+CME Error* |

### 18.4.1 Description

Defines 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.

Each context is permanently stored so that its definition is persistent over power cycles.

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 serial interface.

### 18.4.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CGDCONT=[<cid>[,<PDP_type>[,<APN>[,<PDP_addr>[,<d_comp>[,<h_comp>[,<IPv4AddrAlloc>[,<emergency_indication>[,<P-CSCF_discovery>[,<IM_CN_Signalling_Flag_Ind>]]]]]]]]] | OK | **IPv4 example**<br>AT+CGDCONT=1,"IP","APN_name","1.2.3.4",0,0<br>OK<br>**IPv4v6 example**<br>AT+CGDCONT=1,"IPV4V6","APN","0.0.0.0 0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0",0,0<br>OK<br>**IPv6 example**<br>AT+CGDCONT=1,"IPV6","APN","0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0",0,0<br>OK |
| Read | AT+CGDCONT? | +CGDCONT: <cid>,<PDP_type>,<APN>,<PDP_addr>,<d_comp>,<h_comp>[,<IPv4AddrAlloc>,<emergency_indication>,<P-CSCF_discovery>,<IM_CN_Signalling_Flag_Ind>] | +CGDCONT: 1,"IP","web.omnitel.it","91.80.140.199",0,0<br>OK |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | OK | |
| Test | AT+CGDCONT=? | +CGDCONT: (list of supported <cid>s),<PDP_type>,,,(list of supported <d_comp>s),(list of supported <h_comp>s)[,(list of supported <IPv4AllocAddr>),(list of supported <emergency_indication>),(list of supported <P-CSCF_discovery>),(list of supported <IM_CN_Signalling_Flag_Ind>)]<br><br>OK | +CGDCONT: (1-3),"IP",,,(0-2),(0-4)<br><br>OK |

## 18.4.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <cid> | Number | See *<cid>* |
| <PDP_type> | String | See *<PDP_type>* |
| <APN> | String | See *<APN>* |
| <PDP_addr> | Number | See *<PDP_addr>* |
| <d_comp> | Number | See *<d_comp>* |
| <h_comp> | Number | See *<h_comp>* |
| <IPv4AddrAlloc> | Number | Controls how the MT/TA requests to get the IPv4 address information:<br>• 0 (default value): IPv4 Address Allocation through NAS Signalling<br>• 1: IPv4 Address Allocated through DHCP |
| <emergency_indication> | Number | Indicates whether the PDP context is for emergency bearer services or not:<br>• 0 (default value): PDP context is not for emergency bearer services<br>• 1: PDP context is for emergency bearer services |
| <P-CSCF_discovery> | Number | Influences how the MT/TA requests to get the P-CSCF address, see 3GPP TS 24.229 [*102*] annex B and annex L:<br>• 0 (default value): preference of P-CSCF address discovery not influenced by *+CGDCONT*<br>• 1: preference of P-CSCF address discovery through NAS Signalling<br>• 2: preference of P-CSCF address discovery through DHCP |
| <IM_CN_Signalling_Flag_Ind> | Number | See *<IM_CN_Signalling_Flag_Ind>* |

## 18.4.4 Notes

### Additional examples:

| Command | Response | Description |
|---|---|---|
| AT+CMEE=2 | OK | Use verbose <err> values |
| AT+CGDCONT=? | +CGDCONT: (1-3),"IP",,,(0),(0-1)<br><br>OK | 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<br><br>TOBY-L2 / MPCI-L2<br>This step is not applicable. |
| 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<br><br>+CGDCONT: 1,"IP","STATREAL","0.0.0.0",0,0<br><br>+CGDCONT: 3,"IP","tim.ibox.it","0.0.0.0",0,0<br><br>OK | Read command |

### TOBY-L2 / MPCI-L2

- The module automatically accepts the Mobile Terminated contexts/bearers.

Objective specification

- The <cid> of a mobile terminated context/bearer is assigned following the rules below:
  - Primary context (2G/3G) or default bearer (4G): first <cid> not defined in the ordered list = [4, 3, 2, 1, 8, 7, 6, 5].
  - Secondary context (2G/3G) or dedicated bearer (4G): first <cid> not defined in the ordered list = [8, 7, 6, 5, 1, 2, 3, 4].

**LISA-U / SARA-U**

- If not specified the following values are assumed:
  - <cid>:1
  - <PDP_addr>: "0.0.0.0"
- <IPv4AddrAlloc>, <emergency_indication>, <P-CSCF_discovery> and <IM_CN_Signalling_Flag_Ind> parameters are not supported.

**LISA-U200-00S / LISA-U200-01S / LISA-U200-02S / LISA-U200-52S / LISA-U200-62S / LISA-U230 / LISA-U260 / LISA-U270-00S / LISA-U270-01S / LISA-U270-62S / LISA-U270-63S / LISA-U270-68S**

- If <APN> is not specified the value "apn" is assumed.
- To omit the APN, i.e. to use the so-called "blank APN" setting, leave undefined the PDP context associated to <cid>=1 and use it to dial up a PPP connection.

**SARA-G / LEON-G**

- If not specified the following values are assumed:
  - <cid>:1
  - <APN>: "apn"
  - <PDP_addr>: "0.0.0.0"
- The context's setting is not permanently stored in NVM.
- It is possible to omit the APN by specifying the <cid> and the <PDP_type> only.
- <IPv4AddrAlloc>, <emergency_indication>, <P-CSCF_discovery> and <IM_CN_Signalling_Flag_Ind> parameters are not supported.

**LEON-G**

- If only the parameter <cid> is set the corresponding PDP context is not undefined.

# 18.5 Packet switched data configuration +UPSD

| +UPSD | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | *NVM* | No | - | *+CME Error* |

## 18.5.1 Description

Sets or reads all the parameters in a specific packet switched data (PSD) profile. The command is 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.

To set all the parameters of the PSD profile a set command for each parameter needs to be issued.

The parameter values set with this command are volatile, but the whole profile can be stored in NVM with *AT+UPSDA* command.

In the read command, if only the first parameter is issued, the module returns all the parameters of the given PSD profile, and lists them in separated lines.

TOBY-L2 / MPCI-L2

Objective Specification

The PSD profile configured through the *+UPSD* AT command is mapped to a <cid> context identifier in the *+CGDCONT* table (<cid> 8 by default). The mapping between the +UPSD profile and the corresponding <cid> can be configured through <param_tag> = 100. See *Notes* for more details.

## 18.5.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UPSD=<profile_id>,<param_tag>,<param_val> | OK | AT+UPSD=0,1,"apn.provider.com"<br>OK |
| Read | AT+UPSD=<profile_id>,<param_tag> | +UPSD: <profile_id>,<param_tag>,<param_val><br>OK | AT+UPSD=0,1<br>+UPSD: 0,1,"apn.provider.com"<br>OK |
| | AT+UPSD=<profile_id> | +UPSD: <profile_id>,0,<param_val0><br>+UPSD: <profile_id>,1,<param_val1>...<br>+UPSD: <profile_id>,x,<param_valx><br>OK | AT+UPSD=0<br>+UPSD: 0,0,0<br>+UPSD: 0,1,"apn.provider.com"<br>+UPSD: 0,2,"username"<br>+UPSD: 0,4,"0.0.0.0"<br>...<br>+UPSD: 0,19,0<br>OK |

## 18.5.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <profile_id> | Number | PSD profile identifier, in range 0-6 |
| <param_tag> | Number | • 0: Protocol type; the allowed values of <param_val> parameter are<br>o 0 (factory-programmed value): IPv4<br>o 1: IPv6<br>o 2: IPv4v6 with IPv4 preferred for internal sockets<br>o 3: IPv4v6 with IPv6 preferred for internal sockets<br>• 1: APN - <param_val> defines the APN text string, e.g. "apn.provider.com"; the maximum length is 99. The factory-programmed value is an empty string.<br>• 2: username - <param_val> is the user name text string for the authentication phase. The factory-programmed value is an empty string.<br>• 3: password - <param_val> is the password text string for the authentication phase. Note: the AT+UPSD read command with <param_tag> = 3 is not allowed and the read all command does not display it<br>• 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"). The factory-programmed value is "0.0.0.0".<br>• 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"). The factory-programmed value is "0.0.0.0".<br>• 6: authentication - the <param_val> parameter selects the authentication type:<br>o 0 (factory-programmed value): none<br>o 1: PAP<br>o 2: CHAP<br>o 3: automatic selection of authentication type (none/CHAP/PAP)<br>• 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"). The factory-programmed value is "0.0.0.0". Note: IP address set as "0.0 .0.0" means dynamic IP address assigned during PDP context activation<br>• 8: data compression - the <param_val> parameter refers to the default parameter named <d_comp> and selects the data compression type:<br>o 0 (factory-programmed value): off<br>o 1: predefined, i.e. V.42bis<br>o 2: V.42bis |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 9: header compression - the <param_val> parameter refers to the default parameter named <h_comp> and selects the header compression type:<br>o 0 (factory-programmed value): off<br>o 1: predefined, i.e. RFC1144<br>o 2: RFC1144<br>o 3: RFC2507<br>o 4: RFC3095<br>• 10: QoS precedence - the <param_val> parameter selects the precedence class:<br>o 0 (factory-programmed value): subscribed<br>o 1: high<br>o 2: normal<br>o 3: low<br>• 11: QoS delay - the <param_val> parameter selects the delay class:<br>o 0 (factory-programmed value): subscribed<br>o 1: class 1<br>o 2: class 2<br>o 3: class 3<br>o 4: best effort<br>• 12: QoS reliability - the <param_val> parameter selects the reliability class:<br>o 0 (factory-programmed value): subscribed<br>o 1: class 1 (Interpreted as class 2)<br>o 2: class 2 (GTP Unack, LLC Ack and Protected, RLC Ack)<br>o 3: class 3 (GTP Unack, LLC Unack and Protected, RLC Ack)<br>o 4: class 4 (GTP Unack, LLC Unack and Protected, RLC Unack)<br>o 5: class 5 (GTP Unack, LLC Unack and Unprotected, RLC Unack)<br>o 6: class 6 (Interpreted as class 3)<br>• 13: QoS peak rate - the <param_val> parameter selects the peak throughput in range 0-9. The factory-programmed value is 0.<br>• 14: QoS mean rate - the <param_val> parameter selects the mean throughput in range 0-18, 31. The factory-programmed value is 0.<br>• 15: minimum QoS precedence - the <param_val> parameter selects the acceptable value for the precedence class:<br>o 0 (factory-programmed value): subscribed<br>o 1: high<br>o 2: normal<br>o 3: low<br>• 16: minimum QoS delay - the <param_val> parameter selects the acceptable value for the delay class:<br>o 0 (factory-programmed value): subscribed<br>o 1: class 1<br>o 2: class 2<br>o 3: class 3<br>o 4: best effort<br>• 17: minimum QoS reliability - the <param_val> parameter selects the minimum acceptable value for the reliability class:<br>o 0 (factory-programmed value): subscribed<br>o 1: class 1 (Interpreted as class 2)<br>o 2: class 2 (GTP Unack, LLC Ack and Protected, RLC Ack)<br>o 3: class 3 (GTP Unack, LLC Unack and Protected, RLC Ack)<br>o 4: class 4 (GTP Unack, LLC Unack and Protected, RLC Unack)<br>o 5: class 5 (GTP Unack, LLC Unack and Unprotected, RLC Unack)<br>o 6: class 6 (Interpreted as class 3)<br>• 18: minimum QoS peak rate - the <param_val> parameter selects the acceptable value for the peak throughput in range 0-9. The factory-programmed value is 0.<br>• 19: minimum QoS mean rate - the <param_val> parameter selects the acceptable value for the mean throughput in range 0-18, 31. The factory-programmed value is 0.<br>• 20: 3G QoS delivery order - the <param_val> parameter selects the acceptable value for the delivery order:<br>o 0 (factory-programmed value): subscribed |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | o 1: enable<br>o 2: disable<br>• 21: 3G QoS erroneous SDU delivery - the <param_val> parameter selects the acceptable value for the erroneous SDU delivery:<br>o 0 (factory-programmed value): subscribed<br>o 1: no detection<br>o 2: enable<br>o 3: disable<br>• 22: 3G QoS extended guaranteed downlink bit rate - <param_val> is the value for the extended guaranteed downlink bit rate in kb/s. The factory-programmed value is 0.<br>• 23: 3G QoS extended maximum downlink bit rate - <param_val> is the value for the extended maximum downlink bit rate in kb/s. The factory-programmed value is 0.<br>• 24: 3G QoS guaranteed downlink bit rate - <param_val> is the value for the guaranteed downlink bit rate in kb/s. The factory-programmed value is 0.<br>• 25: 3G QoS guaranteed uplink bit rate - <param_val> is the value for the guaranteed uplink bit rate in kb/s. The factory-programmed value is 0.<br>• 26: 3G QoS maximum downlink bit rate - <param_val> is the value for the maximum downlink bit rate in kb/s. The factory-programmed value is 0.<br>• 27: 3G QoS maximum uplink bit rate - <param_val> is the value for the maximum uplink bit rate in kb/s. The factory-programmed value is 0.<br>• 28: 3G QoS maximum SDU size - <param_val> is the value for the maximum SDU size in octets. The factory-programmed value is 0.<br>• 29: 3G QoS residual bit error rate - <param_val> selects the acceptable value for the residual bit error rate:<br>o 0 (factory-programmed value): subscribed<br>o 1: 5E2<br>o 2: 1E2<br>o 3: 5E3<br>o 4: 4E3<br>o 5: 1E3<br>o 6: 1E4<br>o 7: 1E5<br>o 8: 1E6<br>o 9: 6E8<br>• 30: 3G QoS SDU error ratio - <param_val> selects the acceptable value for the SDU error ratio:<br>o 0 (factory-programmed value): subscribed<br>o 1: 1E2<br>o 2: 7E3<br>o 3: 1E3<br>o 4: 1E4<br>o 5: 1E5<br>o 6: 1E6<br>o 7: 1E1<br>• 31: 3G QoS signalling indicator - <param_val> selects the acceptable value for the signalling indicator:<br>o 0 (factory-programmed value): subscribed<br>o 1: signalling indicator 1<br>• 32: 3G QoS source statistics descriptor - <param_val> selects the acceptable value for the source statistics descriptor:<br>o 0 (factory-programmed value): subscribed<br>o 1: source statistics descriptor 1<br>• 33: 3G QoS traffic class - <param_val> selects the acceptable value for the traffic class:<br>o 0 (factory-programmed value): subscribed<br>o 1: conversational<br>o 2: streaming<br>o 3: interactive<br>o 4: background<br>• 34: 3G QoS traffic priority - <param_val> selects the acceptable value for the traffic priority:<br>o 0 (factory-programmed value): subscribed |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | o 1: priority 1<br>o 2: priority 2<br>o 3: priority 3<br>• 35: 3G QoS transfer delay - <param_val> is the value for the transfer delay in milliseconds. The factory-programmed value is 0.<br>• 36: 3G minimum QoS delivery order - <param_val> selects the acceptable value for the delivery order:<br>o 0 (factory-programmed value): subscribed<br>o 1: enable<br>o 2: disable<br>• 37: 3G minimum QoS erroneous SDU delivery - <param_val> selects the acceptable value for the erroneous SDU delivery:<br>o 0 (factory-programmed value): subscribed<br>o 1: no detection<br>o 2: enable<br>o 3: disable<br>• 38: 3G minimum QoS extended guaranteed downlink bit rate - <param_val> is the value for the extended guaranteed downlink bit rate in kb/s. The factory-programmed value is 0.<br>• 39: 3G minimum QoS extended maximum downlink bit rate - <param_val> is the value for the extended maximum downlink bit rate in kb/s. The factory-programmed value is 0.<br>• 40: 3G minimum QoS guaranteed downlink bit rate - <param_val> is the value for the guaranteed downlink bit rate in kb/s. The factory-programmed value is 0.<br>• 41: 3G minimum QoS guaranteed uplink bit rate - <param_val> is the value for the guaranteed uplink bit rate in kb/s. The factory-programmed value is 0.<br>• 42: 3G minimum QoS maximum downlink bit rate - <param_val> is the value for the maximum downlink bit rate in kb/s. The factory-programmed value is 0.<br>• 43: 3G minimum QoS maximum uplink bit rate - <param_val> is the value for the maximum uplink bit rate in kb/s. The factory-programmed value is 0.<br>• 44: 3G minimum QoS maximum SDU size - <param_val> is the value for the maximum SDU size in octets. The factory-programmed value is 0.<br>• 45: 3G minimum QoS residual bit error rate - <param_val> selects the acceptable value for the residual bit error rate:<br>o 0 (factory-programmed value): subscribed<br>o 1: 5E2<br>o 2: 1E2<br>o 3: 5E3<br>o 4: 4E3<br>o 5: 1E3<br>o 6: 1E4<br>o 7: 1E5<br>o 8: 1E6<br>o 9: 6E8<br>• 46: 3G minimum QoS SDU error ratio - <param_val> selects the acceptable value for the SDU error ratio:<br>o 0 (factory-programmed value): subscribed<br>o 1: 1E2<br>o 2: 7E3<br>o 3: 1E3<br>o 4: 1E4<br>o 5: 1E5<br>o 6: 1E6<br>o 7: 1E1<br>• 47: 3G minimum QoS signalling indicator - <param_val> selects the acceptable value for the signalling indicator:<br>o 0 (factory-programmed value): subscribed<br>o 1: signalling indicator 1<br>• 48: 3G minimum QoS source statistics descriptor - <param_val> selects the acceptable value for the source statistics descriptor:<br>o 0 (factory-programmed value): subscribed<br>o 1: source statistics descriptor 1 |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 49: 3G minimum QoS traffic class - <param_val> selects the acceptable value for the traffic class:<br>o 0 (factory-programmed value): subscribed<br>o 1: conversational<br>o 2: streaming<br>o 3: interactive<br>o 4: background<br>• 50: 3G minimum QoS traffic priority - <param_val> selects the acceptable value for the traffic priority:<br>o 0 (factory-programmed value): subscribed<br>o 1: priority 1<br>o 2: priority 2<br>o 3: priority 3<br>• 51: 3G Minimum QoS transfer delay - <param_val> is the value for the transfer delay in milliseconds. The factory-programmed value is 0.<br>• 100: map the +UPSD profile to the specified <cid> in the *+CGDCONT* table.<br>o 1: map the current profile to <cid> 1<br>o 2: map the current profile to <cid> 2<br>o 3: map the current profile to <cid> 3<br>o 4: map the current profile to <cid> 4<br>o 5: map the current profile to <cid> 5<br>o 6: map the current profile to <cid> 6<br>o 7: map the current profile to <cid> 7<br>o 8 (factory-programmed value): map the current profile to <cid> 8 |

## 18.5.4 Notes

- For the description of the QoS parameters, see 3GPP TS 02.60 and 3GPP TS 23.060 [*10*].
- The maximum length of <param_val> if <param_tag> is equal to 2 or 3 is 64.

**TOBY-L2 / MPCI-L2**

- If <param_tag>=6, <param_val>=3 (automatic selection of authentication type) is not supported.
- If the default <cid> mapping needs to be changed, modify it prior to any other configuration.
- The supported <param_tag>s are:
  - 0: IP type
  - 1: APN
  - 100: profile to <cid> mapping

  The authentication parameters can be configured by means of the *+UAUTHREQ* AT command. All the other advanced parameters (e.g. QoS) can be configured using the standard 3GPP AT commands. In both cases the <cid> to be used shall be the one mapped to the +UPSD profile (through <param_tag> = 100).

**LISA-U / SARA-U**

- Only the IPv4 protocol type for an internal context is supported; hence if <param_tag> = 0 (IP type), <param_val>= 1 (IPv6), 2 (IPv4v6 with IPv4 preferred) and 3 (IPv4v6 with IPv6 preferred) are not supported.
- The <param_tag> = 100 (profile to <cid> mapping) is not supported.

**LISA-U200-00S / LISA-U200-01S / LISA-U200-02S / LISA-U200-52S / LISA-U200-62S / LISA-U200-82S / LISA-U230 / LISA-U260 / LISA-U270 / SARA-U260-00S / SARA-U270-00S / SARA-U270-00X / SARA-U280-00S**

- If <param_tag>=6, <param_val>=3 (automatic selection of authentication type) is not supported.

**LISA-U1**

- If <param_tag>=6, <param_val> can only assume the value 2 (CHAP).
- If <param_tag>=6, <param_val>=3 (automatic selection of authentication type) is not supported.

Objective Specification

**SARA-G340 / SARA-G350 / LEON-G**

- For <param_tag> = 0 (IP type), values 1 (IPv6), 2 (IPv4v6 with IPv4 preferred) and 3 (IPv4v6 with IPv6 preferred) are not supported.
- The maximum length of <param_val> is 30 if <param_tag> is equal to 2 or 3.
- If <param_tag>=6, <param_val>=3 (automatic selection of authentication type) is not supported.
- If <param_tag>=8, <param_val>=2 is not supported.
- If <param_tag>=9, <param_val>=2, 3 and 4 are not supported.
- If <param_tag>=12 (or 17) and <param_val>=1 means GTP Ack, LLC Ack and Protected, RLC Ack.
- If <param_tag>=12 (or 17) <param_val>=6 is not supported.
- The values of <param_tag> greater than 19 are not supported.
- The <param_tag> = 100 (profile to <cid> mapping) is not supported.

## 18.6 Packet switched data action +UPSDA

| +UPSDA | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | No | Yes | *Up to 3 min* | *+CME Error* |

### 18.6.1 Description

Performs the requested action for the specified PSD profile.

The command can be aborted. When a PDP context activation (<action> = 3) or a PDP context deactivation (<action> = 4) is aborted, the +UUPSDA URC is provided. The <result> parameter indicates the operation result. Until this operation is not completed, another set command cannot be issued.

The +UUPSDD URC is raised when the data connection related to the provided PSD profile is deactivated either explicitly by the network (e.g. due to prolonged idle time) or locally by the module after a failed PS registration procedure (e.g. due to roaming) or a user required detach (e.g. triggered by *AT+COPS=2*).

TOBY-L2 / MPCI-L2
The PSD profile configured through the *+UPSD* AT command is mapped to a <cid> in the *+CGDCONT* table (<cid> 8 by default).
If the <cid> has been already activated through the *+CGACT* command (or if the context is enabled by default in LTE network), it is not mandatory to trigger the +UPSDA activation command (this action is still suggested).
If the activation command is triggered for an already active data context, no new activation will be performed.
It is strongly discouraged a mixed use of *+UPSDA* and *+CGACT* commands for the internal profile activation.

TOBY-L2 / MPCI-L2
The command cannot be aborted.

TOBY-L2 / MPCI-L2
The +UUPSDA URC is always raised when the PSD profile is activated.

TOBY-L2 / MPCI-L2
When a <profile_id> is mapped to and already active <cid>, the activation command (<action> = 3) may fail due to the following situations:

1. The APN configured with *+UPSD* does not match the the mapped <cid>'s APN (see *+CGDCONT* AT command). When this error is detected, the final result code will be "+CME ERROR: 4000" if CMEE=1 or "+CME ERROR: APN configuration mismatch" if *+CMEE=2*

Objective Specification

2. The protocol type specified with the *+UPSD* AT command does not match with the PDP type of the mapped <cid> configured through the *+CGDCONT* AT command. To avoid this error, apply these mapping rules:
   - *+UPSD* protocol type 0 maps to *+CGDCONT* PDP type "IP"
   - *+UPSD* protocol type 1 maps to *+CGDCONT* PDP type "IPV6"
   - *+UPSD* protocol types 2 and 3 map to *+CGDCONT* PDP type "IPV4V6"

   When this error is detected, the final result code will be "+CME ERROR: 4001" if *+CMEE=1* or "+CME ERROR: IP type configuration mismatch" if *+CMEE=2*

## 18.6.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UPSDA=<profile_id>,<action> | OK | AT+UPSDA=2,1<br>OK |
| URC | | +UUPSDD: <profile_id> | |
| URC | | +UUPSDA: <result>[,<ip_addr>] | |

## 18.6.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <profile_id> | Number | PSD profile identifier, in range 0-6 |
| <action> | Number | • 0: reset; it clears the specified profile resetting all the parameters to their factory-programmed values<br>• 1: store; it saves all the parameters in NVM<br>• 2: load: it reads all the parameters from NVM<br>• 3: activate; it activates a PDP context with the specified profile, using the current parameters<br>• 4: deactivate; it deactivates the PDP context associated with the specified profile |
| <result> | Number | • 0: action successful<br>• Different values mean an unsuccessful action (the codes are listed in the *Appendix A.1*) |
| <ip_addr> | String | The IP address assigned to the activated PDP context. |

## 18.6.4 Notes

- Only one profile can be activated at the same time. The PDP context activation on more than one profile at the same time is not supported.
- The number of PDP contexts defined with *AT+CGDCONT* plus the number of contexts activated with +UPSDA cannot exceed three. Any further request to define a context with *AT+CGDCONT* or to activate a context with +UPSDA generates an error result code.
- In case of remote deactivation of the PDP context associated with a PSD profile, the URC is sent to the TE to inform the user, otherwise the user should deactivate the PDP context after the usage.
- In case of PDP deactivation (triggered by either network or the user) all the sockets that have been created will automatically be closed.

**LISA-U / SARA-U / SARA-G / LEON-G**

- If the activation command is triggered for an already active data context, no new activation will be performed and the new activation command returns an error result code. If the deactivation command is triggered for a not active data context, the deactivation command returns an error result code.
- The command shall not be aborted before the expected maximum response time of 180 s or before the +UUPSDA URC (if supported) has been received. If aborted, the requested procedure (e.g. the PS data call activation or deactivation) will not be stopped, hence it will not be possible for the application processor to clearly understand when it is finished. The information about the active PDP context may also be polled by means of the *+UPSND* AT command, where supported.
- The <ip_addr> parameter in +UUPSDA URC is not present.

Objective Specification

**LISA-U / SARA-U**

- If the <action>= 3 (activate) the <cid> of the PDP context is set to 31 or a subsequent number if a BIP session is ongoing.

**LISA-U1 / LISA-U200-00S / LISA-U200-01S / LISA-U230 / LISA-U260-01S / LISA-U270-01S**

- The command cannot be aborted.
- The +UUPSDA URC is not supported.

**SARA-G340 / SARA-G350 / LEON-G**

- If the <action>= 3 (activate) the <cid> of the PDP context is set to 4.

**LEON-G100-06S**

- The command cannot be aborted.
- The +UUPSDA URC is not supported.
- In case of PDP deactivation (triggered by either network or the user), it is up to the user or the application to close all the sockets that have been created and are still open.

# 18.7 Packet switched network-assigned data +UPSND

| +UPSND | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | No | No | - | *+CME Error* |

## 18.7.1 Description

Returns the current (dynamic) network-assigned or network-negotiated value of the specified parameter for the active PDP context associated with the specified PSD profile.

## 18.7.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UPSND=<profile_id>,<param_tag> | +UPSND: <profile_id>,<param_tag>,<dynamic_param_val><br>OK | AT+UPSND=2,0<br>+UPSND: 2,0,"151.9.78.170"<br>OK |

## 18.7.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <profile_id> | Number | PSD profile identifier, in range 0-6 |
| <param_tag> | Number | Index representing a network-assigned or network-negotiated parameter:<br>• 0: IP address: dynamic IP address assigned during PDP context activation;<br>• 1: DNS1: dynamic primary DNS address;<br>• 2: DNS2: dynamic secondary DNS address;<br>• 3: QoS precedence: network assigned precedence class of the QoS;<br>• 4: QoS delay: network assigned delay class of the QoS;<br>• 5: QoS reliability: network assigned reliability class of the QoS;<br>• 6: QoS peak rate: network assigned peak rate value of the QoS;<br>• 7: QoS mean rate: network assigned mean rate value of the QoS<br>• 8: PSD profile status: if the profile is active the return value is 1, 0 otherwise<br>• 9: 3G QoS delivery order<br>• 10: 3G QoS erroneous SDU delivery<br>• 11: 3G QoS extended guaranteed downlink bit rate<br>• 12: 3G QoS extended maximum downlink bit rate<br>• 13: 3G QoS guaranteed downlink bit rate |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 14: 3G QoS guaranteed uplink bit rate<br>• 15: 3G QoS maximum downlink bit rate<br>• 16: 3G QoS maximum uplink bit rate<br>• 17: 3G QoS maximum SDU size<br>• 18: 3G QoS residual bit error rate<br>• 19: 3G QoS SDU error ratio<br>• 20: 3G QoS signalling indicator<br>• 21: 3G QoS source statistics descriptor<br>• 22: 3G QoS traffic class<br>• 23: 3G QoS traffic priority<br>• 24: 3G QoS transfer delay |
| <dynamic_param_val> | String | Network-assigned or network-negotiated value of the parameter specified in <param_tag> |

### 18.7.4 Notes

**TOBY-L2 / MPCI-L2**

- The supported <param_tag>s are:
  - 0: IP address query
  - 8: PSD profile status

**SARA-G340 / SARA-G350 / LEON-G**

- The values of <param_tag> greater than 8 are not supported.

## 18.8 Read PDP context DNS information +UDCONF=11

| +UDCONF=11 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-U201 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 18.8.1 Description

Returns the DNS server IP addresses (the secondary one will be provided only if assigned by the network) for all active PDP contexts.

In case the <PDP_type>="IPV4V6", for each <cid> two rows will be printed: the first one will contain the IPv4 DNS addresses, the second one the IPv6 DNS addresses.

### 18.8.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Read | AT+UDCONF=11 | [+UDCONF: 11,<cid>,<DNS_prim_addr>[,<DNS_sec_addr>]<br>[+UDCONF: 11,<cid>,<DNS_prim_addr>[,<DNS_sec_addr>]<br>[...]]]<br>OK | AT+UDCONF=11<br>+UDCONF: 11,1,"192.168.209.199","192.168.209.200"<br>+UDCONF: 11,2,"192.168.209.199","192.168.209.200"<br>OK |

### 18.8.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <cid> | Number | See *<cid>* |
| <DNS_prim_addr> | String | IP address of the primary DNS server |
| <DNS_sec_addr> | String | IP address of the secondary DNS server |

Objective Specification

# 18.9 Quality of service profile (requested) +CGQREQ

| +CGQREQ | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

## 18.9.1 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).

The command defines a PDP context having <PDP_type> set to "IP", <apn> set to "" and with the specified <cid>, if a PDP context with the specified <cid> was not already defined by +CGDCONT AT command.

If not specified the following values are assumed:

- <cid>:1
- <precedence>: 0
- <delay>: 0
- <reliability>: 0
- <peak>: 0
- <mean>: 0

## 18.9.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CGQREQ=[<cid>[,<precedence>[,<delay>[,reliability>[,<peak>[,<mean>]]]]]] | OK | AT+CGQREQ=1,1,1,1,1,1<br>OK |
| Read | AT+CGQREQ? | +CGQREQ: <cid>,<precedence>,<delay>,<reliability>,<peak>,<mean><br>OK | +CGQREQ: 1,1,1,1,1,1<br>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)<br>[+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)]<br>[...]]<br>OK | +CGQREQ: "IP",(0-3),(0-4),(0-5),(0-9),(0-18,31)<br>OK |

## 18.9.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <cid> | Number | See *Chapter 18.1.2* |
| <precedence> | Number | See *Chapter 18.1.23* |
| <delay> | Number | See *Chapter 18.1.4* |
| <reliability> | Number | See *Chapter 18.1.24* |
| <peak> | Number | See *Chapter 18.1.20* |
| <mean> | Number | See *Chapter 18.1.17* |

Objective Specification

# 18.10 Quality of service profile (minimum acceptable) +CGQMIN

| +CGQMIN | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

## 18.10.1 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 values are assumed:

- <cid>:1
- <precedence>: 3
- <delay>: 4
- <reliability>: 5
- <peak>: 1
- <mean>: 1

## 18.10.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CGQMIN=[<cid>[,<precedence>[,<delay>[,reliability>[,<peak>[,<mean>]]]]]] | OK | AT+CGQMIN=1,1,1,1,1,1<br>OK |
| Read | AT+CGQMIN? | +CGQMIN: <cid>,<precedence>,<delay>,<reliability>,<peak>,<mean><br>OK | +CGQMIN: 1,1,1,1,1,1<br>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)<br>[+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)<br>[...]]<br>OK | +CGQMIN: "IP",(0-3),(0-4),(0-5),(0-9),(0-18,31)<br>OK |

## 18.10.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <cid> | Number | See *Chapter 18.1.2* |
| <precedence> | Number | See *Chapter 18.1.23* |
| <delay> | Number | See *Chapter 18.1.4* |
| <reliability> | Number | See *Chapter 18.1.24* |
| <peak> | Number | See *Chapter 18.1.20* |
| <mean> | Number | See *Chapter 18.1.17* |

Objective specification

## 18.11 GPRS attach or detach +CGATT

| +CGATT | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | Yes | *Up to 3 min* | *+CME Error* |

### 18.11.1 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 result code is returned. If the requested state cannot be reached, an error result code is returned. The command can be aborted if a character is sent to the 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 the GSM registration has not yet been performed, AT+CGATT=1 triggers both GSM and GPRS registration.

The deregistration action is carried out even if the command is aborted.

Unless the MS is detached from GPRS service due to a previously performed GPRS detach, the set command with <state>=1 triggers a user reselection. In this case a search for the HPLMN or a higher order PLMN is triggered (for more details see *Chapter 7.4* and 3GPP TS 23.122 *[70]*).

### 18.11.2 Syntax

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

### 18.11.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <state> | Number | See *Chapter 18.1.25* |

## 18.12 Configure the auto attach to PS domain on power on +UCGATT

| +UCGATT | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | *NVM* | No | - | *+CME Error* |

### 18.12.1 Description

Configure the auto attach to PS domain at the module power on. The configuration of the auto attach is stored in the NVM and will be effective at the next power on.

When <mode>=0, the UE will not register on LTE RAT because CS only registration is not supported by the LTE standard (see *+CEMODE* command description). On 2G and 3G RAT, the UE will perform registration on CS domain only.

Objective Specification

### 18.12.2 Syntax

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

### 18.12.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | Auto attach configuration:<br>• 0: auto attach to PS domain at switch on is disabled<br>• 1 (factory-programmed value): auto attach to PS domain at switch on is enabled |

## 18.13 PDP context activate or deactivate +CGACT

| +CGACT | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | Yes | *Up to 40-150 s (see below)* | *+CME Error* |

### 18.13.1 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 result code 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 can be aborted if a character is sent to the DCE during the command execution: in case a PDP context activation on a specific <cid> was requested, the PDP context deactivation is performed; if a multiple PDP context activation was requested, it is aborted after the pending PDP context activation has finished.

The deactivation action is carried out even if the command is aborted.

The maximum expected response time is different in case the activation or the deactivation of a PDP context is performed (150 s and 40 s respectively).

### 18.13.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CGACT=[<status>[,<cid>[,...]]] | OK | AT+CGACT=1,1<br>OK |
| Read | AT+CGACT? | [+CGACT: <cid>,<status><br>[+CGACT: <cid>,<status><br>[...]]]<br>OK | +CGACT: 1,1<br>OK |
| Test | AT+CGACT=? | +CGACT: (list of supported <status>s)<br>OK | +CGACT: (0-1)<br>OK |

### 18.13.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <status> | Number | See *<status>*. |
| <cid> | Number | See *<cid>*. |

Objective Specification

### 18.13.4 Notes

- If <cid> is not defined, the command activates or deactivates all the defined PDP contexts.
- The number of PDP contexts defined with *AT+CGDCONT* plus the number of contexts activated with *AT+UPSDA* should not exceed the maximum number of definable PDP contexts (e.g. 3 or 11): in that case any further request to define a context with *AT+CGDCONT* or to activate a context with *AT+UPSDA* will generate an error result code.
- Do not issue this command to configure internal PDP contexts (see *+UCSD*, *+UCSDA* and *+UCSND* AT commands for establishing a CSD connection and *+UPSD*, *+UPSDA* and *+UPSND* AT commands for establishing a PSD connection).

Examples of usage of *+CGDCONT*, +CGACT, *+CGPADDR* command:

| Command sent by DTE | DCE response | Description |
|---|---|---|
| AT+CMEE=2 | OK | Set the verbose error result codes |
| AT+COPS=0 | OK | |
| AT+COPS? | +COPS: 0,0,"vodafone IT"<br>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<br>+CGDCONT: 3,"IP","internet","0.0.0.0",0,0<br>+CGDCONT: 2,"IP","mms.vodafone.it","0.0.0.0",0,0<br>OK | Read PDP contexts |
| AT+CGACT=1,1 | OK | Activate PDP context 1 |
| AT+CGPADDR=1 | +CGPADDR: 1, "91.80.104.82"<br>OK | Show address of PDP context 1 |
| AT+CGPADDR=2 | +CGPADDR: 2, "0.0.0.0"<br>OK | Show address of PDP context 2 |
| AT+CGPADDR=3 | +CGPADDR: 3, "0.0.0.0"<br>OK | Show address of PDP context 3 |
| AT+CGDCONT? | +CGDCONT: 1,"IP","web.omnitel.it","91.80.104.82",0,0<br>+CGDCONT: 3,"IP","internet","0.0.0.0",0,0<br>+CGDCONT: 2,"IP","mms.vodafone.it","0.0.0.0",0,0<br>OK | |
| AT+CGACT=0,1 | OK | Deactivate PDP context 1 |
| AT+CGDCONT? | +CGDCONT: 1,"IP","web.omnitel.it","0.0.0.0",0,0<br>+CGDCONT: 3,"IP","internet","0.0.0.0",0,0<br>+CGDCONT: 2,"IP","mms.vodafone.it","0.0.0.0",0,0<br>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<br>+CGDCONT: 3,"IP","internet","83.225.114.136",0,0<br>+CGDCONT: 2,"IP","mms.vodafone.it","10.159.135.60",0,0<br>OK | |
| AT+CGPADDR=1 | +CGPADDR: 1, "91.80.101.207"<br>OK | Show address of PDP context 1 |
| AT+CGPADDR=2 | +CGPADDR: 2, "10.159.135.60"<br>OK | Show address of PDP context 2 |

Objective Specification

| Command sent by DTE | DCE response | Description |
|---|---|---|
| AT+CGACT=0 | OK | Deactivate all of defined PDP contexts |
| AT+CGPADDR=2 | +CGPADDR: 2, "0.0.0.0" | Show address of PDP context 2 |
| | OK | |
| AT+CGPADDR=3 | +CGPADDR: 3, "0.0.0.0" | Show address of PDP context 3 |
| | 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 | |
| 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 | |

**TOBY-L2 / MPCI-L2**

- The AT+CGACT=0 command returns an error result code in LTE network.
- If <cid> parameter is out of range (<cid>=0 or greater than 8), the command activates or deactivates all the defined PDP contexts.

**TOBY-L210-62S**

- A single data PDP context is allowed.

**SARA-G300 / SARA-G310**

- As the module supports one active PDP context, if more than one PDP context is defined, a request to activate all defined PDP contexts with <status>=1 and omitted <cid> generates an error result code.

**LEON-G100-06S**

- The command cannot be aborted.

Objective Specification

# 18.14 Manual response to a network request for PDP context activation +CGANS

| +CGANS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U200-62S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | *Up to 150 s* | *+CME Error* |

## 18.14.1 Description

Requests the MT to respond to a network request for the packet domain PDP context activation which has been indicated to the TE by the RING or +CRING URC.

This command is not equivalent to issuing a *+CGDATA* or *+CGACT* command after having received a +CRING URC: *+CGDATA* or *+CGACT* would not command the MT to acknowledge the network request indicated by the +CRING URC but would trigger a new independent PDP context activation.

## 18.14.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CGANS=[<response>,[<L2P>,[<cid>]]] | OK | AT+CGANS=1<br>OK |
| Test | AT+CGANS=? | +CGANS: (list of supported <response>s),(list of supported <L2P>s)<br>OK | +CGANS: (0,1),("PPP","M-OPT-PPP","M-HEX","M-RAW_IP","M-PPP-RELAY")<br>OK |

## 18.14.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <response> | Number | Response action. Allowed values:<br>• 0 (default value): reject the request<br>• 1: accept and request the PDP context activation |
| <L2P> | String | See *<L2P>* |
| <cid> | Number | See *<cid>* |

## 18.14.4 Notes

- Typically only AT+CGANS=0 or AT+CGANS=1 are needed: the MT will automatically handle the remaining parameters.
- If the <L2P> parameter value is unacceptable to the MT, the MT shall return an error result code. Otherwise, the MT issues the CONNECT IRC and enters V.250 online data state. If the <L2P> is omitted then the MT will default it to "PPP" if the <PDP_type>="IP" or to "M-PPP-RELAY" if the <PDP_type>="PPP".
- If no <cid> is given or if there is no matching context definition, the MT will attempt to activate the context using the values for <PDP_type> and <PDP_addr> provided by the network, together with any other relevant information known to the MT. If the activation is successful, data transfer may proceed.

# 18.15 Automatic response to a network request for PDP context activation +CGAUTO

| +CGAUTO | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U200-62S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

## 18.15.1 Description

Disables or enables an automatic positive or negative response (auto-answer) to the reception of a NW-initiated request PDP context activation message. It also provides the control over the use of the V.250 basic commands

Objective Specification

*+CGDATA* or *S0*, *A* and *H* for the handling network requests for a PDP context activation. The setting does not affect the issuing of the RING or +CRING URCs.

### 18.15.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CGAUTO=[<action>] | OK | AT+CGAUTO=0<br>OK |
| Read | AT+CGAUTO? | +CGAUTO: <action><br>OK | +CGAUTO: 1<br>OK |
| Test | AT+CGAUTO=? | +CGAUTO: (list of supported <action>s)<br>OK | +CGAUTO: (0-4)<br>OK |

### 18.15.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <action> | Number | Auto-answer action. The allowed values are:<br>• 0 (default value): turn off the automatic response for Packet Domain only<br>• 1: turn on the automatic response for Packet Domain only<br>• 2: modem compatibility mode, Packet Domain only<br>• 3 (factory-programmed value): modem compatibility mode, Packet Domain and circuit switched calls<br>• 4: turn on the automatic negative response for Packet Domain only |

### 18.15.4 Notes

- If <action>=0 the packet domain network requests are manually accepted or rejected by *+CGANS* commands.
- If <action>=1 the packet domain network requests are automatically accepted.
- If <action>=2 the automatic acceptance of the packet domain network requests is controlled by the *S0* command. The manual control uses the *A* and *H* commands, respectively, to accept and reject the packet domain requests (*+CGANS* may also be used). The incoming circuit switched calls can be neither manually nor automatically answered.
- For <action>=3 automatic acceptance of both packet domain network requests and incoming circuit switched calls is controlled by the *S0* command. The manual control uses the *A* and *H* commands, respectively, to accept and reject the packet domain requests (*+CGANS* may also be used).
- For <action>=4 the packet domain network requests are automatically rejected.

## 18.16 Enter data state +CGDATA

| +CGDATA | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | *Up to 3 min (<1 s for prompt ">" when present)* | *+CME Error* |

### 18.16.1 Description

Causes the MT to set up a data communication channel between the DTE and the PDP network. For the u-blox specific L2 modes M-HEX and M-RAW_IP, this means 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 CONNECT IRC on the DTE and enters the online data mode, thus allowing data transfer. Other commands following +CGDATA in the command line will be processed. When the data transfer is completed, the MT re-enters into command mode and the final result code is displayed on DTE.

Objective Specification

In case of error the final result code NO CARRIER or +CME ERROR: <error> is displayed.

If not specified, value 1 is assumed for <cid>.

The session is terminated sending **~+++**, which may cause the deactivation, if active, of the PDP context depending on DTR line status, i.e. on the AT&D setting (see *Chapter 15.3.4* and *Chapter 15.3.5*). 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, no GPRS attach and no PDP context activation are performed until the PPP on the DTE side starts communication with the PPP on the MT side.

The M-HEX L2 protocol (AT+CGDATA="M-HEX",1) can be used as follows:

- Syntax: <int: counter> <int: length[1-1500]> <hex-sequence>[0-9a-fA-F]
- Syntax: cid=<int: cid>
- Syntax: +++<cr>

Examples:

1 200<CR> - send 1 packet with 200 0x2B (fill character)

5 5<CR> - send 5 packets with 5 0x2B (fill character)

1 5 31 32 33 34 35<CR> - send 1 packet with the given contents

1 5 1 2 3 4 05<CR> - send 1 packet with the given contents

1 10 31 Q<CR> - send 1 packet with 10 0x31

cid=2 - send packets on cid 2 (this requires two active PDP contexts and the M-HEX L2 protocol entered on <cid> = 1

+++ - leave the online mode

A packet is sent if one of the following conditions is met:

- the length field is terminated with <CR>
- the length value is equal to # characters of hex-sequence and it is terminated with <CR>
- the input is terminated with a character not equal to a hex digit and <CR>

The PIN insertion is not mandatory for the local dial-up, started with <cid> set to 100.

This syntax of the command is mainly used to perform regulatory and conformance testing.

## 18.16.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CGDATA=[<L2P>[,<cid>]] | CONNECT<br>(data transfer starts) | AT+CGDATA="PPP",1<br>CONNECT |
| Test | AT+CGDATA=? | +CGDATA: (list of supported <L2P>s)<br>OK | +CGDATA: ("PPP","M-HEX","M-RAW_IP","M-OPT-PPP")<br>OK |

## 18.16.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <L2P> | String | See *Chapter 18.1.13* |
| <cid> | Number | See *Chapter 18.1.2* |

## 18.16.4 Notes

- 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.

Objective Specification

- The cid command accepts as parameter a <cid> value corresponding to a PDP context already active and has to be typed in lower-case.
- Usage of +CGDATA command:

| Command sent by DTE | DCE response | Description |
|---|---|---|
| AT+CMEE=2 | OK | Use verbose error result codes |
| 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<br>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 |

**TOBY-L200-00S / TOBY-L210-00S / TOBY-L210-60S / TOBY-L280-00S / MPCI-L200-00S / MPCI-L210-00S / MPCI-L210-60S**

- The OLCM is not supported.

**TOBY-L210-62S**

- A single data PDP context is allowed.

**SARA-G / LEON-G**

- The module does not start in PPP silent mode.

**SARA-G340-02S / SARA-G350-02A / SARA-G350-02S**

- On the AUX UART interface, the command is not supported.

# 18.17 Enter PPP state/GPRS dial-up D*

| D* | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | *Up to 3 min* | *+CME Error* |

## 18.17.1 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 the communication between the DTE and the external PDP network through the PPP protocol. This can include performing a PS attach and, if the PPP server on the DTE side starts communication, PDP context activation on the specified PDP context identifier (if not already requested by means of *+CGATT* and *+CGACT* commands).

If the command is accepted and the preliminary PS procedures have succeeded, the "CONNECT" intermediate result code is returned, the MT enters the V.25ter online data state and the PPP L2 protocol between the MT and the DTE is started.

The data session is terminated by one of the following events (for more details see the *Table 14*):

- sending **~+++**.
- via a DTR transition from ON to OFF.
- sending an LCP Terminate Request.

If used with <cid>= 100, this command can enable the *local dial-up*, that establishes a PPP communication between the DTE and the module through a serial interface (UART, MUX, or CDC-ACM). In this case an active PDP context is not needed since the DTE is assigned a private IP address.

Objective specification

## 18.17.2 Local dial-up

TOBY-L2 / MPCI-L2
The section applies only to these module series.

The local dial-up feature is enabled by performing a dial-up on <cid>= 100. It establishes a PPP communication between the DTE and the module through a serial interface (UART, MUX, or CDC-ACM). An IP link is created by assigning private IP addresses to the endpoints. An active PDP context is not needed. The IP traffic is automatically routed by the module, thus allowing the DTE to communicate with:

- the internet through an active PDP context (at least one PDP context/EPS bearer is needed for the IP connectivity). By default, the first PDP context activated is used to convey the data;
- a device connected to the Virtual Ethernet over USB (RNDIS/CDC-ECM);
- devices (STA) connected to the Wi-Fi access point (AP) of the cellular module (see *Wi-Fi section*).

The feature has been studied to work in router mode.

In general no defined / no active context is required to use local dial-up. The local dial-up is in any case able to communicate with the interfaces connected to the module IP stack, as for example RNDIS and Wi-Fi interfaces.

The local dial-up feature does not support the OnLine Command Mode (OLCM). Furthermore the DTR ON to OFF transition and the ~+++ cannot be used to terminate the local dial-up (the procedure described in *~+++ behavior in PSD &D* is not applicable).

The PIN insertion is not mandatory for the local dial-up feature.

## 18.17.3 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | ATD[<dialing_type_char>]*<dialing_number>[*[<address>][*[<L2P>][*[<cid>]]]]# | CONNECT<br>(data transfer starts) | ATD*99***1#<br>CONNECT |

## 18.17.4 Defined values

| Parameter | Type | Description |
|---|---|---|
| <dialing_type_char> | String | Optional (legacy) "T" or "P" character indicating the tone dialing or pulse dialing respectively |
| <dialing_number> | Number | List all the supported values |
| <address> | - | Ignored |
| <L2P> | String | See *<L2P>* |
| <cid> | Number | See *<cid>* |

## 18.17.5 Notes

- Dial up with PAP/CHAP authentication is not supported on an already active PDP context that was activated without authentication.
- The context identifier <cid> is mapped to 1 if not specified.
- The GPRS dial-up command maps to AT+CGDATA="PPP",<cid>.
- If FDN is enabled and FDN check for PS data call is supported by the module, to perform a GPRS dial-up one of the following entries must be stored in the FDN phonebook: *99#, *99*#, *99**# or *99***#.

**TOBY-L2 / MPCI-L2**

- Dial-up on an already active <cid> context identifier is not supported if the current *AT+UUSBCONF* command setting enables the virtual Ethernet device, since it could disrupt an already active communication over the USB link. To use the required <cid> the user should manually deactivate it with *AT+CGACT* first.
- The above limitation does not apply to the 'Fairly back-compatible' *AT+UUSBCONF* configuration. At the end of the PPP session the <cid> will be deactivated regardless of its previous status, if possible: if the module is registered in LTE network then the last active <cid> context identifier cannot be deactivated.

Objective Specification

**TOBY-L200-00S / TOBY-L201 / TOBY-L210-00S / TOBY-L210-60S / TOBY-L280-00S / MPCI-L201 / MPCI-L210-60S**

- The local dial-up feature is not supported.

**SARA-G340-02S / SARA-G350-02A / SARA-G350-02S**

- On the AUX UART interface, the command is not supported.

# 18.18 Show PDP address +CGPADDR

| +CGPADDR | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

## 18.18.1 Description

Returns a list of PDP addresses for the specified context identifiers. Only defined PDP contexts are displayed.

## 18.18.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CGPADDR=[<cid>[,<cid> [,...]]] | +CGPADDR: <cid>,<PDP_addr><br>OK | AT+CGPADDR=1<br>+CGPADDR: 1,"1.2.3.4"<br>OK |
| Test | AT+CGPADDR=? | +CGPADDR: [(list of defined <cid>s)]<br>OK | +CGPADDR: 1,3<br>OK |

## 18.18.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <cid> | Number | See *Chapter 18.1.2* |

# 18.19 GPRS MS class configuration +CGCLASS

| +CGCLASS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | *Up to 3 min* | *+CME Error* |

## 18.19.1 Description

Forces the detach/attach to the disabled/enabled service.

The read command gives the current class which does not depend on user settings but on the current registration state (e.g. on a CS cell only, class CC is returned).

The dial-up connection is not allowed if the module class was set to CC by means of this command.

If the module class was not forced to CC by the user, the dial up connection is allowed even if the module is not registered for PS services (e.g. *AT+CGATT=0* was entered), as it will trigger a PS registration beforehand.

## 18.19.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CGCLASS=[<class>] | OK | AT+CGCLASS="B"<br>OK |
| Read | AT+CGCLASS? | +CGCLASS: <class><br>OK | +CGCLASS: "B"<br>OK |
| Test | AT+CGCLASS=? | +CGCLASS: (list of supported <class>s) | +CGCLASS: ("A","B","CC","CG") |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | OK | OK |

### 18.19.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <class> | String | GPRS mobile class<br>• "A" (default value in Iu mode): class-A mode of operation (A/Gb mode), or CS/PS mode of operation (Iu mode) (highest mode of operation)<br>• "B" (default value in A/Gb mode): class B mode of operation (the MT can operate in both circuit-switched and packet-switched services but not simultaneously)<br>• "CC": class CC mode of operation (the MT can operate only in circuit-switched service)<br>• "CG": class CG mode of operation (the MT can operate only in packet-switched service) |

### 18.19.4 Notes

- <class>="A" is only supported when in Iu mode.
- When in Iu mode (i.e. UMTS RAT), class A and class B have equivalent meanings (both CS and PS services supported). When in A/Gb mode (i.e. GSM RAT), class-A mode operation is not supported.

**TOBY-L2 / MPCI-L2**

- If the module is set to "CG" class with +CGCLASS command, the manual selection of a forbidden PLMN shall be triggered with *+UCGOPS* command; the *AT+COPS=1* command cannot be issued for this purpose.
- To change the module class it is needed to deregister it from network with *AT+COPS=2*, change the class type and again register the module on the network

**SARA-G / LEON-G**

- To change the module class it is needed to deregister it from network with *AT+COPS=2*, change the class type and again register the module on the network.
- <class>="A" is not supported.

## 18.20 GPRS MS class configuration at start up +UCGCLASS

| +UCGCLASS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| | LISA-U SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | Yes | *NVM* | No | - | *+CME Error* |

### 18.20.1 Description

Sets the startup class. If the class is set to CS only, before activating a PDP context it is necessary to trigger a PS attach via *+CGATT=1* or to change the class to B.

The current MS class will be stored in NVM and used at the next module power on.

u-blox cellular modules are certified according to all the capabilities and options stated in the Protocol Implementation Conformance Statement document (PICS) of the module. The PICS, according to 3GPP TS 51.010-2 [*83*], 3GPP TS 34.121-2 [*84*], 3GPP TS 36.521-2 [*114*] and 3GPP TS 36.523-2 [*115*], is a statement of the implemented and supported capabilities and options of a device. If the user changes the command settings during the certification process, the PICS of the application device integrating a u-blox cellular module must be changed accordingly.

### 18.20.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UCGCLASS=<class> | OK | AT+UCGCLASS="CC"<br>OK |
| Read | AT+UCGCLASS? | +UCGCLASS: <class> | +UCGCLASS: "B" |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | OK | OK |
| Test | AT+UCGCLASS=? | +UCGCLASS: (list of supported <class>s) | +UCGCLASS: ("B","CC") |
| | | OK | OK |

### 18.20.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <class> | String | • "B" (factory-programmed value): MS class B (the MT supports both circuit-switched and packet-switched services)<br>• "CC": MS class C (the MT supports only circuit switched services) |

### 18.20.4 Notes

- If "CC" is selected, the network selection (*+COPS* AT command) triggers a registration only for CS services.
- If "CC" is selected, *+CGATT=1* forces the registration for PS services (i.e. +UCGCLASS' setting is ignored)

**TOBY-L2 / MPCI-L2**

- The PIN insertion is not mandatory.

## 18.21 Device class setting +UCLASS

| +UCLASS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | *NVM* | No | - | *+CME Error* |

### 18.21.1 Description

Changes the module's multislot classes. 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*) otherwise an error result code is reported; the new multislot class is used starting from the successive GPRS attach. The new multislot classes are also stored to NVM and used at the next module power on.

u-blox cellular modules are certified according to all the capabilities and options stated in the Protocol Implementation Conformance Statement document (PICS) of the module. The PICS, according to 3GPP TS 51.010-2 [*83*], 3GPP TS 34.121-2 [*84*], 3GPP TS 36.521-2 [*114*] and 3GPP TS 36.523-2 [*115*], is a statement of the implemented and supported capabilities and options of a device. If the user changes the command settings during the certification process, the PICS of the application device integrating a u-blox cellular module must be changed accordingly.

If <ms_class_GPRS>=0 the default values are set for all the parameters, regardless of the other parameter settings.

### 18.21.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UCLASS=<ms_class_GPRS>[,<ms_class_EGPRS>[,<ms_class_DTM_GPRS>[,<ms_class_DTM_EGPRS>]]] | OK | AT+UCLASS=10<br>OK |
| Read | AT+UCLASS? | +UCLASS: <ms_class_GPRS>[,<ms_class_EGPRS>[,<ms_class_DTM_GPRS>[,<ms_class_DTM_EGPRS>]]]<br>OK | +UCLASS: 12,12,11,11<br>OK |
| Test | AT+UCLASS=? | +UCLASS: (list of supported <ms_class_GPRS> values)[,(list of supported <ms_class_EGPRS> values)[,(list of supported <ms_class_DTM_GPRS> values)[,(list of supported <ms_class_DTM_EGPRS> values)]]] | +UCLASS: (0-12),(0-12),(0-11),(0-11)<br>OK |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | OK | |

## 18.21.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <ms_class_GPRS> | Number | GPRS multislot class defined according to 3GPP TS 05.02 [42]. Range from 0 to 12. Factory-programmed value is 12. |
| <ms_class_EGPRS> | Number | EGPRS multislot class defined according to 3GPP TS 05.02 [42]. Range from 0 to 12. Factory-programmed value is 12. Default value is the value set in <ms_class_GPRS>. |
| <ms_class_DTM_GPRS> | Number | DTM GPRS multislot class defined according to 3GPP TS 05.02 [42]. Range from 0 to 11. Factory-programmed value is 11. Default value is the value set in <ms_class_GPRS>. |
| <ms_class_DTM_EGPRS> | Number | DTM EGPRS multislot class defined according to 3GPP TS 05.02 [42]. Range from 0 to 11. Factory-programmed value is 11. Default value is the value set in <ms_class_GPRS>. |

## 18.21.4 Notes

- In the set command <ms_class_GPRS>=0 is used to set the maximum supported values.
- The GPRS, EGPRS, DTM GPRS and DTM EGPRS multislot classes cannot be independently chosen (some configurations are not valid and an error result code is reported: "+CME ERROR: operation not supported" if *+CMEE* is set to 2). See the following tables:

| Type | Valid values | Maximum value | Default value |
|---|---|---|---|
| E/GPRS | (1-12) | 12 | 12 |
| DTM E/GPRS | 5, 9,11 | 11 | 11 |

**Table 19: Multislot classes: valid, maximum and default values for each type**

| GPRS multislot class | EGPRS multislot class valid values |
|---|---|
| (1-12) | (1-12) |
| 30 | 30, 32, 33 |
| 31 | 31 |
| 32 | 30, 32, 33 |
| 33 | 30, 32, 33 |

**Table 20: EGPRS multislot classes valid values relative to the selected GPRS multislot class**

| DTM EGPRS/GPRS multislot class | EGPRS/GPRS multislot class valid values |
|---|---|
| 5 | (1-12) |
| 9 | (1-12) |
| 11 | (1-12) |

**Table 21: EGPRS/GPRS multislot classes valid values relative to the selected DTM EGPRS/GPRS multislot class**

**TOBY-L2 / MPCI-L2**

- The <ms_class_GPRS> and <ms_class_EGPRS> parameters can be set to 0, 10 or 12. The <ms_class_GPRS>=0 command sets the maximum allowed values.
- <ms_class_DTM_GPRS> and <ms_class_DTM_EGPRS> parameters are not supported.

**LISA-U1**

- These series require the <ms_class_EGPRS> parameter in the set command.
- <ms_class_DTM_GPRS> and <ms_class_DTM_EGPRS> are not supported.
- if <ms_class_GPRS>=0 the default values are not set for all the parameters.

**LISA-U200-00S**

- The range of <ms_class_GPRS> parameter goes from 0 to 33, the maximum value is 33.
- The range of <ms_class_EGPRS> parameter goes from 0 to 33, the maximum value is 33.

Objective Specification

- if <ms_class_GPRS>=0 the maximum supported values are set for all parameters, regardless of the second parameter's settings.
- if <ms_class_GPRS>=0 the default values are not set for all the parameters.
- <ms_class_DTM_GPRS> and <ms_class_DTM_EGPRS> are not supported.

**SARA-G / LEON-G**

- The range of <ms_class_GPRS> parameter goes from 0 to 10. The factory-programmed value is 10.
- <ms_class_GPRS>=7 is not allowed.
- <ms_class_EGPRS>, <ms_class_DTM_GPRS> and <ms_class_DTM_EGPRS> are not supported.
- if <ms_class_GPRS>=0 the default values are not set for all the parameters.

# 18.22 GPRS event reporting +CGEREP

| +CGEREP | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | Yes | No | No | - | *+CME Error* |

## 18.22.1 Description

Configures sending of URCs from MT to the DTE, in case of certain events occurring during GPRS signalling between the MT and the network.

## 18.22.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CGEREP=[<mode>[,<bfr>]] | OK | AT+CGEREP=1,1<br>OK |
| Read | AT+CGEREP? | +CGEREP: <mode>,<bfr><br>OK | +CGEREP: 0,0<br>OK |
| Test | AT+CGEREP=? | +CGEREP: (list of supported <mode>s),(list of supported <bfr>s)<br>OK | +CGEREP: (0-2),(0-1)<br>OK |
| URC | | +CGEV: ME PDN ACT <cid>[,<reason>[,<cid_other>]] | +CGEV: NW CLASS "CC" |
| | | +CGEV: NW ACT <p_cid>,<cid>,<event_type> | |
| | | +CGEV: ME ACT <p_cid>,<cid>,<event_type> | |
| | | +CGEV: NW PDN DEACT <cid> | |
| | | +CGEV: ME PDN DEACT <cid> | |
| | | +CGEV: NW DEACT <p_cid>,<cid>,<event_type> | |
| | | +CGEV: ME DEACT <p_cid>,<cid>,<event_type> | |
| | | +CGEV: NW MODIFY <cid>,<change_reason>,<event_type> | |
| | | +CGEV: ME MODIFY <cid>,<change_reason>,<event_type> | |
| | | +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> | |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | +CGEV: VZW_SUBS_ACTION_NORMAL<br>(0) - No restriction to data traffic | |

## 18.22.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | Controls the processing of URCs specified within this command. Allowed values:<br>• 0 (default value): buffer URCs in the MT; if the buffer is full the oldest ones will be discarded<br>• 1: discard URCs when V.24 link is reserved (online); otherwise forward them directly to the DTE<br>• 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 effect on buffered codes when <mode> 1 or 2 is entered. Allowed values:<br>• 0 (default value): MT buffer of URCs defined within this command is cleared when <mode> 1 or 2 is entered<br>• 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) |
| <PDP_type> | Number | See *<PDP_type>* |
| <PDP_addr> | Number | See *<PDP_addr>* |
| <cid> | Number | See *<cid>* |
| <class> | String | GPRS mobile class. Allowed values:<br>• "A": class A mode of operation (A/Gb mode), or CS/PS mode of operation (Iu mode) (highest mode of operation)<br>• "B": class B (circuit-switched and packet-switched data alternatively supported)<br>• "CG": class C (one service only) in GPRS mode<br>• "CC": class C (one service only) in circuit-switched (GSM) mode |
| <event_type> | Number | Indicates whether the event is informational or whether the TE has to acknowledge it:<br>• 0: informational event<br>• 1: information request: acknowledgement required |
| <reason> | Number | Indicates whether the reason why the context activation request for PDP type IPv4v6 was not granted<br>• 0: IPv4 only allowed<br>• 1: IPv6 only allowed<br>• 2: single address bearers only allowed<br>• 3: single address bearers only allowed and MT initiated context activation for a second address type bearer was not successful |
| <cid_other> | Number | Indicates whether the context identifier allocated by MT for an MT initiated context of a second address type |
| <change_reason> | Number | Indicates what kind of change occurred:<br>• 1: TFT only changed<br>• 2: QoS only changed<br>• 3: both TFT and QoS changed |

## 18.22.4 Notes

### TOBY-L2 / MPCI-L2

- The PIN insertion is not mandatory.
- <class>= "A" is not supported.
- It is possible to issue the command without "=".

### SARA-G / LEON-G

- <class>= "A" is not supported.

## 18.22.5 Explanation of URCs

| URC | Remarks |
|---|---|
| +CGEV: ME PDN ACT <cid>[,<reason>[,<cid_other>]] | The MT has activated a primary context.<br>LISA-U / SARA-U / SARA-G / LEON-G |

Objective Specification

| URC | Remarks |
|---|---|
| | Not supported. |
| +CGEV: NW ACT <p_cid>,<cid>,<event_type> | The network has forced a secondary context deactivation.<br>LISA-U / SARA-U / SARA-G / LEON-G<br>Not supported. |
| +CGEV: ME ACT <p_cid>,<cid>,<event_type> | The network has responded to a MT initiated secondary context activation.<br>LISA-U / SARA-U / SARA-G / LEON-G<br>Not supported. |
| +CGEV: NW PDN DEACT <cid> | The network has forced a primary context deactivation.<br>LISA-U / SARA-U / SARA-G / LEON-G<br>Not supported. |
| +CGEV: ME PDN DEACT <cid> | The MT has forced a primary context deactivation.<br>LISA-U / SARA-U / SARA-G / LEON-G<br>Not supported. |
| +CGEV: NW DEACT <p_cid>,<cid>,<event_type> | The network has forced a secondary context deactivation.<br>LISA-U / SARA-U / SARA-G / LEON-G<br>Not supported. |
| +CGEV: ME DEACT <p_cid>,<cid>,<event_type> | The MT has forced a secondary context deactivation.<br>LISA-U / SARA-U / SARA-G / LEON-G<br>Not supported. |
| +CGEV: ME MODIFY <cid>,<change_reason>,<event_type> | The MT has forced a context modification.<br>LISA-U / SARA-U / SARA-G / LEON-G<br>Not supported. |
| +CGEV: NW DEACT <PDP_type>,<PDP_addr>,[<cid>] | The network has forced a context deactivation.<br>TOBY-L2 / MPCI-L2<br>Not supported. |
| +CGEV: ME DEACT <PDP_type>,<PDP_addr>,[<cid>] | The MT has forced a context deactivation.<br>TOBY-L2 / MPCI-L2<br>Not supported. |
| +CGEV: NW DETACH | The network has forced a GPRS detach |
| +CGEV: ME DETACH | The mobile station has forced a GPRS detach |
| +CGEV: NW CLASS <class> | 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> | The mobile station has forced a change of MT class; the highest available class is reported |
| +CGEV: VZW_SUBS_ACTION_NORMAL (0) - No restriction to data traffic | No restriction to data traffic. The URC is provided only on Verizon network.<br>TOBY-L200 / TOBY-L210 / TOBY-L280 / MPCI-L200 / MPCI-L210 / MPCI-L280 / LISA-U / SARA-U / SARA-G / LEON-G<br>Not supported. |

# 18.23 GPRS network registration status +CGREG

| +CGREG | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | No | No | - | *+CME Error* |

## 18.23.1 Description

Configures the GPRS network registration information. Depending on the <n> parameter value a URC can be issued:

- +CGREG: <stat> if <n>=1 and there is a change in the GPRS network registration status in GERAN/UTRAN
- +CGREG: <stat>[,<lac>,<ci>[,<AcT>,<rac>]] if <n>=2 and there is a change of the network cell in GERAN/UTRAN

The parameters <lac>, <ci>, <AcT>, <rac> are provided only if available.

Objective Specification

The read command provides the same information issued by the URC together with the current value of <n> parameter. The location information elements <lac>, <ci> and <AcT>, if available, are returned only when <n>= 2 and the MT is registered with the network.

When <n>=2, in UMTS RAT, unsolicited location information can be received if the network sends the UTRAN INFORMATION MOBILITY message during dedicated connections. In contrast, in GSM RAT no unsolicited location information is received during a CS connection.

If the GPRS MT also supports circuit mode services in GERAN/UTRAN and/or EPS services in E-UTRAN, the *+CREG* / *+CEREG* commands return the registration status and location information for those services.

## 18.23.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CGREG=[<n>] | OK | AT+CGREG=1<br>OK |
| Read | AT+CGREG? | If <n>=0 or 1:<br>+CGREG: <n>,<stat><br>OK | +CGREG: 0,4<br>OK |
| | | If <n>=2:<br>+CGREG: <n>,<stat>[,<lac>,<ci>[,<AcT>,<rac>]]<br>OK | +CGREG: 2,1,"61EF","7D58A3",2,"14"<br>OK |
| Test | AT+CGREG=? | +CGREG: (list of supported <n>s)<br>OK | +CGREG: (0-2)<br>OK |
| URC | | If <n>=1:<br>+CGREG: <stat> | +CGREG: 1 |
| | | If <n>=2:<br>+CGREG: <stat>[,<lac>,<ci>[,<AcT>,<rac>]] | +CGREG: 1,"4E54","44A5" |

## 18.23.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <n> | Number | • 0 (default value and factory-programmed value): network registration URC disabled<br>• 1: network registration URC enabled<br>• 2: network registration and location information URC enabled |
| <stat> | Number | • 0: not registered, the MT is not currently searching an operator to register to<br>• 1: registered, home network<br>• 2: not registered, but MT is currently searching a new operator to register to<br>• 3: registration denied<br>• 4: unknown (e.g. out of GERAN/UTRAN coverage)<br>• 5: registered, roaming<br>• 8: attached for emergency bearer services only (see 3GPP TS 24.008 *[30]* and 3GPP TS 24.301 *[87]* that specify the condition when the MS is considered as attached for emergency bearer services) (applicable only when <AcT> indicates 2,4,5,6) |
| <lac> | String | Two bytes location area in hexadecimal format; it is optionally provided in the URC and in the response to the read command if <n>=2. The value FFFF means that the current <lac> value is invalid. |
| <ci> | String | From 2 to 4 bytes cell ID in hexadecimal format; it is optionally provided in the URC and in the response to the read command if <n>=2. The value FFFFFFFF means that the current <ci> value is invalid. |
| <AcT> | Number | Indicates the radio access technology<br>• 0: GSM<br>• 1: GSM COMPACT<br>• 2: UTRAN<br>• 3: GSM with EDGE availability<br>• 4: UTRAN with HSDPA availability |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 5: UTRAN with HSUPA availability<br>• 6: UTRAN with HSDPA and HSUPA availability<br>• 255: the current <AcT> value is invalid |
| <rac> | String | One byte routing area in hexadecimal format |

### 18.23.4 Notes

**TOBY-L2 / MPCI-L2**

- The information text response to the read command and the URC will assume these values in these conditions:
  - During the initial network searching at the module power on the <stat> parameter is 2
  - If the module is PS attached to the GSM/UMTS home network the <stat> parameter is 1
  - If the module is registered to E-UTRAN the <stat> parameter is 4
  - In out of coverage state the <stat> parameter is 4
- <stat>= 8 is not supported.

**LISA-U1**

- <AcT> and <rac> parameters are not supported.

**SARA-G / LEON-G**

- 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.
- <AcT> and <rac> parameters are not supported.

**SARA-G300 / SARA-G310 / SARA-G340-00S / SARA-G340-01S / SARA-G350-00S / SARA-G350-00X / SARA-G350-01B / SARA-G350-01S / LEON-G**

- Equivalent HPLMN for <stat>=1 is not supported: <stat>=5 is indicated in this case.

## 18.24 Extended Packet Switched network registration status +UREG

| +UREG | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| | LISA-U SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | No | No | - | *+CME Error* |

### 18.24.1 Description

Reports the network or the device PS (Packet Switched) radio capabilities.

When the device is not in connected mode, the command reports the network PS (Packet Switched) radio capabilities of the PLMN where the device is attached to.

When the device is in connected mode, the command reports the PS radio capabilities the device has been configured.

The set command enables / disables the URC **+UREG**, generated whenever it is enabled and the capabilities change.

The read command can be used to query the current PS radio capabilities.

### 18.24.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UREG=<n> | OK | AT+UREG=1<br>OK |
| Read | AT+UREG? | +UREG: <n>,<state> | +UREG: 0,3 |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | OK | OK |
| Test | AT+UREG=? | +UREG: (list of supported <n>'s) | +UREG: (0-1) |
| | | OK | OK |
| URC | | +UREG: <state> | +UREG: 3 |

### 18.24.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <n> | Number | • 0: network registration attach status URC disabled<br>• 1: network registration attach status URC +UREG enabled |
| <state> | Number | • 0: not registered for PS service<br>• 1: registered for PS service, RAT=2G, GPRS available<br>• 2: registered for PS service, RAT=2G, EDGE available<br>• 3: registered for PS service, RAT=3G, WCDMA available<br>• 4: registered for PS service, RAT=3G, HSDPA available<br>• 5: registered for PS service, RAT=3G, HSUPA available<br>• 6: registered for PS service, RAT=3G, HSDPA and HSUPA available<br>• 7: registered for PS service, RAT=4G<br>• 8: registered for PS service, RAT=2G, GPRS available, DTM available<br>• 9: registered for PS service, RAT=2G, EDGE available, DTM available |

### 18.24.4 Notes

#### TOBY-L2 / MPCI-L2

- <state>= 8 and 9 are not supported.
- The information text response to the read command and the URC will assume these values in these conditions:
  - During the initial network searching at the module power on the <state> parameter is 0
  - If the module is registered to E-UTRAN the <state> parameter is 7
  - In the out of coverage state the <state> parameter is 0

#### LISA-U1 / LISA-U200-00S

- <state>= 8 and 9 are not supported.

## 18.25 Manual deactivation of a PDP context H

| H | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | *< 20 s* | - |

### 18.25.1 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 *Chapter 6.7* for a detailed description.

In GPRS online command mode, entered by typing the escape sequence "+++" or "~+++" (see *Chapter 15.3.4*), the ATH command is needed to terminate the connection. Alternatively, in data transfer mode, DTE originated DTR toggling or PPP disconnection may be used.

### 18.25.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | ATH | OK | |

Objective Specification

# 18.26 PDP context modify +CGCMOD

| +CGCMOD | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| | LISA-U SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | Yes | No | No | *Up to 40 s* | *+CME Error* |

## 18.26.1 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 result code is returned. If no <cid>s are specified, the activation form of the command modifies all the active contexts.

## 18.26.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CGCMOD=[<cid>[,<cid>[,,...]]] | OK | AT+CGCMOD=1<br>OK |
| Test | AT+CGCMOD=? | +CGCMOD: (list of <cid>s with active contexts)<br>OK | |

## 18.26.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <cid> | Number | See *<cid>*. |

## 18.26.4 Notes

### TOBY-L2 / MPCI-L2

- When changing the QoS of a dedicated EPS/secondary PDP context, TFT settings shall be re-enforced via *+CGTFT* before issuing the +CGCMOD AT command.

# 18.27 3G Quality of service profile (requested) +CGEQREQ

| +CGEQREQ | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| | LISA-U SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | Yes | No | No | - | *+CME Error* |

## 18.27.1 Description

Allows the TE to specify the QoS 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 actually 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.

The command defines a PDP context having a <PDP_type> set to "IP", <apn> set to "" and with the specified <cid>, if a PDP context with the specified <cid> was not already defined by +CGDCONT AT command.

Objective Specification

## 18.27.2 Syntax

| 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> [,<Source_statistics_descriptor>[,<Signalling_indication>]]]]]]]]]]]]] | OK | AT+CGEQREQ=1,2,64,64,,,0,320,"1E4","1E5",1,,3,0,0<br>OK |
| Read | AT+CGEQREQ? | +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><br>[+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>,<Source_statistics_descriptor>,<Signalling_indication><br>[...]]<br>OK | +CGEQREQ: 1,2,5760,5760,0,0,0,1500,"1E4","1E5",0,1000,1,0,0<br>OK |
| 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)<br>[+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),(list of supported <Source_ | +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),(0-1),(0-1)<br>OK |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | statistics_descriptor>s),(list of supported <Signalling_indication>s)<br>[...]]<br>OK | |

### 18.27.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <cid> | Number | See *Chapter 18.1.2* |
| <Traffic_class> | Number | See *Chapter 18.1.27* |
| <Maximum_bitrate_UL> | Number | See *Chapter 18.1.15* |
| <Maximum_bitrate_DL> | Number | See *Chapter 18.1.14* |
| <Guaranteed_bitrate_UL> | Number | See *Chapter 18.1.10* |
| <Guaranteed_bitrate_DL> | Number | See *Chapter 18.1.9* |
| <Delivery_order> | Number | See *Chapter 18.1.6* |
| <Maximum_SDU_size> | Number | See *Chapter 18.1.16* |
| <SDU_error_ratio> | String | See *Chapter 18.1.28* |
| <Residual_bit_error_ratio> | String | See *Chapter 18.1.29* |
| <Delivery_of_erroneous_SDUs> | Number | See *Chapter 18.1.5* |
| <Transfer_delay> | Number | See *Chapter 18.1.30* |
| <Traffic_handling_priority> | Number | See *Chapter 18.1.31* |
| <Source_statistics_descriptor> | Number | See *Chapter 18.1.37* |
| <Signalling_indication> | Number | See *Chapter 18.1.38* |

### 18.27.4 Notes

- If <Maximum_bitrate_UL>, <Maximum bitrate DL>, <Guaranteed_bitrate_UL>, <Guaranteed_bitrate_DL>, <Maximum_SDU_size> and <Transfer_delay> parameters are set outside the allowed range, an error message will be provided. If the value is selected within the allowed range, it is rounded to the closest allowed value according to the specified steps.
- If <Traffic_class>=0 (conversational) or <Traffic_class>=1 (streaming), <Maximum_bitrate_UL>, <Maximum_bitrate_DL>, <Guaranteed_bitrate_UL> and <Guaranteed_bitrate_DL> must be provided.
- If <Traffic_class>=0 (conversational) or <Traffic_class>=1 (streaming), <Source_statistics_descriptor> must be provided.
- If <Traffic_class>=2 (interactive), <Signalling_indication> must be provided.

**LISA-U1**

- <Source_statistics_descriptor> and <Signalling_indication> are not supported.

## 18.28 3G Quality of service profile (minimum acceptable) +CGEQMIN

| +CGEQMIN | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| | LISA-U SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

### 18.28.1 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 actually an extension to the commands +CGDSCONT and +CGDCONT. The special form of this command +CGEQMIN=

Objective Specification

<cid> causes the minimum acceptable profile for context number <cid> to become undefined. No check is made against the negotiated profile.

The command defines a PDP context having <PDP_type> set to "IP", <apn> set to "" and with the specified <cid>, if a PDP context with the specified <cid> was not already defined by +CGDCONT AT command.

## 18.28.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | 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>[,<Source_statistics_descriptor>[,<Signalling_indication>]]]]]]]]]]]]]] | OK | AT+CGEQMIN=1,2,5760,7168,0,0,0,1480,"1E3","1E5",2,1000,1,0,0<br>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><br>[+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>,<Source_statistics_descriptor>,<Signalling_indication><br>[...]]<br>OK | +CGEQMIN: 1,2,5760,7168,0,0,0,1480,"1E3","1E5",2,1000,1,0,0<br>OK |
| 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)<br>[+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 | +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),(0-1),(0-1)<br>OK |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | 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),(list of supported <Source_ statistics_descriptor>s),(list of supported <Signalling_indication>s)<br>[...]]<br>OK | |

### 18.28.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <cid> | Number | See *Chapter 18.1.2* |
| <Traffic_class> | Number | See *Chapter 18.1.27* |
| <Maximum_bitrate_UL> | Number | See *Chapter 18.1.15* |
| <Maximum_bitrate_DL> | Number | See *Chapter 18.1.14* |
| <Guaranteed_bitrate_UL> | Number | See *Chapter 18.1.10* |
| <Guaranteed_bitrate_DL> | Number | See *Chapter 18.1.9* |
| <Delivery_order> | Number | See *Chapter 18.1.6* |
| <Maximum_SDU_size> | Number | See *Chapter 18.1.16* |
| <SDU_error_ratio> | String | See *Chapter 18.1.28* |
| <Residual_bit_error_ratio> | String | See *Chapter 18.1.29* |
| <Delivery_of_erroneous_SDUs> | Number | See *Chapter 18.1.5* |
| <Transfer_delay> | Number | See *Chapter 18.1.30* |
| <Traffic_handling_priority> | Number | See *Chapter 18.1.31* |
| <Source_statistics_descriptor> | Number | See *Chapter 18.1.37* |
| <Signalling_indication> | Number | See *Chapter 18.1.38* |

### 18.28.4 Notes

- If <Maximum_bitrate_UL>, <Maximum bitrate DL>, <Guaranteed_bitrate_UL>, <Guaranteed_bitrate_DL>, <Maximum_SDU_size> and <Transfer_delay> parameters are set outside the allowed range, an error message will be provided. If the value is selected within the allowed range, it is rounded to the closest allowed value according to the specified steps.
- If <Traffic_class>=0 (conversational) or <Traffic_class>=1 (streaming), <Source_statistics_descriptor> must be provided.
- If <Traffic_class>=2 (interactive), <Signalling_indication> must be provided.

**LISA-U1**

- <Source_statistics_descriptor> and <Signalling_indication> are not supported.

## 18.29 3G Quality of Service Profile (negotiated) +CGEQNEG

| +CGEQNEG | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| | LISA-U SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

### 18.29.1 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.

Objective Specification

## 18.29.2 Syntax

| 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>,<Source_statistics_descriptor>,<Signalling_indication><br>[+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>,<Source_statistics_descriptor>,<Signalling_indication><br>[...]]<br>OK | AT+CGEQNEG=1<br>+CGEQNEG: 1,2,5760,7168,0,0,0,1480,"1E3","1E5",2,1000,1,0,0<br>OK |
| Test | AT+CGEQNEG=? | +CGEQNEG: (list of <cid>s associated with active contexts)<br>OK | +CGEQNEG: (1)<br>OK |

## 18.29.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <cid> | Number | See *Chapter 18.1.2* |
| <Traffic_class> | Number | See *Chapter 18.1.27* |
| <Maximum_bitrate_UL> | Number | See *Chapter 18.1.15* |
| <Maximum_bitrate_DL> | Number | See *Chapter 18.1.14* |
| <Guaranteed_bitrate_UL> | Number | See *Chapter 18.1.10* |
| <Guaranteed_bitrate_DL> | Number | See *Chapter 18.1.9* |
| <Delivery_order> | Number | See *Chapter 18.1.6* |
| <Maximum_SDU_size> | Number | See *Chapter 18.1.16* |
| <SDU_error_ratio> | String | See *Chapter 18.1.28* |
| <Residual_bit_error_ratio> | String | See *Chapter 18.1.29* |
| <Delivery_of_erroneous_SDUs> | Number | See *Chapter 18.1.5* |
| <Transfer_delay> | Number | See *Chapter 18.1.30* |
| <Traffic_handling_priority> | Number | See *Chapter 18.1.31* |
| <Source_statistics_descriptor> | Number | See *Chapter 18.1.37* |
| <Signalling_indication> | Number | See *Chapter 18.1.38* |

Objective Specification

# 18.30 Define secondary PDP context +CGDSCONT

| +CGDSCONT | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| | LISA-U SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

## 18.30.1 Description

Configures the 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>:

- The <p_cid> parameter is mandatory when a secondary context is newly defined.
- The <p_cid> parameter can be omitted only when the context is already defined; in this case the PDP context identified by <cid> becomes undefined.

## 18.30.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CGDSCONT=[<cid>[,<p_cid>[,<d_comp>[,<h_comp>[,<IM_CN_Signalling_Flag_Ind>]]]]] | OK | AT+CGDSCONT=2,1<br>OK |
| Read | AT+CGDSCONT? | +CGDSCONT: <cid>,<p_cid>,<d_comp>,<h_comp>[,<IM_CN_Signalling_Flag_Ind>]<br>[+CGDSCONT: <cid>,<p_cid>,<d_comp>,<h_comp>[,<IM_CN_Signalling_Flag_Ind>]<br>[...]]<br>OK | +CGDSCONT: 2,1,0,0,0<br>OK |
| Test | AT+CGDSCONT=? | +CGDSCONT: (list of supported <cid>s),(list of <cid>s for defined primary contexts),(list of supported <d_comp>s),(list of supported <h_comp>s)[,(list of supported <IM_CN_Signalling_Flag_Ind>)]<br>OK | +CGDSCONT: (1-8),(4,8),(0-2),(0-2),(0-1)<br>OK |

## 18.30.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <cid> | Number | See *<cid>* |
| <p_cid> | Number | See *<p_cid>* |
| <d_comp> | Number | See *<d_comp>* |
| <h_comp> | Number | See *<h_comp>* |
| <IM_CN_Signalling_Flag_Ind> | Number | See *<IM_CN_Signalling_Flag_Ind>* |

## 18.30.4 Notes

### LISA-U / SARA-U

- <IM_CN_Signalling_Flag_Ind> parameter is not supported.

Objective Specification

# 18.31 UE modes of operation for EPS +CEMODE

| +CEMODE | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

## 18.31.1 Description

Sets the MT to operate according to the specified mode of operation for EPS, see 3GPP TS 24.301 [87]. If the requested operation mode is not supported, an error result code is returned.

u-blox cellular modules are certified according to all the capabilities and options stated in the Protocol Implementation Conformance Statement document (PICS) of the module. The PICS, according to 3GPP TS 51.010-2 [83], 3GPP TS 34.121-2 [84], 3GPP TS 36.521-2 [114] and 3GPP TS 36.523-2 [115], is a statement of the implemented and supported capabilities and options of a device. If the user changes the command settings during the certification process, the PICS of the application device integrating a u-blox cellular module must be changed accordingly.

## 18.31.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CEMODE=[<mode>] | OK | AT+CEMODE=1<br>OK |
| Read | AT+CEMODE? | +CEMODE: <mode><br>OK | +CEMODE: 1<br>OK |
| Test | AT+CEMODE=? | +CEMODE: (list of supported <mode>'s)<br>OK | +CEMODE: (0-3)<br>OK |

## 18.31.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | Mode configuration:<br>• 0: PS mode 2 of operation. The UE registers only to EPS services, and the UE's usage setting is "data centric"<br>• 1 (default and factory-programmed value for voice capable devices): CS/PS mode 1 of operation. The UE registers to both EPS and non-EPS services, and the UE's usage setting is "voice centric"<br>• 2 (default and factory-programmed value for voice not-capable devices): CS/PS mode 2 of operation. The UE registers to both EPS and non-EPS services, and the UE's usage setting is "data centric"<br>• 3: PS mode 1 of operation. The UE registers only to EPS services, and the UE's usage setting is "voice centric" |

## 18.31.4 Notes

- A UE set to "Data centric" does not disable the E-UTRAN capability if voice services cannot be obtained. Upon receiving combined EPS/IMSI attach accept or combined TA/LA Update accept with "SMS-only" indication, a data centric UE stays in the current RAT and is not allowed to use CSFB. Upon receiving combined EPS/IMSI attach accept or combined TA/LA Update accept with "CSFB Not Preferred" indication, a data centric UE stays in the current RAT and is allowed to use CSFB.
- A UE set to "Voice centric" shall always try to ensure that Voice service is possible. A CSFB and an IMS/CS-voice capable UE set to "Voice centric" unable to obtain voice service in E-UTRAN (e.g. CSFB and IMS voice are not supported or the configured preferences on how to handle voice services prevent usage of any available voice services), shall disable the E-UTRAN capability, which results in re-selecting GERAN or UTRAN. The E-UTRAN capability is re-enabled by the UE under the conditions described in 3GPP TS 24.301 [87].

Objective Specification

**TOBY-L200-00S / TOBY-L201 / TOBY-L210-00S / TOBY-L210-60S / TOBY-L280-00S / MPCI-L200-00S / MPCI-L200-60S / MPCI-L201 / MPCI-L210-00S**

- <mode>=1 and 3 are not supported.

# 18.32 EPS network registration status +CEREG

| +CEREG | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 18.32.1 Description

Controls the presentation of the network registration URC. The URC assumes a different syntax depending on the network and the <n> parameter:

- +CEREG: <stat> when <n>=1 and there is a change in the MT's EPS network registration status in E-UTRAN
- +CEREG: <stat>[,[<tac>],[<ci>],[<AcT>]] when <n>=2 and there is a change of the network cell in EUTRAN
- +CEREG: <stat>[,[<tac>],[<ci>],[<AcT>][,<cause_type>,<reject_cause>]] when <n>=3 and the value of <stat> changes

The parameters <AcT>, <tac>, <ci>, <cause_type> and <reject_cause> are provided only if available.

The read command returns the status of result code presentation and an integer <stat> which shows whether the network has currently indicated the registration of the MT. The location information elements <tac>, <ci> and <AcT>, if available, are returned only when <n>=2 and the MT is registered with the network. The parameters <cause_type>, <reject_cause>, if available, are returned when <n>=3.

If the EPS MT in GERAN/UTRAN/E-UTRAN also supports circuit mode services and/or GPRS services, the *+CREG* / *+CGREG* set and read command result codes apply to the registration status and location information for those services.

## 18.32.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CEREG=[<n>] | OK | AT+CEREG=1<br>OK |
| Read | AT+CEREG? | +CEREG: <n>,<stat>[,[<tac>],[<ci>],[<AcT>[,<cause_type>,<reject_cause>]]]<br>OK | +CEREG: 2,1,"3a9b","0000c33d",7<br>OK |
| Test | AT+CEREG=? | +CEREG: (list of supported <n>s)<br>OK | +CEREG: (0-3)<br>OK |
| URC | | +CEREG: <stat>[,[<tac>],[<ci>],[<AcT>][,<cause_type>,<reject_cause>]] | +CEREG: 1,"3a9b","0000c33d",7 |

## 18.32.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <n> | Number | Mode configuration:<br>• 0 (default value): network registration URC disabled<br>• 1: network registration URC +CEREG: <stat> enabled<br>• 2: network registration and location information URC +CEREG: <stat>[,[<tac>],[<ci>],[<AcT>]] enabled<br>• 3: network registration, location information and EMM cause value information URC +CEREG: <stat>[,[<tac>],[<ci>],[<AcT>][,<cause_type>,<reject_cause>]] enabled |
| <stat> | Number | EPS registration status:<br>• 0: not registered, the MT is not currently searching an operator to register to<br>• 1: registered, home network<br>• 2: not registered, but the MT is currently trying to attach or searching an operator to register to |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 3: registration denied<br>• 4: unknown (e.g. out of E-UTRAN coverage)<br>• 5: registered, roaming<br>• 8: attached for emergency bearer services only (see 3GPP TS 24.008 *[30]* and 3GPP TS 24.301 *[87]* that specify the condition when the MS is considered as attached for emergency bearer services) |
| <tac> | String | Two bytes tracking area code coded in hexadecimal format |
| <ci> | String | Four bytes E-UTRAN cell-id in hexadecimal format |
| <Act> | Number | Access technology of the service cell<br>• 7: E-UTRAN (see 3GPP TS 44.060 *[88]* that specifies the System Information messages which give the information about whether the serving cell supports EGPRS) |
| <cause_type> | Number | <reject_cause> type<br>• 0: indicates that <reject_cause> contains an EMM cause value, see 3GPP TS 24.301 *[87]* Annex A<br>• 1: indicates that <reject_cause> contains a manufacture-specific cause |
| <reject_cause> | Number | Cause of the failed registration. The value is of type as defined by <cause_type> |

### 18.32.4 Notes

#### TOBY-L2 / MPCI-L2

- <stat>= 8 is not supported.
- The information text response to the read command and the URC will assume these values in these conditions:
  - During the initial network searching at the module power on the <stat> parameter is 2
  - If the module is PS attached to the GSM/UMTS home network the <stat> parameter is 4
  - If the module is registered to E-UTRAN the <stat> parameter is 1
  - In the out of coverage state the <stat> parameter is 4

## 18.33 Delete non-active PDP contexts +CGDEL

| +CGDEL | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 18.33.1 Description

Removes the indicated PDP context and removes all the associated data related to the indicated PDP contexts that are not activated. The AT command does not delete or remove the information for activated PDP contexts. The removed PDP context is listed by the +CGDEL: <cid> IRC.

If the <cid> parameter points to a primary PDP context, the PDP context will be deleted together with all the linked secondary PDP contexts if none of the PDP contexts are activated.

If the <cid> parameter points to a secondary PDP context, the PDP context will be deleted if it is not activated.

If the parameter <cid> is omitted, all the primary PDP contexts that are not activated or that have any activated secondary PDP contexts will be removed and all secondary PDP contexts that are not activated will be removed. The associated data of all the deleted PDP contexts will be removed, and the removed PDP context are listed by the +CGDEL: <cid>[,<cid>,...]] IRC.

The command removes the associated PDP context data that can be set by the AT commands *+CGDCONT*, *+CGDSCONT*, *+CGTFT*, *+CGEQREQ*, *+CGEQMIN* and *+CGEQOS*. For an attempt to delete PDP context(s) which would violate these rules, an error result code is returned

Objective specification

### 18.33.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CGDEL=[<cid>] | +CGDEL: <cid>[,<cid>[,...]]<br>OK | AT+CGDEL=2<br>+CGDEL: 2<br>OK |
| Test | AT+CGDEL=? | OK | OK |

### 18.33.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <cid> | Number | PDP context identifier. A numeric parameter specifying a particular PDP context definition. This parameter is valid only locally on the interface DTE-MT.<br>The maximum number of definable PDP context is 11. The maximum number of active PDP contexts is 3. |

## 18.34 Traffic flow template read dynamic parameters +CGTFTRDP

| +CGTFTRDP | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 18.34.1 Description

Returns the relevant information about Traffic Flow Template for an active secondary or non secondary PDP context specified by <cid> together with the additional network assigned values when established by the network.

The test command returns a list of <cid>s associated with active secondary and non secondary contexts.

If the parameter <cid> is omitted, the relevant information for all active secondary non secondary PDP contexts is returned.

The parameters of both network and MT/TA initiated PDP contexts will be returned.

### 18.34.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CGTFTRDP=[<cid>] | [+CGTFTRDP: <cid>,<packet_filter_identifier>,<evaluation_precedence_index>,<source_address_and_subnet_mask>,<protocol_number_(ipv4)/next_header_(ipv6)>,<local_port_range>,<remote_port_range>,<ipsec_security_parameter index (spi)>,<type_of_service_(tos)(ipv4)_and_mask/traffic_class_(ipv6)_and_mask>,<flow_label(ipv6)>,<direction>,<NW_packet_filter_Identifier>]<br>[+CGTFTRDP: <cid>,<packet_filter_identifier>,<evaluation_precedence_index>,<source_address_and_subnet_mask>,<protocol_number_(ipv4)/next_header_(ipv6)>,<local_port_range>,<remote_port_range>,<ipsec_security_parameter index (spi)>,<type_of_service_(tos)(ipv4)_and_mask/traffic_class_(ipv6)_and_mask>,<flow_label(ipv6)>,<direction>,<NW_packet_filter_Identifier>]<br>[...]]<br>OK | AT+CGTFTRDP=2<br>+CGTFTRDP: 2,1,1,"8.9.10.11.255.255.0.0",0,0.65535,0.65535,0,0,0,0,0<br>OK |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| Test | AT+CGTFTRDP=? | +CGTFTRDP: (list of <cid>s associated with active contexts)<br>OK | +CGTFTRDP: 1,2<br>OK |

### 18.34.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <cid> | Number | See *Chapter 18.1.2* |
| <packet_filter_identifier> | Number | See *Chapter 18.1.19* |
| <evaluation_precedence_index> | Number | See *Chapter 18.1.8* |
| <source_address_and_subnet_mask> | String | See *Chapter 18.1.32* |
| <protocol_number_(ipv4)/next_header_(ipv6)> | Number | See *Chapter 18.1.33* |
| <local_port_range> | Number | Specifies the destination port range attribute of a valid packet filter:<br>• The range goes from 0 to 65535 |
| <remote_port_range> | Number | Specifies the source port range attribute of a valid packet filter:<br>• The range goes from 0 to 65535 |
| <ipsec_security_parameter index_(spi)> | String | See *Chapter 18.1.12* |
| <type_of_service_(tos)(ipv4)_and_mask/traffic_class_(ipv6)_and_mask> | String | See *Chapter 18.1.35* |
| <flow_label(ipv6)> | String | See *Chapter 18.1.36* |
| <direction> | Number | See *Chapter 18.1.39* |
| <NW_packet_filter_Identifier> | Number | The value range is from 1 to 16. In LTE the value is assigned by the network when the dedicated EPS bearer is established. |

## 18.35 Configure the authentication parameters of a PDP/EPS bearer +UAUTHREQ

| +UAUTHREQ | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U201 SARA-U260-03S SARA-U270-03S SARA-U270-53S SARA-U280-03S | | | | | |
| | SARA-G340-02S SARA-G350-02A SARA-G350-02S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 18.35.1 Description

Configures the authentication parameters of a defined PDP/EPS bearer. The authentication parameters will be sent during the context activation phase as a PCO information element.

When <auth_type>=3 is set, *+CGACT=1,<cid>* may trigger at most 3 PDP context activation requests for <cid> to the protocol stack. The first request for <cid> is done with no authentication. If the PDP context activation fails, a second attempt is triggered with PAP authentication. If the second PDP context activation fails a third attempt is triggered with CHAP authentication. These 3 PDP context activation requests are not to be confused with the effective number of request PDP context activations sent to the network (see the 3GPP TS 24.008 *[30]*).

In the set command the <username> and <password> parameters must be issued if the authentication type is PAP or CHAP or automatic (if supported).

The command returns an error result code if the input <cid> is already active or not yet defined.

### 18.35.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UAUTHREQ=<cid>,<auth_type>[,<username>,<password>] | OK | AT+UAUTHREQ=1,1,"user","pass"<br>OK |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| Test | AT+UAUTHREQ=? | +UAUTHREQ: (list of supported <cid>s),(list of supported <auth_type>s)[,,]<br>OK | +UAUTHREQ: (1-8),(0-2),,<br>OK |

### 18.35.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <cid> | Number | See *<cid>*. |
| <auth_type> | Number | Configure the authentication. Allowed values:<br>• 0: no authentication<br>• 1: PAP<br>• 2: CHAP<br>• 3: automatic selection of authentication type (none/CHAP/PAP) |
| <username> | String | Username. See *Notes* for the maximum length of the parameter. The default value is an empty string. |
| <password> | String | Password. See *Notes* for the maximum length of the parameter. The default value is an empty string. |

### 18.35.4 Notes

- In a PPP dial-up scenario, the authentication parameters set by the +UAUTHREQ command are overwritten in case the host provides a new setting via the PPP authentication protocol (PAP or CHAP).

**TOBY-L2 / MPCI-L2**

- <auth_type>=3 is not supported.
- The maximum length of <username> and <password> parameters is 50.

**TOBY-L200-00S / TOBY-L201 / TOBY-L210-00S / TOBY-L210-60S / TOBY-L280-00S / MPCI-L200-00S / MPCI-L201 / MPCI-L210-00S / MPCI-L210-60S**

- In a PPP dial-up scenario, the authentication parameters set by the +UAUTHREQ command are not overwritten in case the host provides a new setting via the PPP authentication protocol (PAP or CHAP).

**LISA-U2 / SARA-U**

- The maximum length of <username> and <password> parameters is 64.

**SARA-G**

- The maximum length of <username> and <password> parameters is 32.

## 18.36 Send custom packets over a context +UTGSINK

| +UTGSINK | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 18.36.1 Description

Sends the required number of packets over a context identified by <cid>. The packet content is hardcoded and is a series of '*' characters.

No check is performed on <cid>'s status: the context must be activated before issuing the command.

The sending process is not guaranteed, and might depend on channel conditions and internal protocols status.

### 18.36.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UTGSINK=[[<cid>][,<packet_size>][,<packet_count>]] | OK | AT+UTGSINK=1,1400,10<br>OK |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | | AT+UTGSINK=1,1200<br>OK |
| | | | AT+UTGSINK=4<br>OK |
| Test | AT+UTGSINK=? | +UTGSINK: (list of supported <cid>s), (list of supported <packet_size>s),(list of supported <packet_count>s)<br>OK | +UTGSINK: (1-8),(1-1500),(1-50)<br>OK |

### 18.36.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <cid> | Number | Context identifier.<br>The range goes from 1 to 8. The default value is 1. |
| <packet_size> | Number | Packet size in bytes. The range goes from 1 to 1500. The default value is 1 |
| <packet_count> | Number | Number of packets to send. The range goes from 1 to 50. The default value is 1 |

## 18.37 Define EPS quality of service +CGEQOS

| +CGEQOS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 18.37.1 Description

Allows the TE to specify the EPS Quality of Service parameters <cid>, <QCI>, <DL_GBR>, <UL_GBR>, <DL_MBR> and <UL_MBR> for a PDP context or Traffic Flows (see 3GPP TS 24.301 *[87]* and 3GPP TS 23.203 *[90]*). When in UMTS/GPRS the MT applies a mapping function to UTMS/GPRS Quality of Service.

The read command returns the current settings for each defined QoS.

The set command +CGEQOS=<cid> causes the values for context number <cid> to become undefined.

### 18.37.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CGEQOS=[<cid>[,<QCI>[,<DL_GBR>,<UL_GBR>[,<DL_MBR>,<UL_MBR>]]]] | OK | AT+CGEQOS=1,1,2500,7000,2500,7000<br>OK |
| Read | AT+CGEQOS? | +CGEQOS: <cid>,<QCI>,[<DL_GBR>,<UL_GBR>],[DL_MBR>,<UL_MBR>]<br>OK | +CGEQOS: 1,1,2500,7000,2500,7000<br>OK |
| Test | AT+CGEQOS=? | +CGEQOS: (list of supported <cid>s), (list of supported <QCI>s),(list of supported <DL_GBR>s),(list of supported <UL_GBR>s),(list of supported <DL_MBR>s),(list of supported <UL_MBR>s)<br>OK | +CGEQOS: (1-8),(0-9),(0-5000),(0-21000),(0-5000),(0-21000)<br>OK |

### 18.37.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <cid> | Number | See *Chapter 18.1.2* |
| <QCI> | Number | Specifies a class of EPS QoS (see 3GPP TS 24.301 *[87]*):<br>• 0: QCI is selected by network<br>• 1-4: value range for guaranteed bit rate Traffic Flows<br>• 5-9: value range for non-guaranteed bit rate Traffic Flows |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 128-254: value range for Operator-specific QCIs |
| <DL_GBR> | Number | Indicates DL GBR in case of GBR QCI. The value is expressed in kb/s. This parameter is omitted for a non-GBR QCI (see 3GPP TS 24.301 *[87]*). |
| <UL_GBR> | Number | Indicates UL GBR in case of GBR QCI. The value is expressed in kb/s. This parameter is omitted for a non-GBR QCI (see 3GPP TS 24.301 *[87]*). |
| <DL_MBR> | Number | Indicates DL MBR in case of GBR QCI. The value is expressed in kb/s. This parameter is omitted for a non-GBR QCI (see 3GPP TS 24.301 *[87]*). |
| <UL_MBR> | Number | Indicates UL MBR in case of GBR QCI. The value is expressed in kb/s. This parameter is omitted for a non-GBR QCI (see 3GPP TS 24.301 *[87]*). |

# 18.38 EPS quality of service read dynamic parameters +CGEQOSRDP

| +CGEQOSRDP | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 18.38.1 Description

Returns the Quality of Service parameters <QCI>, <DL_GBR>, <UL_GBR>, <DL_MBR> and <UL_MBR> of the active secondary or non secondary PDP context associated to the provided context identifier <cid>.

The test command returns a list of <cid>s associated with secondary or non secondary active PDP contexts.

The parameters of both network and MT/TA initiated PDP contexts will be returned.

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

## 18.38.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CGEQOSRDP[=<cid>] | +CGEQOSRDP: <cid>,<QCI>,[<DL_GBR>,<UL_GBR>],[DL_MBR>,<UL_MBR>],[DL_AMBR>,<UL_AMBR>]<br>OK | AT+CGEQOSRDP=1<br>+CGEQOSRDP: 1,7,0,0,0,0<br>OK |
| Test | AT+CGEQOSRDP=? | +CGEQOSRDP: (list of <cid>s associated with active contexts)<br>OK | +CGEQOSRDP: 1<br>OK |

## 18.38.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <cid> | Number | See *Chapter 18.1.2* |
| <QCI> | Number | Specifies a class of EPS QoS (see 3GPP TS 24.301 *[87]*):<br>• 0: QCI is selected by network<br>• 1-4: value range for guaranteed bit rate Traffic Flows<br>• 5-9: value range for non-guaranteed bit rate Traffic Flows<br>• 128-254: value range for Operator-specific QCIs |
| <DL_GBR> | Number | Indicates DL GBR in case of GBR QCI. The value is expressed in kb/s. This parameter is omitted for a non-GBR QCI (see 3GPP TS 24.301 *[87]*). |
| <UL_GBR> | Number | Indicates UL GBR in case of GBR QCI. The value is expressed in kb/s. This parameter is omitted for a non-GBR QCI (see 3GPP TS 24.301 *[87]*). |
| <DL_MBR> | Number | Indicates DL MBR in case of GBR QCI. The value is expressed in kb/s. This parameter is omitted for a non-GBR QCI (see 3GPP TS 24.301 *[87]*). |
| <UL_MBR> | Number | Indicates UL MBR in case of GBR QCI. The value is expressed in kb/s. This parameter is omitted for a non-GBR QCI (see 3GPP TS 24.301 *[87]*). |
| <DL_AMBR> | Number | Indicates DL APN aggregate MBR (see 3GPP TS 24.301 *[87]*). The value is expressed in kb/s. |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| <UL_AMBR> | Number | Indicates UL APN aggregate MBR (see 3GPP TS 24.301 *[87]*). The value is expressed in kb/s. |

# 18.39 Secondary PDP context read dynamic parameters +CGSCONTRDP

| +CGSCONTRDP | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 18.39.1 Description

Returns the <p_cid>, <bearer_id> and <IM_CN_Signalling_Flag_Ind> parameters for an active secondary PDP context having the context identifier <cid>. The test command returns the list of <cid>s associated with active secondary PDP contexts.

If the parameter <cid> is omitted, the relevant information for all active secondary PDP contexts is returned.

The parameters for UE initiated and network initiated PDP contexts are returned.

In EPS, the Traffic Flow parameters are returned.

## 18.39.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CGSCONTRDP=[<cid>] | [+CGSCONTRDP: <cid>,<p_cid>,<bearer_id>[,<IM_CN_Signalling_Flag_Ind>]]<br>[+CGSCONTRDP: <cid>,<p_cid>,<bearer_id>[,<IM_CN_Signalling_Flag_Ind>]<br>[...]]<br>OK | AT+CGSCONTRDP=2<br>+CGCONTRDP: 2,1,6,0<br>OK |
| Test | AT+CGSCONTRDP=? | +CGSCONTRDP: (list of active secondary PDP contexts)<br>OK | +CGSCONTRDP: 2<br>OK |

## 18.39.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <cid> | Number | See *<cid>* |
| <p_cid> | Number | See *<p_cid>* |
| <bearer_id> | Number | Bearer identification, i.e. the EPS bearer in EPS and the NSAPI in UMTS/GPRS. The allowed range goes from 5 to 16. |
| <IM_CN_Signalling_Flag_Ind> | Number | See *<IM_CN_Signalling_Flag_Ind>* |

# 18.40 UE's usage setting for EPS +CEUS

| +CEUS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 18.40.1 Description

Sets the MT to operate according to the specified UE's usage setting for EPS, as defined in 3GPP TS 24.301 *[87]*.

Objective Specification

The read command returns the usage setting set by the TE.

The test command is used for requesting information on the supported MT settings.

### 18.40.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CEUS=[<setting>] | OK | AT+CEUS=1<br>OK |
| Read | AT+CEUS? | +CEUS: <setting><br>OK | +CEUS: 1<br>OK |
| Test | AT+CEUS=? | +CEUS: (list of supported <setting>s)<br>OK | +CEUS: (0,1)<br>OK |

### 18.40.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <setting> | Number | Configure the UE usage setting:<br>• 0: voice centric<br>• 1 (default value): data centric |

### 18.40.4 Notes

- See 3GPP TS 23.221 *[89]* for the definition of the "voice centric" and "data centric" usage settings.

**TOBY-L200-00S / TOBY-L201 / TOBY-L210-00S / TOBY-L210-60S / TOBY-L280-00S / MPCI-L200-00S / MPCI-L201 / MPCI-L210-00S / MPCI-L210-60S**

- The <setting> parameter cannot be set to 0.

## 18.41 PDP Context Read Dynamic Parameters +CGCONTRDP

| +CGCONTRDP | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 18.41.1 Description

Returns the relevant information <bearer_id>, <apn>, <local_addr_and_subnet_mask>, <gw_addr>, <DNS_prim_addr>, <DNS_sec_addr>, <P-CSCF_prim_addr>, <P-CSCF_sec_addr>, <IM_CN_Signalling_Flag>and <LIPA_indication> for an active non secondary PDP context with the context identifier <cid>.

If the MT has dual stack capabilities, for each <cid> will be printed two different rows: the first one will contain the IPv4 parameters, in the second one the IPv6 parameters.

If the parameter <cid> is omitted, the relevant information for all active non secondary PDP contexts is returned.

### 18.41.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CGCONTRDP=[<cid>] | [+CGCONTRDP: <cid>,<bearer_id>,<apn>[,<local_addr_and_subnet_mask>[,<gw_addr>[,<DNS_prim_addr>[,<DNS_sec_addr>[,<P-CSCF_prim_addr>[,<P-CSCF_sec_addr>[,<IM_CN_Signalling_Flag>[,<LIPA_indication>]]]]]]]]<br>[+CGCONTRDP: <cid>,<bearer_id>,<apn>[,<local_addr_and_subnet_mask>[,<gw_addr>[,<DNS_prim_addr>[,<DNS_sec_addr>[,<P- | AT+CGCONTRDP=1<br>+CGCONTRDP: 1,0,"web.omnitel.it","109.113.62.238.255.255.255.255","109.113.62.201","83.224.70.77","83.224.70.54",,,,0<br>OK |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | CSCF_sec_addr>[,<IM_CN_Signalling_ Flag>[,<LIPA_indication>]]]]]]]<br>[...]]<br>OK | |
| Test | AT+CGCONTRDP=? | +CGCONTRDP: (list of active non secondary PDP Contexts)<br>OK | +CGCONTRDP: 1<br>OK |

### 18.41.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <bearer_id> | Number | Identifies the bearer, i.e. the EPS bearer in EPS and the NSAPI in UMTS/GPRS. The range goes from 5 to 16 |
| <local_addr_and_ subnet_mask> | String | IP address and subnet mask of the MT. The string is given as dot-separated numeric (0-255) parameters on the form<br>• "a1.a2.a3.a4.m1.m2.m3.m4" for IPv4<br>• "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 |
| <gw_addr> | String | Gateway Address of the MT. The string is given as dot-separated numeric (0-255) parameters. |
| <DNS_prim_addr> | String | IP address of the primary DNS server. |
| <DNS_sec_addr> | String | IP address of the secondary DNS server. |
| <P_CSCF_prim_addr> | String | IP address of the primary P-CSCF server. |
| <P_CSCF_sec_addr> | String | IP address of the secondary P-CSCF server. |
| <IM_CN_Signalling_ Flag> | Number | See *<IM_CN_Signalling_Flag_Ind>* |
| <LIPA_indication> | Number | Indicates that the PDP context provides connectivity using a LIPA PDN connection. This parameter cannot be set by the TE:<br>• 0: indication not received that the PDP context provides connectivity using a LIPA PDN connection<br>• 1: indication received that the PDP context provides connectivity using a LIPA PDN connection |

### 18.41.4 Notes

- See 3GPP TS 23.221 [89] for the definition of the "voice centric" and "data centric" usage settings.

## 18.42 Configure the initial PDP context +UCGDFLT

| +UCGDFLT | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

### 18.42.1 Description

Configures the initial PDP context, i.e. sets the configuration of the PDN activated at attach time in LTE network. The configuration can be optionally saved in NVM.

Once registered, the default bearer will obtain a <cid> context identifier by the rules described in *AT+CGDCONT* command. The active context configuration will be available through standard 3GPP TS 27.007 *[2]* AT commands, by using this <cid> context identifier.

The *AT+CGDCONT* command cannot be used to define the initial PDP context even though a valid <cid> is assigned at its activation.

If the module is already registered to a LTE network the user is required to:

- Deregister with *AT+CFUN=4*
- Change the initial PDP context configuration with AT+UCGDFLT

Objective Specification

- Register again with *AT+CFUN=1* (the MT is set now to full functionality, the registration will start if manual or automatic registration was previously set)

## 18.42.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UCGDFLT=<nvm_mode>[,<PDP_type>[,<APN>[,<emg_ind>[,<ipcp_req>[,<pcscf_v6>[,<imcn_sig>[,<dns_v6>[,<nw_bear>[,<dsm_v6_ha>[,<dsm_v6_pref>[,<dsm_v6_ha_v4>[,<ip_via_nas>[,<ip_via_dhcp>[,<pcscf_v4>[,<dns_v4>[,<msisdn>[,<ifom>[,<v4mtu>[,<local_tft>[,<auth_type>[,<auth_user>[,<auth_pass>[,<vendor_specific>]]]]]]]]]]]]]]]]]]]] | OK | AT+UCGDFLT=1,"IPV4V6","IMS"<br>OK |
| Read | AT+UCGDFLT? | +UCGDFLT: <PDP_type>,<APN>,<emg_ind>,<ipcp_req>,<pcscf_v6>,<imcn_sig>,<dns_v6>,<nw_bear>,<dsm_v6_ha>,<dsm_v6_pref>,<dsm_v6_ha_v4>,<ip_via_nas>,<ip_via_dhcp>,<pcscf_v4>,<dns_v4>,<msisdn>,<ifom>,<v4mtu>,<local_tft>,,,<vendor_specific><br>OK | +UCGDFLT: "IPV4V6","IMS",0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,,,"FF00FF01FF02FFFF"<br>OK |
| Test | AT+UCGDFLT=? | For each <PDP_type>:<br>+UCGDFLT: (list of supported <nvm_mode>s),<PDP_type>,,(list of supported <emg_ind>s),(list of supported <ipcp_req>s),(list of supported <pcscf_v6>s),(list of supported <imcn_sig>s),(list of supported <dns_v6>s),(list of supported <nw_bear>s),(list of supported <dsm_v6_ha>s),(list of supported <dsm_v6_pref>s),(list of supported <dsm_v6_ha_v4>s),(list of supported <ip_via_nas>s),(list of supported <ip_via_dhcp>s),(list of supported <pcscf_v4>s),(list of suppored <dns_v4>s),(list of supported <msisdn>s),(list of supported <ifom>s),(list of supported <v4mtu>s),(list of supported <local_tft>s),(list of supported <auth_type>s),,,<br>[..]<br>OK | +UCGDFLT: (0-1),"IP",,(0-1),(0-1),(0-1),(0-1),(0-1),(0-1),(0-1),(0-1),(0-1),(0-1),(0-1),(0-1),(0-1),(0-1),(0-1),(0-1),(0-2),,,<br>+UCGDFLT: (0-1),"IPV6",,(0-1),(0-1),(0-1),(0-1),(0-1),(0-1),(0-1),(0-1),(0-1),(0-1),(0-1),(0-1),(0-1),(0-1),(0-1),(0-1),(0-2),,,<br>+UCGDFLT: (0-1),"IPV4V6",,(0-1),(0-1),(0-1),(0-1),(0-1),(0-1),(0-1),(0-1),(0-1),(0-1),(0-1),(0-1),(0-1),(0-1),(0-1),(0-1),(0-2),,,<br>OK |

## 18.42.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <nvm_mode> | Number | State configuration:<br>• 0: set the initial PDP configuration without saving it in NVM<br>• 1: set and save the initial PDP configuration |
| <PDP_type> | String | Configures the PDP context type. The default type is "IP". |
| <APN> | String | Configures the PDN's APN name. The default value is "". |
| <emg_ind> | Number | Indicates whether the context is for emergency bearer services or not:<br>• 0 (default value): PDP context is not for emergency bearer services<br>• 1: PDP context is for emergency bearer services |
| <ipcp_req> | Number | PCO option related to IPCP. See 3GPP TS 24.008 *[12]* ch. 10.5.6.3:<br>• 0 (default value): request disabled<br>• 1: request enabled |
| <pcscf_v6> | Number | PCO option related to P-CSCF IPv6 server discovery. See 3GPP TS 24.008 *[12]* ch. 10.5.6.3:<br>• 0 (default value): request disabled<br>• 1: request enabled |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| <icmn_sig> | Number | PCO option related to IM-CN subsystem signalling bearer. See 3GPP TS 24.008 *[12]* ch. 10.5.6.3:<br>• 0 (default value): request disabled<br>• 1: request enabled |
| <dns_v6> | Number | PCO option related to DNSv6 server discovery. See 3GPP TS 24.008 *[12]* ch. 10.5.6.3:<br>• 0 (default value): request disabled<br>• 1: request enabled |
| <nw_bear> | Number | Reserved for future use |
| <dsm_v6_ha> | Number | Reserved for future use |
| <dsm_v6_pref> | Number | Reserved for future use |
| <dsm_v6_ha_v4> | Number | Reserved for future use |
| <ip_via_nas> | Number | PCO option related to IP address assignation via NAS signalling. See 3GPP TS 24.008 *[12]* ch. 10.5.6.3:<br>• 0: request disabled<br>• 1 (default value): request enabled |
| <ip_via_dhcp> | Number | PCO option related to IP address assignation via DHCP. See 3GPP TS 24.008 *[12]* ch. 10.5.6.3:<br>• 0 (default value): request disabled<br>• 1: request enabled |
| <pcscf_v4> | Number | PCO option related to P-CSCF IPv4 server discovery. See 3GPP TS 24.008 *[12]* ch. 10.5.6.3:<br>• 0 (default value): request disabled<br>• 1: request enabled |
| <dns_v4> | Number | PCO option related to DNSv4 server discovery. See 3GPP TS 24.008 *[12]* ch. 10.5.6.3:<br>• 0: request disabled<br>• 1 (default value): request enabled |
| <msisdn> | Number | Reserved for future use |
| <ifom> | Number | Reserved for future use |
| <v4mtu> | Number | Reserved for future use |
| <local_tft> | Number | Reserved for future use |
| <auth_type> | Number | Configure the authentication<br>• 0 (default value): no authentication<br>• 1: PAP<br>• 2: CHAP |
| <auth_user> | String | Username. The maximum length is 50 characters, the default value is the NULL string. |
| <auth_pass> | String | Password. The maximum length is 50 characters, the default value is the NULL string |
| <vendor_specific> | String | Vendor specific PCO. If given, the string must be "" or a combination of hexadecimal digit quadruplets d.d.d.d in range [FF00-FFFF]. Allowed examples:<br>• "FF00"<br>• "FF00FF01FF02FFFF"<br>• "FF00FFFF"<br>• ""<br>The default value is the empty string "", which disables the PCO. |

## 18.42.4 Notes

### TOBY-L200 / TOBY-L201 / MPCI-L200 / MPCI-L201

- The factory-programmed value of <APN> parameter is "broadband" (AT&T).

### TOBY-L210-00S / TOBY-L210-02S / TOBY-L210-60S / TOBY-L220 / TOBY-L280 / MPCI-L210 / MPCI-L280

- The factory-programmed value of <APN> parameter is an empty string.

### TOBY-L210-62S

- The factory-programmed value of <APN> parameter is "4gsmartphone"; <APN> parameter cannot be set to an empty string.
- A single data PDP context is allowed; hence the <PDP_type> parameter can be set only to "IP".

Objective Specification

# 18.43 Always-On mode parameters settings +CGPERMSET

| +CGPERMSET | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U270-62S LISA-U270-63S LISA-U270-68S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 18.43.1 Description

Sets the APN, user ID, password and the Keep Alive timer for the Always-On mode. If the command sets the parameter value out of the allowed range, an ERROR result code is returned whatever is the configuration of +CMEE command.

For sake of simplicity in <cid> management, <cid> uniquely identifies a PDP context within the module. Such PDP context may be defined either with +CGPERMSET or with +CGDCONT command and no check is internally done in SW on which cid has been configured with which command. This assures large flexibility in handling the 11 definable PDP contexts. It is recommended to exploit the whole cid range and to assign Always on PDP contexts and other PDP contexts different <cid> values.

## 18.43.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CGPERMSET=<cid>,<apn>,<id>,<pwd>[,<time>] | OK | |
| Read | AT+CGPERMSET? | AT+CGPERMSET: <cid>,<apn>,<id>,<pwd>,<time><br>OK | |
| Test | AT+CGPERMSET=? | +CGPERMSET: (list of supported <cid>s),,,,(list of supported <time>s)<br>OK | |

## 18.43.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <cid> | Number | See *Chapter 18.1.2* |
| <APN> | String | See *Chapter 18.1.1* |
| <id> | String | User ID to be used in Always-On mode |
| <pwd> | String | Password to be used in Always-On mode |
| <time> | Number | Value expressed in minutes of Keep Alive Time to be used in Always-On mode<br>The range goes from 60 to 600. The default value is 120 (min) |

# 18.44 Always-On mode settings +CGPERMACT

| +CGPERMACT | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U270-62S LISA-U270-63S LISA-U270-68S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 18.44.1 Description

Sets the Always-On mode / On-Demand mode. A protocol level error causes the issuing of the +ALWAYSONERROR URC. If the command sets the parameter value out of the allowed range, an ERROR result code is returned whatever is the configuration of +CMEE command.

## 18.44.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CGPERMACT=<cid>,<mode> | OK | |
| Read | AT+CGPERMACT? | AT+CGPERMACT: <cid>,<mode> | |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | OK | |
| Test | AT+CGPERMACT=? | +CGPERMACT: (list of supported <cid>s),<br>(list of supported <mode>s)<br>OK | |
| URC | | +ALWAYSONERROR<br>OK | |

### 18.44.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <cid> | Number | See *Chapter 18.1.2* |
| <mode> | Number | Mode set for the module<br>• 0: On-Demand mode<br>• 1: Always-On mode |

## 18.45 Always-On mode check state +CGPERMSTATE

| +CGPERMSTATE | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U270-62S LISA-U270-63S LISA-U270-68S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 18.45.1 Description

Returns the Always-On state on which the module currently belongs.

### 18.45.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Read | AT+CGPERMSTATE? | AT+CGPERMSTATE: <cid>,<mode><br>OK | If the On-Demand mode is disabled:<br>+CGPERMSTATE: ,0<br>OK<br>Otherwise:<br>+CGPERMSTATE: 1,0<br>OK |
| Test | AT+CGPERMSTATE=? | +CGPERMSTATE: (list of supported <cid>s),(list of supported <state>s)<br>OK | |

### 18.45.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <cid> | Number | See *Chapter 18.1.2* |
| <state> | Number | State to which the module belongs<br>• 0: On-Demand mode state<br>• 1: Always-On active state<br>• 2: Always-On stand-by state<br>• 3: Always-On pending state<br>• 4: other unknown state |

Objective Specification

# 18.46 Traffic Flow Template +CGTFT

| +CGTFT | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| | LISA-U SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

## 18.46.1 Description

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 (see the 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 *+CGDCONT* and *+CGDSCONT* AT commands.

The syntax +CGTFT=<cid> causes all of the Packet Filters in the TFT for the specified <cid> to become undefined.

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]*.

A valid packet filter must contain a unique identifier and a unique evaluation precedence index within all TFTs for one PDP address. The network will reject the activation of a secondary PDP context if the corresponding packet filter contains an identifier or an evaluation precedence index which is not unique within all TFTs for one PDP address.

## 18.46.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CGDCONT or AT+CGDSCONT are needed previously<br>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)>[,<direction>]]]]]]]]] | OK | AT+CGTFT=2,1,1,"10 9.115.183.216.255.255.0.0"<br>OK |
| 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)>[,<direction>]<br>[+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)>[,<direction>]<br>[...]] | +CGTFT: 2,1,1,"10 9.115.183.216.255.255.0.0",0,"0.0","0 .0",00000000,"0.0",00000<br>OK |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | 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)[,(list of supported <direction>s)]<br><br>[+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)[,(list of supported <direction>s)]<br><br>[...]]<br><br>OK | +CGTFT: IP,(1-8),(0-255),("0.0.0.0.0.0.0.0.0-255.255.255.255.255.255.255.255"),(0-255),("0.0-65535.65535"),("0.0-65535.65535"),(00000000-ffffffff),("0.0-255.255"),(00000-00000)<br><br>OK |

## 18.46.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <cid> | Number | See *Chapter 18.1.2* |
| <packet_filter_identifier> | Number | See *Chapter 18.1.19* |
| <evaluation_precedence_index> | Number | See *Chapter 18.1.8* |
| <source_address_and_subnet_mask> | String | See *Chapter 18.1.32* |
| <protocol_number_(ipv4)-next_header_(ipv6)> | Number | See *Chapter 18.1.33* |
| <destination_port_range> | String | See *Chapter 18.1.7* |
| <source_port_range> | String | See *Chapter 18.1.34* |
| <ipsec_security_parameter_index_(spi) | Number | See *Chapter 18.1.12* |
| <type_of_service_(tos)_(ipv4)_and_mask-traffic_class_(ipv6)_and_mask> | String | See *Chapter 18.1.35* |
| <flow_label(ipv6)> | Number | See *Chapter 18.1.36* |
| <direction> | Number | See *Chapter 18.1.39* |

## 18.46.4 Notes

### LISA-U

- The read command's information text response does not display the <source_address_and_subnet_mask> parameter entirely in dotted notation, i.e. characters [ and ] are used to separate subnet mask from source address.

Objective Specification

# 18.47 Read counters of sent or received PSD data +UGCNTRD

| +UGCNTRD | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U SARA-U | | | | | |
| | SARA-G LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

## 18.47.1 Description

Allows reading the counters for total sent / received bytes for each defined context.

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.

The sent / received bytes are the gross payload evaluated by the protocol stack, therefore they comprise the TCP and IP header bytes and the packets used to open and close the TCP connection.

## 18.47.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | AT+UGCNTRD | +UGCNTRD:<br><cid>,<sent_sess_bytes>,<received_sess_bytes>,<sent_total_bytes>,<received_total_bytes><br>[...<br>+UGCNTRD:<br><cid>,<sent_sess_bytes>,<received_sess_bytes>,<sent_total_bytes>,<received_total_bytes>]<br>OK | AT+UGCNTRD<br>+UGCNTRD: 1, 100, 0, 100, 0<br>OK |
| Test | AT+UGCNTRD=? | OK | |

## 18.47.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <cid> | Number | Local PDP context identifier in the range of 0-255 |
| <sent_sess_bytes> | Number | Sent bytes for the current PSD session |
| <received_sess_bytes> | Number | Received GPRS session bytes for the current PSD session |
| <sent_total_bytes> | Number | Total sent bytes |
| <received_total_bytes> | Number | Total received bytes |

# 18.48 Set/reset counter of sent or received PSD data +UGCNTSET

| +UGCNTSET | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U SARA-U | | | | | |
| | SARA-G LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | Yes | No | No | - | *+CME Error* |

## 18.48.1 Description

Allows setting 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.

Objective Specification

Given offset parameters are ignored in this case.

### 18.48.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UGCNTSET=<cid>,[<total_bytes_sent_offset>,<total_bytes_received_offset>] | OK | AT+UGCNTSET=0,20,20<br>OK |
| Test | AT+UGCNTSET=? | +UGCNTSET: (range of <cid>s),(range of <total_bytes_sent_offset>),(range of <total_bytes_received_offset>)<br>OK | +UGCNTSET: (0-255),(0-2147483646),(0-2147483646)<br>OK |

### 18.48.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <cid> | Number | Number containing the local PDP context identifier in range of 0-255 |
| <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. |

### 18.48.4 Notes

**LEON-G**

- It is not possible to set the counters of internal PDP contexts.
- The range of <cid> parameter goes from 0 to 3.

## 18.49 Uplink user data plane configuration +UDCONF=9

| +UDCONF=9 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

### 18.49.1 Description

Enables or disables the uplink user data plane. When the uplink data traffic is disabled, the module will not be able to transmit data to the cellular network.

The new setting is saved in NVM and remains valid also after system reboot.

The AT command does not affect the functionality of *AT+UTGSINK* command.

### 18.49.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UDCONF=9,<UUDP_enable> | OK | AT+UDCONF=9,1<br>OK |
| Read | AT+UDCONF=9 | +UDCONF: 9,<UUDP_enable><br>OK | AT+UDCONF=9<br>+UDCONF: 9,1<br>OK |

### 18.49.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <UUDP_enable> | Number | Configures the uplink user data plane feature:<br>• 0: uplink user data plane disabled<br>• 1 (factory-programmed value): uplink user data plane enabled |

Objective Specification

## 18.50 Multiple PDP contexts

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 embedded TCP/IP stack) is configured, established and handled via the data connection management *+UPSD*, *+UPSDA* and *+UPSND* AT commands.

Multiple PDP contexts are supported. The DTE can access these PDP contexts either alternatively through the physical serial interface, 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 a internal PDP context is supported. This IP instance supports up to 7 sockets;
- Using only external PDP contexts, it is possible to have at most 3 IP instances (with 3 different IP addresses) simultaneously active. If in addition the internal PDP context is used, at most 2 external PDP contexts can be activated.

SARA-G300 / SARA-G310
Multiple PDP contexts and internal PDP contexts are not supported.

LEON-G
Using the MT's embedded TCP/IP stack, the IP instance supports up to 16 sockets.

## 18.51 Primary and secondary PDP contexts

A PDP context can be either **primary** or **secondary**. In LTE, PS data connections are referred to as EPS bearers: EPS bearers are conceptually equivalent to the legacy PDP contexts, which are often referred to for sake of simplicity. Similarly to a PDP context, the EPS bearer can be a default (primary) or dedicated (secondary) one. The initial EPS bearer established during LTE attach procedure is actually a default EPS bearer. A secondary PDP context uses the same IP address of a primary PDP context (the usual PDP context activated e.g. via dial-up). The Traffic Flow Filters for such secondary contexts shall be specified according to 3GPP TS 23.060 *[10]*.

The typical usage of the secondary PDP contexts is in VoIP calls, where RTP (speech) packets are conveyed on one PDP context (e.g. the primary one) with a given QoS (e.g. low reliability) whereas SIP signalling is routed on a different PDP context (e.g. the secondary one, with the same IP address but different port numbers) with a more reliable QoS.

A Traffic Flow Template (i.e. a filter based on port number, specifying relative flow precedence) shall be configured for the secondary context to instruct the GGSN to route down-link packets onto different QoS flows towards the TE.

TOBY-L2 / MPCI-L2
The TFT filter can be applied also on uplink packets: in this case the filter has a local scope, as it instructs the MT to route a packet of a given source or destination address on a specific radio bearer to achieve the negotiated QoS

| PDP context type | Activation procedure |
|---|---|
| Primary | Used to establish a logical connection through the network from the UE to the GGSN with a specifically negotiated Quality of Service (QoS).<br><br>The UE initiates the PDP context activation: it changes the session management state to active, creates the PDP context, obtains the IP address and reserves radio resources. After the activation, the UE is able to send IP packets over the air interface. |
| Secondary | Used to establish a second PDP context with the same IP address and the same APN as the primary PDP context.<br><br>The two contexts may have different QoS profiles, which makes the feature useful for applications that have different QoS requirements (e.g. IP multimedia); QoS is applied based on port number addressing. |

TOBY-L2 / MPCI-L2
At most 8 PDP contexts can be theoretically defined and activated, both by the UE and the NW, as network initiated PDP context activation is supported (and by default accepted) by the UE.

Objective Specification

TOBY-L2 / MPCI-L2
At most 3 PDP contexts can be used with dial-up; further constraints may derive from the current USB connectivity configuration, e.g. from the number of CDC-ACMs supporting AT interface (see the *+UUSBCONF* command description)).

On all other modules, at most 2 secondary PDP contexts may be associated to a primary PDP context and at most 2 secondary PDP contexts can be activated, since the maximum number of PDP contexts, both normal and secondary, is always 3.

SARA-G / LEON-G
The secondary PDP contexts are not supported.

Objective Specification

# 19 System features

## 19.1 Firmware installation +UFWINSTALL

| +UFWINSTALL | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U200-82S LISA-U200-83S LISA-U201-83S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *FW Install Error* |

### 19.1.1 Description

Triggers the FW installation procedure, starting from the file (update binary file) stored in the module file system. It could be used as a part of implementation of the FOTA procedure. The command causes a SW system reset with network deregistration.

During the update process, the device cannot be used to make calls, even emergency calls. The update process is fault tolerant, even if the battery is suddenly removed.

At the end of a successful installation, the main firmware software boots up, NVM and profiles data are set to the factory-programmed values of the new firmware version and the SIM is reset (the PIN will be required if enabled).

Once the command has been sent correctly, the FW resets and at the next boot up FW install will start.

In case of power loss during the install phase, at the next module wake-up a fault is detected and the module remains in Firmware Install Mode until the end of the procedure (install terminated).

For more details see the Firmware update Application Note [*85*].

The command syntax differs depending on the module: see the corresponding subsection for the correct command handling.

LISA-U2
The firmware can be updated using either the UART interface with configurable baud rate (only one port is available) or the USB interface with configurable USB instance.

LISA-U2
During the update operations, the +UUFWINSTALL URC displays the progress indication and the result operation on the interface chosen via +UFWINSTALL command. When the FW update is completed, a URC will notify the final result of the operation.

### 19.1.2 TOBY-L2 / MPCI-L2 syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UFWINSTALL=<md5> | OK<br>UFWINSTALL REBOOT | AT+UFWINSTALL=a07a553420 1b2e42dd2d964920e57319<br>OK<br>UFWINSTALL REBOOT |
| Test | AT+UFWINSTALL=? | OK | OK |

### 19.1.3 TOBY-L2 / MPCI-L2 defined values

| Parameter | Type | Description |
|---|---|---|
| <md5> | Number | 32 hexadecimal number |

Objective Specification

### 19.1.4 Notes

- After the command is issued, the module reboots and starts the install process which will take about 1 minute long. No result codes are issued on the terminal during this phase. At the end of the update process the module reboots again with the new firmware installed, NVM, profiles and the file system restored to the factory-programmed values.
- If the <md5> parameter is provided correctly (32 hex digits), then the check is done with the update file stored in the module.
- If the <md5> parameter is provided incorrectly (less digits, more digits, or at least one not hex digits), then the install will not be started, and the module will exit from Firmware Install Mode and the actual will continue to run. A proper error result code will be issued on the same channel where the command has been sent.
- Store the update file into the module cache folder before starting the install with +UFWINSTALL. Otherwise the "*update file not found*" error result code is issued. The procedure for storing is up to the user (via UFTPC, *+UFTPC*. +UFTPC command for FOTA erases the cache content before storing new update file)

### 19.1.5 LISA-U2 syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UFWINSTALL=<filename>[,<Serial_Port_Number>[,<BaudRate>]] | OK | AT+UFWINSTALL="update_FW_90_to_91.upd",1,115200<br>OK |
| Test | AT+UFWINSTALL=? | +UFWINSTALL: "filename",(list of supported <Serial_Port_Number>s),(list of supported <BaudRate>s)<br>OK | +UFWINSTALL: "filename",(0,1,4-6),(19200,38400,57600,115200,230400,460800,921600)<br>OK |
| URC | | +UUFWINSTALL:<progress_install> | |

### 19.1.6 LISA-U2 defined values

| Parameter | Type | Description |
|---|---|---|
| <filename> | String | The update filename from version 0 to version 1 which has been previously downloaded in FS. The update file can have different extension |
| <Serial_Port_Number> | Number | Serial interface where the progress percentage and the information text responses will be sent:<br>• 0: no info will be shown<br>• 1: UART interface<br>• 4: USB1<br>• 5: USB2<br>• 6: USB3<br>If omitted, the command will take as default value for <Serial_Port_Number> the port where the command is issued. |
| <BaudRate> | Number | Available baud rates expressed in b/s:<br>• 19200<br>• 38400<br>• 57600<br>• 115200<br>• 230400<br>• 460800<br>• 921600<br>When a USB interface is selected, the parameter has no effect in the FW install configuration.<br>If omitted, the command will take as default value for <BaudRate> the baud rate of the port where the command is issued. |
| <progress_install> | Number | Provide the installation progress from 1 to 100 and the update result (see *FWINSTALL error result codes*). |

Objective Specification

### 19.1.7 Notes

- Store the update file into the module file system before starting the install with +UFWINSTALL. Otherwise the "*FFS file not found*" error result code is issued. The procedure for FS storing is up to the user (via FTP, *+UDWNFILE*). When the new FW has been installed, the user can optionally delete the "filename" using the file system AT commands (for more details see the *+UDELFILE*).

| Command | Response | Description |
|---|---|---|
| AT+UFWINSTALL="update_FW_90_to_91.upd",1,115200 | | The "OK" final result code is printed out just before the FW reset. |
| | +UUFWINSTALL: 1 | The progression of installation is incremental, but the URC step can be different from 1. |
| | +UUFWINSTALL: 2 | |
| | +UUFWINSTALL: 3 | |
| | +UUFWINSTALL: 4 | |
| | .... | |
| | +UUFWINSTALL: 9 | |
| | +UUFWINSTALL: 12 | |
| | +UUFWINSTALL: 15 | |
| | .... | |
| | +UUFWINSTALL: 99 | |
| | +UUFWINSTALL: 100 | The installation is done when the percentage ends with +UUFWINSTALL: 100. |
| | +UUFWINSTALL: 128 | The last URC with a value greater than 100 indicates the update operation result (e.g. 128 means operation completed with success (for more details see the *FWINSTALL error result codes*). |

**Table 22: +UFWINSTALL example**

## 19.2 Firmware update Over AT (FOAT) +UFWUPD

| +UFWUPD | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | No | No | - | *FOAT Error* |

### 19.2.1 Description

Triggers the firmware update using the Xmodem or Xmodem-1k protocol.

The command syntax differs depending on the module series: see the corresponding subsection for the correct command handling.

The errors (data corruption, data loss, etc.) during the Update phase are internally handled by the Xmodem protocol itself; for more details about the error result codes, see *FOAT error result codes*.

If no data comes to the module after having issued the 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*).

NVM parameters and profiles are set at factory-programmed values.

For more details see u-blox Firmware Update Application Note [*85*].

### 19.2.2 TOBY-L2 / MPCI-L2 description

Making use of the **bin** file and the md5 signature officially released with FW release version triggers the firmware and File System update types using the Xmodem and Xmodem-1k protocols.

Maximum errors allowed (timeout, bad data) is 10, after that Xmodem exits with this string:

*ERROR1*

Objective Specification

TOBY-L200-00S / TOBY-L201 / TOBY-L210-00S / TOBY-L210-60S / TOBY-L280-00S / MPCI-L200-00S / MPCI-L201 / MPCI-L210-00S / MPCI-L210-60S
If 10 errors are provided, the Xmodem exits with these strings:
*"too many errors; giving up"*
*ERROR1*

At the end of the download procedure, the module reboots and starts the update process which will take about 1 minute long. No result codes are issued on the terminal during this phase. At the end of the update process the module reboots again with the new firmware installed, NVM, profiles and the file system restored to the factory-programmed values.

Once the update file has been downloaded, if the <md5> parameter is provided correctly (32 hex digits), then the MD5 check is performed.

If the <md5> parameter is provided incorrectly (less digits, more digits, or at least one not hex digits), then the download will not be started, and the module will exit from Firmware Update Mode and the current FW will be started. A proper error result code will be issued on the same channel where the command has been sent.

In case of power loss during the update phase, 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 handshake.

If the FW download ends with an *ERROR1* condition, the module exits from Firmware Update Mode and returns to normal mode since the FW is still unchanged and usable (FW not corrupted by previous download process).

TOBY-L200-00S / TOBY-L210-00S / TOBY-L210-60S / TOBY-L280-00S / MPCI-L200-00S / MPCI-L210-00S / MPCI-L210-60S
The <md5> parameter is not mandatory.

### 19.2.3 TOBY-L2 / MPCI-L2 syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UFWUPD=<md5> | +UFWUPD: ONGOING<br>CCC...<br>OK<br>UFWUPD REBOOT | AT+UFWUPD=a07a553420 1b2e42dd2d964920e57319<br>+UFWUPD: ONGOING<br>CCC...<br>OK<br>UFWUPD REBOOT |

### 19.2.4 TOBY-L2 / MPCI-L2 defined values

| Parameter | Type | Description |
|---|---|---|
| <md5> | Number | 32 hexadecimal number |

### 19.2.5 LISA-U / SARA-U / SARA-G / LEON-G description

Depending on the <filetype> parameter and the corresponding file format, the update will affect:

- Module firmware: the firmware can be updated only using the file in **fls** format
- NVM and profiles: they are reset to the factory-programmed values using either the file in **dffs** or in **fls** format
- FS: it is updated only using the file in **dffs** format

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 upgrade restarts from Xmodem handshake; the FW is corrupted and useless (*ERROR2*).

If the FW upgrade ends with an ERROR condition, the module remains in Firmware Update Mode expecting that the upgrade restarts from Xmodem handshake; the FW is corrupted and useless (*ERROR2*).

LISA-U200-00S / LISA-U200-01S / LISA-U230 / LISA-U260-01S / LISA-U270-01S
The file in fls format contains the File System image. Any <filetype> value of the +UFWUPD command which involves the file system update will require the fls file.

Objective Specification

SARA-G
The NVM and the profiles are not updated with the file in dffs format.

LEON-G
The file in fls and dffs format do not allow updating the profile and the NVM.

### 19.2.6 LISA-U / SARA-U / SARA-G / LEON-G syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UFWUPD=<filetype>[,<speed>] | +UFWUPD: ONGOING | AT+UFWUPD=0 |
| | | *(Sent at new baud rate, if specified)* | +UFWUPD: ONGOING |
| | | CCC<NACK><NACK><NACK><NACK><NACK><NACK><NACK><NACK><NACK><NACK><NACK><NACK> | CCC<NACK><NACK><NACK><NACK><NACK><NACK><NACK><NACK><NACK><NACK><NACK><NACK> |
| | | OK | OK |
| Test | AT+UFWUPD=? | +UFWUPD: (list of supported <filetype>s), (list of supported <speed>s) | +UFWUPD: (0-2),(115200,230400,460800,921600) |
| | | OK | OK |

### 19.2.7 LISA-U / SARA-U / SARA-G / LEON-G defined values

| Parameter | Type | Description |
|---|---|---|
| <filetype> | Number | Download type<br>• 0: firmware image update (*.fls file)<br>• 1: File System image update (*.dffs file)<br>• 2: firmware and File System image update |
| <speed> | Number | Baud rate in b/s. Allowed values:<br>• 115200 (default value)<br>• 230400<br>• 460800<br>• 921600 |

### 19.2.8 Notes

- If <filetype>=2 make sure the file contains both the firmware and file system images.

**SARA-G**

- The FW update process is not allowed on the AUX UART interface (where present).
- <filetype>=2 is not supported.

**SARA-G300 / SARA-G310**

- <filetype>=1 is not supported.

**LISA-U1 / LISA-U200-00S / LISA-U200-03S / LISA-U200-83S / LISA-U201 / SARA-U / SARA-G / LEON-G**

- <filetype>=2 is not supported.

## 19.3 Antenna detection +UANTR

| +UANTR | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 19.3.1 Description

Measures the DC component of load of the GSM antenna (the GPS antenna is RFU). The antenna load is expressed in kOhm.

Objective Specification

### 19.3.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UANTR=[<antenna_id>] | +UANTR: <antenna_id>,<antenna_load><br>OK | AT+UANTR=0<br>+UANTR: 0,10<br>OK |
| Test | AT+UANTR=? | +UANTR: (list of supported <antenna_id>s)<br>OK | +UANTR: (0)<br>OK |

### 19.3.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <antenna_id> | Number | Antenna identifier (optional parameter)<br>• 0 (default value): GSM antenna<br>• 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:<br>• -1: open circuit<br>• 0: short circuit<br>• 1: 1 kOhm (minimum limit of the measurement range)<br>...<br>• 53: 53 kOhm (maximum limit of the measurement range) |

### 19.3.4 Notes

- The load resistor values below the minimum limit of 1 kOhm are identified as short circuit (<antenna_load>= 0), while values above the maximum limit of 53 kOhm are identified as open circuit (<antenna_load>=-1).
- 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.

## 19.4 RX antenna selection +UANT

| +UANT | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L280 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

### 19.4.1 Description

This command allows user to select the active antenna receiver path. The user can activate the Primary antenna receiver only, the Secondary antenna receiver only, or both antenna receiver paths together. The command can be used for the execution of receiver sensitivity measurements like the Total Isotropic Sensitivity (TIS) test. Antenna transmitting path is not affected by the execution of this command.

### 19.4.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UANT=<setting>,<value> | OK | AT+UANT=0,1<br>OK |
| Test | AT+UANT=? | +UANT: (list of supported <setting>s),(list of supported <value>s)<br>OK | +UANT: (0),(0-2)<br>OK |

Objective Specification

### 19.4.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <setting> | Number | Setting type:<br>• 0: RX path selection |
| <value> | Number | Selects which antenna RX path to use:<br>• 0: both antennas<br>• 1: Primary antenna RX path only<br>• 2: Secondary antenna RX path only |

### 19.4.4 Notes

- This command is exclusively implemented for UMTS/LTE diversity antenna sensitivity test, the module must be attached on a 3G packet switch context or registered on an LTE network, otherwise an error result code is returned.
- To be sure to perform a test in a reliable starting condition, it is suggested to issue *AT+CFUN=15* (silent reset) command before each test.

## 19.5 Rx diversity +URXDIV

| +URXDIV | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U230 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

### 19.5.1 Description

Controls the 3G Rx diversity and 2G DARP during runtime.

The features can be enabled or disabled during operation. Specifying the 2G DARP is optional.

See 3GPP TS 25.101 [64] and 3GPP TS 45.005 [65].

u-blox cellular modules are certified according to all the capabilities and options stated in the Protocol Implementation Conformance Statement document (PICS) of the module. The PICS, according to 3GPP TS 51.010-2 [83], 3GPP TS 34.121-2 [84], 3GPP TS 36.521-2 [114] and 3GPP TS 36.523-2 [115], is a statement of the implemented and supported capabilities and options of a device. If the user changes the command settings during the certification process, the PICS of the application device integrating a u-blox cellular module must be changed accordingly.

### 19.5.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+URXDIV=<RxDiv3G>[,<DARP>] | OK | AT+URXDIV=1,3<br>OK |
| Read | AT+URXDIV? | +URXDIV: <RxDiv3G>,<DARP><br>OK | +URXDIV: 1,3<br>OK |
| Test | AT+URXDIV=? | +URXDIV: (list of supported <RxDiv3G>s), (list of supported <DARP>s)<br>OK | +URXDIV: (0-1),(1-3)<br>OK |

### 19.5.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <RxDiv3G> | Number | Rx diversity configuration. Allowed values:<br>• 0: 3G Rx Diversity disabled<br>• 1 (factory-programmed value): 3G Rx Diversity enabled |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| <DARP> | Number | DARP Phase and mode. Allowed values:<br>• 1: DARP Phase 1<br>• 2: DARP Phase 2 - traffic only<br>• 3 (default and factory-programmed value): DARP Phase 2 - always on |

### 19.5.4 Notes

- It is possible to set the parameters only if the module is not registered with the network.
- The diversity receiver is provided to improve the quality and reliability of the wireless link on all 2G and 3G operating bands except 2G DCS 1800.

## 19.6 ADC read command +UADC

| +UADC | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 19.6.1 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.

### 19.6.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UADC=<adc_id> | +UADC: <adc_id>,<adc_val><br>OK | AT+UADC=0<br>+UADC: 0,480<br>OK |
| Test | AT+UADC=? | +UADC: (range of <adc_id>s)<br>OK | +UADC: (0-1)<br>OK |

### 19.6.3 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] |

## 19.7 Power saving control (Power SaVing) +UPSV

| +UPSV | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | *Profile* | No | - | *+CME Error* |

### 19.7.1 Description

Sets the UART power saving configuration, but it has a global effect on the module power saving configuration:

- If the power saving is enabled (+UPSV=1), the UART interface is cyclically enabled and the module enters idle-mode automatically whenever possible
- If the power saving is disabled (+UPSV=0), the UART interface is always enabled and the module does not enter idle-mode
- If the power saving is controlled by the UART **RTS** line (+UPSV=2), the UART interface is enabled and the module does not enter idle-mode as long as the UART **RTS** line state is ON
- If the power saving is controlled by the UART **DTR** line (+UPSV=3), the UART interface is enabled and the module does not enter idle-mode as long as the UART **DTR** line state is ON

Objective Specification

## 19.7.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UPSV=<mode>[,<Timeout>] | OK | AT+UPSV=1,3000<br>OK |
| Read | AT+UPSV? | +UPSV: <mode>[,<Timeout>]<br>OK | +UPSV: 1,3000<br>OK |
| Test | AT+UPSV=? | +UPSV: (list of supported <mode>s),(list of supported <Timeout>s)<br>OK | +UPSV: (0-3),(40-65000)<br>OK |

## 19.7.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | Power saving configuration. Allowed values:<br>• 0 (default and factory-programmed value): disabled<br>• 1: enabled<br>o The UART is re-enabled from time to time to allow the DTE to transmit, and the module switches 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<br>• 2: power saving is controlled by UART **RTS** line:<br>o If the **RTS** line state is set to OFF, the power saving mode is allowed<br>o If the **RTS** line state is set to ON, the module shall exit from power saving mode<br><mode>=2 is allowed only if the HW flow control has been previously disabled on the UART interface (e.g. with *AT&K0*), otherwise the command returns an error result code (+CME ERROR: operation not allowed if *+CMEE* is set to 2).<br>With <mode>=2 the DTE can start sending data to the module without risk of data loss after having asserted the UART **RTS** line (**RTS** line set to ON state).<br>• 3: power saving is controlled by UART **DTR** line:<br>o If the **DTR** line state is set to OFF, the power saving mode is allowed<br>o If the **DTR** line state is set to ON, the module shall exit from power saving mode<br><mode>=3 is allowed regardless the flow control setting on the UART interface. In particular, the HW flow control can be set on UART during this mode.<br>With <mode>=3 the DTE can start sending data to the module without risk of data loss after having asserted the UART **DTR** line (**DTR** line set to ON state). |
| <Timeout> | Number | If <mode>=1 and active-mode entered, it provides the guard period of no reception of characters on the UART interface before entering idle-mode again. It is expressed in GSM frames (4.615 ms)<br>• 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)<br>• This parameter is accepted only if <mode>=1 |

## 19.7.4 Notes

- <mode>= 1, <mode>= 2 and <mode>= 3 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 memory profiles are accordingly updated, but the setting is only applied to the UART interface.
- <mode>= 2 requires the disabling of the HW flow control only on the UART interface. The other serial interfaces can request the <mode>=2 for the UART regardless their flow control configuration.
- For a detailed explanation of modules' operating modes, modules and interfaces behavior in reference to the +UPSV command setting, see the corresponding system integration manual.

**TOBY-L2**

- If an active, i.e. not suspended, USB connection exists, the module cannot enter power saving.
- In case of <mode>=1, there is no periodic **CTS** ON/OFF cycle but rather less regular **CTS** ON/OFF transitions.

Objective Specification

- In case of <mode>=1, the UART interface is disabled after the <Timeout> parameter time, since the command result code is issued.
- In case of <mode>=2, the following handling is implemented:
  - When **RTS** line is set to ON state by the DTE, the behavior is the same of <mode>=0.
  - When **RTS** line is set to OFF state by the DTE the CTS line is hold in OFF state, hence DTE to DCE communication shall be suspended.
- In case of <mode>=3, the following handling is implemented:
  - When **DTR** line is set to ON state by the DTE, the behavior is the same of <mode>=0.
  - When **DTR** line is set to OFF state by the DTE the CTS line is hold in OFF state, hence DTE to DCE communication shall be suspended.
- The current command setting is automatically stored in NVM after the command issuing and it is not managed in the memory profile. As a result, if the flow control configuration is not saved in the memory profile, a wrong power saving behavior can happen at the next boot, in this scenario:
  - Power saving mode controlled by UART **RTS** line (<mode>=2) is applied.
  - DTE-DCE local flow control set to the default setting (HW flow control), because it was the stored configuration (in the memory profile that has been loaded).
  - **RTS** line set to OFF state by the DTE.

  In this configuration, the module is not allowed to send any data as long as the **RTS** line is set to OFF state, because the flow control "stop" condition forbids it. Therefore, in case <mode>=2 is selected, it is important to save the flow control configuration via the *AT&W* command before any module reset or power-off. The suggested procedure to be performed once is:
  - Set the "no flow control" configuration (via *AT&K0*, or *AT+IFC=0,0* or *AT\Q0* AT commands)
  - Set the +UPSV <mode>=2
  - Save the flow control configuration into the proper RAM profile mirror via the *AT&W* AT command
  - Update the stored profile in the NVM via *+CPWROFF* AT command

  At the next boot, the configuration will be consistent.
- For the same reason (+UPSV is not managed as part of the memory profile configuration), the commands *AT&V*, *AT&W*, *ATZ* and *AT&F* do not handle the +UPSV command's configuration

**TOBY-L200-02S / TOBY-L210-02S / TOBY-L280-02S**

- In case of <mode>=1, the UART SW flow control (*&K4 &K5 &K6*, *+IFC=1,1*, *\Q1*) shall not be used.

**TOBY-L201 / TOBY-L210-60S / TOBY-L280-00S**

- In case <mode>=2 is set, the following handling is implemented:
  - When **RTS** line is set to ON state by the DTE, the behavior is the same of <mode>=0.
  - When **RTS** line is set to OFF state by the DTE the behavior is the same of <mode>=1.
- In case <mode>=3 is set, the following handling is implemented:
  - When **DTR** line is set to ON state by the DTE, the behavior is the same of <mode>=0.
  - When **DTR** line is set to OFF state by the DTE the behavior is the same of <mode>=1.

**TOBY-L200-00S / TOBY-L210-00S / MPCI-L2**

- Since the UART interface is not supported, the command only configures the module power saving and the <Timeout> parameter has no effect.
- The command behaviour with <mode>=2 and <mode>=3 is the same of <mode>=1 (but the <Timeout> parameter is not accepted).

**LISA-U / SARA-U**

- Since these series are equipped with other serial interfaces besides the UART (e.g. USB, SPI), there are some interactions among the power saving mechanisms implemented by the different interfaces. See the corresponding module's system integration manual for a detailed description.
  For power consumption minimization, a DTE could require to set <mode>=1 or <mode>=2 or <mode>=3 (more likely 2 or 3), even if the UART is not used (or even connected). In this condition, the autobauding should be disabled on the UART interface. Otherwise, the +UPSV setting could be not allowed on the other

Objective Specification

available AT interfaces (e.g. USB) (an error result code is returned). If the UART interface is not accessible, the autobauding can be disabled on UART only by change the *+IPR* configuration from value 0 (autobauding) to a different value on the stored memory profile, that is according with the procedure described in *Appendix B.3* applied on the other available AT interfaces (e.g. USB). If this procedure cannot be performed, the +UPSV <mode>=1 or <mode>=2 or <mode>=3 can be set on other available AT interfaces on the condition that the module UART has not pending data to send (that is URCs or the greeting message, since the UART is not used by the DTE). Basically, this can be possible only if the +UPSV command is issued as the first command after the module boot.

- In case of <mode>=1, the UART interface is immediately disabled after the command result code is issued.

**LISA-U1 / LISA-U200-00S / LISA-U200-01S / LISA-U230 / LISA-U260-01S / LISA-U270-01S**

- <mode>=3 is not supported.

**SARA-G**

- In case of <mode>=1, the UART interface is disabled after the <Timeout> parameter time, since the command result code is issued.
- <mode>=3 is not supported.

**SARA-G300 / SARA-G310**

- If a valid reference clock signal is not provided to the EXT32K input pin, the <mode>=1 and <mode>=2 does not change the power saving configuration of the UART and the module: the UART is always enabled and the module does not enter idle-mode as for <mode>=0.

**SARA-G340-02S / SARA-G350-02A / SARA-G350-02S**

- There is an extended behaviour in case both UART and AUX UART are configured as AT interfaces (see *+USIO*).
  The command can be issued on either UART or AUX UART interface, and it has a global effect.
  - If power saving is disabled (+UPSV=0), both UART and AUX UART interfaces are always enabled and the module does not enter idle-mode.
  - If power saving is enabled (+UPSV=1), both UART and AUX UART interfaces are cyclically enabled and the module enters idle-mode automatically whenever possible. The enabling is synchronous, and the interfaces share the same <Timeout> parameter configuration. The description provided for UART interface is fully applicable to AUX UART interface.
  - If power saving is controlled by the UART **RTS** line (+UPSV=2), the UART and AUX UART interfaces are enabled and the module does not enter idle-mode as long as the UART **RTS** line state is ON.
    The description provided for the UART interface is fully applicable to the AUX UART interface, just keeping in mind that the power saving of both interfaces is controlled by the UART **RTS** line (since AUX UART is not equipped with the **RTS** line).

**SARA-G340-00S / SARA-G340-01S / SARA-G350-00S / SARA-G350-00X / SARA-G350-01B / SARA-G350-01S**

- If <mode>=2 the **CTS** line follows the module power saving state if **RTS** is set to OFF.

**LEON-G**

- In case of <mode>=1, the UART interface is disabled after the <Timeout> parameter time, since the command result code is issued.
- If <mode>=2 the **CTS** line follows the module power saving state if **RTS** is set to OFF.
- <mode>=3 is not supported.

Objective Specification

# 19.8 End user test +UTEST

| +UTEST | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | All products | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 19.8.1 Description

Enables the module testing about RF parts and all the digital pins.

The usage of this command shall be restricted to controlled (shielded chamber/box) environments and for test purpose only.

u blox assumes no responsibilities for the inappropriate use of this command.

## 19.8.2 RF test description

Sets the module in non-signalling (or test) mode, or returns to signalling (or normal) mode.

In test/non-signalling mode the module switches off the 2G/3G/4G protocol stack for performing single tests which could not be performed during signalling mode.

Improper usage of this command on real network could disturb other users and the network itself.

When entering the test mode, it is possible to sequentially trigger the following actions for testing purposes:

- 2G transmission of GSM burst sequence on the desired channel and power level (only one time slot configuration is available)
- 2G transmission of 8-PSK modulation burst sequence on the desired channel and power level (only one time slot configuration is available)
- 3G transmission of WCDMA signal on the desired channel and power level
- 4G transmission of LTE SC-FDMA OFDM signal (5 MHz bandwidth) in the desired channel in FDD band and power level
- Receiving signal detection and RF level measurement on the desired 2G, 3G or 4G (LTE) channel
- Receiving signal detection at diversity or secondary antenna input and RF level measurement on the desired 2G, 3G or 4G (LTE) channel

TOBY-L2 / MPCI-L2
The receiving signal detection at the secondary antenna is limited to the only 3G and 4G channels.

The command only accepts the parameters set supported by the specific module version. When an unsupported parameter is issued an error result code will be provided ("+CME ERROR: operation not supported" if *+CMEE* is set to 2).

The execution of these actions is performed in non-signalling mode. In non-signalling mode:

- The module only accepts +UTEST commands

In normal mode:

- The only allowed +UTEST command is the AT+UTEST=1 used to enable testing interface
- All other +UTEST commands return an error result code ("+CME ERROR: operation not allowed" if *+CMEE* is set to 2)

The module must not be registered with the network before entering the non-signalling mode, otherwise an error result code ("+CME ERROR: operation not allowed" if *+CMEE* is set to 2) is provided.

The *+CMEE* command can only be set in normal mode.

Objective Specification

To return to the normal mode perform one of these actions:

- A module reset
- Power off the module
- Send AT+UTEST=0

When the module returns the normal mode, the network registration status stored in the profile will be restored.

TOBY-L2 / MPCI-L2
A network deregistration is not needed, as the AT+UTEST=1 command deactivates the protocol stack before entering the non-signalling mode.
When the module exits from the test mode, the network status before entering this mode will be restored.

See the End User Test Application Note [132] for further test command examples.

### 19.8.3 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UTEST=<mode>,[<par1>],[<par2>],[<par3>],[<par4>],[<par5>] | If <mode>=0 or 1<br>OK | AT+UTEST=0<br>OK |
| | | If <mode>=2 or 3<br>+UTEST: [<par1>,<par2>][,<par3>,<par4>,<par5>][,<min>,<avg>,<max>]<br>OK | AT+UTEST=2,124,250<br>+UTEST: 124,250,-80,-80,-80<br>OK |
| Read | AT+UTEST? | +UTEST: <mode><br>OK | +UTEST: 1<br>OK |
| Test | AT+UTEST=? | +UTEST: (list of supported <mode>s)<br>OK | +UTEST: (0-3)<br>OK |

### 19.8.4 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | Test mode setting:<br>• 0: the module returns to the module normal mode<br>• 1: the module enters non-signalling mode<br>• 2: RX test mode (measuring the antenna level estimation of the received RF signal)<br>• 3: TX test mode (GSMK/8-PSK burst or transmission in 3G bands) |
| <par1>..<par5> | Number | Parameters needed for RX and TX test mode as reported in the table below. |

### 19.8.5 Notes

- **RX mode setting (<mode>=2)**

| Parameter | Description | Range | Default | Notes |
|---|---|---|---|---|
| <par1> | Channel | 0 ÷ 165535 | 32 | RX channel 2G RAT: for 850, 900, 1800 bands the value corresponds to ARFCN while for 1900 band an offset of 32768 is added.<br>o [0-124]: GSM 900 MHz<br>o [128-251]: GSM 850 MHz<br>o [512-885]: DCS 1800 MHz<br>o [975-1023]: EGSM 900 MHz<br>o [33280-33578]: PCS 1900 MHz (corresponding to ARFCN 512-810 range in band 1900)<br>RX channel 3G RAT: the value corresponds to UARFCN except for band 19 where an offset of 20000 is added, additional channels available in some 3G bands are not supported.<br>o [1537-1738]: band 4 (1700 MHz)<br>o [2937-3088]: band 8 (900 MHz)<br>o [4357-4458]: band 5 (850 MHz) |

Objective Specification

| Parameter | Description | Range | Default | Notes |
|---|---|---|---|---|
| | | | | o [4387-4413]: band 6 (800 MHz)<br>o [20712-20763]: band 19 (800 MHz)<br>o [9662-9938]: band 2 (1900 MHz)<br>o [10562-10838]: band 1 (2100 MHz)<br>RX channel 4G RAT: the value corresponds to EARFCN with an offset of 100000.<br>o [101950-102399]: FDD band 4 (EARFCN range 1950 - 2399)<br>o [105180-105279]: FDD band 13 (EARFCN range 5180 - 5279)<br>o [101200-101949]: FDD band 3 (EARFCN range 1200 - 1949)<br>o [102750-103449]: FDD band 7 (EARFCN range 2750 - 3449)<br>o [106150-106449]: FDD band 20 (EARFCN range 6150 - 6449)<br>o [109210-109659]: FDD band 28 (EARFCN range 9210 - 9659)<br>o [100000-100599]: FDD band 1 (EARFCN range 0 - 599)<br>o [100600-101199]: FDD band 2 (EARFCN range 600 - 1199)<br>o [102400-102649]: FDD band 5 (EARFCN range 2400 - 2649)<br>o [103450-103799]: FDD band 8 (EARFCN range 3450 - 3799)<br>o [105730-105849]: FDD band 17 (EARFCN range 5730 - 5849)<br>The "+CME ERROR: operation not supported" error result code will be provided in these cases (if *+CMEE* is set to 2):<br>o A value not belonging to the above ranges is set<br>o The RX channel parameter value belongs to a not supported RAT (2G or 3G or 4G RAT) or band |
| <par2> | Time | 1 ÷ 600000 | 1000 | Time interval for RX test expressed in ms<br>TOBY-L2 / MPCI-L2<br>The range goes from 50 ms to 600000 ms. |
| <par3> | Antenna diversity | 0 ÷ 1 | 0 | Receiver path:<br>o 0: main / primary antenna<br>o 1: diversity / secondary antenna<br>The parameter is available only if supported, otherwise an error result code will be provided ("+CME ERROR: operation not supported" if *+CMEE* is set to 2) |
| <min> | Minimum antenna RF level estimation | -100 ÷ -20 | | Expressed in dBm, for 2G RAT<br>In 3G / 4G RAT the range goes from -90 to -20.<br>TOBY-L2 MPCI-L2<br>The range is [-100 ÷ -30] in 2G and [-90 ÷ -30] in 3G and 4G. |
| <avg> | Average antenna RF level estimation | -100 ÷ -20 | | Expressed in dBm, for 2G RAT<br>In 3G / 4G RAT the range goes from -90 to -20.<br>TOBY-L2 MPCI-L2<br>The range is [-100 ÷ -30] in 2G and [-90 ÷ -30] in 3G and 4G. |
| <max> | Maximum antenna RF level estimation | -100 ÷ -20 | | Expressed in dBm, for 2G RAT<br>In 3G / 4G RAT the range goes from -90 to -20.<br>TOBY-L2 MPCI-L2<br>The range is [-100 ÷ -30] in 2G and [-90 ÷ -30] in 3G and 4G. |

Objective Specification

- **TX mode setting (<mode>=3)**

| Parameter | Description | Range | Default | Notes |
|---|---|---|---|---|
| <par1> | Tx channel | 0 ÷ 165535 | 32 | TX channel 2G RAT: for 850, 900, 1800 bands the value corresponds to ARFCN while for 1900 band an offset of 32768 is added.<br>o [0-124]: GSM 900 MHz<br>o [128-251]: GSM 850 MHz<br>o [512-885]: DCS 1800 MHz<br>o [975-1023]: EGSM 900 MHz<br>o [33280-33578]: PCS 1900 MHz (corresponding to ARFCN 512-810 range in band 1900)<br>TX channel 3G RAT: the value corresponds to UARFCN except for the band 19 where an offset of 20000 is added, additional channels available in some 3G bands are not supported.<br>o [1312-1513]: band 4 (1700 MHz)<br>o [2712-2863]: band 8 (900 MHz)<br>o [4132-4233]: band 5 (850 MHz)<br>o [4162-4188]: band 6 (800 MHz)<br>o [20312-20363]: band 19 (800 MHz)<br>o [9262-9538]: band 2 (1900 MHz)<br>o [9612-9888]: band 1 (2100 MHz)<br>TX channel 4G RAT: the value corresponds to EARFCN with an offset of 100000.<br>o [118000-118599]: FDD band 1 (EARFCN range 18000 - 18599)<br>o [118600-119199]: FDD band 2 (EARFCN range 18600 - 19199)<br>o [119950-120399]: FDD band 4 (EARFCN range 19950 - 20399)<br>o [119200-119949]: FDD band 3 (EARFCN range 19200 - 19949)<br>o [120400-120649]: FDD band 5 (EARFCN range 20400 - 20649)<br>o [120750-121449]: FDD band 7 (EARFCN range 20750 - 21449)<br>o [121450-121799]: FDD band 8 (EARFCN range 21450 - 21799)<br>o [123180-123279]: FDD band 13 (EARFCN range 23180 - 23279)<br>o [123730-123849]: FDD band 17 (EARFCN range 23730 - 23849)<br>o [124150-124449]: FDD band 20 (EARFCN range 24150 - 24449)<br>o [127210-127659]: FDD band 28 (EARFCN range 27210 - 27659)<br>The "+CME ERROR: operation not supported" error result code will be provided in these cases (if *+CMEE* is set to 2):<br>o A value not belonging to the above ranges is set<br>o The TX channel parameter value belongs to a not supported RAT (2G or 3G or 4G RAT) or band |
| <par2> | Power control level | -56 ÷ 24 | 5 | For 2G RAT: PCL (power control level). The allowed values depend on the related <par1> value: lower numbers means higher power level.<br>o [0-19]: GSM 850 and 900, if <par2> is less than 5 the handling is the same for <par2>=5<br>o [0-15]: DCS 1800 and PCS 1900<br>In case <par4> is set to 2 (8-PSK modulation) the range is as below. Other values are valid but behave as the indicated level:<br>o [0-19]: GSM 850 and 900 if <par2> is less than 8 the handling is the same for <par2>=8 |

Objective Specification

| Parameter | Description | Range | Default | Notes |
|---|---|---|---|---|
| | | | | o [0-15]: DCS 1800 and PCS 1900; if <par2> is less than 2 the handling is the same for <par2>=2<br>For 3G RAT: absolute output power [dBm]<br>o [-56 ÷ 24] for all the bands<br>For 4G RAT: absolute output power [dBm]<br>o [-40 ÷ 24] for all the bands<br>Only the values indicated in the above ranges are valid, otherwise an error result code will be provided ("+CME ERROR: operation not supported" if *+CMEE* is set to 2).<br>TOBY-L2 / MPCI-L2<br>The minimum value of the output power level <par2> is -50 dBm in 3G mode. |
| <par3> | Training sequence | 0 ÷ 7 | 5 | Training sequence to be used (to be changed only in case of link with network simulator, else use default)<br>In 3G / 4G RAT the values is unused. |
| <par4> | Modulation mode | 1 ÷ 2 | 1 | Modulation mode<br>o 1: GMSK normal modulation including the training sequence<br>o 2: 8-PSK normal modulation including the training sequence<br>In 3G / 4G RAT the parameter is ignored.<br>LTE SC-FDMA OFDM modulation (5 MHz bandwidth), FDD, is automatically set using for <par1> an EARFCN value. |
| <par5> | Time | 0 ÷ 600000 | 1000 | Time interval for TX test expressed in ms<br>o 0: burst sequence is continuously transmitted. In this case the command will immediately return the information text response. The command line will be immediately available for any +UTEST command. Provide AT+UTEST=1 command to stop the burst sequence transmission, any other +UTEST commands can be set and the current sequence transmission is stopped.<br>TOBY-L2 / MPCI-L2<br>The range goes from 50 ms to 600000 ms. |

**TOBY-L2 / MPCI-L2**

- During the continuous TX mode tests it is not possible to change the technology: in this case the testing must be stopped by the command AT+UTEST=1 or by forcing the module to transmit for a limited time interval, and the RAT correctly configured. After that the continuous TX mode tests can be restarted.

## 19.8.6 Examples

In *RX mode test command examples* the module provides the information text response after the timeout issued in the set command.

| Command | Response | Description |
|---|---|---|
| AT+UTEST=2 | +UTEST: 32,1000,-89,-88,-87<br>OK | The module measures the antenna RX level at RX channel 32 band GSM 900 for 1 s interval.<br>In the example -89,-88,-87 are the antenna RF level estimation: the numbers are just an example. |
| AT+UTEST=2,885,5000 | +UTEST: 885,5000,-66,-65,-65<br>OK | The module measures the antenna RX level at RX channel 885 band DCS 1800 for 5 s interval. |
| AT+UTEST=2,10562,2000 | +UTEST: 10562,2000,-60,-60,-59<br>OK | The module measures the antenna RX level at RX channel 10562 band B1 for 2 s interval on the main antenna path. |
| AT+UTEST=2,10562 | +UTEST: 10562,1000,0,-85,-85,-85<br>OK | The module measures the antenna RX level at RX channel 10562 band B1 for 1 s interval on the main antenna path. |

Objective Specification

| Command | Response | Description |
|---|---|---|
| AT+UTEST=2,65,3000,0 | +UTEST: 65,3000,0,-63,-62,-62<br>OK | The module measures the antenna RX level at RX channel 65 band GSM 900 for 3 s interval on the main antenna path. |
| AT+UTEST=2,4357,,1 | +UTEST: 4357,1000,1,-51,-51,-51<br>OK | The module measures the antenna RX level at RX channel 4357 band B5 for 1 s interval on the diversity antenna path. |
| AT+UTEST=2,102174,500,0 | +UTEST: 102174,500,0,-71,-70,-70<br>OK | The module measures the antenna RX level at RX channel 2174 band FDD 4 for 0.5 s interval on the primary antenna path. |
| AT+UTEST=2,105230,,1 | +UTEST: 105230,1000,1,-72,-71,-70<br>OK | The module measures the antenna RX level at RX channel 5230 band FDD 13 for 1 s interval on the secondary antenna path. |

**Table 23: RX mode test command examples**

| Command | Response | Description |
|---|---|---|
| AT+UTEST=3,32,7,5 | +UTEST: 32,7,5,1,1000<br>OK | The module will transmit for 1 s interval 1 slot burst sequence at TX channel 32 GSM 900 at PCL 5 using training sequence 5 and normal GMSK modulation. |
| AT+UTEST=3,65,8,,2,5000 | +UTEST: 65,8,5,2,5000<br>OK | The module will transmit for 5 s interval 1 slot burst sequence at TX channel 65 GSM 900 at PCL 8 (gamma 6, 27 dBm) using training sequence 5 and normal 8-PSK modulation. |
| AT+UTEST=3,660,,,,0 | +UTEST: 660,5,5,1,0<br>OK | The module will transmit continuously 1 slot burst sequence at TX channel 660 DCS 1800 at PCL 5 using training sequence 5 and normal GMSK modulation. |
| AT+UTEST=3,9612,22,,,2000 | +UTEST: 9612,22,5,1,2000<br>OK | The module will transmit for 2 s interval at TX channel 9612 band B1 at 22 dBm power level using WCDMA modulation. |
| AT+UTEST=3,120399,15,,,3000 | +UTEST: 120399,15,5,1,3000<br>OK | The module transmits for 3 s interval at TX channel 20399 band FDD 4 at 15 dBm power level using SC-FDMA OFDM modulation 5 MHz bandwidth. |
| AT+UTEST=3,123230,-10,,,0 | +UTEST: 123230,-10,5,1,0<br>OK | The module continuously transmits at TX channel 23230 band FDD 13 at -10 dBm power level using SC-FDMA OFDM modulation 5 MHz bandwidth. |

**Table 24: TX mode test command examples**

## 19.8.7 Digital pins testing description

TOBY-L200-00S / TOBY-L201 / TOBY-L210-00S / TOBY-L210-60S / TOBY-L280-00S / MPCI-L200-00S / MPCI-L201 / MPCI-L210-00S / MPCI-L210-60S / LISA-U200-00S / LISA-U200-01S / LISA-U200-02S / LISA-U200-52S / LISA-U200-62S / LISA-U200-82S / LISA-U230 / LISA-U260 / LISA-U270 / SARA-U260-00S / SARA-U270-00S / SARA-U270-00X / SARA-U280-00S / SARA-G300 / SARA-G310 / SARA-G340-00S / SARA-G340-01S / SARA-G350-00S / SARA-G350-00X / SARA-G350-01B / SARA-G350-01S / LEON-G
The feature is not supported.

Defines the commands to perform some verifications on all the digital pins of the u-blox cellular modules.

These pins can be considered as generic digital input / output pins; it is possible to configure one pin as a digital output with "high" logic level and then verify the voltage level present. Conversely, it is possible set a pin as a digital input, externally apply a "high" or "low" logic level and then check if the module is able to correctly measure the voltage level applied.

After the execution of the AT+UTEST=10,5 command, it is possible to externally apply a voltage level to the enabled input pins and / or measure the voltage level on the pins configured as digital input.

These commands are intended for production to check the correct digital pins behavior, detect possible soldering or functional problems and can be executed only in non-signalling mode (otherwise the "+CME ERROR: operation not allowed" (if *+CMEE* is set to 2) error result code is issued without performing any operations).

Objective Specification

Do not exceed the values reported in the Generic Digital Interface section of the module data sheet when testing a pin as a digital input pin, since stressing the device above the listed ratings may cause a permanent damage of the module.

See the End User Test Application Note [132] and the corresponding module data sheet for the list of pins available for testing and their levels characteristics.

## 19.8.8 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| **Digital pins testing generic syntax** | | | |
| Set | AT+UTEST=10,<op_code>[,[<bit_padding>]<pin_seq>] | OK | AT+UTEST=10,3,"0000001000000300"<br>OK |
| **Original configuration restoring** | | | |
| Set | AT+UTEST=10,0 | OK | AT+UTEST=10,0<br>OK |
| **Pins set definition** | | | |
| Set | AT+UTEST=10,2,[<bit_padding>]<pin_seq> | OK | AT+UTEST=10,2,"0000000C300000003000"<br>OK |
| **Pins configuration** | | | |
| Set | AT+UTEST=10,3,[<bit_padding>]<pin_seq> | OK | AT+UTEST=10,3,"0000000420000000 1000"<br>OK |
| **Output pins definition** | | | |
| Set | AT+UTEST=10,4,[<bit_padding>]<pin_seq> | OK | AT+UTEST=10,4,"0000000010000000 2000"<br>OK |
| **Digital testing execution** | | | |
| Set | AT+UTEST=10,5 | OK | AT+UTEST=10,5<br>OK |
| **Digital value measurement** | | | |
| Set | AT+UTEST=10,6 | <bit_padding>]<pin_seq><br>OK | AT+UTEST=10,6<br>00000004100000003000<br>OK |
| Read | AT+UTEST? | +UTEST: <mode><br>OK | +UTEST: 1<br>OK |
| Test | AT+UTEST=? | +UTEST: (list of supported <mode>s)<br>OK | +UTEST: (0-3)<br>OK |

## 19.8.9 Defined values

| Parameter | Type | Description |
|---|---|---|
| <op_code> | Number | Test mode setting:<br>• 0: exits the test interface and restore the pins to the original configuration<br>• 2: defines a set of pins that will be tested and initialize these pins to be ready for testing. The original pins configuration is kept for final restore. See the End User Test Application Note [132] for the list of pins available for testing. In the [<bit_padding>]<pin_seq> parameter use this notation to represent each module pin with its binary digit:<br>o 0: the pin will not be tested<br>o 1: the pin will be tested (as digital input or output)<br>• 3: configures the logical pins previously enabled for testing as output or input; the command has effect only if AT+UTEST=10,2 has been previously issued.<br>In case a not enabled pin is set as digital input or output, the command does not return an error and the setting is not applied. In the [<bit_padding>]<pin_seq> parameter use this notation to represent each module pin with its binary digit: |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | o 0: the pin will be set as an output<br>o 1: the pin will be set as an input<br>• 4: configures the value of the output pins under testing; the command has effect only if AT +UTEST=10,3 has been previously issued; The command is not mandatory if there are not output pins to configure. In the [<bit_padding>]<pin_seq> parameter use this notation to represent each module pin with its binary digit:<br>o 0: the pin will output a "low" logic level<br>o 1: the pin will output a "high" logic level<br>• 5: apply the setting change defined with <op_code>= 2 / 3 / 4 and triggers the execution of the digital testing. Digital testing of the pins is possible only after the execution of the AT +UTEST=10,5 command.<br>• 6: returns the logic value of pins under testing (both input and output); in the [<bit_padding>]<pin_seq> parameter use this notation to represent each module pin with its binary digit:<br>o 0: "low" logic digital level measured at the module pin<br>o 1: "high" logic digital level measured at the module pin |
| [<bit_padding>]<pin_seq> | Number | Sequence of hexadecimal digits containing the pins information and the action to execute<br>See the *Notes* and End User Test Application Note [*132*] for detailed number description |

## 19.8.10 Notes

- Consider these steps to construct the [<bit_padding>]<pin_seq> sequence
  - Consider the total number of module's pins available (76 pins for LISA-U2 series, 64 pins for SARA-U2 series, 92 pins, for TOBY-L2 series)
  - See the End User Test Application Note [*132*] for the list of pins available for testing
  - In case a non-testable pin is selected, the command does not return an error result code but the value is not considered and not applied.
  - The status of the n-th pin will be represented by the corresponding n-th bit; see the <op_code> description for the notation of each mode setting
  - Convert each group of four binary digits into its hexadecimal representation
  - Add one 0 digit at the beginning of the sequence for TOBY-L2 and LISA-U2 series to complete the resulting sequence of hexadecimal values with 0 padding
- An example of AT commands sequence to test the digital pins is reported in *Table 25*.

| Command | Response | Description |
|---|---|---|
| AT+CMEE=2 | OK | Enable the verbose error result code |
| AT+COPS=2 | OK | Deregister the module from the network |
| AT+UTEST=1 | OK | The module enters the test mode |
| AT+UTEST=10,2,"000007F400C000D83F00" | OK | The command puts the module in Interface initialised state; the command saves the pins status to restore it at the end of the test.<br>Pins enabled for testing: DSR, RI, DCD, DTR, RTS, CTS, GPIO1, GPIO2, GPIO3, GPIO4, I2S1_RXD/GPIO6, I2S1_TXD/GPIO7, GPIO5, I2S1_CLK/GPIO8, I2S1_WA/GPIO9, SPI_SCLK/GPIO10, SPI_MOSI/GPIO11, SPI_MISO/GPIO12, SPI_SRDY/GPIO13, SPI_MRDY/GPIO14 |
| AT+UTEST=10,3,"00000494004000C01800" | OK | Pins configuration:<br>o DTR, RTS, GPIO3, GPIO4, I2S1_RXD/GPIO6, GPIO5, I2S1_CLK/GPIO8, SPI_MOSI/GPIO11, SPI_MRDY/GPIO14 as input<br>o DSR, RI, DCD, CTS, GPIO1, GPIO2, I2S1_TXD/GPIO7, I2S1_WA/GPIO9, SPI_SCLK/GPIO10, SPI_MISO/GPIO12, SPI_SRDY/GPIO13 as output |
| AT+UTEST=10,4,"00000360008000182700" | OK | Digital logic value of the output pins:<br>o DSR, RI, DCD, CTS, GPIO1, GPIO2, I2S1_TXD/GPIO7, I2S1_WA/GPIO9, SPI_SCLK/GPIO10, SPI_MISO/GPIO12, SPI_SRDY/GPIO13 set to "high". |
| AT+UTEST=10,5 | OK | Configurations made by AT+UTEST=10,2; AT+UTEST=10,3 and AT+UTEST=10,4 are executed. |

Objective specification

| Command | Response | Description |
|---|---|---|
| AT+UTEST=10,6 | 000007F400C000D83F00<br>OK | Logic digital value measured at modules pins:<br>o DSR, RI, DCD, DTR, RTS, CTS, GPIO1, GPIO2, GPIO3, GPIO4, I2S1_RXD/GPIO6, I2S1_TXD/GPIO7, GPIO5, I2S1_CLK/GPIO8, I2S1_WA/GPIO9, SPI_SCLK/GPIO10, SPI_MOSI/GPIO11, SPI_MISO/GPIO12, SPI_SRDY/GPIO13, SPI_MRDY/GPIO14: "high" level detected |
| AT+UTEST=0 | OK | Module exits from the test mode and normal pins configurations is restored. |

**Table 25: Digital pins test command examples**

- The digital pins can be configured as many times as needed by the testing process; AT+UTEST=10,2 command is not needed any more as the DUT is already in Interface initialised state:
- See the End User Test Application Note [*132*] for further test command examples.

# 19.9 Smart temperature supervisor +USTS

| +USTS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | *Profile* | No | - | *+CME Error* |

## 19.9.1 Description

Enables/disables 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 a URC will be issued 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 a URC will be issued to notify the dangerous working condition. After the notification the device will start the shutting down procedure to avoid damaging itself.

The shutting down procedure is performed only if <mode>=1: a 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 the call termination: a URC will be sent to notify this.

LISA-U200-03S / LISA-U200-83S / LISA-U201 / SARA-U
The shut-down procedure will start 3 s after the "dangerous working condition" URC has been issued. If emergency calls have not yet been disconnected by the user by means of the *ATH* command, after this 3 s timer they will be released by the module itself before starting the shutdown procedure.

If the feature is disabled (<mode>= 0 and <mode>= 2) there is no embedded protection against not allowed temperature working conditions.

For more details on Smart Temperature Supervisor feature, see the corresponding module system integration manual.

## 19.9.2 Syntax

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

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | OK | OK |
| URC | | +UUSTS: <mode>,<event> | +UUSTS: 1,1 |

### 19.9.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | Enables / disables the smart temperature mode:<br>• 0 (default value and factory-programmed value): smart temperature feature disabled<br>• 1: smart temperature feature enabled; the indication and shutting down are performed<br>• 2: smart temperature indication enabled |
| <event> | Number | Provides the event status:<br>• -2: temperature below $t_{-2}$ threshold<br>• -1: temperature below $t_{-1}$ threshold<br>• 0: temperature inside the allowed range - not close to the limits<br>• 1: temperature above $t_{+1}$ threshold<br>• 2: temperature above the $t_{+2}$ threshold<br>• 10: timer expired and no emergency call is in progress, shutdown phase started<br>• 20: emergency call ended, shutdown phase started<br>• 100: error during measurement |

### 19.9.4 Notes

**LEON-G**

- <event>=100 is not supported.

## 19.10 MSPR profile handling configuration +UDCONF=40

| +UDCONF=40 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | *NVM* | No | - | *+CME Error* |

### 19.10.1 Description

The multi-slot transmission power can be reduced according to the 3GPP specifications and set to a defined threshold.

u-blox cellular modules are certified according to all the capabilities and options stated in the Protocol Implementation Conformance Statement document (PICS) of the module. The PICS, according to 3GPP TS 51.010-2 [*83*], 3GPP TS 34.121-2 [*84*], 3GPP TS 36.521-2 [*114*] and 3GPP TS 36.523-2 [*115*], is a statement of the implemented and supported capabilities and options of a device. If the user changes the command settings during the certification process, the PICS of the application device integrating a u-blox cellular module must be changed accordingly.

In 3G mode (i.e. UMTS radio access), the maximum output power cannot be set through the AT command, but is automatically set by the module according to the UE Maximum Power Reduction for the nominal maximum output power with HS-DPCCH and E-DCH defined by 3GPP specifications.

In 2G mode (i.e. GPRS and EDGE radio access), the maximum output power in GMSK or 8-PSK multi-slot configuration can be set by selecting the active multi-slot power reduction profile within the available profiles defined in *Table 26* according to 3GPP specifications.

The maximum output power in GMSK or 8-PSK multislot configuration depends on the active MSPR profile set by the AT command and the number of active Tx slots set by the network, as described in *Table 26*:

Objective Specification

| Active Tx slots | MSPR profile 0 | MSPR profile 1 | MSPR profile 2 | MSPR profile 3 |
|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 0 |
| 2 | 3 | 1 | 0 | 0 |
| 3 | 4,8 | 2,8 | 0,8 | 0 |
| 4 | 6 | 4 | 2 | 0 |

**Table 26: Power reduction (dBm)**

LISA-U2 / SARA-U
The changes in the user defined power reduction are effective after reboot.

### 19.10.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UDCONF=40,<GMSK_profile>[,<8PSK_profile>] | OK | AT+UDCONF=40,2,3<br>OK |
| Read | AT+UDCONF=40 | +UDCONF: 40,<GMSK_profile>,<8PSK_profile><br>OK | AT+UDCONF=40<br>+UDCONF: 40,2,2<br>OK |

### 19.10.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <GMSK_profile> | Number | User defined power reduction: MSPR GMSK profile (range 0-3). The factory-programmed value is 2. |
| <8PSK_profile> | Number | User defined power reduction: MSPR 8-PSK profile (range 0-3). This parameter is optional: if omitted, the MSPR 8-PSK profile is not affected. The factory-programmed value is 2.<br>The parameter is significant only for cellular modules supporting 8-PSK in uplink. |

### 19.10.4 Notes

- For AT&T certification: the 8-PSK MSPR profile should be limited to values 2 and 3.

**TOBY-L2 / MPCI-L2**

- The command setting is volatile and not stored in NVM.
- The module reverts back to the default MSPR profile after a network detach operation (e.g. using *AT+COPS=2*).

## 19.11 Data channel configuration +UDATACHANNEL

| +UDATACHANNEL | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 19.11.1 Description

Configures the serial interface over which CS or PS data shall be routed during a data connection (initiated by the *ATD* or *AT+CGDATA* commands), after the CONNECT intermediate result code has been received.

As a factory-programmed setting, the data is routed on the same channel where the connection is established.

The channels are identified by a string made up of a trailing forward slash followed by the device type name and a numerical index, separated by a forward slash. For example:

- "/USBCDC/0" is the 1st USB AT command interface
- "/tyCo/0" is the UART AT command interface
- "/tyCo/2" is the SPI AT command interface
- "/mux/1" is the 2nd multiplexer AT command interface (channel)

Objective Specification

The MUX channels are available only if the mux is activated.

| Channel identifier | Description |
|---|---|
| "/tyCo/0" | UART |
| "/tyCo/2" | SPI |
| "/USBCDC/0" | USB channel #0 |
| "/USBCDC/1" | USB channel #1 |
| "/mux/1" | MUX channel #1 |
| "/mux/2" | MUX channel #2 |

**Table 27: Examples of channel's identification string**

Only AT command interfaces are valid channels. An error result code will be provided if the referenced channels are not AT command interfaces (e.g. SAP channel) or they are not active / available.

See the corresponding module system integration manual for details about the available AT command interfaces in each product. See also *+CMUX* command description for the list of the available AT command MUX channels in each product.

## 19.11.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UDATACHANNEL=<mode>,<csd_psd_flag>,<ctrl-tid-path>[,<tid-path>[,<connect_flag>]] | [+UDATACHANNEL: <mode>]<br>OK | AT+UDATACHANNEL=1,1,"/mux/1","/mux/2",0<br>OK |
| Test | AT+UDATACHANNEL=? | +UDATACHANNEL: (list of supported <mode>s),(list of supported <csd_psd_flag>'s),(list of supported <connect_flag>'s)<br>OK | +UDATACHANNEL: (0-2),(0-1),(0-1)<br>OK |

## 19.11.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | • 0 (factory-programmed value): disable the routing<br>• 1: enable the routing<br>• 2: query current setting for the type of data specified by <csd_psd_flag> and the channel referenced by <ctrl-tid-path>; the <tid-path> must not be set. |
| <csd_psd_flag> | Number | • 0: configure the channel for a CSD connection<br>• 1: configure the channel for a PSD 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: reporting on the data channel disabled (neither CONNECT nor NO CARRIER result codes are reported)<br>• 1 (default value): reporting on the data channel enabled (CONNECT and NO CARRIER result codes are reported) |

## 19.11.4 Notes

- The information text response for the set command is only provided if a query status is issued (<mode>=2)
- <ctrl-tid-path> or <tid-path> parameters cannot refer to UART and MUX channels at the same time, since MUX channels are established over UART.
- In case <ctrl-tid-path> or <tid-path> parameters refer to a MUX channel, the corresponding MUX channel shall be available when the command is issued (that is MUX protocol active and MUX channel established). Otherwise an error result code is reported. Furthermore, when the data connection is initiated, the MUX channel referred by <tid-path> shall be already established.

Objective Specification

# 19.12 RING line handling +URING

| +URING | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U260-02S LISA-U270-02S LISA-U270-62S LISA-U270-63S LISA-U270-68S SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

## 19.12.1 Description

Configures the RING line handling of the UART interface for other events besides the usual ones, that is the incoming call indication (RING) (linked to the "RING" URC) and the incoming SMS indication (linked to the +CMT and the +CMTI URCs).

The RING line will be asserted when one of the configured events will occur and it remains asserted for 1 s unless another configured event will happen (in this case the 1 s timer will be started again). Same behavior will be applied if the events are the incoming call or the incoming SMS.

## 19.12.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+URING=<mode> | OK | AT+URING=1<br>OK |
| Read | AT+URING? | +URING: <mode><br>OK | +URING: 1<br>OK |
| Test | AT+URING=? | +URING: (list of the supported <mode>s)<br>OK | +URING: (0-3)<br>OK |

## 19.12.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | Configures the RING line handling:<br>• 0 (factory-programmed value): feature disabled (RING line is asserted only on incoming call and incoming SMS)<br>• 1: RING line asserted for all the URCs<br>• 2: RING line asserted for all the incoming data in PPP and Direct Link connections<br>• 3: RING line asserted for all URCs and all incoming data (PPP, Direct Link) |

# 19.13 CTS line state in case of disabled HW flow control +UCTS

| +UCTS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U201 SARA-U260-03S SARA-U270-03S SARA-U270-53S SARA-U280-03S | | | | | |
| | SARA-G340-02S SARA-G350-02A SARA-G350-02S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

## 19.13.1 Description

Configures the CTS line's state (module's output) of the UART interface in case the HW flow control is not enabled. Instead, if the HW flow control is enabled, the CTS line's state is the result of power saving and flow control conditions.

## 19.13.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UCTS=<mode> | OK | AT+UCTS=1 |

Objective Specification

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

### 19.13.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | Configures the CTS line state of the UART interface:<br>• 0 (factory-programmed value): set the CTS line to the ON state (output low) in case of SW or no flow control.<br>• 1: set the CTS line to the OFF state (output high) in case of SW or no flow control. |

### 19.13.4 Notes

- Regardless the AT interface where the command is issued (UART, SPI, USB), it always has effect on the UART CTS line behavior.

## 19.14 PPP/LCP silent mode configuration +UDCONF=0

| +UDCONF=0 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 19.14.1 Description

Configures the advanced settings for the PPP/LCP silent mode. It means that it is possible to configure whether the module must wait for the first LCP frame or send the first LCP frame while establishing a PPP connection.

### 19.14.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UDCONF=0,<ppp_lcp_silent_mode> | OK | AT+UDCONF=0,0 |
| | | | OK |
| Read | AT+UDCONF=0 | AT+UDCONF: 0,<ppp_lcp_silent_mode> | AT+UDCONF=0 |
| | | OK | AT+UDCONF: 0,0 |
| | | | OK |

### 19.14.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <ppp_lcp_silent_mode> | Number | Enables/disables the PPP-LCP silent mode. Allowed values:<br>• 0: silent mode disabled, the module sends the first LCP frame<br>• 1 (factory-programmed value): silent mode enabled, the module waits for the other end to start first |

Objective Specification

# 19.15 F-DPCH/enhanced F-DPCH configuration +UDCONF=60

| +UDCONF=60 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| | LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

## 19.15.1 Description

Configures the F-DPCH/enhanced F-DPCH support.

u-blox cellular modules are certified according to all the capabilities and options stated in the Protocol Implementation Conformance Statement document (PICS) of the module. The PICS, according to 3GPP TS 51.010-2 [*83*], 3GPP TS 34.121-2 [*84*], 3GPP TS 36.521-2 [*114*] and 3GPP TS 36.523-2 [*115*], is a statement of the implemented and supported capabilities and options of a device. If the user changes the command settings during the certification process, the PICS of the application device integrating a u-blox cellular module must be changed accordingly.

## 19.15.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UDCONF=60,<F-DPCH_EnhancedF-DPCH_enable> | OK | AT+UDCONF=60,0<br>OK |
| Read | AT+UDCONF=60 | +UDCONF: 60,<F-DPCH_EnhancedF-DPCH_enable><br>OK | AT+UDCONF=60<br>+UDCONF: 60,1<br>OK |

## 19.15.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <F-DPCH_EnhancedF-DPCH_enable> | Number | CPC's UL discontinuous DPCCH transmission support enabled / disabled:<br>• 0: both F-DPCH and Enhanced F-DPCH are disabled<br>• 1: only F-DPCH enabled<br>• 2 (factory-programmed value): both F-DPCH and Enhanced F-DPCH enabled |

## 19.15.4 Notes

### LISA-U200-01S / LISA-U230 / LISA-U260-01S / LISA-U270-01S

- The factory-programmed value of <F-DPCH_EnhancedF-DPCH_enable> is 0.

# 19.16 USB profiles configuration +UUSBCONF

| +UUSBCONF | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U201 SARA-U260-03S SARA-U270-03S SARA-U270-53S SARA-U280-03S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | *NVM* | No | - | *+CME Error* |

## 19.16.1 Description

The following terminology will be adopted for the +UUSBCONF command description:

- USB function: a USB capability such as RNDIS, UMS (USB Mass Storage), CDC-ECM, etc. It is implemented within a device class.

Objective Specification

- USB profile: a set of available USB functions (where available means that the function is presented to the host during the enumeration process), e.g. RNDIS plus CDC-ACM. An identifier (product id, PID) is assigned for each profile.
- USB product: a set of USB profiles, sharing the same PID, one active at a time. It is possible to switch among USB profiles within the same USB product.

Each u-blox cellular module consists of one or more USB products from the point of view of the USB configuration context. Each USB product includes a certain amount of USB profiles. Each USB profile includes a certain amount of USB endpoints, depending on the overall USB functions of the USB profile.

The command configures the active USB profile. The USB profile selection is performed by the specification of the USB product category, the network USB function (when available), and the audio over USB function configuration (enable/disable, when available).

The USB profile switch is not performed run-time. The settings are saved in NVM at the module power off; the new configuration will be effective at the subsequent module reboot.

## 19.16.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UUSBCONF=[<id>[,<network>[,<audio>]]] | OK | AT+UUSBCONF=0,"AUTO",0<br>OK |
| Read | AT+UUSBCONF? | +UUSBCONF: <id>,<network>,<audio>,<pid><br>OK | +UUSBCONF: 0,"RNDIS",0,"0x1144"<br>OK |
| Test | AT+UUSBCONF=? | +UUSBCONF: (<id> (Corresponding USB functions (string) for <id>),(list of the supported <network>s for <id>),(list of the supported <audio> values for <id>))[, <id>, (Corresponding USB functions (string) for <id>),(list of the supported <network>s for <id>),(list of the supported <audio> values for <id>)[, ...] ]<br>OK | +UUSBCONF: (0 ("6 CDC-ACM"),(""),()),(2 ("NETWORK, 3 CDC-ACM"),("ECM"),()),(3 ("NETWORK, 1 CDC-ACM"),("RNDIS"),())<br>OK |

## 19.16.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <id> | Number | USB product category number; see *Notes* for the allowed values and their detailed description |
| <network> | String | USB network function<br>• "AUTO": network autodetection<br>• "ECM": CDC-ECM device class<br>• "NCM": CDC-NCM device class<br>• "MBIM": MBIM device class<br>• "RNDIS": RNDIS device class |
| <audio> | Number | Audio over USB function configuration<br>• 0: audio over USB disabled<br>• 1: audio over USB enabled |
| <pid> | String | String in HEX format with 0x prefix, showing the identifier (PID) of the current profile.<br>Assigned range for PID is 0x1102-0x1FFF. |

## 19.16.4 Notes

- <network> value is only considered if the <id> category includes a network USB function.
- <audio> value is only considered if the <id> category includes a audio over USB function.
- When the <id> category does not include a network USB function or an audio over USB function, the information text response of the read command is an empty string and an empty value for <network> and <audio> respectively.

Objective Specification

- *Table 28* lists the USB product category associated to a <id>.

| <id> | USB Product category |
|---|---|
| 0 | Fairly back-compatible:<br>It is a configuration similar to the one implemented in the u-blox LISA-U series, where only CDC-ACMs and, if present, a specific USB function for diagnostic log (e.g. CDC-DIAG) are available. |
| 1 | Fairly back-compatible plus audio:<br>It is like the "Fairly back-compatible", but audio over USB function is available; audio over USB function can be enabled or disabled within the same PID. |
| 2 | Low/Medium throughput:<br>It is a configuration including a Network USB function, a certain number of CDCs-ACM and, if present, a specific USB for the diagnostic log (e.g. CDC-DIAG). Audio over USB is available, but it can be enabled or disabled.<br>The presence of several USB functions limits the reachable data transfer throughput. |
| 3 | High throughput:<br>It is like the "Low/Medium throughput", but only 1 CDC-ACM is available. High throughput data rate can be reached only if the audio over USB function is disabled. |

**Table 28: USB product configuration**

**TOBY-L2 / MPCI-L2**

- <network>="AUTO", "MBIM", "NCM" are not supported.
- The <audio> parameter is not supported.
- The allowed USB configurations are listed as follows:

| Command | PID | Available USB functions | Remark |
|---|---|---|---|
| AT+UUSBCONF=0 | 0x1141 | 6 CDC-ACM | |
| AT+UUSBCONF=2<br>AT+UUSBCONF=2,"ECM" | 0x1143 | CDC-ECM (only) + 3 CDC-ACM | |
| AT+UUSBCONF=3<br>AT+UUSBCONF=3,"RNDIS" | 0x1146 | RNDIS (only) + 1 CDC-ACM | Default and factory-programmed value |

**Table 29: Supported USB functions**

**LISA-U2 / SARA-U**

- <network>="AUTO", "RNDIS", "MBIM", "NCM" are not supported.
- The <audio> parameter is not supported.
- The allowed USB configurations are listed as follows:

| Command | PID | Available USB functions | Remark |
|---|---|---|---|
| AT+UUSBCONF=0 | 0X1102 | 7 CDC-ACM | Default and factory-programmed value |
| AT+UUSBCONF=2<br>AT+UUSBCONF=2,"ECM" | 0x1104 | CDC-ECM (only) + 4 CDC-ACM | |

**Table 30: Supported USB functions**

# 19.17 Serial interfaces configuration selection +USIO

| +USIO | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340-02S SARA-G350-02A SARA-G350-02S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

## 19.17.1 Description

Selects the serial interfaces' configuration.

The configuration affects how an available serial interface is used, i.e. the meaning of the data flowing over it. Possible usages are:

Objective Specification

- Modem interface (AT command)
- Trace interface (diagnostic log)
- Raw interface(e.g. GNSS tunnelling)
- Digital audio interface

A set of configurations, that considers all the available serial interfaces' is called +USIO's configuration variant.

The serial interfaces' configuration switch is not performed run-time. The settings are saved in NVM; the new configuration will be effective at the subsequent module reboot.

A serial interface might not support all the usages. For instance, UART cannot be used as digital audio interface.

## 19.17.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+USIO=<requested_variant> | OK | AT+USIO=1<br>OK |
| Read | AT+USIO? | +USIO: <requested_variant>,<active_variant><br>OK | +USIO: 1,1<br>OK |
| Test | AT+USIO=? | +USIO: Variant=<requested_variant>: [AT=<AT_interface>;][GNSS=<GNSS_interface>;][TRACE=<Trace_interface>;][DIGITAL AUDIO=<Digital_audio_interface>] [+USIO: Variant=<requested_variant>: [AT=<AT_interface>;][GNSS=<GNSS_interface>;][TRACE=<Trace_interface>;][DIGITAL AUDIO=<Digital_audio_interface>] [...]]<br>OK | +USIO: Variant=0: AT="UART"; AT="AUX UART"; TRACE="EXT UART"<br>+USIO: Variant=1: AT="UART"; TRACE="AUX UART"; DIGITAL AUDIO="I2S"<br>+USIO: Variant=2: AT="UART"; AT="AUX UART"; DIGITAL AUDIO="I2S"<br>+USIO: Variant=3: AT="UART"; GNSS="AUX UART"; TRACE="EXT UART"<br>+USIO: Variant=4: AT="UART"; GNSS="AUX UART"; DIGITAL AUDIO="I2S"<br>OK |

## 19.17.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <requested_variant> | Number | Requested (stored in NVM for next boot) configuration variant (range 0-255). The factory-programmed value is 1. |
| <active_variant> | Number | Active (currently used) configuration variant (range 0-255). The factory-programmed value is 1. |
| <AT_interface> | String | Serial interface configured for AT commands |
| <GNSS_interface> | String | Serial interface configured for GNSS tunnelling |
| <Trace_interface> | String | Serial interface configured for diagnostic log |
| <Digital_audio_interface> | String | Serial interface configured for digital audio |

## 19.17.4 Notes

- *Table 31* explains the meaning of <AT_interface>, <GNSS_interface>, <Trace_interface>, <Digital_audio_interface>.

| <AT_interface>, <GNSS_interface>, <Trace_interface>, <Digital_audio_interface> | Serial interface description |
|---|---|
| "UART" | Main UART:<br>It is the full featured UART (9-wire), used as main interface to the host. |
| "AUX UART" | Auxiliary UART:<br>It is the general purpose UART (3-wire), with with limited v.24 features. |
| "EXT UART" | External UART: |

Objective Specification

| <AT_interface>, <GNSS_interface>, <Trace_interface>, <Digital_audio_interface> | Serial interface description |
|---|---|
| | It is not a real UART, but the SPI interface is used to communicate with an external chip providing SPI to UART conversion. Basically, it is limited to diagnostic log. |
| "I2S" | $I^2S$ interface:<br>It can be used for the digital audio. See the *Chapter 22* for the required configurations. |

**Table 31: Serial interfaces**

**SARA-G3**

- For information about the <Trace_interface>="EXT UART" configuration, see the module system integration manual
- <Digital_audio_interface>="I2S" and <Trace_interface>="EXT UART" are not supported at the same time, since they share the module's same pins
- The allowed (including MUX protocol) configurations are listed as follows:

| <active_variant> | AT instance 1 | AT instance 2 | Diagnostic log | Mux protocol | Digital audio | GNSS tunneling |
|---|---|---|---|---|---|---|
| 0 | UART | AUX UART | EXT UART (via SPI interface, using the I2S pins) | UART | Not available | Not available |
| 1 (default) | UART | Not available | AUX UART | UART | I2S | Not available |
| 2 | UART | AUX UART | Not available | UART | I2S | Not available |
| 3 | UART | Not available | EXT UART (via SPI interface, using the I2S pins) | UART | Not available | AUX UART |
| 4 | UART | Not available | Not available | UART | I2S | AUX UART |

**Table 32: Supported USIO variants**

# 19.18 Establish ECM data connection +UCEDATA

| +UCEDATA | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U201 SARA-U260-03S SARA-U270-03S SARA-U270-53S SARA-U280-03S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | Yes | *Up to 3 min* | *+CME Error* |

## 19.18.1 Description

Establishes a data communication between the TE and the network over the CDC-ECM interface. This may include a GPRS attach and a PDP context activation. In case of error, an error result code is displayed. The requested PDP context cannot be already active. When the data transfer is completed, the ECM connection can be released by deactivating the corresponding PDP context via the *AT+CGACT* command.

## 19.18.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UCEDATA=<cid>,<ecm_id> | OK | AT+UCEDATA=1,0<br>OK |
| Read | AT+UCEDATA? | +UCEDATA: [(<cid>,<ecm_id>)]<br>[+UCEDATA: (<cid>,<ecm_id>)]<br>[...]]]<br>OK | +UCEDATA: (1,0)<br>OK |
| Test | AT+UCEDATA=? | +UCEDATA: (list of the supported <cid>s),(list of the supported <ecm_id>s)<br>OK | +UCEDATA: (1-11),(0-2)<br>OK |

Objective Specification

### 19.18.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <cid> | Number | Specifies a particular PDP context definition. The range goes from 1 to 11. |
| <ecm_id> | Number | Specifies the CDC-ECM interface. The range goes from 0 to 2. |
| <error> | Number | These error result codes will be provided if *+CMEE* is set to 2:<br>• "+CME ERROR: operation not supported": an incorrect number of parameters is provided or the parameter values are out of range<br>• "+CME ERROR: CDC-ECM is not available": the CDC-ECM connectivity is not present (e.g. because of the current *AT+UUSBCONF* command configuration)<br>• "+CME ERROR: GPRS context busy": the <cid> refers to an already active PDP context<br>• "+CME ERROR: CDC-ECM is busy": the data communication between the TE and the network over the CDC-ECM interface specified by <ecm_id> is already established<br>• "+CME ERROR: No DHCP Packets received from the DTE": the data communication between the TE and the network over the CDC-ECM interface cannot be established because of a DHCP issue in the TE side |

### 19.18.4 Notes

- The command can be used only if a CDC-ECM interface is present in the active *AT+UUSBCONF* command configuration.
- IP and DNS addresses are provided to the TE by the network via the DHCP protocol. The module implements a DHCP server, and the TE shall implement a DHCP client. A 25 s timer is used to allow command completion (with error result code), in case the DHCP client is not implemented or not responding.

**LISA-U2 / SARA-U2**

- Only <ecm_id>=0 is supported, since only one CDC-ECM interface is available (see the *AT+UUSBCONF* command description).
- CONNECT and NO CARRIER result codes are never sent on the AT interface where the command is issued, because the interface does not enter data mode. For this reason, it is still possible to establish a data connection on the same AT interface (e.g. PPP dial-up), if the CDC-ECM data communication is established. As a consequence of missing indications on the AT interface, the TE is informed about the CDC-ECM data communication release by means of specific indications provided by the CDC-ECM interface (e.g. media disconnection indication).

## 19.19 IPv6 configuration +UDCONF=66

| +UDCONF=66 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

### 19.19.1 Description

Configures IPv6 support.

If IPv6 is not supported, also IPv4v6 is not supported.

The configuration will be effective at the next power on.

### 19.19.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UDCONF=66,<IPv6_conf> | OK | AT+UDCONF=66,1<br>OK |
| Read | AT+UDCONF=66 | +UDCONF: 66,<IPv6_conf><br>OK | AT+UDCONF=66<br>+UDCONF: 66,0 |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | | OK |

### 19.19.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <IPv6_conf> | Number | IPv6 support enable / disable:<br>• 0: IPv6 support disabled<br>• 1 (factory-programmed value): IPv6 support enabled |

### 19.19.4 Notes

**TOBY-L200 / TOBY-L201 / TOBY-L210-60S / TOBY-L210-62S / MPCI-L200 / MPCI-L201 / MPCI-L210-60S / LISA-U / SARA-U**

- The factory-programmed value of <IPv6_conf> parameter is 0.

**TOBY-L210-62S**

- If <IPv6_conf>=0 the IPv6 only is disabled while the IPv4v6 protocol remains enabled.

## 19.20 MCC update table +UNVMMCC

| +UNVMMCC | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U201 SARA-U260-03S SARA-U270-00X SARA-U270-03S SARA-U270-53S SARA-U280-03S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

### 19.20.1 Description

Allows the access to the MCC update list. This list is a writeable extension to the MCC Nettype List.

The set command overwrites the entry if it has already been entered. The MCC update list is stored in NVM. The list is first stored in the volatile NVM mirror, and the NVM copy is then updated in the background. It is recommended to power cycle the module after the list is updated.

### 19.20.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UNVMMCC=<mode>[,<idx>[,<mcc>,<gsmbands>,<umtsbands>]] | OK | AT+UNVMMCC=0<br>OK |
| Read | AT+UNVMMCC? | +UNVMMCC: <idx>,<mcc>,<gsmbands>,<umtsbands><br>[...]<br>+UNVMMCC: <idx>,<mcc>,<gsmbands>,<umtsbands><br>OK | +UNVMMCC: 1,65535,65535,65535<br>[...]<br>+UNVMMCC: 20,65535,65535,65535<br>OK |
| Test | AT+UNVMMCC=? | +UNVMMCC: <(list of supported <mode>s),(list of supported <idx>s), (list of supported <mcc>s),(list of supported <gsmbands>s), ...,(list of supported <umtsbands>s)<br>OK | +UNVMMCC: (0-1),(1-20),(0-999),(0-65535),(0-65535)<br>OK |

### 19.20.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | Defines the command.<br>• 0: clear one or all entries in a list:<br>o Select an entry to clear with <idx><br>o If <idx> is omitted, all the entries will be cleared |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | o When an entry is cleared, all the bytes in the entry are set to 0xFF<br>• 1: write one entry: |
| <idx> | Number | Index of the entries in the MCC update list. The allowed range is 1-20. |
| <mcc> | Number | Mobile Country Code. The allowed range is 0-999. |
| <gsmbands> | Number | GSM/2G band selection. The parameter is a bit mask, 16-bits in length given as an integer. Only the values listed below are allowed.<br>• 1: b0, PGSM 900<br>• 2: b1, EGSM 900<br>• 4: b2, RGSM 900<br>• 8: b3, DCS 1800<br>• 16: b4, PCS 1900<br>• 32: b5, GSM 450<br>• 64: b6, GSM 480<br>• 128: b7, GSM 850 |
| <umtsbands> | Number | UMTS/3G band selection. The parameter is a bit mask, 16-bits in length given as an integer. Only the values listed below are allowed.<br>• 1: b0, Band 1<br>• 2: b1, Band 2<br>• ... |

### 19.20.4 Notes

- The 2G / 3G tables are by default empty.

## 19.21 PLMN information list +UNVMPLMN

| +UNVMPLMN | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U201 SARA-U260-03S SARA-U270-00X SARA-U270-03S SARA-U270-53S SARA-U280-03S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

### 19.21.1 Description

Provides the access to the protocol stack's PLMN tables used to improve the PLMN selection procedure. There are two tables one for the GSM network and one for the UMTS network.

The PLMN information is stored in NVM and may be updated by the protocol stack. Thus the *+COPS=2* AT command shall be issued before updating the list.

After the list is updated, the module shall be power cycled.

### 19.21.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| **PLMN tables management generic syntax** | | | |
| Set | AT+UNVMPLMN=<op_code>,<rat>[,<idx>[,<mcc>,<mnc>,<bands>[,<f1>[,<f2>...[,<fn>]]]]] | OK | AT+UNVMPLMN=1,1,1,222,1,1,10663,10688,10638<br>OK |
| **PLMN tables cleaning** | | | |
| Set | AT+UNVMPLMN=0,<rat>[,<idx>] | OK | AT+UNVMPLMN=0,1,1<br>OK |
| **PLMN tables editing** | | | |
| Set | AT+UNVMPLMN=1,<rat>,<idx>,<mcc>,<mnc>,<bands>,<f1>[,<f2>...[,<fn>]] | OK | AT+UNVMPLMN=1,1,1,222,1,1,10663,10688,10638<br>OK |
| **PLMN tables reading** | | | |
| Set | AT+UNVMPLMN=2,<rat>[,<idx>] | +UNVMPLMN: <rat>,<idx>,<mcc>,<mnc>,<bands>,<f1>[,<f2>...[,<fn>]] | AT+UNVMPLMN=2,1 |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | [...]<br>[+UNVMPLMN: <rat>,<idx>,<mcc>,<mnc>,<bands>,<f1>[,<f2>...[,<fn>]]]<br>OK | +UNVMPLMN: 1,1,222,1,1,10663,10688,10638<br>+UNVMPLMN: 1,2,222,88,1,10563,10588,10613<br>...<br>+UNVMPLMN: 1,50,0,0,0<br>OK |
| Test | AT+UNVMPLMN=? | +UNVMPLMN: (list of supported <mode>s),(list of supported <rat>s),(list of supported <idx>s), (list of supported <mcc>s),(list of supported <mnc>s),(list of supported <bands>s),(list of supported <f1>s) ...,(list of supported <fn>s)<br>OK | +UNVMPLMN: (0-2),(0,1),(1-50),(0-999),(0-999),(1-8192),(0-10838),...,(0-10838)<br>OK |

## 19.21.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <op_code> | Number | Defines the command to be executed. Allowed values:<br>• 0: clear one or all the entries in a list; if the <idx> parameter is omitted, all the entries will be cleared<br>• 1: write one entry; at least one frequency must be provided (<f1>)<br>• 2: read one or all entries in a list; if the <idx>parameter is omitted, all the entries will be read |
| <rat> | Number | Selects one of the two PLMN information lists:<br>• 0: GSM list<br>• 1: UMTS list |
| <idx> | Number | Index of the entries in the PLMN information lists. The allowed range is 1-50.<br>If the parameter is omitted, all the entries will be cleared or read depending on the <op_code> parameter value. |
| <mcc> | Number | Mobile Country Code. The allowed range is 0-999. |
| <mnc> | Number | Mobile Network Code. The allowed range is 0-999. |
| <bands> | Number | Band:<br>• GSM:<br>o 1: PGSM 900<br>o 2: EGSM 900<br>o 4: RGSM 900<br>o 8: DCS 1800<br>o 16: PCS 1900<br>o 32: GSM 450<br>o 64: GSM 480<br>o 128: GSM 850<br>• UMTS:<br>o 1: band 1<br>o 2: band 2<br>o 4: band 3<br>o 8: band 4<br>o 16: band 5<br>o 32: band 6<br>o 64: band 7<br>o 128: band 8<br>o 256: band 9<br>o 512: band 10<br>o 1024: band 11<br>o 2048: band 12<br>o 4096: band 13<br>o 8192: band 14 |

Objective specification

| Parameter | Type | Description |
|---|---|---|
| <f1>...<fn> | Number | Frequency. In GSM represents the ARFCN, in UMTS the UARFCN.<br>n's range is 1-32 in GSM and 1-10 in UMTS |

### 19.21.4 Notes

- As factory-programmed settings the PLMN tables are empty, but it may be updated by the protocol stack.
- North American PLMNs whose 3rd MNC digit is 0, may be displayed with a 2 digit MNC (1st and 2nd MNC digit). For example <mcc>=310, <mnc>=150 may be displayed as [...]310,15 (see 3GPP TS 23.122 *[70]* Annex A)

## 19.22 Enable, disable or configure the OMA-DM client +UOMADM

| +UOMADM | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-U201 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 19.22.1 Description

To enable, disable or change the configuration of the OMA-DM client.

For more information on OMA-DM, see OMA-DM specs [*133*].

### 19.22.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UOMADM=<mode>[,<sessionID>, <serverInfo>,<encoding_option>, <certinfo_dynamic>,<certtype>] | OK | AT+UOMADM=1<br>OK |
| Test | AT+UOMADM=? | +UOMADM: (list of supported <mode>'s)<br>OK | +UOMADM: (0-2)<br>OK |

### 19.22.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | Indicates whether the start or stop the OMA-DM client:<br>• 0: stop the OMA-DM client. <sessionID>, <serverInfo>, <encoding_option>, <certinfo_dynamic>, <certtype> must not be specified.<br>• 1: start the OMA-DM client. <sessionID>, <serverInfo>, <encoding_option>, <certinfo_dynamic>, <certtype> must not be specified.<br>• 2: configure the OMA-DM client. <sessionID>, <serverInfo>, <encoding_option>, <certinfo_dynamic>, <certtype> must be specified. |
| <sessionID> | Number | Specifies the OMA-DM session ID. |
| <serverInfo> | String | Specifies the OMA-DM server URL and port type. |
| <encoding_option> | Number | Specifies the encoding used for communicating with the OMA-DM server. Allowed values:<br>• 0: unspecified<br>• 1: WBXML<br>• 2: XML |
| <certinfo_dynamic> | String | Specifies the certificate used for communicating with the OMA-DM server. |
| <certtype> | Number | Specifies the type of certificate used for communicating with the OMA-DM server. Allowed values:<br>• 0: DER<br>• 1: PEM<br>• 2: P7B<br>• 2: PFX |

Objective Specification

# 19.23 OMA-DM alert +UOMADMALERT

| +UOMADMALERT | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-U201 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 19.23.1 Description

Allows the Host Device SW to initiate an OMA-DM session sending a generic alert to the OMA-DM server.

For more information on OMA-DM, see OMA-DM specs [133].

## 19.23.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UOMADMALERT=<mode>[,<alert_name>,<alert_URI>,<alert_data>] | OK | AT+UOMADMALERT=1,"","test_URI","test_DATA"<br>OK |
| Test | AT+UOMADMALERT=? | +UOMADMALERT: (list of supported <mode>'s)<br>OK | +UOMADMALERT: (0,1)<br>OK |

## 19.23.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | Specifies whether to start or stop an OMA-DM alert session:<br>• 0: stops a client initiated OMA-DM generic alert session. <alert_name>, <alert_URI> and <alert_data> must not be specified.<br>• 1: starts a client initiated OMA-DM generic alert session. <alert_name>, <alert_URI> and <alert_data> must all be specified. |
| <alert_name> | String | String indicating the OMA-DM generic alert identifier. This parameter is ignored. |
| <alert_URI> | String | URI to be included in the generic alert message. |
| <alert_data> | String | String containing the alert data. It can be empty (""). |

# 19.24 OMA-DM repository access +UOMADMREP

| +UOMADMREP | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-U201 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 19.24.1 Description

Allows a direct interaction with the OMA-DM repository. The set command is used to set/read the value to the corresponding node path. The +UUOMADMREP URC indicates a node content has been modified.

To use this command, the OMA-DM client must have been enabled first.

The node path (or URI) is case sensitive.

When a node has been successfully changed via this AT command, the OK result code is followed by the +UUOMADMREP URC.

For writing into the DM tree, the URI of a leaf (terminal) node URI has to be specified. For reading, if an internal (non-terminal) node is specified, then a quoted, comma separated list of sub-nodes is displayed.

For more information on OMA-DM, see OMA-DM specs [133].

Objective Specification

### 19.24.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| **Generic syntax** | | | |
| | AT+UOMADMREP=<access_mode>,<node_URI>[,<leaf_node_data>] | OK | |
| **Writing values into the DM tree** | | | |
| Set | AT+UOMADMREP=1,<node_URI>,<leaf_node_data> | OK | AT+UOMADMREP=1,"./DevInfo/Lang","Italian"<br>OK |
| **Reading values and structure from the DM tree** | | | |
| Read | AT+UOMADMREP=0,<node_URI> | +UOMADMREP: <node_URI>,<node_data><br>OK | AT+UOMADMREP="./DevInfo"<br>+UOMADMREP: "./DevInfo","Ext/Mod/Man/Lang/DmV/DevId"<br>OK<br><br>AT+UOMADMREP="./DevInfo/Lang"<br>+UOMADMREP: "./DevInfo/Lang","Italian"<br>OK |
| Test | AT+UOMADMREP=? | +UOMADMREP: (list of supported <mode>'s)<br>OK | +UOMADMREP: (0-1)<br>OK |
| URC | | +UUOMADMREP: <node_URI>,<leaf_node_data> | +UUOMADMREP: "./DevInfo/Lang","Italian" |

### 19.24.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <access_mode> | Number | Indicates what action is to be perfomed<br>• 0: read command; it returns the contents of a node<br>• 1: write command; it replaces the contents of a node |
| <node_URI> | String | Path (URI) to the node in the OMA-DM tree. If the node is a leaf, the contents of the node is displayed. If the node is internal, a quoted, comma separated list of sub-nodes is displayed. |
| <node_data> | String | Contents of the OMA-DM node, if it is a leaf (terminal) node.<br>List of the sub-nodes, if it is an internal (non-terminal) node. |
| <leaf_node_data> | String | Contents of the leaf (terminal) node of the DM Tree.<br>It must not be specified when reading (<access_mode>=0).<br>It must be specified when writing (<access_mode>=1). |

## 19.25 Enable/disable OMA-DM unsolicited status messages +UOMASTAT

| +UOMASTAT | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-U201 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 19.25.1 Description

To enable/disable OMA-DM unsolicited status messages.

### 19.25.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UOMASTAT=<mode> | OK | AT+UOMASTAT=1<br>OK |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| Read | AT+UOMASTAT? | +UOMASTAT: <mode><br>OK | +UOMASTAT: 0<br>OK |
| Test | AT+UOMASTAT=? | +UOMASTAT: (list of supported <mode>'s)<br>OK | +UOMASTAT: (0,1)<br>OK |
| URC | | +UUOMASTAT: <SessionType>,<State>, <Error> | +UUOMASTAT: 1,0,0 |

### 19.25.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | Indicates whether the +UUOMASTAT URC is enabled or not:<br>• 0 (factory-programmed value): OMA-DM status indication disabled<br>• 1: OMA-DM status indication enabled |
| <SessionType> | Number | Indicates the OMA-DM Session Type. Allowed values:<br>• 1: DM Session<br>• 2: download Session |
| <State> | Number | Indicates the OMA-DM Session State. Allowed values:<br>• 0: session started<br>• 1: session completed successfully<br>• 2: session aborted |
| <Error> | Number | Indicates the OMA-DM Error Code. Allowed values:<br>• 0: successful (no error)<br>• other: Error code |

## 19.26 Network Friendly Mode (NFM) activation +UNFM

| +UNFM | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U201 SARA-U260-03S SARA-U270-03S SARA-U270-53S SARA-U280-03S | | | | | |
| | SARA-G340-02S SARA-G350-02A SARA-G350-02S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | *NVM* | No | - | *+CME Error* |

### 19.26.1 Description

Activates or deactivates the Network Friendly Mode (NFM) feature.

Generally an UE aggressively retries the registration procedure until it is successful and behaves similarly if the PDP context activation procedure fails. This behaviour may cause signalling overload and consequently prolonged network outage. To avoid these scenarios and provide a more efficient access to the network, the NFM feature controls the number of network accesses per service type over a configurable amount of time. In case of appropriate network rejection error causes, also a back-off timer can be started: when the timer is running or the number of allowed accesses is reached, further attempts are denied and the +UUNFM URC, if enabled, indicates the time remaining before a further attempt can be served. The back-off timer controls the temporal spread of successive attempts to register to CS or PS services, to activate a PDP context and to send SMS messages.

Some network rejection error causes require specific behaviours which NFM does not alter (see the 3GPP TS 24.008 *[12]*). Furthermore NFM blocks and counts only application requests.

When a set command is issued, all related timers and counters are reset and block conditions are cleared.

See the *+UNFMCONF* for the parameter configuration.

If a SIM card belonging to AT&T is used, the factory-programmed value <mode>=0 shall be used to avoid conflicts with the Radio Policy Manager (RPM).

*+URPM* and +UNFM AT commands cannot be both active at the same time.

Objective Specification

### 19.26.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UNFM=<mode>[,<enableURC>] | OK | AT+UNFM=1<br>OK |
| Read | AT+UNFM? | +UNFM: <mode>,<enableURC>,<residual_time_1>,<residual_time_2>,<residual_time_3>,<residual_time_4><br>OK | +UNFM: 0,0,0,0,0,0<br>OK |
| Test | AT+UNFM=? | +UNFM: (list of supported <mode>s),(list of supported <enableURC>s)<br>OK | +UNFM: (0,1),(0,1)<br>OK |
| URC | | +UUNFM: <type>[,<residual_time_n>] | +UUNFM: 2,1600 |

### 19.26.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | Indicates the action to perform:<br>• 0: (factory-programmed value): NFM deactivated<br>• 1: NFM activated |
| <enableURC> | Number | Configures the +UUNFM URC presentation:<br>• 0: (default and factory-programmed value): +UUNFM URC disabled<br>• 1: +UUNFM URC enabled |
| <residual_time_n> | Number | Time in seconds until the active block <type> (n=<type>) is cleared. |
| <type> | Number | Information type.<br>It indicates the block type that denied the application's request (see the *+UNFMCONF*):<br>• 0: CS back-off timer running<br>• 1: PS back-off timer running<br>• 2: PDP back-off timer running<br>• 3: SMS back-off timer running<br>• 4: <CS_REG> attempts reached<br>• 5: <PS_REG> attempts reached<br>• 6: <PDP_OK> attempts reached |

## 19.27 Network Friendly Mode (NFM) configuration +UNFMCONF

| +UNFMCONF | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U201 SARA-U260-03S SARA-U270-03S SARA-U270-53S SARA-U280-03S | | | | | |
| | SARA-G340-02S SARA-G350-02A SARA-G350-02S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

### 19.27.1 Description

Configures the Network Friendly Mode (NFM) related parameters.

The parameters are grouped in different sets:

- Back-off timer parameters: the timer follows a geometric sequence whose scale factor, common duration and upper limit are configurable. The timer duration is reset to the scale factor at every successful registration or PDP context activation
- Basic parameters: they define the maximum numbers of CS and PS registration and PDP context activation attempts in a given time interval

Back-off timer parameters are set to a predefined value; all the other parameters are by default disabled.

User defined parameter configurations are stored in NVM: to make them effective, either a power cycle or *+UNFM=1* command is required.

Objective Specification

The <op_code> parameter is not saved in NVM; the information text response to the read command provides the setting for all the <op_code> parameter values.

## 19.27.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| **Generic syntax** | | | |
| Set | AT+UNFMCONF=<op_code>,..... | OK | |
| **Back-off timer configuration** | | | |
| Set | AT+UNFMCONF=0,<scale_factor>,<common_ratio>,<upper_limit> | OK | |
| **Basic parameter configuration** | | | |
| Set | AT+UNFMCONF=1,<CS_REG>,<time_interval>,<PS_REG>,<time_interval>,<PDP_OK>,<time_interval> | OK | AT+UNFMCONF=1,60,2,1920<br>OK |
| Read | AT+UNFMCONF? | +UNFMCONF: 0,<scale_factor>,<common_ratio>,<upper_limit><br>+UNFMCONF: 1,<CS_REG>,<time_interval>,<PS_REG>,<time_interval>,<PDP_OK>,<time_interval><br>OK | +UNFMCONF: 0,60,2,7680<br>+UNFMCONF: 1,10,1,10,1,10,1<br>OK |
| Test | AT+UNFMCONF=? | +UNFMCONF: (list of the supported <op_code>s)<br>OK | +UNFMCONF: (0-1)<br>OK |

## 19.27.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <op_code> | Number | Type of operation<br>• 0: back-off timer configuration parameter set<br>• 1: basic parameter set |
| <scale_factor> | Number | Back-off timer base in seconds, range 1 - 255 (the factory-programmed value is 60) |
| <common_ratio> | Number | Multiplier factor of the geometrical sequence, range 1 - 255 (the factory-programmed value is 2) |
| <upper_limit> | Number | Back-off timer's maximum duration in seconds, range 0 - 86400 (0: back-off timer disabled, the factory programmed value is 7680) |
| <CS_REG> | Number | Maximum number of CS registration attempts per defined <time_interval>, range 0 - 255 (0: unlimited attempts). The factory-programmed value is 10. |
| <time_interval> | Number | Time interval in hours associated to the preceding parameter, range 0 - 24 (0: unlimited attempts). The factory-programmed value is 1. |
| <PS_REG> | Number | Maximum number of PS registration attempts per defined <time_interval>, range 0 - 255 (0: unlimited attempts). The factory-programmed value is 10. |
| <PDP_OK> | Number | Maximum number of successful PDP context activation attempts per defined <time_interval>, range 0 - 255 (0: unlimited attempts). The factory-programmed value is 10. |

## 19.27.4 Notes

| Block type | Associated network rejection error causes |
|---|---|
| Back-off timer | IMSI unknown in HLR, illegal MS, IMEI not accepted, illegal ME, GPRS services not allowed, GPRS services and non-GPRS services not allowed, device identity cannot be derived by network, MSC temporarily unreachable, network failure, congestion, service option temporarily out of order, protocol error unspecified, insufficient resources, unknown or missing APN, unknown PDP address, authentication failed, activation rejected by GGSN, service option out of order, NSAPI already in use |

**Table 33: Network rejection error causes relation with block types**

## 19.27.5 Notes

- The block types related to PDP activations and/or deactivations are based on the internal <cid> value, thus:
  - if a <cid> is re-used, the internal counters are reset.
  - *+CGACT* set command's syntax with omitted <cid> is not allowed.

Objective Specification

# 19.28 Radio Policy Manager (RPM) activation +URPM

| +URPM | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U201 SARA-U260-03S SARA-U270-03S SARA-U270-53S SARA-U280-03S | | | | | |
| | SARA-G340-02S SARA-G350-02A SARA-G350-02S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

## 19.28.1 Description

Activates or deactivates the Radio Policy Manager (RPM) feature for SIM cards not belonging to AT&T network operator.

Generally an UE aggressively retries the registration procedure until it is successful and behaves similarly in case the PDP context activation procedure fails. This behaviour may cause signalling overload and consequently prolonged network outage. To avoid these scenarios and provide a more efficient access to the network, the RPM feature controls the number of network accesses per service type over a fixed amount of time. For more details on the RPM feature see AT&T Device Requirements *[61]*.

Some network rejection error causes require specific behaviours which the RPM feature does not alter (see the 3GPP TS 24.008 *[12]*).

If a SIM card belonging to AT&T is used, the factory-programmed value <mode>=0 shall be used.

+URPM and *+UNFM* AT commands cannot be both active at the same time.

## 19.28.2 Syntax

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

## 19.28.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | Indicates the action to perform:<br>• 0: (factory-programmed value): RPM feature deactivated<br>• 1: RPM feature activated |

# 19.29 Restore factory configuration +UFACTORY

| +UFACTORY | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U201 SARA-U260-03S SARA-U270-03S SARA-U270-53S SARA-U280-03S | | | | | |
| | SARA-G340-02S SARA-G350-02A SARA-G350-02S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | *5 s* | *+CME Error* |

## 19.29.1 Description

Force, at the next module boot, the restore of the factory configuration for FS and/or NVM.

Objective Specification

When the command is issued, a flag is written into the NVM: no action is done and it will be triggered to be executed only at the next module boot. If, before the next boot, the triggered operation must be deleted it is possible to issue the command with parameter 0,0.

## 19.29.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UFACTORY=<fs_op>,<nvm_op> | OK | AT+UFACTORY=1,2<br>OK |
| Read | AT+UFACTORY? | +UFACTORY: <fs_op>,<nvm_op><br>OK | +UFACTORY: 1,2<br>OK |
| Test | AT+UFACTORY=? | +UFACTORY: (list of supported <fs_op>s),(list of supported <nvm_op>s)<br>OK | +UFACTORY: (0-2),(0-2)<br>OK |

## 19.29.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <fs_op> | Number | FS factory restore type:<br>• 0 (factory-programmed value): no factory restore<br>• 1: FS flash sectors erased<br>• 2: all files stored in FS deleted |
| <nvm_op> | Number | NVM factory restore type:<br>• 0 (factory-programmed value): no factory restore<br>• 1: NVM flash sectors erased<br>• 2: for internal use only |

## 19.29.4 Notes

### TOBY-L2 / MPCI-L2

- Depending on amount of user files stored in the module, the next boot could be delayed by at most one or two seconds.
- <fs_op>=1 is not supported.

### LISA-U2 / SARA-U2

- Depending on <fs_op> and <nvm_op> values, the next module boot could be delayed. *Table 34* lists delays of each operation.

| Parameter | Value | Delay |
|---|---|---|
| <fs_op> | 1 | 2 minutes |
| | 2 | No delay (but back ground garbage collector process needs to run).<br>If garbage collector has not time to be executed, it will be executed at next power-off/reset that will take more time. If the FS is total full, the garbage collector takes about 2 minutes. |
| <nvm_op> | 1 | 2 s |

**Table 34: Module boot timing**

### SARA-G3

- <fs_op>=2 is not supported.
- If <fs_op>=1 the SMSes stored in the ME message storage are deleted.
- The settings of these commands is restored to the factory-programmed setting by means of <fs_op>=1: *+UCSD*, *+ICF*, *+UPSD*, *+UGAOF*, *+UGAOP*, *+UGGGA*, *+UGGLL*, *+UGGSA*, *+UGGSV*, *+UGPRF*, *+UGRMC*, *+UGZDA*, *+UGSRV*, *+ULOCCELL*, *+ULOCGNSS*.
- Depending on <fs_op> and <nvm_op> values, the next module boot could be delayed.

| Parameter | Value | Delay |
|---|---|---|
| <fs_op> | 1 | 9 s |

Objective Specification

| Parameter | Value | Delay |
|---|---|---|
| <nvm_op> | 1 | - |

**Table 35: SARA-G3 boot timing**

# 19.30 KT remote reset KTCFUN

| KTCFUN | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-U270-53S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | *< 10 s* | *+CME Error* |

## 19.30.1 Description

This KT specific AT command selects the level of facility in the MT.

## 19.30.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | KTCFUN=[<fac>] | KTCFUN: <result> | ATKTCFUN=4 |
| | | | KTCFUN: OK |
| Test | ATKTCFUN=? | KTCFUN: (list of supported <fac>s) | KTCFUN: (1-4) |
| | | OK | OK |

## 19.30.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <fac> | Number | Facility to set. Allowed values:<br>• 1: online mode<br>• 2: offline mode<br>• 3: low power mode; this setting does not have effect<br>• 4 (factoru-programmed value): reset |
| <result> | String | If the command success, the "KTCFUN: OK" is returned |

# 19.31 KT reading quality information KTDEVSTAT

| KTDEVSTAT | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-U270-53S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 19.31.1 Description

This KT specific AT command retrieves quality information elements from the MT.

In the information text response the strings are not enclosed within double quotes.

The command needs of the SIM to correctly work.

## 19.31.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | ATKTDEVSTAT | KTDEVSTAT:<qmv>,<rssi>,<rscp>,<e/i>,<br><tx>,<apn>,<qos>,<br>,<srvc>,<ss>,<br><cs>,<freq>,<rat>,<psc>,<d/n>,<ver>,<br><imei>,<iccid> | KTDEVSTAT:1.1.9,-95,-106,-11,-98,<br>biz.ktfwing.com,5760/42000,0,2,2,1,210<br>0,HSPA,49,SARA-U270,23.41,3522530<br>60016648,89390100001253978700 |
| | | OK | OK |

Objective Specification

### 19.31.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <qmv> | String | Quality Management Version, fixed value 1.1.9 |
| <rssi> | Number | Received Signal Strength Indication, value expressed in dBm, range (-118 ~ -26) |
| <rscp> | Number | Received Signal Code Power, value expressed in dBm, range (-115 ~ -40) |
| <ec/io> | Number | Signal to Noise ratio, value expressed in dBm, range (-32 ~ 0) |
| <tx> | Number | Tx power level, value expressed in dBm, range (-50 ~ -33) |
| <apn> | String | Access Point Name, maximum length 30 characters. Only the APN set for CID 3 is shown. Value is displayed if it matches one of the following APNs:<br>• bizauth.ktfwing.com<br>• publicip.ktfwing.com<br>• biz.ktfwing.com<br>• Custom APN set with *KTUBXCONF* AT command |
| <qos> | String | Quality of Service, maximum length 12 bytes. The value represents a string with the values of maximum uplink/downlink bit rate assigned by the network |
| <br> | Number | Block Error Rate, value in range (0 ~ 100) |
| <srvc> | Number | Service status, value in range (0 ~ 4)<br>• 0: No service<br>• 1: Limited service<br>• 2: Service available<br>• 3: Limited regional service<br>• 4: Power save or deep sleep |
| <ss> | Number | Socket state, value in range (0 ~ 10)<br>• 0: None, initial state<br>• 1: Data access connecting<br>• 2: Data access connected<br>• 3: TCP access connecting<br>• 4: TCP access connected<br>• 5: TCP access terminating<br>• 6: TCP access terminated<br>• 7: Data access terminating<br>• 8: Data access terminated<br>• 9: DNS reading<br>• 10: DNS reading complete |
| <cs> | Number | Call state, value in range (-1 ~ 4)<br>• -1: None<br>• 1: Idle (no call)<br>• 2: Dialling<br>• 3: Incoming call<br>• 4: Busy |
| <freq> | Number | Frequency Channel Number |
| <rat> | String | Radio access technology. Value expressed as string. Possible values are:<br>• GSM<br>• GPRS<br>• EGPRS<br>• UMTS<br>• HSDPA<br>• HSUPA<br>• HSPA<br>• LTE (not applicable for 3G modules) |
| <psc> | Number | Primary Scrambling Code, value in range (0 ~ 511) |
| <d/n> | String | Device Name, maximum length 20 characters. The module model name. |
| <ver> | String | Device Version, maximum length 20 characters. The module firmware version |
| <imei> | String | International Mobile Equipment Identity, maximum length 15. |
| <iccid> | String | Integrated Circuit Card Identifier, maximum length 20. |

Objective Specification

### 19.31.4 Notes

- The APN to be used for FOTA connection shall be configured to CID 3
- On the reception of SMS PUSH of type Modem Quality Information (SMS text = *147359*12358*2*,IP_ADDRESS,PORT) the module needs to activate and internal data context in order to send an HTTP POST request to the FOTA server. The APN and authentication parameters SHALL be configured with the *+UPSD* command on the profile id 3. The configuration shall also be stored into NVM with the *+UPSDA=3,1* command, in order to make possible for the module to load the data connection configuration when it is required.

## 19.32 KT configuration command KTUBXCONF

| KTUBXCONF | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-U270-53S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 19.32.1 Description

This command let the user specify the telephone number of the inserted SIM card and an optional APN to be recognized as valid for KT FOTA connection.

### 19.32.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | ATKTUBXCONF=<phone_number>[,<fota_apn>] | OK | ATKTUBXCONF="1030000000","custom.kt.fota.apn"<br>OK |
| Read | ATKTUBXCONF? | KTUBXCONF:<phone_number>,<fota_apn> | KTUBXCONF:"1030000000","custom.kt.fota.apn"<br>OK |
| Test | ATKTUBXCONF=? | KTUBXCONF:(list of supported params)<br>OK | ATKTUBXCONF=?<br>KTUBXCONF:"phone_number","fota_apn"<br>OK |

### 19.32.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <phone_number> | String | Customer phone number |
| <fota_apn> | String | Additional APN to be recognized as valid for KT FOTA connection on CID 3. See also *ATKTDEVSTAT* |

## 19.33 Reject international calls KTUCALLREJ

| KTUCALLREJ | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-U270-53S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 19.33.1 Description

Enables/disables the automatic rejection of incoming international calls.

The set command may be issued only when a South Korean SIM card (MCC=450) is inserted.

Objective Specification

### 19.33.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | ATKTUCALLREJ=<mode> | OK | ATKTUCALLREJ=1<br>OK |
| Read | ATKTUCALLREJ? | KTUCALLREJ: <mode><br>OK | KTUCALLREJ: 1<br>OK |
| Test | ATKTUCALLREJ=? | KTUCALLREJ: (list of supported <mode>s)<br>OK | KTUCALLREJ: (0-1)<br>OK |

### 19.33.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | Indicates the rejection configuration:<br>• 0 (factory-programmed value): rejection disabled<br>• 1: rejection enabled |

### 19.33.4 Notes

| Prefix | Description |
|---|---|
| 001 | KT |
| 002 | LGU+ |
| 005 | SKB |
| 006 | SK TelLink |
| 00755 | Onse Telecom |
| 003YY | Special Category Telecommunications Operator including SB Interactive |
| 007YY | Special Category Telecommunications Operator including SB Interactive |
| 009 | Company with no Identification Number |

**Table 36: Prefixes which force a calling party number to be recognized as an international number**

## 19.34 Request KT OTA opening *KTF*OPENING

| *KTF*OPENING | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-U270-53S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | *Up to 3 min* | *+CMS Error* |

### 19.34.1 Description

KT proprietary AT command, which sends a specific SMS message (containing IMSI, ICCID, IMEI, etc.) to initiate KT's OTA opening procedure.

### 19.34.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT*KTF*OPENING | OK | AT*KTF*OPENING<br>OK |

## 19.35 Display the current UMTS environment KTUUMTSENV

| KTUUMTSENV | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-U270-53S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 19.35.1 Description

Displays the UMTS environment parameters when available.

Objective Specification

If the module is not camped only the "OK" final result code is immediately issued.

## 19.35.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | ATKTUUMTSENV | [KTUUMTSENV: <uarfcn>,<utran_band>,<psc>,<mcc>,<mnc>,<lac>,<rac>,<ci>,<nom>,<rrc_state>,<drx_cycle_len><br><rssi>,<rscp>,<ecio>,<tx_pow>,<ktf_tx_adjust>,<bler>,<mm_service_state>,<mm_reject_cause>,<gmm_service_state>,<gmm_reject_cause>]<br>OK | KTUUMTSENV: 10638,2100,83,222,1,61325,0,52d2388,2,0,128,-92,-25,-5,19,-62,0,5,0,5,0<br>OK |

## 19.35.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <uarfcn> | Number | UTRAN Absolute Radio Frequency Channel Number (UARFCN) |
| <utran_band> | Number | UTRAN band:<br>• 900: band VIII<br>• 2100: band I |
| <psc> | Number | Primary Scrambling Code (range 0-511) |
| <mcc> | Number | Mobile Country Code range (0 - 999) |
| <mnc> | Number | Mobile Network Code (range 0 - 999) |
| <lac> | Number | Location Area Code (range 0 - 65535) |
| <rac> | Number | Routing Area Code (range 0 - 65535) |
| <ci> | Number | Cell Identity in hexadecimal format (range 0h - FFFFh) |
| <nom> | Number | Network Operation Mode:<br>• 1: network mode of operation I<br>• 2: network mode of operation II<br>• 3: network mode of operation III |
| <rrc_state> | Number | RRC state:<br>• 0: CELL DCH<br>• 1: CELL FACH<br>• 2: CELL PCH<br>• 3: URA PCH<br>• 4: IDLE<br>• 5: IDLE CCCH |
| <drx_cycle_len> | Number | DRX cycle length |
| <rssi> | Number | Received Signal Strength Indication |
| <rscp> | Number | Received Signal Code Power |
| <ecio> | Number | Signal to noise ratio |
| <tx_pow> | Number | Tx power level |
| <ktf_tx_adjust> | Number | KTF_Tx_Adjust = Tx_Pwr + PathLoss -Node-B UL RSSI (-103 dBm) + TX Constant(21.5 dBm) |
| <bler> | Number | Block Error Rate (range 1 - 100) |
| <mm_service_state> | Number | MM service state<br>• 1: no network available<br>• 2: search for network<br>• 3: emergency calls only<br>• 4: limited service<br>• 5: full service<br>• 6: PLMN list available<br>• 7: disabled |
| <mm_reject_cause> | Number | MM reject cause received (see the 3GPP TS 24.008 [12]) |
| <gmm_service_state> | Number | GMM service state<br>• 1: no network available<br>• 2: search for network |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 4: limited service<br>• 5: full service<br>• 7: disabled<br>• 8: detached<br>• 9: no GPRS cell<br>• 10: suspended |
| <gmm_reject_cause> | Number | GMM reject cause received (see the 3GPP TS 24.008 [12]) |

Objective Specification

# 20 GPIO

## 20.1 Introduction

The section describes the AT commands used to configure the GPIO pins provided by u-blox cellular modules.

### 20.1.1 GPIO functions

On u-blox cellular modules, GPIO pins can be opportunely configured as general purpose input or output. Moreover GPIO pins of u-blox cellular modules can be configured to provide custom functions via *+UGPIOC* AT command. The custom functions availability can vary depending on the u-blox cellular modules series and version: see the following tables for an overview of the custom functions supported by u-blox cellular modules.

| <gpio_mode> | Function | TOBY-L2 |
|---|---|---|
| 0 | Output | Supported |
| 1 | Input | Supported |
| 2 | Network status indication | Supported |
| 3 | GNSS supply enable | Not supported |
| 4 | GNSS data ready | Not supported |
| 5 | GNSS RTC sharing | Not supported |
| 7 | SIM card detection | Supported |
| 8 | Headset detection | Not supported |
| 9 | GSM Tx burst indication | Not supported |
| 10 | Module operating status indication | Not supported |
| 11 | Module functionality status indication | Not supported |
| 12 | $I^2S$ digital audio interface | Supported |
| 13 | SPI serial interface | Not supported |
| 14 | Master clock generation | Supported |
| 15 | UART (DSR, DTR, DCD e RI) interface | Supported |
| 16 | Wi-Fi enable | Supported |
| 255 | Pad disabled | Supported |

**Table 37: GPIO custom functions overview (TOBY-L2 series)**

| <gpio_mode> | Function | LISA-U1 series | LISA-U200-00S | LISA-U2 series (except LISA-U200-00S) |
|---|---|---|---|---|
| 0 | Output | Supported | Supported | Supported |
| 1 | Input | Supported | Supported | Supported |
| 2 | Network status indication | Supported | Supported | Supported |
| 3 | GNSS supply enable | Supported | Not supported | Supported |
| 4 | GNSS data ready | Supported | Not supported | Supported |
| 5 | GNSS RTC sharing | Supported | Not supported | Supported |
| 7 | SIM card detection | Supported | Supported | Supported |
| 8 | Headset detection | Not supported | Not supported | Not supported |
| 9 | GSM Tx burst indication | Supported | Supported | Supported |
| 10 | Module operating status indication | Not supported | Not supported | Supported |
| 11 | Module functionality status indication | Not supported | Not supported | Supported |
| 12 | $I^2S$ digital audio interface | Not supported | Not supported | Supported |
| 13 | SPI serial interface | Not supported | Not supported | Supported |
| 255 | Pad disabled | Supported | Supported | Supported |

**Table 38: GPIO custom functions overview (LISA-U series)**

| <gpio_mode> | Function | SARA-U series |
|---|---|---|
| 0 | Output | Supported |
| 1 | Input | Supported |

Objective specification

| <gpio_mode> | Function | SARA-U series |
|---|---|---|
| 2 | Network status indication | Supported |
| 3 | GNSS supply enable | Supported |
| 4 | GNSS data ready | Supported |
| 5 | GNSS RTC sharing | Supported |
| 7 | SIM card detection | Supported |
| 8 | Headset detection | Not supported |
| 9 | GSM Tx burst indication | Supported[1] |
| 10 | Module operating status indication | Supported |
| 11 | Module functionality status indication | Supported |
| 12 | $I^2S$ digital audio interface | Supported |
| 13 | SPI serial interface | Not supported |
| 255 | Pad disabled | Supported |

**Table 39: GPIO custom functions overview (SARA-U series)**

| <gpio_mode> | Function | SARA-G340 / SARA-G350 |
|---|---|---|
| 0 | Output | Supported |
| 1 | Input | Supported |
| 2 | Network status indication | Supported |
| 3 | GNSS supply enable | Supported |
| 4 | GNSS data ready | Supported |
| 5 | GNSS RTC sharing | Supported |
| 6 | Jamming detection | Supported |
| 9 | GSM Tx burst indication | Supported |
| 255 | Pad disabled | Supported |

**Table 40: GPIO custom functions overview (SARA-G340 / SARA-G350 series)**

| <gpio_mode> | Function | LEON-G |
|---|---|---|
| 0 | Output | Supported |
| 1 | Input | Supported |
| 2 | Network status indication | Supported |
| 3 | GNSS supply enable | Supported |
| 4 | GNSS data ready | Supported |
| 5 | GNSS RTC sharing | Supported |
| 7 | SIM card detection | Not supported |
| 8 | Headset detection | Supported |
| 9 | GSM Tx burst indication | Not supported |
| 10 | Module operating status indication | Not supported |
| 11 | Module functionality status indication | Not supported |
| 12 | $I^2S$ digital audio interface | Not supported |
| 13 | SPI serial interface | Not supported |
| 255 | Pad disabled | Supported |

**Table 41: GPIO custom functions overview (LEON-G series)**

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.

## 20.1.2 GPIO mapping

The number of available GPIO pins and their mapping can vary depending on the u-blox cellular modules series and version. The GPIOs mapping for different u-blox cellular modules is reported in the following tables.

[1] Not supported by SARA-U270-53S and SARA-U280

Objective specification

See the corresponding module system integration manual for the functions supported by each GPIO.

| <gpio_id> | Pin name | Pin number | Factory-programmed function | Remarks |
|---|---|---|---|---|
| 10 | DSR | 10 | UART DSR | Only pin 10 can be configured for UART DSR line functionality |
| 11 | RI | 11 | UART RI | Only pin 11 can be configured for UART RI line functionality |
| 12 | DCD | 12 | UART DCD | Only pin 12 can be configured for UART DCD line functionality |
| 13 | DTR | 13 | UART DTR | Only pin 13 can be configured for UART DTR line functionality |
| 21 | GPIO1 | 21 | Wi-Fi enable | - |
| 22 | GPIO2 | 22 | Pin disabled | - |
| 24 | GPIO3 | 24 | Pin disabled | - |
| 25 | GPIO4 | 25 | General purpose output (low) | - |
| 50 | I2S_WA | 50 | $I^2S$ word alignment input/output | Only pin 50 can be configured for $I^2S$ word alignment input/output functionality |
| 51 | I2S_TXD | 51 | $I^2S$ transmit data output | Only pin 51 can be configured for $I^2S$ transmit data output functionality |
| 52 | I2S_CLK | 52 | $I^2S$ clock input/output | Only pin 52 can be configured for $I^2S$ clock input/output functionality |
| 53 | I2S_RXD | 53 | $I^2S$ receive data output | Only pin 53 can be configured for $I^2S$ receive data input functionality |
| 60 | GPIO5 | 60 | SIM card detection | Only pin 60 can be configured for SIM card detection functionality |
| 61 | GPIO6 | 61 | Master clock generation | Only pin 61 can be configured for master clock generation functionality |

**Table 42: TOBY-L2 series GPIO mapping**

| <gpio_id> | Pin name | Pin number | Factory-programmed function | Remarks |
|---|---|---|---|---|
| 20 | GPIO1 | 20 | Pad disabled | |
| 21 | GPIO2 | 21 | Pad disabled | |
| 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 |
| 39 | GPIO6 | 39 | Pad disabled | |
| 40 | GPIO7 | 40 | Pad disabled | |
| 53 | GPIO8 | 53 | Pad disabled | |
| 54 | GPIO9 | 54 | Pad disabled | |

**Table 43: LISA-U200-00S GPIO mapping**

| <gpio_id> | Pin name | Pin number | Factory-programmed function | Remarks |
|---|---|---|---|---|
| 20 | GPIO1 | 20 | Pad disabled | |
| 21 | GPIO2 | 21 | GNSS supply enable | |
| 23 | GPIO3 | 23 | GNSS data ready | Only pin 23 can be configured for GNSS data ready functionality |
| 24 | GPIO4 | 24 | GNSS RTC sharing | Only pin 24 can be configured for GNSS RTC sharing functionality |
| 51 | GPIO5 | 51 | SIM card detection | Only pin 51 can be configured for SIM card detection functionality |
| 39 | GPIO6 | 39 | 2nd $I^2S$ receive data input | Only pin 39 can be configured for 2nd $I^2S$ receive data input functionality |
| 40 | GPIO7 | 40 | 2nd $I^2S$ transmit data output | Only pin 40 can be configured for 2nd $I^2S$ transmit data output functionality |
| 53 | GPIO8 | 53 | 2nd $I^2S$ clock input/output | Only pin 53 can be configured for 2nd $I^2S$ clock input/output functionality |

Objective Specification

| <gpio_id> | Pin name | Pin number | Factory-programmed function | Remarks |
|---|---|---|---|---|
| 54 | GPIO9 | 54 | 2nd I²S word alignment input/output | Only pin 54 can be configured for 2nd I²S word alignment input/output functionality |
| 55 | GPIO10 | 55 | SPI Serial Clock Input | Only pin 55 can be configured for SPI Serial Clock Input functionality |
| 56 | GPIO11 | 56 | SPI Data Line Input | Only pin 56 can be configured for SPI Data Line Input functionality |
| 57 | GPIO12 | 57 | SPI Data Line Output | Only pin 57 can be configured for SPI Data Line Output functionality |
| 58 | GPIO13 | 58 | SPI Slave Ready Output | Only pin 58 can be configured for SPI Slave Ready Output functionality |
| 59 | GPIO14 | 59 | SPI Master Ready Input | Only pin 59 can be configured for SPI Master Ready Input functionality |

**Table 44: LISA-U2 series (except LISA-U200-00S) GPIO mapping**

| <gpio_id> | Pin name | Pin number | Factory-programmed function | Remarks |
|---|---|---|---|---|
| 20 | GPIO1 | 20 | Pad disabled | |
| 21 | GPIO2 | 21 | GNSS supply enable | |
| 23 | GPIO3 | 23 | GNSS data ready | Only pin 23 can be configured for GNSS data ready functionality |
| 24 | GPIO4 | 24 | GNSS RTC sharing | Only pin 24 can be configured for GNSS RTC sharing functionality |
| 51 | GPIO5 | 51 | SIM card detection | Only pin 51 can be configured for SIM card detection functionality |

**Table 45: LISA-U1 series GPIO mapping**

| <gpio_id> | Pin name | Pin number | Factory-programmed function | Remarks |
|---|---|---|---|---|
| 16 | GPIO1 | 16 | Pad disabled | |
| 23 | GPIO2 | 23 | GNSS supply enable | |
| 24 | GPIO3 | 24 | GNSS data ready | Only pin 24 can be configured for GNSS data ready functionality |
| 25 | GPIO4 | 25 | GNSS RTC sharing | Only pin 25 can be configured for GNSS RTC sharing functionality |
| 42 | GPIO5 | 42 | SIM card detection | Only pin 42 can be configured for SIM card detection functionality |
| 37 | GPIO6 | 37 | I²S receive data input | Only pin 37 can be configured for I²S receive data input functionality |
| 35 | GPIO7 | 35 | I²S transmit data output | Only pin 35 can be configured for I²S transmit data output functionality |
| 36 | GPIO8 | 36 | I²S clock input/output | Only pin 36 can be configured for I²S clock input/output functionality |
| 34 | GPIO9 | 34 | I²S word alignment input/output | Only pin 34 can be configured for I²S word alignment input/output functionality |

**Table 46: SARA-U GPIO mapping**

| <gpio_id> | Pin name | Pin number | Factory-programmed function | Remarks |
|---|---|---|---|---|
| 16 | GPIO1 | 16 | Pad disabled | |
| 23 | GPIO2 | 23 | GNSS supply enable | |
| 24 | GPIO3 | 24 | GNSS data ready | Only pin 24 can be configured for GNSS data ready functionality |
| 25 | GPIO4 | 25 | GNSS RTC sharing | Only pin 25 can be configured for GNSS RTC sharing functionality |

**Table 47: SARA-G350 / SARA-G340 GPIO mapping**

Objective Specification

| <gpio_id> | Pin name | Pin number | Factory-programmed 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 | GNSS supply enable | |
| 23 | GPIO3 | 23 | GNSS data ready | Only pin 23 can be configured for GNSS data ready functionality |
| 24 | GPIO4 | 24 | GNSS RTC sharing | Only pin 24 can be configured for GNSS RTC sharing functionality |

**Table 48: LEON-G series GPIO mapping**

The "GNSS supply enable", "GNSS data ready" and "GNSS RTC sharing" custom functions can be handled by the *+UGPS* and the *+UGPRF* custom AT commands to manage the u-blox GNSS receiver connected to the cellular module and the embedded GPS aiding.

The AT+UGPIOC=xx,255 or AT+UGPIOC=xx,0 or AT+UGPIOC=xx,1 commands (where xx= 55, 56, 57, 58, 59) cannot be sent over SPI interface (the "+CME ERROR: GPIO busy" error result code is reported). This is because these commands disable the SPI interface.

When the GPIOs 10-14 need to be switched from tristate (<gpio_mode>=255) or GPIO output (<gpio_mode>=0) or GPIO input (<gpio_mode>=1) to SPI functionality (<gpio_mode>=13), a power cycle (reset) is required for the changes to take effect.

When SIM card detection functionality is enabled, the status is reported by *+CIND* AT command.

Both the SIM hot insertion detection feature (configurable through the *+UDCONF=50* AT command where supported) and the SIM card detection feature must be enabled to allow a correct implementation of these features.

See the corresponding module system integration manual for the complete overview of all allowed configurations.

### 20.1.3 Network status indication

When a GPIO pin is configured to provide network status indication, its progress depends on the CS network registration state (see *+CREG*) and on the module transmission state:

- No service: indicates no network coverage or not registered state
- Registered home network 2G: indicates registered state on home network in 2G RAT
- Registered home network 3G: indicates registered state on home network in 3G RAT
- Registered roaming 2G: indicates registered state with visitor 2G network (roaming in 2G RAT)
- Registered roaming 3G: indicates registered state with visitor 3G network (roaming in 3G RAT)
- Data transmission: indicates voice or data call active either in 2G, 3G or 4G RAT
- Data transmission roaming: indicates voice or data call active either in 2G, 3G or 4G RAT with visitor network

TOBY-L200-00S / TOBY-L201 / TOBY-L210-00S / TOBY-L210-60S / TOBY-L280-00S / LISA-U / SARA-U / SARA-G / LEON-G
The data transmission roaming is not supported.

TOBY-L2
Registered state on a 4G (LTE) network is always interpreted as a data transmission.

SARA-U
If the module is in CG class, the PS network registration state determines the network status indication; otherwise the GPIO pin progress depends on the CS network registration state.

The following figures report the allowed progresses for GPIO pin set as network indication: $V_H$ and $V_L$ values are provided in the corresponding module data sheet in the "Generic Digital Interfaces pins" section.

Objective Specification

#### 20.1.3.1 No service (no network coverage or not registered)

- Continuous Output / Low

**Figure 4: GPIO pin progress for no service**

#### 20.1.3.2 Registered home network 2G

- Cyclic Output / High for 100 ms, Output / Low for 2 s

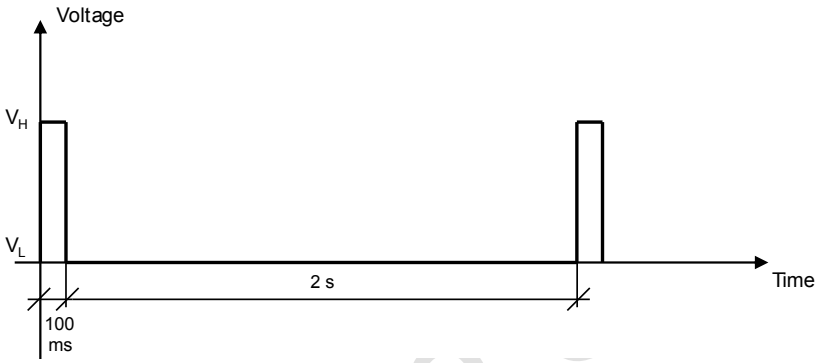



**Figure 5: GPIO pin progress for registered home network 2G**

#### 20.1.3.3 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

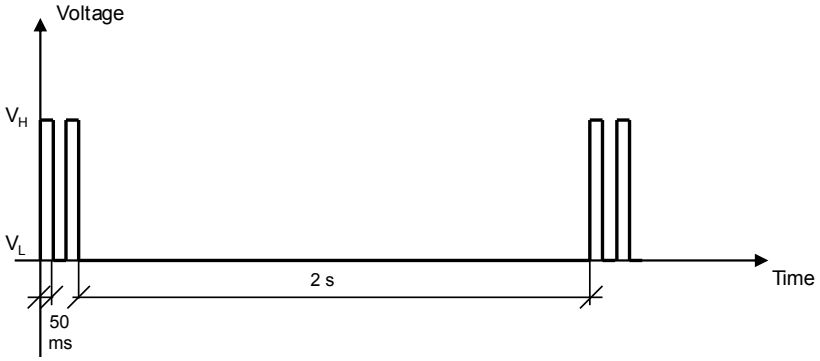



**Figure 6: GPIO pin progress for registered home network 3G**

#### 20.1.3.4 Registered roaming 2G

- Cyclic Output / High for 100 ms, Output / Low for 100 ms, Output / High for 100 ms, Output / Low for 2 s

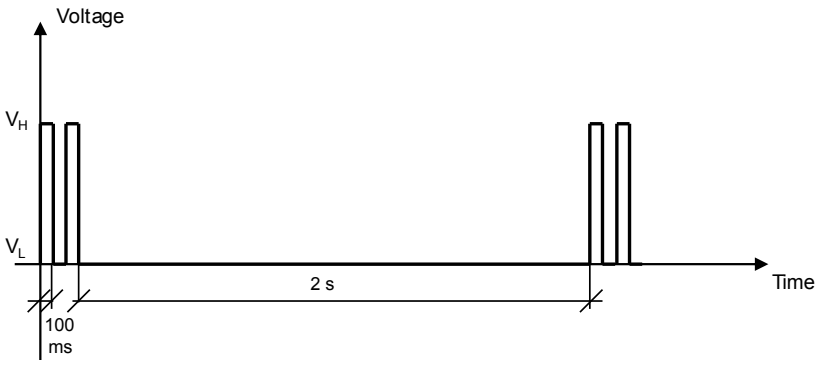



**Figure 7: GPIO pin progress for registered roaming 2G**

### 20.1.3.5 Registered roaming 3G

- Cyclic Output / High for 50 ms, Output / Low for 50 ms, Output / High for 50 ms, Output / Low for 100 ms

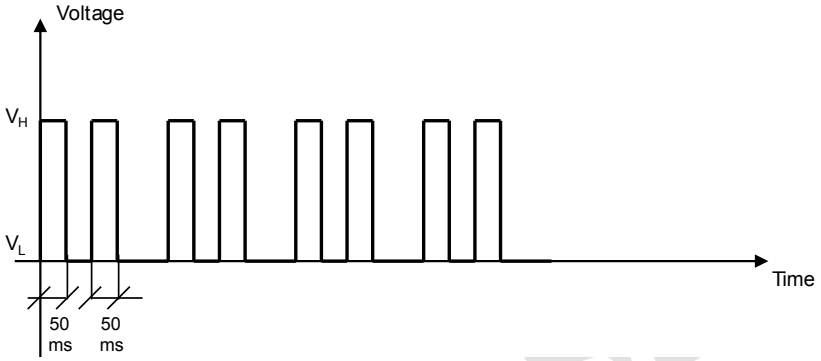



**Figure 8: GPIO pin progress for registered roaming 3G**

### 20.1.3.6 Data transmission

- Continuous Output / High

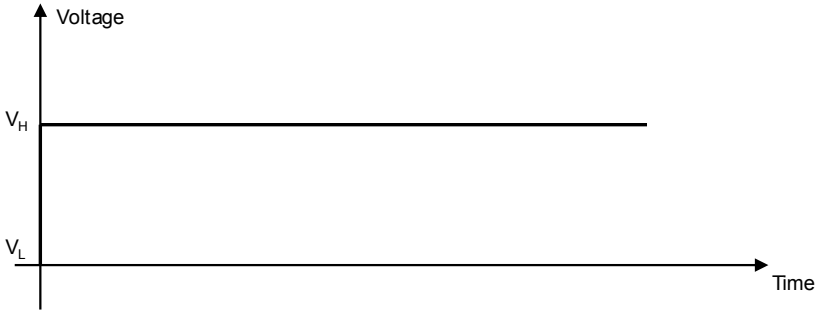



**Figure 9: GPIO pin progress for data transmission**

### 20.1.3.7 Data transmission roaming

- Cyclic Output / High for 800 ms, Output / Low for 200 ms

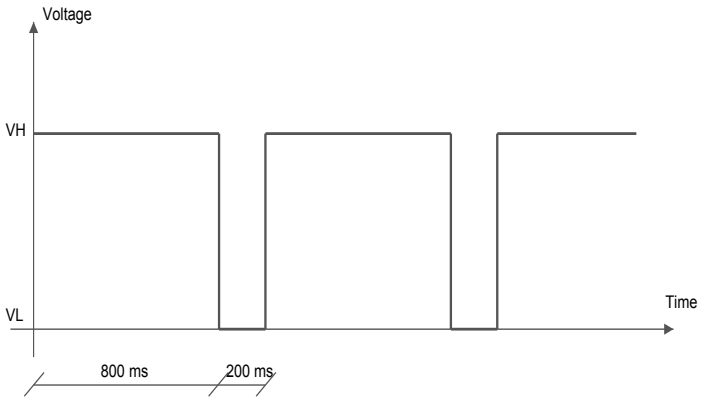



**Figure 10: GPIO pin progress for data transmission roaming**

### 20.1.4 Jamming detection

When a GPIO pin is configured to provide the jamming detection functionality, its progress depends on the *+UCD* configuration. If the jamming detection reporting is not configured by *+UCD* there is no progress on the jamming detection GPIO pin and it remains in the default state (GPIO output $V_L$).

If the *+UCD* AT command is opportunely configured to report the jamming detection, the corresponding GPIO pin has the following output progress:

- Jamming ON: GPIO Output / High ($V_H$)
- Jamming OFF: GPIO Output / Low ($V_L$)

$V_H$ and $V_L$ values are provided in the corresponding module data sheet in the "Generic Digital Interfaces pins" section.

SARA-G340-00S / SARA-G340-01S / SARA-G350-00S / SARA-G350-00X / SARA-G350-01B / SARA-G350-01S
The jamming detection mode is not supported.

## 20.2 GPIO select configuration command +UGPIOC

| +UGPIOC | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | *NVM* | No | *< 10 s* | *+CME Error* |

### 20.2.1 Description

Configures the GPIOs pins as input, output or to handle a custom function. When the 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 the GPIOs.

Not all the GPIO functions can be assigned to each GPIO pin. If the configuration is not allowed, an error result code will be returned (error result code 1502 - "+CME ERROR: Select GPIO mode error").
The following custom functions cannot be simultaneously configured on 2 GPIOs:

- Network status indication
- GNSS supply enable
- GNSS data ready
- GNSS RTC sharing

Objective Specification

- SIM card detection
- Headset detection
- GSM Tx burst indication
- Module operating status indication
- Module functionality status indication

The AT+UGPIOC=xx,255 or AT+UGPIOC=xx,0 or AT+UGPIOC=xx,1 commands (where xx= 55, 56, 57, 58, 59) cannot be sent over the SPI interface (the error result code "+CME ERROR: GPIO busy" is reported). This is because these commands disable the SPI interface.

To make available the GPIO set as "GNSS supply enable" mode it is needed to stop supplying GNSS receiver with the *AT+UGPS=0* command.

For more details regarding the custom functions supported by the u-blox cellular modules and the factory-programmed settings, see *GPIO functions* and *GPIO mapping*.

TOBY-L2 / LISA-U / SARA-U / SARA-G340 / SARA-G350

The list of the <gpio_id> with the related <gpio_mode> is not provided in the test command.

## 20.2.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UGPIOC=<gpio_id>,<gpio_mode>[,<gpio_out_val>\<gpio_in_pull>] | OK | AT+UGPIOC=20,0,1<br>OK |
| Read | AT+UGPIOC? | +UGPIOC:<br><gpio_id>,<gpio_mode><br>[<gpio_id>,<gpio_mode><br>[....]]<br>OK | +UGPIOC:<br>20,0<br>21,3<br>23,255<br>24,255<br>51,7<br>OK |
| Test | AT+UGPIOC=? | +UGPIOC: (list of supported <gpio_id>),(list of supported <gpio_mode>),(list of supported <gpio_out_val>\<gpio_in_pull>)<br>[<gpio_id1>,<gpio_mode><br>...<br><gpio_idN>,<gpio_mode>]<br>OK | +UGPIOC: (20,21,23,24,51),(0-5,7,9,255),(0-2)<br>OK |

## 20.2.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <gpio_id> | Number | GPIO pin identifier: pin number<br>See the *GPIO mapping* for the available GPIO pins, their mapping and factory-programmed values on different u-blox cellular modules series and product version. |
| <gpio_mode> | Number | Mode identifier: configured function<br>See the *GPIO functions* for custom functions supported by different u-blox cellular modules series and product version.<br>Allowed values:<br>• 0: output<br>• 1: input<br>• 2: network status indication<br>• 3: GNSS supply enable<br>• 4: GNSS data ready |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 5: GNSS RTC sharing<br>• 7: SIM card detection<br>• 8: headset detection<br>• 9: GSM Tx burst indication<br>• 10: module operating status indication<br>• 11: module functionality status indication<br>• 12: $I^2S$ digital audio interface<br>• 13: SPI serial interface<br>• 14: master clock generation<br>• 15: UART (DSR, DTR, DCD e RI) interface<br>• 16: Wi-Fi enable<br>• 255: pad disabled |
| <gpio_out_val> | Number | GPIO output value (for output function <gpio_mode>=0 only):<br>• 0 (default value): low<br>• 1: high |
| <gpio_in_pull> | Number | GPIO input value (for input function <gpio_mode>=1 only):<br>• 0 (default value): no resistor activated<br>• 1: pull up resistor active<br>• 2: pull down resistor active |

## 20.2.4 Notes

### TOBY-L2

- I2S_WA, I2S_TXD, I2S_CLK, I2S_RXD pins can be configured as I2S digital interface. If not all these pins are set in "I2S digital audio interface" mode, the *+USPM* command attempting to switch the audio path on I2S (AT+USPM=255,255,0,0) will return the "+CME ERROR: operation not allowed" error result code. On the other side, if the audio path is already set as I2S by *+USPM* command, the +UGPIOC command trying to reconfigure the GPIO mode on any of the I2S pins, will return the "+CME ERROR: GPIO busy" error result code. By default the audio path is I2S, to use I2S pins as GPIO, the I2S interface must be disabled setting the audio path to 'Null' path by command *+USPM* command.
- GPIO6 pin can be configured as master clock generation. If this pin is not set in "master clock generation" mode, the *+UMCLK* command attempting to enable the master clock (<mode> parameter not set to 0) will return the "+CME ERROR: operation not allowed" error result code. On the other side, if the clock generation is already enabled by *AT+UMCLK* command, the +UGPIOC command trying to reconfigure the GPIO mode on GPIO6, will return the "+CME ERROR: GPIO busy" error result code: issue the *AT+UMCLK=0* command before the GPIO6 mode reconfiguration.

### SARA-U

- GPIO6 - GPIO9 pins can be configured as I2S digital interface. If not all these pins are set in "I2S digital audio interface" mode, the *+USPM* command attempting to switch the audio path on I2S will return the "+CME ERROR: operation not allowed" error result code. On the other side, if the audio path is already set as I2S by *+USPM* command, the +UGPIOC command trying to reconfigure the GPIO mode on any of the I2S pins, will return the "+CME ERROR: GPIO busy" error result code. By default the audio path is I2S, to use I2S pins as GPIO, the I2S interface must be disabled setting audio path to 'Null' path by command *+USPM* command.

### LISA-U2

- GPIO6 - GPIO9 pins can be configured as I2S1 digital interface. If not all these pins are set in "I2S digital audio interface" mode, the *+USPM* command attempting to switch the audio path on I2S1 will return the "+CME ERROR: operation not allowed" error result code. On the other side, if the audio path is already set as I2S1 by *+USPM* command, the +UGPIOC command trying to reconfigure the GPIO mode on any the I2S1 pins, will return the "+CME ERROR: GPIO busy" error result code.

### LISA-U200-00S / LISA-U200-01S / LISA-U200-02S / LISA-U200-52S / LISA-U200-62S / LISA-U200-82S / LISA-U230 / LISA-U260 / LISA-U270

- <gpio_in_pull> is not supported. It is pulled none by default for input function <gpio_mode>=1.

Objective Specification

**LISA-U1**

- <gpio_in_pull> is not supported. It is pulled none by default for input function <gpio_mode>=1.

**LEON-G**

- <gpio_in_pull> is not supported. It is pulled none by default for input function <gpio_mode>=1.
- The read command is not supported.

# 20.3 GPIO read command +UGPIOR

| +UGPIOR | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | *< 10 s* | *+CME Error* |

## 20.3.1 Description

Reads the current value of the specified GPIO pin, no matter whether it is configured as input or output (see the *+UGPIOC* AT command to define the GPIO function). The parameters range is shown in the information text response to the test command.

## 20.3.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UGPIOR=<gpio_id> | +UGPIOR: <gpio_id>,<gpio_val><br>OK | AT+UGPIOR=20<br>+UGPIOR: 20,0<br>OK |
| Test | AT+UGPIOR=? | +UGPIOR: (list of supported <gpio_id>s)<br>OK | +UGPIOR: (20, 21)<br>OK |

## 20.3.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <gpio_id> | Number | GPIO pin identifier: pin number<br>See the *GPIO mapping* for the available GPIO pins, their mapping and factory-programmed values on different u-blox cellular modules series and version. |
| <gpio_val> | Number | GPIO value. Allowed values are 0 and 1. |

## 20.3.4 Notes

- The command works only if the parameter <gpio_mode> of the *+UGPIOC* AT command is set to 0 or 1.

# 20.4 GPIO set command +UGPIOW

| +UGPIOW | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | *< 10 s* | *+CME Error* |

## 20.4.1 Description

Sets ("writes") the output of the specified GPIO pin, but only if it is configured in output function (see the *+UGPIOC* AT command to set the pin as output).

Objective Specification

### 20.4.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UGPIOW=<gpio_id>,<gpio_out_val> | OK | AT+UGPIOW=20,1<br>OK |
| Test | AT+UGPIOW=? | +UGPIOW: (list of supported <gpio_id>s), (list of supported <gpio_out_val>s)<br>OK | +UGPIOW: (20, 21),(0-1)<br>OK |

### 20.4.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <gpio_id> | Number | GPIO pin identifier: pin number<br>See the *GPIO mapping* for the available GPIO pins, their mapping and factory-programmed values on different u-blox cellular modules series and version. |
| <gpio_out_val> | Number | GPIO value. Allowed values are 0 and 1. |

### 20.4.4 Notes

- The command works only if the parameter <gpio_mode> of the *+UGPIOC* AT command is set to 0.

Objective Specification

# 21 File System

## 21.1 File tags

### 21.1.1 Description

File system commands have the optional <tag> parameter that allows to specify a file type when an AT command is issued, to inform the system what to do with it. Application specific files must be saved with the correct type tag, otherwise they are treated as common user files.

*Table 49* defines the tags and their specific meaning:

| Tag | Name | Specification |
|---|---|---|
| "USER" | User file system | This is the default type if the <tag> parameter is omitted in file system AT commands. All generic files can be stored in this manner.<br>Example: AT+UDWNFILE="foobar",25,"USER" is the same as AT+UDWNFILE="foobar",25 |
| "AUDIO" | Audio parameters | This tag is used to store audio calibration file "audio_gain_calibration<X>.xml" and "voice<X>.nvm" in the selected profile <X>=0,1. The profile is stored into NVM by using *AT&Z<X>*.<br>The "audio_gain_calibration<X>.xml" and "voice<X>.nvm" files can be over-written with *AT&W<X>* command. |

**Table 49: Tags meaning**

TOBY-L200-00S / TOBY-L201 / TOBY-L210-00S / TOBY-L210-60S / TOBY-L280-00S / MPCI-L200-00S / MPCI-L201 / MPCI-L210-00S / MPCI-L210-60S / LISA-U / SARA-U / SARA-G / LEON-G
The AUDIO tag is not supported.

## 21.2 Download file +UDWNFILE

| +UDWNFILE | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 21.2.1 Description

Stores (writes) a file into the file system.

The available free memory space is checked before starting the file transfer. If the file size exceeds the available space, the "+CME ERROR: NOT ENOUGH FREE SPACE" error result code will be provided (if *+CMEE=2*).

If the data transfer stops, after 20s the command is stopped and the "+CME ERROR: FFS TIMEOUT" error result code (if *+CMEE=2*) is returned.

If the module shuts down during the file storing, all bytes of the file will be deleted.

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 HW flow control is disabled (*AT&K0*), a data loss could be experienced. So the HW flow control usage is strongly recommended.

Issue the *AT+ULSTFILE=1* to retrieve the available user space in the file system.

Two files with different types can have the same name, i.e. AT+UDWNFILE="testfile",20,"USER" and AT +UDWNFILE="testfile",43,"AUDIO".

Objective Specification

### 21.2.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UDWNFILE=<filename>,<size>[,<tag>]<br>><br><text> | OK | AT+UDWNFILE="filename",36,"USER"<br>><br>The 36 downloaded bytes of the file!<br>OK |

### 21.2.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <filename> | String | File name. For file system file name and data size limits see *File system limits*. |
| <size> | Number | File size expressed in bytes. For file system file name and data size limits see *File system limits*. |
| <tag> | String | Optional parameter that specifies the application file type. *FILE TAGS* table lists the allowed <tag> strings. |
| <text> | String | Stream of bytes. |

### 21.2.4 Notes

- 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" final result code or an error result code is returned. The feed process cannot be interrupted i.e. the command mode is re-entered once the user has provided the declared the number of bytes.

**TOBY-L2 / MPCI-L2**

- If the file already exists, the file will be overwritten.

**LISA-U2 / SARA-U / SARA-G / LEON-G**

- The <tag> parameter is not supported.

**LISA-U200-00S / LISA-U200-01S / LISA-U230 / LISA-U260-01S / LISA-U270-01S**

- If the file already exists, the file will be overwritten.

**LISA-U1**

- The <tag> parameter is not supported.
- If the file already exists, the file will be overwritten.
- If the module shuts down during the file storing, all the bytes successfully sent to the module will be stored.

## 21.3 List files information +ULSTFILE

| +ULSTFILE | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 21.3.1 Description

Retrieves some information about the FS. Depending on the specified <op_code>, it can print:

- List of files stored into the FS
- Remaining free FS space expressed in bytes
- Size of the specified file expressed in bytes

The available free space on FS in bytes reported by the command AT+ULSTFILE=1 is the theoretical free space including the space occupied by the hidden and temporary files which are not displayed by the AT+ULSTFILE=0.

Objective Specification

## 21.3.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| **Generic syntax** | | | |
| Set | AT+ULSTFILE=<op_code>[,<param1>[,<param2>]] | +ULSTFILE: [<param3>,...[,<paramN>]]<br>OK | AT+ULSTFILE=1<br>+ULSTFILE: 236800<br>OK |
| **List of files stored into the FS** | | | |
| Set | AT+ULSTFILE=0[,<tag>] | +ULSTFILE: [<filename1>[,<filename2>[,...[,<filenameN>]]]]<br>OK | AT+ULSTFILE=<br>+ULSTFILE: "filename"<br>OK |
| **Remaining free FS space expressed in bytes** | | | |
| Set | AT+ULSTFILE=1[,<tag>] | +ULSTFILE: <free_fs_space><br>OK | AT+ULSTFILE=1<br>+ULSTFILE: 236800<br>OK |
| **Size of the specified file** | | | |
| Set | AT+ULSTFILE=2,<filename>[,<tag>] | +ULSTFILE: <file_size><br>OK | AT+ULSTFILE=2,"filename"<br>+ULSTFILE: 784<br>OK |

## 21.3.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <op_code> | Number | Allowed values are:<br>• 0 (default value): lists the files belonging to <tag> file type<br>• 1: gets the free space for the specific <tag> file type<br>• 2: gets the file size expressed in bytes, belonging to <tag> type (if specified) |
| <tag> | String | Specifies the application file type. *FILE TAGS* table lists the allowed <tag> strings. |
| <filename1>,.., <filenameN> | String | File name. For file system file name and data size limits see *File system limits*. |
| <free_fs_space> | Number | Available free space on FS in bytes |
| <file_size> | Number | Size of the file specified with the <filename> parameter |
| <param1> | Number / String | Type and supported content depend on related <op_code> (details are given above). |
| <param2> | Number / String | Type and supported content depend on related <op_code> (details are given above). |

## 21.3.4 Notes

- The theoretical maximum number of files also includes system, hidden and temporary files whose number is not statically predictable, so the actual number can be less than this.

### LISA-U / SARA-U

- The <tag> parameter is not supported.
- The maximum number of files that can be stored is 1100.

### SARA-G340 / SARA-G350 / LEON-G

- The <tag> parameter is not supported.
- The theoretical maximum number of files that can be stored is 135.

Objective Specification

# 21.4 Read file +URDFILE

| +URDFILE | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 21.4.1 Description

Retrieves a file from the file system.

## 21.4.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+URDFILE=<filename>[,<tag>] | +URDFILE: <filename>,<size>,<data> | AT+URDFILE="filename" |
| | | OK | +URDFILE: "filename",36,"these bytes are the data of the file" |
| | | | OK |

## 21.4.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <filename> | String | File name. For file system file name and data size limits see *File system limits*. |
| <tag> | String | The optional parameter <tag> specifies a different application file type. *FILE TAGS* table lists the allowed <tag> strings. |
| <size> | Number | File size, in bytes |
| <data> | String | File content |

## 21.4.4 Notes

- The returned file data is displayed as an ASCII string of <size> characters in the range [0x00,0xFF]. At the end of the string, CRLF are provided for user convenience and visualization purposes.

### LISA-U / SARA-U / SARA-G

- The <tag> parameter is not supported.

### LEON-G

- The <tag> parameter is not supported.
- The filename is not enclosed within double quotes.

# 21.5 Partial download file +URDBLOCK

| +URDBLOCK | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U260-02S LISA-U270-02S LISA-U270-62S LISA-U270-63S LISA-U270-68S SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | No | No | - | *+CME Error* |

## 21.5.1 Description

Retrieves a file from the file system.

Differently from *+URDFILE* command, this command allows the user to read only a portion of the file, indicating the offset and amount of bytes.

Objective Specification

### 21.5.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+URDBLOCK=<filename>,<offset>,<size>[,<tag>] | +URDBLOCK: <filename>,<size>,<data><br>OK | AT+URDBLOCK="filename",0,20<br>+URDBLOCK: "filename",20,"these bytes are the "<br>OK |

### 21.5.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <filename> | String | File name. For file system file name and data size limits see *File system limits*. |
| <offset> | Number | Offset in bytes from the beginning of the file |
| <size> | Number | Number of bytes to be read starting from the <offset>. |
| <data> | String | Content of the file read |
| <tag> | String | The optional parameter <tag> specifies a different application file type. *FILE TAGS* table lists the allowed <tag> strings. |

### 21.5.4 Notes

- The returned file data is displayed as an ASCII string of <length> characters in the range [0x00,0xFF]. At the end of the string, <CRLF> 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 result code is triggered.

#### LISA-U / SARA-U

- The <tag> parameter is not supported.

#### SARA-G / LEON-G

- The <tag> parameter is not supported.
- The <filename> is not enclosed in double quotes in the information text response of the set command.

## 21.6 Delete file +UDELFILE

| +UDELFILE | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 21.6.1 Description

Deletes a stored file from the file system.

If <filename> file is not stored in the file system the following error result code will be provided: "+CME ERROR: FILE NOT FOUND".

### 21.6.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UDELFILE=<filename>[,<tag>] | OK | AT+UDELFILE="filename","USER"<br>OK |

### 21.6.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <filename> | String | File name. For file system file name and data size limits see *File system limits*. |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| <tag> | String | The optional parameter <tag> specifies a different application file type. *FILE TAGS* table lists the allowed <tag> strings. |

### 21.6.4 Notes

**LISA-U / SARA-U**

- The <tag> parameter is not supported.

**SARA-G340 / SARA-G350 / LEON-G**

- The <tag> parameter is not supported.
- The command immediately returns the "OK" final result code but the actual erasing is completed in background, and the freed space is not immediately available.

## 21.7 File system limits

### 21.7.1 Limits

Here below are listed the maximum file name length and the maximum data size of the file system for the u-blox cellular modules.

Maximum file name length:

- LISA-U1 / LISA-U230 / LISA-U260 / LISA-U270 / SARA-G / LEON-G - 47 characters
- TOBY-L2 / MPCI-L2 / LISA-U200 / LISA-U201 / SARA-U - 248 characters

TOBY-L200-00S / TOBY-L210-00S / TOBY-L210-60S / TOBY-L280-00S / MPCI-L200-00S / MPCI-L210-00S / MPCI-L210-60S
The file system AT commands are not supported.

LISA-U200-00S / LISA-U200-01S / LISA-U200-02S / LISA-U200-52S / LISA-U200-62S / LISA-U200-82S / SARA-U260-00S / SARA-U270-00S / SARA-U270-00X / SARA-U280-00S
The maximum file name length is 47 characters.

Maximum file size:

- TOBY-L2 / MPCI-L2 / LISA-U2 / SARA-U - 5242880 bytes
- LISA-U1 - 1458176 bytes
- SARA-G / LEON-G - 1048575 bytes

Objective Specification

# 22 Audio interface

This section describes a set of u-blox proprietary AT commands to be used for the audio features configuration:

- *+USPM* command sets the audio path
- *+UI2S* command configures $I^2S$ interfaces
- *+UPAR*, *+USAR*, *+UPLAYFILE*, *+USTOPFILE*, *+UTGN*, *+URNG*, *+UMSM* commands manage players
- *+UMCLK*, *+UEXTDCONF* manage the external codec or other external audio IC
- *+UDCONF=30* configures allowed speech codecs

*Audio parameters tuning* section describes commands for the audio parameters tuning.

*eCall* section describes commands specific for eCall.

*DTMF* section describes commands specific for DTMF detection and generation.

Other standard commands available for audio configuration are listed as follows: *+CALM*, *+CRSL*, *+CLVL*, *+CMUT*, *+VTD*, *+VTS*, *+UVTS*.

The <silent> parameter in *+CALA* command refers to the alarm tone.

## 22.1 Audio path mode setting +USPM

| +USPM | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S | | | | | |
| | LISA-U120 LISA-U130 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

### 22.1.1 Description

Sets the audio path mode enabling the different audio paths (audio uplink and downlink) of the module for different use cases.

Besides the routing via analog or digital interface, the uplink and downlink paths are characterized by a set of audio parameters (gains, digital filters, echo canceller parameters). The uplink paths can be configured through Microphone Gain Control (*+UMGC*), Uplink Biquad Filters (*+UUBF*), Hands-Free Parameters (*+UHFP*) or Audio Parameter Tuning (*+UAPT*) AT commands, where supported.

The downlink paths can be configured through Speaker Gain Control (*+USGC*), Downlink Biquad Filters (*+UDBF*), Sidetone (*+USTN*) or Audio Parameter Tuning (*+UAPT*) AT commands, where supported.

The command is used to choose the uplink and downlink path used.

Only one single uplink path and one single downlink path can be used. The parallel paths are not managed.

### 22.1.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+USPM=<main_uplink>,<main_downlink>,<alert_sound>,<headset_indication>[,<vmic_ctrl>] | OK | AT+USPM=1,1,0,0<br>OK |
| Read | AT+USPM? | +USPM: <main_uplink>,<main_downlink>,<alert_sound>,<headset_indication>,<vmic_ctrl><br>OK | +USPM: 0,0,0,0,2<br>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_ | +USPM: (0-9,255),(0-9,255),(0),(0),(2)<br>OK |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | indication>s),(list of supported <vmic_ctrl>s)<br><br>OK | |

## 22.1.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <main_uplink> | Number | Specifies the audio input path used for speech. See *Notes* for the allowed and default values. |
| <main_downlink> | Number | Specifies the audio output path used for speech. See *Notes* for the allowed and default values. |
| <alert_sound> | Number | Specifies whether 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:<br>• 0: main downlink path<br>• 1: loudspeaker<br>See *Notes* for the allowed and default values. |
| <headset_indication> | Number | Specifies if the speech path is switched on the headset or not when the headset is inserted:<br>• 0: the headset plug insertion is not indicated to the module; thus the module does not change automatically the speech audio path and leaves it as specified in <main_uplink>, <main_downlink> parameters<br>• 1: the headset plug insertion is indicated to the module and thus the module automatically switches the speech audio path to headset mode (headset microphone for uplink and headset earpiece for downlink). The indication is carried by the rising edge of HS_DET signal, thus HS_DET pin should be connected to the audio headset connector. For more details about this connection see the corresponding module System Integration Manual. When the headset plug will be removed, an opposite falling edge will be generated and the module will automatically switch back to the main audio path (<main_uplink>, <main_downlink>).<br>See *Notes* for allowed and default values. |
| <vmic_ctrl> | Number | Specifies the control mode for microphones voltage supply (VMIC).<br>• 0: VMIC is synchronously switched on/off with the microphone amplifier; i.e. while the module is idle or is using $I^2S$ input line, microphone amplifiers and VMIC are switched off<br>• 1: VMIC is switched always on<br>• 2: VMIC is switched always off<br>See *Notes* for allowed and default values. |
| <error> | String | If an incorrect number of parameters is provided or the parameter values are out of range the error result code "+CME ERROR: operation not supported" will be provided if *+CMEE* is set to 2. |

## 22.1.4 Notes

### TOBY-L2

- Allowed and default values for parameters:
  - **<main_uplink>**
    - 0: uplink path 0 via I2S
    - 1 (default value): uplink path 1 via I2S
    - 2: uplink path 2 via I2S
    - 3: uplink path 3 via I2S
    - 4: uplink path 4 via I2S
    - 255: null path ; no audio interface is enabled
  - **<main_downlink>**
    - 0: downlink path 0 via I2S
    - 1 (default value): downlink path 1 via I2S
    - 2: downlink path 2 via I2S
    - 3: downlink path 3 via I2S
    - 4: downlink path 4 via I2S
    - 255: null path ; no audio interface is enabled
  - **<alert_sound>**
    - 0 (default value): main downlink path

Objective Specification

  - **<headset_indication>**
    - 0 (default value): not considered
  - **<vmic_ctrl>**
    - 2 (default value): VMIC is switched always off
- The uplink path 255 (null path) can be combined only with the <main_downlink> path 255. This is the NULL path mode. In this audio path mode no audio path is never enabled and I2S pin can be reconfigured. Parameters <alert_sound> ,<headset_indication> and <vmic_ctrl> are not considered in this mode.
- The <main_uplink> paths from 0 to 4 can be combined only with the <main_downlink> path with the same index (I2S is used).
- The I2S pin are the GPIO pins (GPIO6-GPIO9). If not all these pins are set in "$I^2S$ digital audio interface" mode (see the *AT+UGPIOC* command, <gpio_mode>=12), the +USPM command attempting to switch the audio path from NULL mode to I2S mode, will return a "+CME ERROR: operation not allowed" error result code. On the other side, if the audio path is already set as I2S by the +USPM command, the *+UGPIOC* command trying to reconfigure the GPIO mode on any I2S pin, will return a "+CME ERROR: GPIO busy" error result code. To configure GPIO6-GPIO9 in any mode different of "I2S digital audio interface", the +USPM command must previously switch the audio path in NULL path mode (<main_uplink>=255, <main_downlink>=255).

**SARA-U**

- Allowed and default values for parameters:
  - **<main_uplink>**
    - 0: uplink path 0 via I2S
    - 1 (default value): uplink path 1 via I2S
    - 2: uplink path 2 via I2S
    - 3: uplink path 3 via I2S
    - 4: uplink path 4 via I2S
    - 255: null path ; no audio interface is enabled
  - **<main_downlink>**
    - 0: downlink path 0 via I2S
    - 1 (default value): downlink path 1 via I2S
    - 2: downlink path 2 via I2S
    - 3: downlink path 3 via I2S
    - 4: downlink path 4 via I2S
    - 255: null path ; no audio interface is enabled
  - **<alert_sound>**
    - 0 (default value): main downlink path
  - **<headset_indication>**
    - 0 (default value): not considered
  - **<vmic_ctrl>**
    - 2 (default value): VMIC is switched always off
- The uplink path 255 (null path) can be combined only with the <main_downlink> path 255. This is the NULL path mode. In this audio path mode no audio path is never enabled and I2S pin can be reconfigured. Parameters <alert_sound> ,<headset_indication> and <vmic_ctrl> are not considered in this mode.
- The <main_uplink> paths from 0 to 4 can be combined with any <main_downlink> paths from 0 to 4 (I2S is used).
- The I2S pin are the GPIO pins (GPIO6-GPIO9). If not all these pins are set in "$I^2S$ digital audio interface" mode (see the *AT+UGPIOC* command, <gpio_mode>=12), the +USPM command attempting to switch the audio path from NULL mode to I2S mode will return a "+CME ERROR: operation not allowed" error result code. On the other side, if the audio path is already set as I2S by the +USPM command, the *+UGPIOC* command trying to reconfigure the GPIO mode on any I2S pin, will return a "+CME ERROR: GPIO busy" error result code. To configure GPIO6-GPIO9 in any mode other than "I2S digital audio interface", the

Objective Specification

+USPM command must have been previously used to switch the audio path in NULL path mode (<main_uplink>=255, <main_downlink>=255).

**LISA-U2**

- Allowed and default values for parameters:
  - **<main_uplink>**
    - 0: uplink path 0 via I2S
    - 1 (default value): uplink path 1 via I2S
    - 2: uplink path 2 via I2S
    - 3: uplink path 3 via I2S
    - 4: uplink path 4 via I2S
    - 5: uplink path 5 via I2S1
    - 6: uplink path 6 via I2S1
    - 7: uplink path 7 via I2S1
    - 8: uplink path 8 via I2S1
    - 9: uplink path 9 via I2S1
  - **<main_downlink>**
    - 0: downlink path 0 via I2S
    - 1 (default value): downlink path 1 via I2S
    - 2: downlink path 2 via I2S
    - 3: downlink path 3 via I2S
    - 4: downlink path 4 via I2S
    - 5: downlink path 5 via I2S1
    - 6: downlink path 6 via I2S1
    - 7: downlink path 7 via I2S1
    - 8: downlink path 8 via I2S1
    - 9: downlink path 9 via I2S1
  - **<alert_sound>**
    - 0 (default value): alert sounds are played on main downlink path
  - **<headset_indication>**
    - 0 (default value): headset indication is not considered
  - **<vmic_ctrl>**
    - 2 (default value): VMIC is switched always off
- The <main_uplink> paths from 0 to 4 can be combined with the <main_downlink> paths from 0 to 4 (I2S is used).
- The <main_uplink> paths from 5 to 9 can be combined with the <main_downlink> paths from 5 to 9 (I2S1 is used).
- The I2S1 pins are the GPIO pins (GPIO6-GPIO9). If not all these pins are set to "$I^2S$ digital audio interface" mode (see the *AT+UGPIOC* command, <gpio_mode>=12), the command attempting to switch the audio path on I2S1 will return a "+CME ERROR: operation not allowed" error result code. On the other side, if the audio path is already set to I2S1 by the +USPM command, the +UGPIOC command trying to reconfigure the GPIO mode on any I2S1 pin, will return a "+CME ERROR: GPIO busy" error result code.

**LISA-U1**

- Allowed and default values for parameters:
  - **<main_uplink>**
    - 0: (pins MIC_P, MIC_N)
    - 1 (default value): headset microphone (pins: MIC_P, MIC_N)
    - 2: $I^2S$ input line (pin I2S_RXD)
    - 4: hands-free microphone (pins: MIC_P, MIC_N)

Objective Specification

- **<main_downlink>**
  - 0: normal earpiece (pins: SPK_N, SPK_P)
  - 1 (default value): mono headset (pins: SPK_N, SPK_P)
  - 3: loudspeaker (pins: SPK_N, SPK_P)
  - 4: $I^2S$ output line (pin I2S_TXD)
- **<alert_sound>**
  - 0 (default value): alert sounds are played on the main downlink path
- **<headset_indication>**
  - 0 (default value): headset indication is not considered
- **<vmic_ctrl>**
  - 2 (default value): VMIC is switched always off

- The following table summarizes the allowed combination of parameters <main_uplink> and <main_downlink> (<alert_sound>, <headset_indication> must always be set to 0):

| Uplink\Downlink | 0 - Earpiece | 1 - Mono headset | 2 - Unused | 3 - Loudspeaker | 4 - $I^2S$ output |
|---|---|---|---|---|---|
| **0** - Handset | x | x | | x | |
| **1** - Headset | x | x | | x | |
| **2** - $I^2S$ input | | | | | x |
| **3** - Unused | | | | | |
| **4** - Hands-free mic | x | x | | x | |

**SARA-G340 / SARA-G350**

- Allowed and default values for parameters:
  - **<main_uplink>**
    - 0 (default value): handset microphone (pins: MIC_P, MIC_N, MIC_BIAS, MIC_GND)
    - 1: headset microphone (pins: MIC_P, MIC_N, MIC_BIAS, MIC_GND)
    - 2: $I^2S$ input line (pin I2S_RXD)
    - 4: hands-free microphone (pins: MIC_P, MIC_N, MIC_BIAS, MIC_GND)
  - **<main_downlink>**
    - 0 (default value): normal earpiece (pins: SPK_N, SPK_P)
    - 1: mono headset (pins: SPK_N, SPK_P)
    - 3: loudspeaker (pins: SPK_N, SPK_P)
    - 4: $I^2S$ output line (pin I2S_TXD)
  - **<alert_sound>**
    - 0 (default value): alert sounds are played on the main downlink path
  - **<headset_indication>**
    - 0 (default value): headset indication is not considered
  - **<vmic_ctrl>**
    - 0 (default value): VMIC is switched on/off

- The following table summarizes the allowed combination of parameters <main_uplink> and <main_downlink> (<alert_sound>, <headset_indication> must always be set to 0):

| Uplink\Downlink | 0 - Earpiece | 1 - Mono headset | 2 - Unused | 3 - Loudspeaker | 4 - $I^2S$ output |
|---|---|---|---|---|---|
| **0** - Handset | x | x | | x | |
| **1** - Headset | x | x | | x | |
| **2** - $I^2S$ input | | | | | x |
| **3** - Unused | | | | | |
| **4** - Hands-free mic | x | x | | x | |

**LEON-G**

- Allowed and default values for parameters:
  - **<main_uplink>**
    - 0 (default value): handset microphone (pins: MIC_BIAS1, MIC_GND1)

Objective Specification

  - 1: headset microphone (pins: MIC_BIAS2, MIC_GND2)
  - 2: I²S input line (pin I2S_RXD)
- **<main_downlink>**
  - 0 (default value): normal earpiece (pins: HS_P, GND)
  - 1: mono headset (pins: HS_P, GND)
  - 3: loudspeaker (pins: SPK_P, SPK_N)
  - 4: I²S output line (pin I2S_TXD)
- **<alert_sound>**
  - 0: alert sounds are played on main downlink path
  - 1 (default value): alert sounds are played on loudspeaker
- **<headset_indication>**
  - 0: headset indication is not considered
  - 1 (default value): headset indication is considered
- **<vmic_ctrl>**
  - 0 (default value): VMIC is switched on/off
  - 1: VMIC is always on
  - 2: VMIC is always off

- The following table summarizes the allowed combination of parameters <main_uplink>, <main_downlink>, <alert_sound>, <headset_indication>:

| Allowed values | Uplink | Downlink | Alert on | Headset indication |
|---|---|---|---|---|
| **0, 0, 0, 1** | Handset | Earpiece | Main path | Considered |
| **0, 0, 1, 1** | Handset | Earpiece | Loudspeaker | Considered |
| **0, 0, 0, 0** | Handset | Earpiece | Main path | Not considered |
| **0, 0, 1, 0** | Handset | Earpiece | Loudspeaker | Not considered |
| **0, 3, 0, 0** | Handset | Loudspeaker | Main path | Considered |
| **0, 3, 0, 1** | Handset | Loudspeaker | Main path | Not considered |
| **0, 1, 0, 0** | Handset | Mono headset | Main path | Not considered |
| **1, 1, 0, 0** | Handset | Mono headset | Main path | Not considered |
| **1, 0, 0, 0** | Handset | Earpiece | Main path | Not considered |
| **1, 0, 1, 0** | Handset | Earpiece | Loudspeaker | Not considered |
| **1, 3, 0, 0** | Handset | Loudspeaker | Main path | Not considered |
| **2, 4, 0, 0** | I²S input | I²S output | Main path | Not considered |

# 22.2 I²S digital interface mode +UI2S

| **+UI2S** | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S | | | | | |
| | LISA-U120 LISA-U130 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

## 22.2.1 Description

Configures the I²S digital audio interface to be used when digital audio paths are chosen (see the *+USPM* command description, <main_uplink>=I2S RX, <main_downlink>=I2S TX).

The I²S TX and RX data lines can be connected to two different access points of the uplink and downlink audio path (see the module audio block diagram in the *Audio parameters tuning introduction*).

The digital audio interface is I2S.

The I²S interface can be configured either in Master or in Slave mode through the <I2S_Master_Slave> parameter:

- In Master mode the module generates the WA (word alignment) and CLK (clock) signals

Objective Specification

- In Slave mode the remote device must generate the WA (word alignment) and CLK (clock) signals

The sample rate of transmitted and received words is configurable through the <I2S_sample_rate> parameter.

Furthermore synchronization between data, clock and word alignment lines can be configured in different modes through the <I2S_mode> parameter:

- PCM modes (short synchronization signal)
- Normal I²S modes (long synchronization signal)

For details about I²S technical features in PCM and Normal I²S mode, see the system integration manual for the corresponding module.

The physical I²S port is composed of 4 pins. The signals are:

- **I2S_WA** (Word Alignment): output signal in Master mode, input signal in Slave mode; it synchronizes the data word; the WA cycle frequency is <I2S_sample_rate>, while WA cycle timing depends on the mode (see *PCM modes*, *PCM modes timing diagrams*, *Normal I²S modes* and *Normal I²S modes timing diagrams*)
- **I2S_TXD** (Transmitted Data): output signal; sequence of data bits, most significant bit transmitted first. Each word is 16 bits long, in 2's complement format with the configured I²S sample rate
- **I2S_CLK** (Clock): output signal in Master mode, input signal in Slave mode; it synchronizes the bits composing the data words; CLK frequency and edge synchronization with TXD/RXD signals depends on <I2S_mode> and the configured I²S sample rate. See *PCM modes* and *Normal I²S modes*
- **I2S_RXD** (Received Data): input signal; sequence of data bits, most significant bit read first. Each word is 16 bits long, in 2's complement format with the configured I²S sample rate

☞ The I²S pins are mapped in the following way:

| Product | I2S_WA | I2S_TXD | I2S_CLK | I2S_RXD |
|---|---|---|---|---|
| TOBY-L2 | 50 | 51 | 52 | 53 |
| LISA-U2 (first interface) | 41 | 42 | 43 | 44 |
| LISA-U2 (second interface) | 54 (pin: I2S1_WA) | 40 (pin: I2S1_TXD) | 53 (pin: I2S1_CLK) | 39 (pin: I2S1_RXD) |
| LISA-U1 | 41 | 42 | 43 | 44 |
| SARA-U2 | 34 | 35 | 36 | 37 |
| SARA-G3 | 34 | 35 | 36 | 37 |
| LEON-G | 26 | 27 | 28 | 29 |

**Table 50: I²S pins mapping on u-blox cellular modules**

## 22.2.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UI2S=<I2S_mode>,<I2S_port>,<I2S_clk_wa>[,<I2S_sample_rate>[,<I2S_Master_Slave>]] | OK | AT+UI2S=10,1,1,5,1<br>OK |
| Read | AT+UI2S? | +UI2S: <I2S_mode>,<I2S_port>,<I2S_clk_wa>,<I2S_sample_rate>,<I2S_Master_Slave><br>[...]<br>(for all the I²S interfaces)<br>OK | +UI2S: 4,1,1,4,1<br>+UI2S: 10,3,1,5,0<br>OK |
| Test | AT+UI2S=? | +UI2S: (list of supported <I2S_mode>s),(list of supported <I2S_port>s),(list of supported <I2S_clk_wa>)[,(list of supported <I2S_sample_rate>),(list of supported <I2S_Master_Slave>)]<br>OK | +UI2S: (0-13),(1,3),(0-1),(0-8),(0-1)<br>OK |

Objective Specification

### 22.2.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <I2S_mode> | Number | Specifies I²S configurable modes: PCM modes (short synchronization signal) and normal I²S modes (long synchronization signal) are available. The allowed values are (0-13, 20-23) as described in *PCM modes*, *Normal I²S modes*:<br>• See *PCM modes*, *Normal I²S modes* for modes available on each connection point and for their settings<br>• See the *PCM modes timing diagrams* and *Normal I²S modes timing diagrams* for the signals timing |
| <I2S_port> | Number | Specifies the I²S physical port (I2S or I2S1) and its connection in the internal audio processing path (I2Sx or I2Sy connection points) when the digital path is selected as audio path (see the *AT+USPM* command). I²S connections points positions are showed in the audio paths block diagram in *Audio parameters tuning introduction*. The allowed values are:<br>• 1: I2S is connected to I2Sx connection point<br>• 2: I2S is connected to I2Sy connection point<br>• 3: I2S1 is connected to I2Sx connection point<br>• 4: I2S1 is connected to I2Sy connection point<br>☞ 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 (see the *AT+USPM* command)<br>☞ 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<br>☞ Volume control (*+CLVL*) and hands-free algorithm (*+UHFP*) are active for both connection points.<br>☞ The analog gains in the *+USGC* and *+UMGC* commands are unused for both connection points. |
| <I2S_clk_wa> | Number | Specifies when CLK and WA signals are active. The allowed values are:<br>• 0: dynamic mode. CLK and WA outputs are active and only running when the audio path is active (audio samples are read on RX line and written on TX line). After the audio path is disabled (i.e. a call is hang up), CLK and WA are disabled too<br>• 1: continuous mode. CLK and WA outputs are always active and running if the *+USPM* current setting implies the <I2S_port> usage, even when the module is idle and the audio path is disabled (no audio data written on TX line, no audio data read on RX line). This implies the module cannot enter power saving mode |
| <I2S_sample_rate> | Number | I²S sample rate (frame rate). This is the frequency of the word set and received by I²S interface. The words are synchronized by the WA (word alignment) signal. Thus the <I2S_sample_rate> parameter matches with the frequency of WA signal. The allowed values are:<br>• 0: 8 kHz sampling rate<br>• 1: 11.025 kHz sampling rate<br>• 2: 12 kHz sampling rate<br>• 3: 16 kHz sampling rate<br>• 4: 22.05 kHz sampling rate<br>• 5: 24 kHz sampling rate<br>• 6: 32 kHz sampling rate<br>• 7: 44.1 kHz sampling rate<br>• 8: 48 kHz sampling rate |
| <I2S_Master_Slave> | Number | Indicates the Master/Slave mode of I²S interface. The allowed values are:<br>• 0: Master mode. CLK, WA, TX are output signals generated by the module. RX is an input signal<br>• 1: Slave mode. Only TX signal is an output signal generated by the module. CLK, WA, RX are input signals and must be generated by the remote device. |

### 22.2.4 Notes

**TOBY-L200-02S / TOBY-L210-02S / TOBY-L220 / TOBY-L280-02S**

- <I2S_mode>=0, 1, 10, 11, 12 and 13 are not supported.
- <I2S_port>=2 and 4 are not supported.

Objective Specification

- <I2S_sample_rate>=1, 2, 4, 5, 6, 7, and 8 are not supported (only the 8 and 16 kHz sampling rates are supported). <I2S_sample_rate>=0 is supported only on the audio path 4 (see the <main_uplink> and <main_downlink> parameters in *+USPM* AT command)
- <I2S_Master_Slave>=1 (slave mode) is not supported.
- If an incorrect number of parameters is provided or the parameter value is out of range the error result code "*+CME ERROR: operation not supported*" will be provided if *+CMEE* is set to 2:
  - Changing the $I^2S$ settings during voice activity is not recommended. Reboot the module (*+CFUN=16*) after having changed $I^2S$ settings.
  - The command returns an error result code if $I^2S$ pins are already allocated by another resource
- The factory-programmed values are as follows:
  - I2S: <I2S_mode>=21, <I2S_port>=1, <I2S_clk_wa>=0, <I2S_sample_rate>=3, <I2S_Master_Slave>=0

**SARA-U**

- <I2S_mode>=20, 21, 22 and 23 are not supported.
- <I2S_port>=2, 3 and 4 are not supported.
- If an incorrect number of parameters is provided or the parameter value is out of range the error result code "*+CME ERROR: operation not supported*" will be provided if *+CMEE* is set to 2:
  - The command returns an error result code when the audio path is in digital mode. This is because the $I^2S$ settings cannot be changed when the audio path is configured to use this interface. It is necessary to disable the digital audio path switching the audio path to NULL path mode (see the *+USPM* AT command), configure the $I^2S$ interface, and then re-select the digital path (see the *+USPM* AT command).
  - The command returns an error result code if $I^2S$ pins are already allocated by another resource
- The factory-programmed values are as follows:
  - <I2S_mode>=1, <I2S_port>=1, <I2S_clk_wa>=0, <I2S_sample_rate>=3, <I2S_Master_Slave>=0

**LISA-U2**

- A second digital audio interface (I2S1) is also available.
- <I2S_mode>=20, 21, 22 and 23 are not supported.
- <I2S_port>=2 and 4 are not supported.
- If an incorrect number of parameters is provided or the parameter value is out of range the error result code "*+CME ERROR: operation not supported*" will be provided if *+CMEE* is set to 2:
  - The command returns an error result code when the <I2S_port> specified is used by the current audio path (<I2S_port>=3; +USPM: 8,7,0,0). The $I^2S$ settings cannot be changed when the audio path is configured to use this interface. It is necessary to change the audio path by the *+USPM* AT command to a configuration not using the <I2S_port>, configure the <I2S_port> by +UI2S, and then re-select the *+USPM* mode using the <I2S_port> specified.
  - The command returns an error result code if $I^2S$ pins are already allocated by another resource
- The factory-programmed values are as follows:
  - I2S: <I2S_mode>=1, <I2S_port>=1, <I2S_clk_wa>=0, <I2S_sample_rate>=3, <I2S_Master_Slave>=0
  - I2S1: <I2S_mode>=1, <I2S_port>=3, <I2S_clk_wa>=0, <I2S_sample_rate>=3, <I2S_Master_Slave>=0

**LISA-U1**

- <I2S_mode>=20, 21, 22 and 23 are not supported.
- <I2S_port>=2, 3 and 4 are not supported.
- If an incorrect number of parameters is provided or the parameter value is out of range the error result code "*+CME ERROR: operation not supported*" will be provided if *+CMEE* is set to 2:
  - The command returns an error result code when the audio path is in digital mode (+USPM: 2,4,0,0). This is because the $I^2S$ settings cannot be changed when the audio path is configured to use this interface. It is necessary to disable the digital audio path switching to analog path (e.g.: by command AT+USPM=0,0,0,0; see the *+USPM* AT command), configure the $I^2S$ interface, and then re-select the digital path by command AT+USPM=2,4,0,0 (see the *+USPM* AT command).

Objective Specification

  - The command returns an error result code if I²S pins are already allocated by another resource
- The factory-programmed values are as follows:
  - <I2S_mode>=0, <I2S_port>=1, <I2S_clk_wa>=0, <I2S_sample_rate>=0, <I2S_Master_Slave>=0

**SARA-G340 / SARA-G350**

- <I2S_mode>=20, 21, 22 and 23 are not supported.
- The <I2S_sample_rate> and <I2S_Master_Slave> parameters are not supported.
- <I2S_port>=2, 3 and 4 are not supported.
- <I2S_Master_Slave>=1 (slave mode) is not supported.
- If an incorrect number of parameters is provided or the parameter value is out of range the error result code "*+CME ERROR: operation not supported*" will be provided if *+CMEE* is set to 2:
  - The command returns an error result code when the audio path is in digital mode (+USPM: 2,4,0,0). This is because the I²S settings cannot be changed when the audio path is configured to use this interface. It is necessary to disable the digital audio path switching to analog path (e.g.: by command AT+USPM=0,0,0,0; see the *+USPM* AT command), configure the I²S interface, and then re-select the digital path by command AT+USPM=2,4,0,0 (see the *+USPM* AT command).
  - The command returns an error result code if I²S pins are already allocated by another resource
- The factory-programmed values are as follows:
  - <I2S_mode>=1, <I2S_port>=1, <I2S_clk_wa>=0

**LEON-G**

- <I2S_mode>=20, 21, 22 and 23 are not supported.
- <I2S_port>=3 and 4 are not supported.
- The <I2S_sample_rate> and <I2S_Master_Slave> parameters are not supported.
- <I2S_Master_Slave>=1 (slave mode) is not supported.
- If an incorrect number of parameters is provided or the parameter value is out of range the error result code "*+CME ERROR: operation not supported*" will be provided if *+CMEE* is set to 2:
  - The command returns an error result code when the audio path is in digital mode (+USPM: 2,4,0,0). This is because the I²S settings cannot be changed when the audio path is configured to use this interface. It is necessary to disable the digital audio path switching to analog path (e.g.: by command AT+USPM=0,0,0,0; see the *+USPM* AT command), configure the I²S interface, and then re-select the digital path by command AT+USPM=2,4,0,0 (see the *+USPM* AT command)
  - The command returns an error result code if I²S pins are already allocated by another resource
- The factory-programmed values are as follows:
  - <I2S_mode>=4, <I2S_port>=2, <I2S_clk_wa>=1
- *Table 51*, *Table 52*, *Table 53* , *Table 54* and *Table 55* sections describe the allowed combinations of <I2S_mode> and <I2S_port>

| <I2S_port> | PCM modes | Normal I²S modes |
|---|---|---|
| I2Sx connection of I2S | (20-23) | (2-9) |
| I2Sy connection of I2S | Not supported | Not supported |
| I2Sx connection of I2S1 | Not supported | Not supported |
| I2Sy connection of I2S1 | Not supported | Not supported |

**Table 51: TOBY-L2 series I²S modes**

| <I2S_port> | PCM modes | Normal I²S modes |
|---|---|---|
| I2Sx connection of I2S | (0-1) | (2-13) |
| I2Sy connection of I2S | Not supported | Not supported |
| I2Sx connection of I2S1 | (0-1) | (2-13) |
| I2Sy connection of I2S1 | Not supported | Not supported |

**Table 52: LISA-U2 series I²S modes**

Objective Specification

| | PCM modes | Normal I²S modes |
|---|---|---|
| I2Sx connection of I2S | (0-1) | (2-13) |
| I2Sy connection of I2S | Not supported | Not supported |
| I2Sx connection of I2S1 | Not supported | Not supported |
| I2Sy connection of I2S1 | Not supported | Not supported |

**Table 53: LISA-U1 / SARA-U series I²S modes**

| | PCM modes | Normal I²S modes |
|---|---|---|
| I2Sx connection of I2S | (0-1) | (2-13) |
| I2Sy connection of I2S | Not supported | Not supported |
| I2Sx connection of I2S1 | Not supported | Not supported |
| I2Sy connection of I2S1 | Not supported | Not supported |

**Table 54: SARA-G series I²S modes**

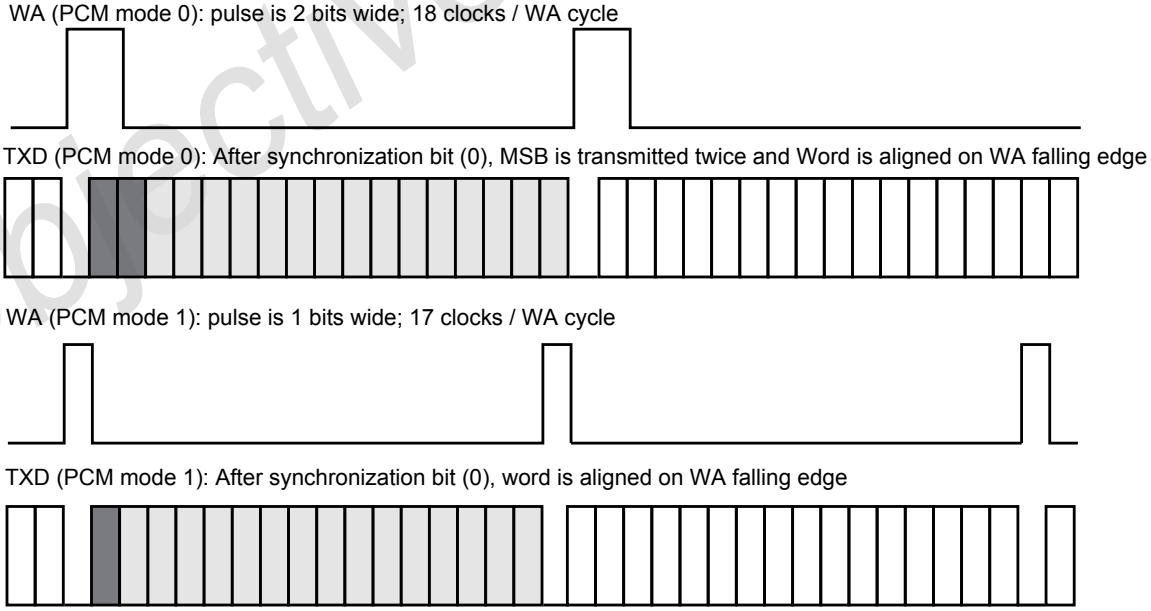
| | PCM modes | Normal I²S modes |
|---|---|---|
| I2Sx connection of I2S | (0-1) | Not supported |
| I2Sy connection of I2S | Not supported | (2-13) |
| I2Sx connection of I2S1 | Not supported | Not supported |
| I2Sy connection of I2S1 | Not supported | Not supported |

**Table 55: LEON-G series I²S modes**

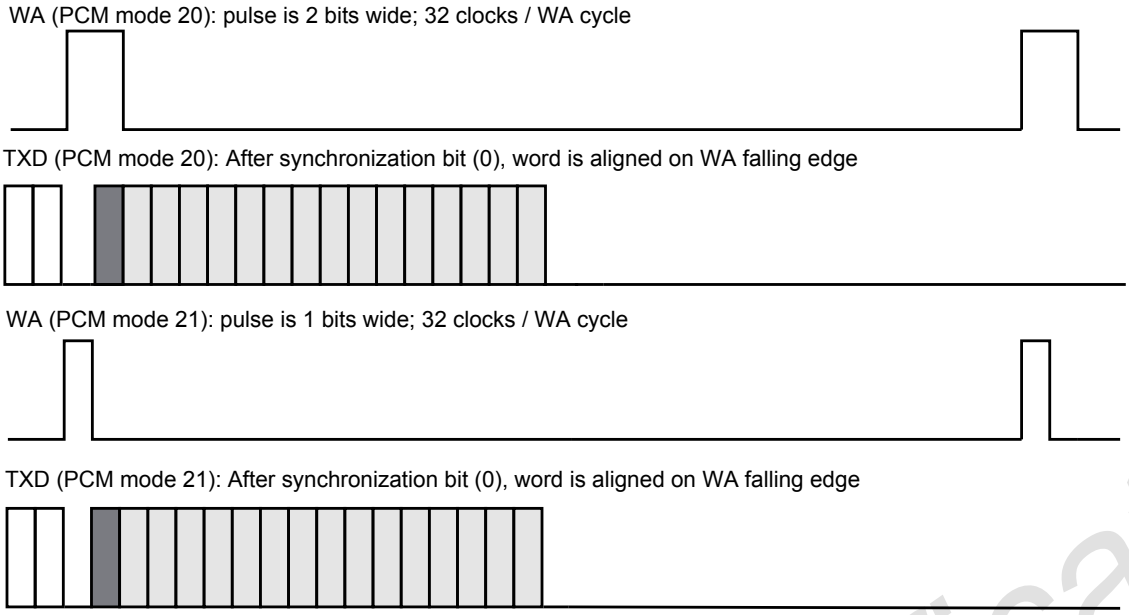
### 22.2.5 PCM modes (short synchronization signal)

| Mode | CLK EDGE for TX | CLK EDGE for RX | WA pulse length | CLK frequency | WA frequency |
|---|---|---|---|---|---|
| 0 | RISING | FALLING | 2 clks | 18*<I2S_sample_rate> | <I2S_sample_rate> |
| 1 | RISING | FALLING | 1 clk | 17*<I2S_sample_rate> | <I2S_sample_rate> |
| 20 | RISING | FALLING | 2 clks | 32*<I2S_sample_rate> | <I2S_sample_rate> |
| 21 | RISING | FALLING | 1 clk | 32*<I2S_sample_rate> | <I2S_sample_rate> |
| 22 | FALLING | RISING | 2 clks | 32*<I2S_sample_rate> | <I2S_sample_rate> |
| 23 | FALLING | RISING | 1 clk | 32*<I2S_sample_rate> | <I2S_sample_rate> |

### 22.2.6 PCM modes timing diagrams



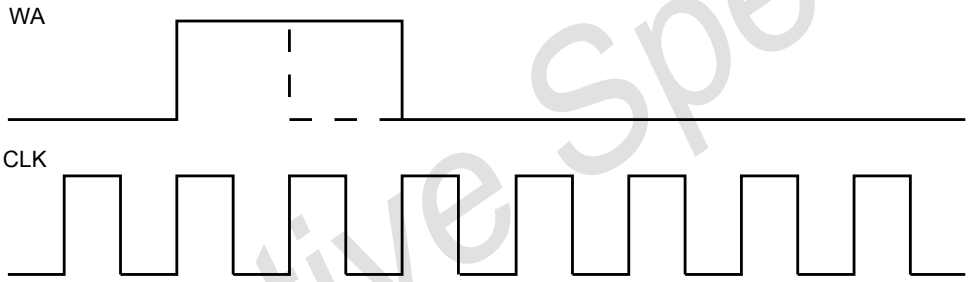

Objective specification




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:

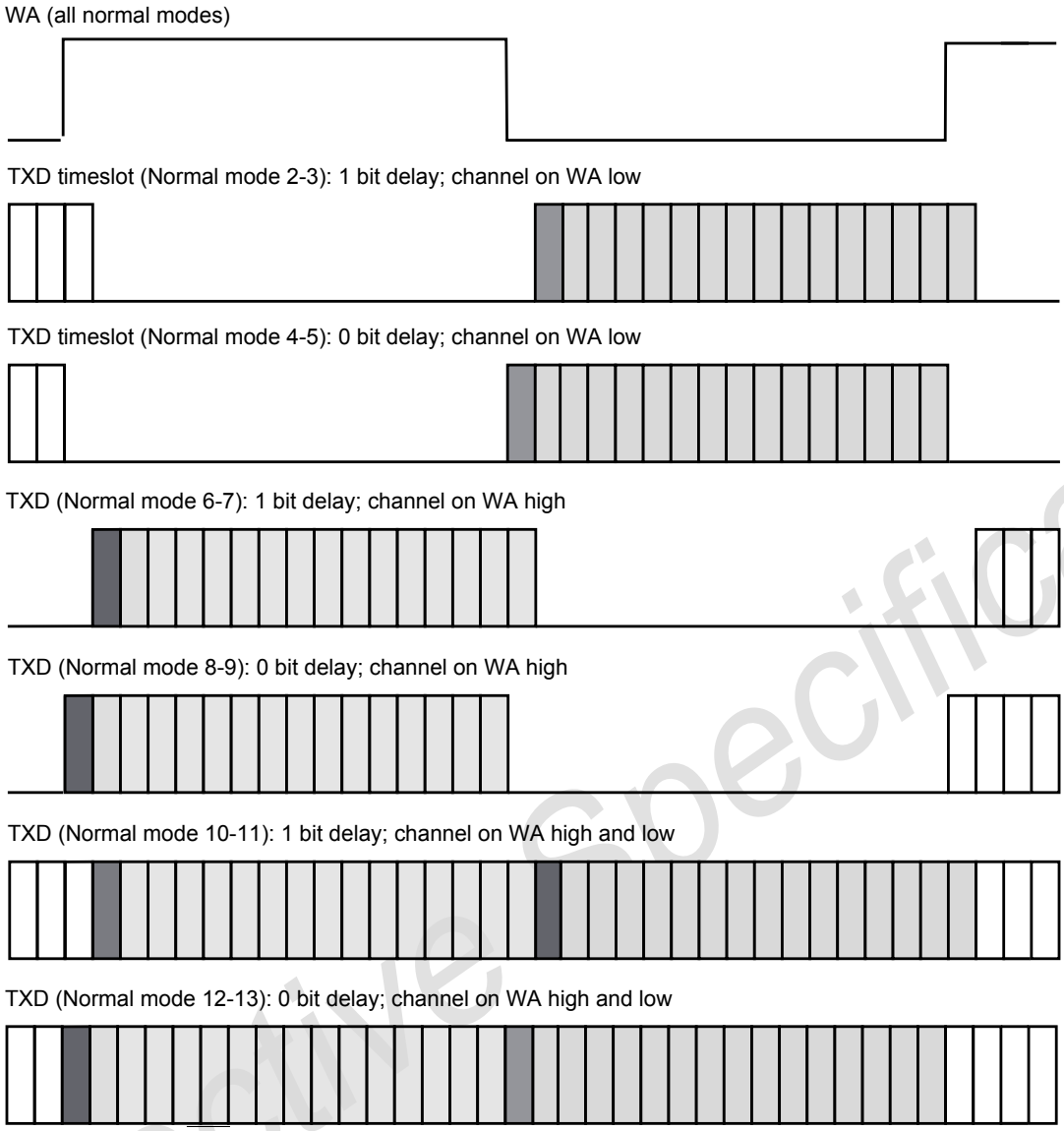



## 22.2.7 Normal I²S modes (long synchronization signal)

| Mode | CLK edge for TX | CLK edge for RX | MSB delay | TX channel | RX channel | CLK frequency | WA frequency |
|---|---|---|---|---|---|---|---|
| 2 | FALLING | RISING | 1 bit | WA LOW | WA LOW | 32*<I2S_sample_rate> | <I2S_sample_rate> |
| 3 | RISING | FALLING | 1 bit | WA LOW | WA LOW | 32*<I2S_sample_rate> | <I2S_sample_rate> |
| 4 | FALLING | RISING | 0 bit | WA LOW | WA LOW | 32*<I2S_sample_rate> | <I2S_sample_rate> |
| 5 | RISING | FALLING | 0 bit | WA LOW | WA LOW | 32*<I2S_sample_rate> | <I2S_sample_rate> |
| 6 | FALLING | RISING | 1 bit | WA HIGH | WA HIGH | 32*<I2S_sample_rate> | <I2S_sample_rate> |
| 7 | RISING | FALLING | 1 bit | WA HIGH | WA HIGH | 32*<I2S_sample_rate> | <I2S_sample_rate> |
| 8 | FALLING | RISING | 0 bit | WA HIGH | WA HIGH | 32*<I2S_sample_rate> | <I2S_sample_rate> |
| 9 | RISING | FALLING | 0 bit | WA HIGH | WA HIGH | 32*<I2S_sample_rate> | <I2S_sample_rate> |
| 10 | FALLING | RISING | 1 bit | WA HIGH & LOW | WA HIGH | 32*<I2S_sample_rate> | <I2S_sample_rate> |
| 11 | RISING | FALLING | 1 bit | WA HIGH & LOW | WA HIGH | 32*<I2S_sample_rate> | <I2S_sample_rate> |
| 12 | FALLING | RISING | 0 bit | WA HIGH & LOW | WA HIGH | 32*<I2S_sample_rate> | <I2S_sample_rate> |
| 13 | RISING | FALLING | 0 bit | WA HIGH & LOW | WA HIGH | 32*<I2S_sample_rate> | <I2S_sample_rate> |

Objective Specification

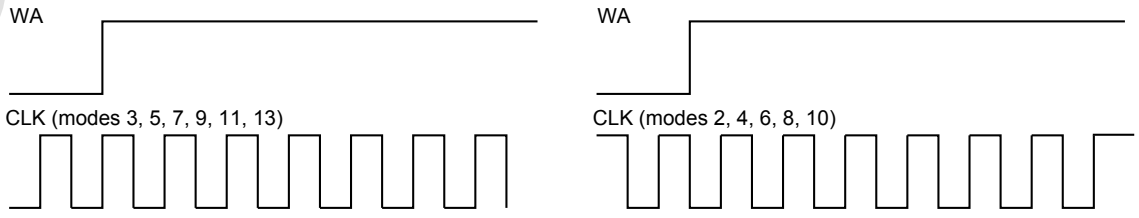
### 22.2.8 Normal I²S modes timing diagrams




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:




Objective Specification

# 22.3 Play audio resource +UPAR

| +UPAR | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S | | | | | |
| | LISA-U120 LISA-U130 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | No | No | - | *+CME Error* |

## 22.3.1 Description

Starts the playback of the pre-defined tone of the selected audio resource.

## 22.3.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UPAR=<audio_resource>,<tone_id>,<nof_repeats> | OK | AT+UPAR=0,1,0<br>OK |
| Test | AT+UPAR=? | +UPAR: (list of supported <audio_resource>s),(list of supported <tone_id>s),(list of supported <nof_repeats>s)<br>OK | +UPAR: (0-2),(0-66),(0-255)<br>OK |

## 22.3.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <audio_resource> | Number | Specifies the audio resource<br>• 0: tone generator<br>• 1: MIDI player<br>• 2: audio loop for test purposes. Use this command to generate an audio loop between the uplink and downlink current path (*+USPM*) when not in a call. Use the sidetone command (*+USTN*) for the loop amount configuration. For the uplink to downlink loop on call use sidetone (*+USTN*) command only |
| <tone_id> | Number | Specifies the pre-defined tone id to be played; the supported values depend by <audio_resource> values according to the *Notes* |
| <nof_repeats> | Number | Specifies the number of repeats<br>• 0: infinite loop<br>• n: n repeats |
| <error> | Number | The "+CME ERROR: operation not supported" error result code will be provided in these cases (if *+CMEE* is set to 2):<br>• An incorrect number of parameters is provided<br>• The parameter values are out of range |

## 22.3.4 Notes

- Allowed values for tone generator are:

| Id | Tone | Id | Tone | Id | Tone |
|---|---|---|---|---|---|
| 0 | DTMF 0 | 25 | service tone 8 | 50 | melody 4 |
| 1 | DTMF 1 | 26 | service tone 9 | 51 | melody 5 |
| 2 | DTMF 2 | 27 | service tone 10 | 52 | melody 6 |
| 3 | DTMF 3 | 28 | service tone 11 | 53 | melody 7 |
| 4 | DTMF 4 | 29 | service tone 12 | 54 | melody 8 |
| 5 | DTMF 5 | 30 | service tone 13 | 55 | melody 9 |
| 6 | DTMF 6 | 31 | service tone 14 | 56 | melody 10 |
| 7 | DTMF 7 | 32 | service tone 15 | 57 | melody 11 |
| 8 | DTMF 8 | 33 | service tone 16 | 58 | melody 12 |
| 9 | DTMF 9 | 34 | service tone 17 | 59 | melody 13 |
| 10 | DTMF hash | 35 | service tone 18 | 60 | melody 14 |

Objective Specification

| Id | Tone | Id | Tone | Id | Tone |
|---|---|---|---|---|---|
| 11 | DTMF asterix | 36 | service tone 19 | 61 | melody 15 |
| 12 | key tone 1 | 37 | service tone 20 | 62 | melody 16 |
| 13 | key tone 2 | 38 | service tone 21 | 63 | melody 17 |
| 14 | key tone 3 | 39 | service tone 22 | 64 | melody 18 |
| 15 | key tone 4 | 40 | service tone 23 | 65 | service tone 29 |
| 16 | key tone 5 | 41 | service tone 24 | 66 | service tone 30 |
| 17 | service tone 0 | 42 | service tone 25 | 67 | Audio tone 300 Hz |
| 18 | service tone 1 | 43 | service tone 26 | 68 | Audio tone 500 Hz |
| 19 | service tone 2 | 44 | service tone 27 | 69 | Audio tone 1000 Hz |
| 20 | service tone 3 | 45 | service tone 28 | 70 | Audio tone 2000 Hz |
| 21 | service tone 4 | 46 | melody 0 | 71 | Audio tone 3000 Hz |
| 22 | service tone 5 | 47 | melody 1 | 72 | Audio tone 3400 Hz |
| 23 | service tone 6 | 48 | melody 2 | | |
| 24 | service tone 7 | 49 | melody 3 | | |

**Table 56: Allowed pre-defined tones**

- Allowed values for <audio_resource>=1 (MIDI player) are:

| Id | Ringing tone | Id | Ringing tone |
|---|---|---|---|
| 0 | ring | 5 | ramp spmidi |
| 1 | baroque | 6 | mozart imel |
| 2 | caribic | 7 | whenever |
| 3 | jamesbond | 8 | imperialmarch |
| 4 | moonstar | | |

**Table 57: Allowed ringing tones**

- MIDI Melodies are the same selectable as ringer by *+URNG* command.
- <tone_id> and <nof_repeats> are unused when <audio_resource>= 2 (audio loop).
- The ringer on an incoming call, the alarm tones (*+CALA*) and service tones (e.g.: Call Waiting tone) have the priority on the audio player (+UPAR). If they are not muted and must be played, the audio player (+UPAR) is stopped. Incoming call ringer and service tones can be muted by *+CALM* command (see notes), alarm tones can be muted by <silent> parameter in *+CALA* command.

**TOBY-L2**

- <audio_resource>=0 (TONE generator) only the DTMF tones are supported.
- <audio_resource>=1 (MIDI player) is not supported.
- <tone_id>=67 .. 72 are not supported.
- Dual streaming (simultaneous playing of tones and audio files) is not supported: the tone generator should not be executed if the audio player is already active (*+UPLAYFILE*)
- During a speech call the pre-defined tone is not mixed with speech; the speech is muted while the tone is playing.

**LISA-U / SARA-U**

- <audio_resource>=1 (MIDI player) is not supported.
- The SMS tones have the priority on audio player (+UPAR). If they must be played, the audio player (+UPAR) is stopped. SMS tones can be muted by *+CALM*, *+UMSM* commands.

**LISA-U200-01S / LISA-U200-02S / LISA-U200-52S / LISA-U200-62S / LISA-U200-82S / LISA-U230 / LISA-U260 / LISA-U270 / SARA-U260-00S / SARA-U270-00S / SARA-U270-00X / SARA-U280-00S**

- <tone_id>=67 .. 72 are not supported.

**LISA-U1**

- <audio_resource>=2 (audio loop for test purposes) is not supported.
- <tone_id>=67 .. 72 are not supported.

Objective Specification

**SARA-G / LEON-G**

- The audio player (+UPAR) has the priority on SMS tones. If a player is active, SMS tones are not played.

**SARA-G340-00S / SARA-G340-01S / SARA-G350-00S / SARA-G350-00X / SARA-G350-01B / SARA-G350-01S**

- <tone_id>=67 .. 72 are not supported.

**LEON-G**

- <audio_resource>=2 (audio loop for test purposes) is not supported.
- <tone_id>=67 .. 72 are not supported.

# 22.4 Stop audio resource +USAR

| +USAR | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S | | | | | |
| | LISA-U120 LISA-U130 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | No | No | - | *+CME Error* |

## 22.4.1 Description

Stops the playback of the selected audio resource.

## 22.4.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+USAR=<audio_resource> | OK | AT+USAR=0<br>OK |
| Test | AT+USAR=? | +USAR: (list of supported <audio_resource>s)<br>OK | +USAR: (0-2)<br>OK |

## 22.4.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <audio_resource> | Number | Specifies the audio resource<br>• 0: DSP tone generator<br>• 1: MIDI player<br>• 2: audio loop for test purposes. Use this command to stop an audio loop between uplink and downlink current path (*+USPM*). |
| <error> | Number | The "+CME ERROR: operation not supported" error result code will be provided in these cases (if *+CMEE* is set to 2):<br>• An incorrect number of parameters is provided<br>• The parameter values are out of range |

## 22.4.4 Notes

**TOBY-L2**

- <audio_resource>=1 (MIDI player) is not supported.
- The command AT+USAR=0 stops the tone generated by the *+UPAR* or *+UTGN* AT commands.

**LISA-U / SARA-U**

- <audio_resource>=1 (MIDI player) is not supported.

**LISA-U1**

- <audio_resource>=2 (audio loop for test purposes) is not supported.

Objective Specification

**SARA-G**

- The command AT+USAR=0 stops the tone generated by the *+UPAR* or *+UTGN* AT commands.

**LEON-G**

- <audio_resource>=2 (audio loop for test purposes) is not supported.
- The command AT+USAR=0 stops the tone generated by the *+UPAR* or *+UTGN* AT commands.

# 22.5 Play audio file +UPLAYFILE

| +UPLAYFILE | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S | | | | | |
| | LISA-U120 LISA-U130 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | No | No | - | *+CME Error* |

## 22.5.1 Description

Play the specified audio file stored into the file system. The audio signal from the player is only routed to the downlink path. For more details about file system description see the *File System Introduction*.

After having issued the command and played the requested file, one of these URCs is provided:

- "+UPLAYFILE": the player reaches the end of the file and the player is stopped.
- "+UPLAYFILE STOPPED": the player is stopped before reaching the end of the file.

The player can be stopped before end of file by *AT+USTOPFILE* command or automatically in case of these events:

- Call dialup or hangup during file playing
- Call handover with a narrow band/wide band speech change during file playing

It is not possible to route the audio signal from the player to the uplink path; the signal is only routed to the downlink path.

## 22.5.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UPLAYFILE=<filename> | OK | AT+UPLAYFILE="file1.amr"<br>OK |
| Read | AT+UPLAYFILE? | +UPLAYFILE: <playstatus><br>OK | +UPLAYFILE: 0<br>OK |
| URC | | +UPLAYFILE | |
| URC | | +UPLAYFILE STOPPED | |

## 22.5.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <filename> | String | Specifies the audio resource file name to be played |
| <playstatus> | Number | Play status<br>• 0: no file is playing<br>• 1: the file is playing |
| <error> | Number | These error result codes will be provided if *+CMEE* is set to 2:<br>• "+CME ERROR: operation not supported": an incorrect number of parameters is provided or the parameter values are out of range<br>• "+CME ERROR: FILE NOT FOUND": the <filename> file is not present in the file system |

Objective Specification

### 22.5.4 Notes

**TOBY-L2**

- The *+CRSL* command selects the player volume; if *+CRSL* is set to 0 or *+CALM* is set to 1, the +UPLAYFILE command returns an error result code (+CME ERROR: operation not supported).
- Modules support the WAV audio format. The storage format of PCM audio files must be: 8/16 kHz sample rate, signed 16 bits, little endian, mono.
- Dual streaming (simultaneous playing of tones and audio files) is not supported: the tone generator should not be executed if the audio player is already active (*+UTGN*, *+UPAR*).
- The command provides an error result code ("+CME ERROR: operation not allowed" if *+CMEE=2*) if the <mode> parameter of *+UDMTFD* AT command differs from 0.

**LISA-U2 / SARA-U**

- The *+CRSL* command does not impact the volume of the audio file player. The player volume is affected by <Mix_afe> parameter and <Scal_Rec> (see the *+USGC* command).
- Modules support the PCM audio file. The storage format of PCM audio files must be: 8 kHz sample rate, signed 16 bits, little endian, mono.

**LISA-U1**

- If *+CRSL* is set to 0, the audio file player is muted, otherwise *+CRSL* does not change the volume of the audio file player. The player volume is changed by <Mix_afe> parameter, <Scal_Rec> and <Analog_gain> parameters (see the *+USGC* command).
- Modules support the PCM audio file. The storage format of PCM audio files must be: 8 kHz sample rate, signed 16 bits, little endian, mono.

**SARA-G**

- The *+CRSL* command selects the player volume; if *+CRSL* is set to 0 or *+CALM* is set to 1, the +UPLAYFILE command returns an error result code (+CME ERROR: operation not supported). The player volume is also changed by <Scal_Rec> and <Analog_gain> parameters (see the *+USGC* command).
- Modules support the AMR audio file. The storage format of AMR encoded audio content must be compliant to RFC3267 *[54]*.
- The URC (+UPLAYFILE STOPPED) is not supported.
- The command cannot be used during an eCall activity; in that case an error result code is provided ("+CME ERROR: operation not supported" if *+CMEE=2*).

**LEON-G**

- The *+CRSL* command selects the player volume; if *+CRSL* is set to 0 or *+CALM* is set to 1, the +UPLAYFILE command returns an error result code (+CME ERROR: operation not supported). The player volume is also changed by <Scal_Rec> and <Analog_gain> parameters (see the *+USGC* command).
- Modules support the AMR audio file. The storage format of AMR encoded audio content must be compliant to RFC3267 *[54]*.
- The URC (+UPLAYFILE STOPPED) is not supported.

## 22.6 Stop audio file +USTOPFILE

| +USTOPFILE | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S | | | | | |
| | LISA-U120 LISA-U130 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 22.6.1 Description

Stop the audio file reproduction.

Objective Specification

A URC is provided after the AT+USTOPFILE command correctly stopped the file.

The player is stopped and a URC (+UPLAYFILE STOPPED) is provided in the following cases:

- Call dialup or hangup during file playing
- Call handover with a narrow band/wide band speech change during file playing

### 22.6.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | AT+USTOPFILE | OK | AT+USTOPFILE<br>OK |
| URC | | +UPLAYFILE STOPPED | |

### 22.6.3 Notes

#### SARA-G340 / SARA-G350 / LEON-G

- The URC is not available.

## 22.7 Tone generator +UTGN

| +UTGN | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S<br>LISA-U120 LISA-U130 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U<br>SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 22.7.1 Description

Starts a tone on the module tone generator. The frequency, duration and volume of the tone must be set.

### 22.7.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UTGN=<freq>,<duration>,<volume>[,<UplinkSending>] | OK | AT+UTGN=1000,1000,100,1<br>OK |
| Test | AT+UTGN=? | +UTGN: (list of supported <freq>s),(list of supported <duration>s),(list of supported <volume>s)[,(list of supported <UplinkSending>s)]<br>OK | +UTGN: (300-3400),(50-1360),(1-100),(0-2)<br>OK |

### 22.7.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <freq> | Number | Frequency of the sinus waveform in Hz for the tone generator:<br>• TOBY-L2 - The range goes from 50 to 7000<br>• LISA-U / SARA-U / SARA-G / LEON-G - The range goes from 300 to 3400 |
| <duration> | Number | Duration of the tone in milliseconds:<br>• TOBY-L2 - The range of permitted values is from 20 to 8000 in steps of multiples of 20. If the parameter is set to a value that is not a multiple of 20, it will be rounded down to the nearest multiple-of-20 value. E.g., if the user sets the parameter to 115, the generated tone duration will be 100 ms.<br>• LISA-U2 / SARA-U - The range goes from 50 to 1360<br>• LISA-U1 - The range goes from 10 to 1360<br>• SARA-G / LEON-G - The range goes from 10 to 8000 |
| <volume> | Number | Volume for the tone generator:<br>• TOBY-L2 - The range goes from 1 to 37, where 1 means -36 dB, 37 means 0 dB. Increasing step is 1 dB (e.g.: 30 means -7 dB) |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • LISA-U / SARA-U / SARA-G / LEON-G - The range goes from 1 to 100; volume 1 means muted. Increasing step is 0.25 dB |
| <UplinkSending> | Number | Enables/disables the connection of the tone generator to uplink and/or downlink path:<br>• 0 (default value): the tone is sent only on downlink path<br>• 1: the tone is sent only on uplink path<br>• 2: the tone is sent both on downlink and uplink path |
| <error> | Number | The "+CME ERROR: operation not supported" error result code will be provided in these cases (if *+CMEE* is set to 2):<br>• An incorrect number of parameters is provided<br>• The parameter values are out of range |

### 22.7.4 Notes

- The tone playing can be stopped by means of the set command: AT+UTGN=0,0,0. If no tone is playing an error result code (+CME ERROR: operation not supported) is returned.
- If the "silent mode" is enabled (*+CALM=1*) the +UTGN command returns an error result code (+CME ERROR: operation not supported).
- The ringer on an incoming call, the alarm tones (*+CALA*) and service tones (e.g.: Call Waiting tone) have the priority on the tone generator (+UTGN). If they are not muted and must be played, the tone generator (+UTGN) is stopped. An incoming call ringer and service tones can be muted by *+CALM* command (see notes), alarm tones can be muted by <silent> parameter in *+CALA* command.

**TOBY-L2**

- The command AT+UTGN=0,0,0 stops the tone generated by the *+UPAR* or +UTGN AT commands.
- Dual streaming (simultaneous playing of tones and audio files) is not supported: the tone generator should not be executed if the audio player is already active (*+UPLAYFILE*)
- During a speech call the pre-defined tone is not mixed with speech; the speech is muted while the tone is playing.

**LISA-U / SARA-U**

- The SMS tones have the priority on the tone generator (+UTGN). If they must be played, the tone generator (+UTGN) is stopped. SMS tones can be muted by *+CALM*, *+UMSM* commands.

**SARA-G / LEON-G**

- The tone generator (+UTGN) has the priority on SMS tones. If tone generator is active, SMS tones are not played.
- The command AT+UTGN=0,0,0 stops the tone generated by the *+UPAR* or +UTGN AT commands.

## 22.8 Ringing tone selection +URNG

| +URNG | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U120 LISA-U130 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

### 22.8.1 Description

Allows the user to select one out of a set of predefined ringers.

### 22.8.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+URNG=<rng_id> | OK | AT+URNG=5<br>OK |
| Read | AT+URNG? | +URNG: <rng_id> | +URNG: 0 |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | OK | OK |
| Test | AT+URNG=? | +URNG: (list of supported <rng_id>s) | +URNG: (0-18) |
| | | OK | OK |

### 22.8.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <rng_id> | Number | Ringer identifier currently selected; the factory-programmed 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 error result code "+CME ERROR: operation not supported" will be provided |

### 22.8.4 Notes

**SARA-G340 / SARA-G350 / LEON-G**

- The test command is:
  +URNG:

  0 - <rng_name_1>

  1 - <rng_name_2>

  ...

  rng_max_num - <rng_name_n>

  OK
- If <rng_id> value is not allowed the error result code "+CME ERROR: Wrong ringer identifier" will be provided.

## 22.9 SMS alert sound mode (Message Sound Muting) +UMSM

| +UMSM | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S | | | | | |
| | LISA-U120 LISA-U130 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 22.9.1 Description

Mutes the signalling sound of SMS on the MT.

### 22.9.2 Syntax

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

### 22.9.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | • 0 (default value): normal mode (the signalling sound of SMS on the MT is not muted)<br>• 1: silent mode (the signalling sound of SMS on the MT is muted) |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| <error> | Number | If an incorrect number of parameters is provided or the parameter value is out of range the error result code "+CME ERROR: operation not supported" will be provided if *+CMEE* is set to 2. |

# 22.10 Master clock control +UMCLK

| +UMCLK | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S | | | | | |
| | LISA-U2 SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

## 22.10.1 Description

Enables or disables the master clock output signal. This is mainly designed to feed the master clock input of an external audio codec. For more details see the corresponding module system integration manual.

The available output pin configurations are:

- Disabled, set as tristate
- Pin output low
- Generate 13 MHz clock
- Generate 26 MHz clock

Depending on the <enabling_mode> parameter value, the configuration can be applied as soon as the command is invoked, or as soon as there is an audio activity (i.e. a digital audio interface is enabled).

## 22.10.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UMCLK=[<mclk_mode>[,<enabling_mode>]] | OK | AT+UMCLK=1,1<br>OK |
| Read | AT+UMCLK? | +UMCLK: <mclk_mode>,<enabling_mode><br>OK | +UMCLK: 1,1<br>OK |
| Test | AT+UMCLK=? | +UMCLK: (list of supported <mclk_mode>s),(list of supported <enabling_mode>s)<br>OK | +UMCLK: (0-3),(0-1)<br>OK |

## 22.10.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mclk_mode> | Number | CODEC_CLK pin setting<br>• 0 (default and factory-programmed value): disabled pin; 3-state with pull down resistor<br>• 1: pin output steady low<br>• 2: codec master clock at 13 MHz<br>• 3: codec master clock at 26 MHz |
| <enabling_mode> | Number | Specifies when the <mclk_mode> is enabled on CODEC_CLK pin<br>• 0 (default and factory-programmed value): "Audio dependent" mode<br><mclk_mode> is applied to the CODEC_CLK pin only when the audio path is active (audio samples are read on the I2S_RX line and written on the I2S_TX line). When the audio path is disabled (i.e. at call end), then the CODEC_CLK pin is disabled too (3-state with pull-down resistor)<br>• 1: "Continuous" mode<br><mclk_mode> is applied to the CODEC_CLK pin as soon as the AT command is invoked, even when the module is in idle and the audio path is disabled (no audio data written on I2S_TX line, no audio data read on I2S_RX line) |

Objective specification

| Parameter | Type | Description |
|---|---|---|
| | | When <mclk_mode> is 0 (pin disabled) and <enabling_mode> is 0 ("Audio dependent" mode), the CODEC_CLK pin is disabled both when audio path is enabled or disabled. In this case "Audio dependent" mode matches with "Continuous" mode (the command AT+UMCLK=0,0 and AT +UMCLK=0,1 are equivalent). |

### 22.10.4 Notes

- If <mclk_mode>= 1 ("Continuous" mode) the actual clock generation occurs within 10 ms of the command invocation.
- If the +UPSV AT command enables the power saving, the 13 or 26 MHz clock is turned off while the module enters the low power idle-mode, even if <mclk_mode> is "Continuous" mode. So, for <mclk_mode> = 2 or 3, the 13 or 26 MHz clock is continuously generated only if power saving is disabled (+UPSV=0 setting).
- Changes are saved in NVM, but they can be recovered by calling AT+UMCLK= (with no parameters).
- Setting of +UMCLK can be forced at boot by *+UEXTDCONF* setting.

**TOBY-L2**

- The master clock output signal is provided by GPIO6 pin if configured as "Master clock output" by *AT +UGPIOC* command.

**LISA-U2 / SARA-U2**

- The master clock output signal is provided by the CODEC_CLK pin.

## 22.11 External device configuration +UEXTDCONF

| +UEXTDCONF | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S<br>LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

### 22.11.1 Description

LISA-U200-01S / LISA-U200-02S / LISA-U200-52S / LISA-U200-62S / LISA-U200-82S / LISA-U230 / LISA-U260 / LISA-U270
To be used if and only if the $I^2C$ lines are biased high by external pull-ups providing proper circuit connection to an external audio codec.

Configures an external device, e.g. an audio codec, at the boot time.

The setting (on / off) for each supported device is saved in NVM and applied at each module power-on.

The configuration for each supported device is hard-coded in the firmware.

The only supported external device is the Maxim MAX9860 audio codec. See Maxim datasheet *[69]*.

### 22.11.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UEXTDCONF=<device_id>[, <configuration_enable>] | OK | AT+UEXTDCONF=0,0<br>OK |
| Read | AT+UEXTDCONF? | +UEXTDCONF: <device_1>, <configuration_enable1><br>...<br>+UEXTDCONF: <device_N>, <configuration_enableN><br>OK | +UEXTDCONF: 0,0<br>+UEXTDCONF: 1,0<br>+UEXTDCONF: 2,1<br>OK |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| Test | AT+UEXTDCONF=? | +UEXTDCONF: (list of supported <device_id>s),(list of supported <configuration_enable>s)<br>OK | +UEXTDCONF: (0),(0,1)<br>OK |

### 22.11.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <device_id> | Number | Device identifier. Allowed value:<br>• 0 (factory-programmed value): Maxim MAX9860 audio codec, connected via I²C.<br>When enabled, at every startup the module sets the external codec master clock at audio dependent 13 MHz (corresponding to the command AT+UMCLK=2,0) and configures the external codec via I²C, see *Notes* below.<br>Codec Maxim MAX9860 is available on EVK boards.<br>Setting +UEXTDCONF: 0,1 forces at every startup AT+UMCLK=2,0. Thus +UMCLK:2,0 setting is written in NVM. To undo / remove it, the AT+UMCLK=0 command must be explicitly invoked after every startup with +UEXTDCONF: 0,1. |
| <configuration_enable> | Number | Enables/disables the autoconfiguration of the specified external device:<br>• 0 (default and factory-programmed value): disabled<br>• 1: enabled |

### 22.11.4 Notes

#### TOBY-L2

- Module specific behavior for +UEXTDCONF: 0,1: Maxim MAX9860 audio codec is programmed dynamically via I²C commands every time audio path is enabled, according to gains stored in file *audio_gain_calibration.xml*. Settings can be edited by command *+UVGC*

#### LISA-U2 / SARA-U2

- Module specific behavior for +UEXTDCONF: 0,1: the following commands are issued at every startup

| Command | Meaning |
|---|---|
| AT+UI2CO=1,0,0,0x10,0 | Open the I²C logical channel (connected to the external codec) |
| AT+UI2CW="00000000101E3F2400000633004A0000008A",18 | Send, via I²C, the specified byte sequence (for external codec configuration)<br>LISA-U200-01S / LISA-U200-02S / LISA-U200-52S / LISA-U200-62S / LISA-U200-82S / LISA-U230 / LISA-U260 / LISA-U270<br>This command is issued: AT+UI2CW="000000001008F2024000010330025000000 8A",18 |
| AT+UI2CW="049E",2 | Send, via I²C, the specified byte sequence (for external codec configuration) |
| AT+UI2CC | Close the I²C logical channel |

## 22.12 Speech codec configuration +UDCONF=30

| +UDCONF=30 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S | | | | | |
| | LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G100-07S LEON-G100-08S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | *NVM* | No | - | *+CME Error* |

### 22.12.1 Description

Configures the allowed speech codec to be presented to the network during a voice call setup.

Objective specification

The supported codec list may vary for each product. The <supported_codec_bitmap> must be checked before making any change.

The new setting is saved in NVM and is immediately used.

u-blox cellular modules are certified according to all the capabilities and options stated in the Protocol Implementation Conformance Statement document (PICS) of the module. The PICS, according to 3GPP TS 51.010-2 [83], 3GPP TS 34.121-2 [84], 3GPP TS 36.521-2 [114] and 3GPP TS 36.523-2 [115], is a statement of the implemented and supported capabilities and options of a device. If the user changes the command settings during the certification process, the PICS of the application device integrating a u-blox cellular module must be changed accordingly.

## 22.12.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UDCONF=30,<codec_bitmap> | OK | AT+UDCONF=30,31<br>OK |
| Read | AT+UDCONF=30 | +UDCONF: 30,<active_codec_bitmap>,<supported_codec_bitmap><br>OK | AT+UDCONF=30<br>+UDCONF: 30,31,255<br>OK |

## 22.12.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <codec_bitmap> | Number | Bitmask representing the list of available speech codecs to be presented to the network during voice call setup.<br>GSM Full Rate must be always presented to the network, thus is always implicitly set.<br>See Table 58 for the meaning of each bit and codec availability. |
| <active_codec_bitmap> | Number | The currently active codecs, in the format described for <codec_bitmap> |
| <supported_codec_bitmap> | Number | The list of currently supported codecs, in the format described for <codec_bitmap> |

## 22.12.4 Notes

| Bit | Codec | LISA-U2 / SARA-U2 | SARA-U270-53S | LEON-G | SARA-G | TOBY-L2 |
|---|---|---|---|---|---|---|
| 0 | Full Rate Adaptive Multi-Rate | • | • | • | • | • |
| 1 | GSM Enhanced Full Rate (12.2 kb/s) | • | • | • | • | • |
| 2 | GSM Full Rate (13.0 kb/s) | • | • | • | • | • |
| 3 | Half Rate Adaptive Multi-Rate | • | • | • | • | • |
| 4 | GSM Half Rate (5.6 kb/s) | • | • | • | • | • |
| 5 | Full Rate Adaptive Multi-Rate WideBand | • | • | | | • |
| 6 | 8-PSK Half Rate Adaptive Multi-Rate | | | | | |
| 7 | 8-PSK Full Rate Adaptive Multi-Rate WideBand | | | | | |
| 8 | 8-PSK Half Rate Adaptive Multi-Rate WideBand | | | | | |
| 9 | UMTS Adaptive Multi-Rate | | • | | | • |
| 10 | UMTS Adaptive Multi-Rate 2 | • | • | | | • |
| 11 | UMTS Adaptive Multi-Rate WideBand | • | • | | | • |

**Table 58: Speech codec bit meaning and availability on modules**

**TOBY-L2**

- The allowed range of <codec_bitmap> is 1-3647 (equivalent to bits 000000000001-111000111111).
- The factory-programmed value of <active_codec_bitmap> is 3647.

**LISA-U / SARA-U**

- The allowed range of <codec_bitmap> is 1-3135 (equivalent to bits 000000000001-110000111111); bit 2 (GSM Full Rate) is always implicitly set to 1.

Objective Specification

- The factory-programmed value of <active_codec_bitmap> is 3135.

**LISA-U200-00S / LISA-U2x0-01S**

- The bit 2 (GSM Full Rate) in <codec_bitmap> can be set to 0.

**SARA-U270-53S**

- The factory-programmed value of <active_codec_bitmap> is 1567, i.e. UMTS Adaptive Multi-Rate 2 is not active.

**SARA-G340 / SARA-G350**

- The allowed range of <codec_bitmap> is 1-31 (equivalent to bits 00001-11111).
- The factory-programmed value of <active_codec_bitmap> is 31.

**LEON-G**

- The allowed range of <codec_bitmap> is 0-31 (equivalent to bits 00000-11111).
- The factory-programmed value of <active_codec_bitmap> is 31.

Objective Specification

# 23 Audio parameters tuning

## 23.1 Introduction

The audio driver switches the uplink and downlink audio paths. For example the uplink path can be switched from the handset microphone to the headset microphone and the downlink path can be switched from the handset earpiece to the loudspeaker (for more details see command *+USPM*).

Each 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 microphone gain that can be different for handset or headset microphone path.

For each audio path the configuration of the uplink and downlink audio paths parameters is possible by means of the following AT commands (where supported):

- *AT+UMGC*: Microphone Gain Control
- *AT+USGC*: Speaker Gain Control
- *AT+USTN*: SideToNe
- *AT+UUBF*: Uplink Biquad Filters
- *AT+UDBF*: Downlink Biquad Filters
- *AT+UHFP*: Hands-Free Parameters

Alternatively, the configuration of the uplink and downlink audio paths parameters is possible by means of the following AT command (where supported):

- *AT+UAPT*: Audio Parameter Tuning

Gains of external Maxim MAX9860 audio codec (connected via $I^2C$) can be controlled by means of the following AT commands (where supported):

- *AT+UVGC*: Volume Gain Control

Audio recording for test and tuning of audio profiles can be performed by means of this command (where supported):

- *AT+URECFILE*: Record audio file

The audio parameters configuration for all the audio paths can be stored in one of the two available user profiles in NVM by *AT&W* command or alternatively stored immediately by the AT command in the non volatile memory (check the "Settings Saved" attribute of each command to know the storing modality it uses).

The audio parameters in the user profiles in NVM are managed by commands *AT&W* (it saves in profile 0 or profile 1), *AT&F* (it resets to the factory profile), *AT&Y* (it selects user profile to be used after hardware reset), and *ATZ* (it reloads the user profile).

Setting of *+UAPT* and *+UVGC*, where supported, can also be stored in the in one of the two available user profiles in NVM and recovered.

*AT&V* command does not display the audio parameters settings. The audio parameters can be displayed by the corresponding read command, for example AT+UMGC?.

See the next subsections for an explanation of the audio path relations and position in the audio paths of parts affected by audio parameters.

Objective Specification

### 23.1.1 TOBY-L2

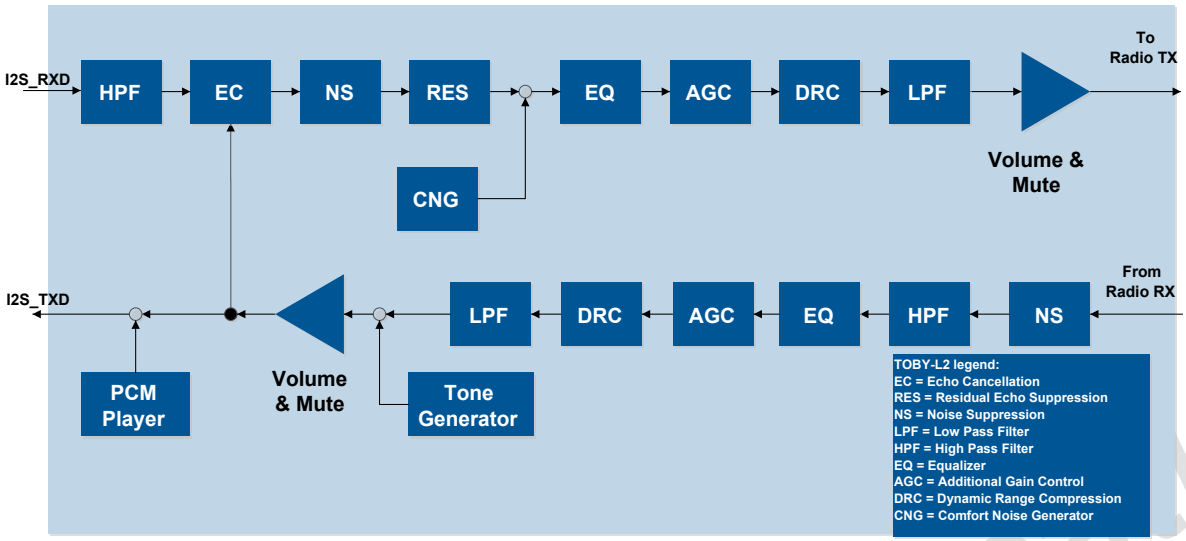



**Figure 11: TOBY-L2 series audio paths**

- The management and parameters tuning of audio paths can be configured by means of the following AT commands:
  - *+UAPT* (Audio Parameter Tuning): audio parameters management for all the signal processing blocks:
    - High Pass Filter (**HPF**)
    - Echo Cancellation (**EC**)
    - Noise Suppression (**NS**)
    - Residual Echo Suppression (**RES**)
    - Equalizer (**EQ**)
    - Additional Gain Control (**AGC**)
    - Dynamic Range Compression (**DRC**)
    - Low Pass Filter (**LPF**)
  - *+USPM* (Set Path Mode)
  - *+UVGC* (Volume Gain Control): gains of external Maxim MAX9860 audio codec (connected via $I^2C$ interface)
  - *+CLVL*(Loudspeaker Volume Level): sets the downlink **Volume & Mute**
- Sidetone must be generated by the external codec connected via $I^2C$ interface). For sidetone control on Maxim MAX9860 audio codec see *+UVGC* (Volume Gain Control).
- The audio parameters configuration for all the audio paths can be stored in the user profiles by *AT&W*. The audio parameters configuration can be restored to factory-programmed values by *AT&F*.
- The module supports the following speech codecs for GSM:
  - Full Rate speech codec (8 kHz sampling rate)
  - Enhanced Full Rate speech codec (8 kHz sampling rate)
  - Half Rate speech codec (8 kHz sampling rate)
  - NB-AMR speech codec (8 kHz sampling rate)
  - WB-AMR speech codec (16 kHz sampling rate)
- The module supports the following speech codecs for UMTS:
  - NB-AMR speech codec (8 kHz sampling rate)
  - WB-AMR speech codec (16 kHz sampling rate)

Objective Specification

- The tone generator generates the tones (see *+UTGN* command) and the pre-defined tones (see *+UPAR* command), the alarm tone (see *+CALA* command). The PCM player (see *+UPLAYFILE* command) is used by the ringer tones on an incoming call and SMS reception tone. See also *+CRSL* command and *+CALM* command.

### 23.1.2 SARA-U

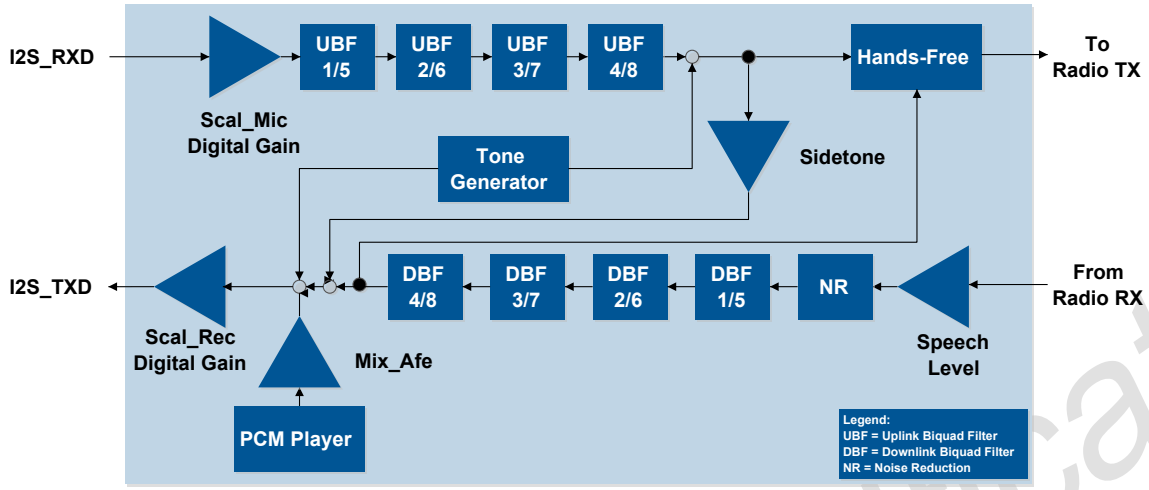



**Figure 12: SARA-U series audio paths**

- Allowed values for audio path tuning:
  - **<uplink_path_num>**
    - 0: uplink path 0 via I2S
    - 1: uplink path 1 via I2S
    - 2: uplink path 2 via I2S
    - 3: uplink path 3 via I2S
    - 4: uplink path 4 via I2S
  - **<downlink_path_num>**
    - 0: downlink path 0 via I2S
    - 1: downlink path 1 via I2S
    - 2: downlink path 2 via I2S
    - 3: downlink path 3 via I2S
    - 4: downlink path 4 via I2S
- For downlink path, biquad filters 1-4 are used with speech codec at 8 kHz sampling rate, filters 1-5 are used with speech codec at 16 kHz sampling rate.
- For uplink path, uplink biquad filters 5-8 are used if the $I^2S$ sampling rate is 16 kHz, uplink biquad filters 1-4 for all the others $I^2S$ sampling rates.
- The module supports the following speech codecs for GSM:
  - Full Rate speech codec (8 kHz sampling rate)
  - Enhanced Full Rate speech codec (8 kHz sampling rate)
  - Half Rate speech codec (8 kHz sampling rate)
  - NB-AMR speech codec (8 kHz sampling rate)
  - WB-AMR speech codec (16 kHz sampling rate)
- The module supports the following speech codecs for UMTS:
  - NB-AMR speech codec (8 kHz sampling rate)
  - WB-AMR speech codec (16 kHz sampling rate)
- The *+CLVL* command sets the downlink **Speech Level**

Objective Specification

- The *+UDBF* command sets the biquad filters (**DBF**) on the downlink path.
- A noise reduction (**NR**) block reduces the noise on the downlink speech.
- The <scal_rec> parameter in *+USGC* command controls the **Scal_Rec** digital gain.
- The <digital_gain> parameter in *+UMGC* command controls the **Scal_Mic** digital gain.
- The *+UUBF* command sets the biquad filters (**UBF**) on the uplink path.
- The *+UHFP* command controls the **Hands-Free** speech processing block.
- The *+USTN* command controls the **Sidetone**.
- The tone generator generates the tones (see *+UTGN* command), the pre-defined tones and MIDI melodies (see *+UPAR* command), the alarm tone (see *+CALA* command), the ringer tones on an incoming call, SMS reception tone and the service tones (e.g.: Call Waiting tone). They are affected by the <Scal_Rec> digital gain (see *+USGC* command). The PCM player (see *+UPLAYFILE* command) is affected by <Mix_afe> parameter (see *+USGC* command). See also *+CRSL* command and *+CALM* command.

### 23.1.3 LISA-U2

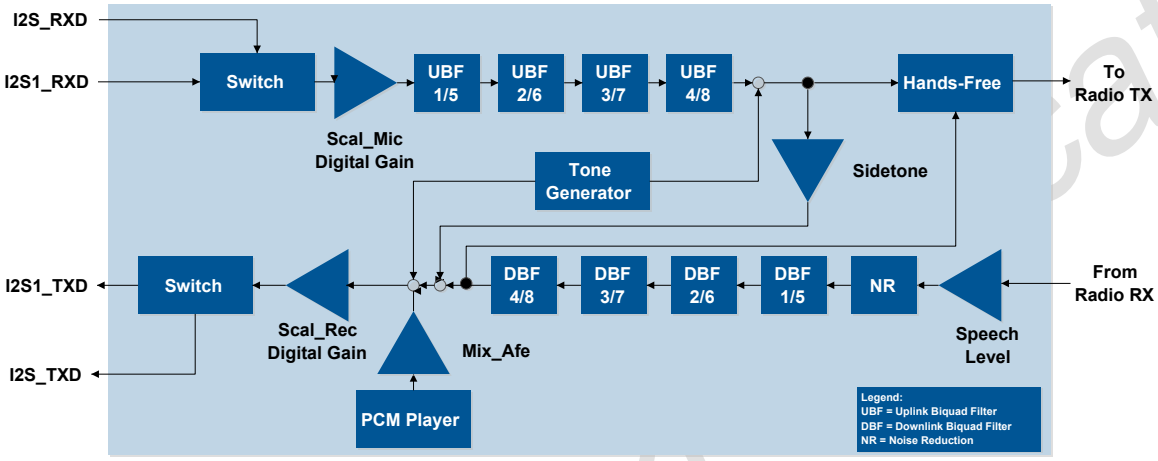



**Figure 13: LISA-U2 series audio paths**

- Allowed values for audio path tuning:
  - **<uplink_path_num>**
    - 0: uplink path 0 via I2S
    - 1: uplink path 1 via I2S
    - 2: uplink path 2 via I2S
    - 3: uplink path 3 via I2S
    - 4: uplink path 4 via I2S
    - 5: uplink path 5 via I2S1
    - 6: uplink path 6 via I2S1
    - 7: uplink path 7 via I2S1
    - 8: uplink path 8 via I2S1
    - 9: uplink path 9 via I2S1
  - **<downlink_path_num>**
    - 0: downlink path 0 via I2S
    - 1: downlink path 1 via I2S
    - 2: downlink path 2 via I2S
    - 3: downlink path 3 via I2S
    - 4: downlink path 4 via I2S
    - 5: downlink path 5 via I2S1

Objective Specification

  - 6: downlink path 6 via I2S1
  - 7: downlink path 7 via I2S1
  - 8: downlink path 8 via I2S1
  - 9: downlink path 9 via I2S1
- For downlink path, biquad filters 1-4 are used with speech codec at 8 kHz sampling rate, filters 1-5 are used with speech codec at 16 kHz sampling rate.
- For uplink path, uplink biquad filters 5-8 are used if the $I^2S$ sampling rate is 16 kHz, uplink biquad filters 1-4 for all the others $I^2S$ sampling rates.
- The module supports the following speech codecs for GSM:
  - Full Rate speech codec (8 kHz sampling rate)
  - Enhanced Full Rate speech codec (8 kHz sampling rate)
  - Half Rate speech codec (8 kHz sampling rate)
  - NB-AMR speech codec (8 kHz sampling rate)
  - WB-AMR speech codec (16 kHz sampling rate)
- The module supports the following speech codecs for UMTS:
  - NB-AMR speech codec (8 kHz sampling rate)
  - WB-AMR speech codec (16 kHz sampling rate)
- The *+CLVL* command sets the downlink **Speech Level**.
- The *+UDBF* command sets the biquad filters (**DBF**) on the downlink path.
- A noise reduction (**NR**) block reduces the noise on the downlink speech.
- The <scal_rec> parameter in *+USGC* command controls the **Scal_Rec** digital gain.
- The <digital_gain> parameter in *+UMGC* command controls the **Scal_Mic** digital gain.
- The *+UUBF* command sets the biquad filters (**UBF**) on the uplink path.
- The *+UHFP* command controls the **Hands-Free** speech processing block.
- The *+USTN* command controls the **Sidetone**.
- The tone generator generates the tones (see *+UTGN* command), the pre-defined tones and MIDI melodies (see *+UPAR* command), the alarm tone (see *+CALA* command), the ringer tones on an incoming call, SMS reception tone and the service tones (e.g.: Call Waiting tone). They are affected by the <Scal_Rec> digital gain (see *+USGC* command). The PCM player (see *+UPLAYFILE* command) is affected by <Mix_afe> parameter (see *+USGC* command). See also *+CRSL* command and *+CALM* command.

## 23.1.4 LISA-U120 / LISA-U130

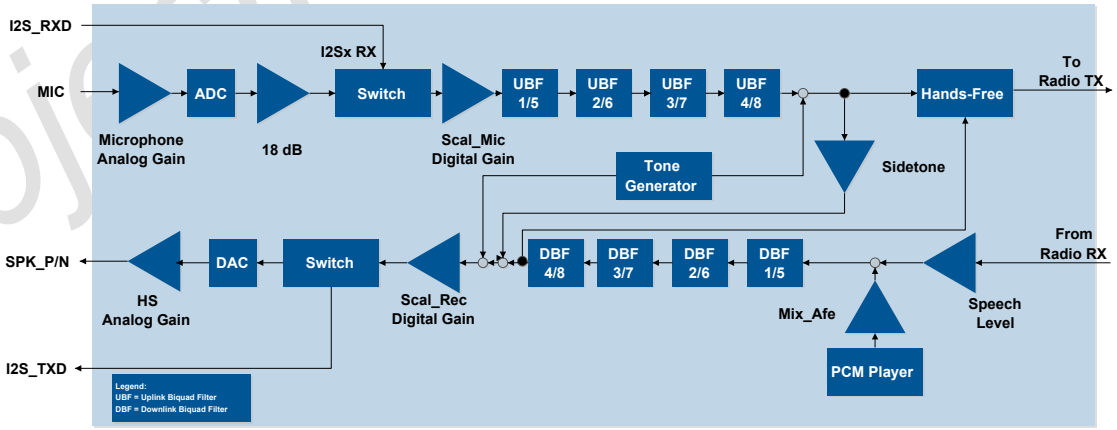



**Figure 14: LISA-U120 / LISA-U130 audio paths**

- Allowed values for audio path tuning:

Objective Specification

- **<uplink_path_num>**
  - 0: handset microphone (pins: MIC_P, MIC_N)
  - 1: headset microphone (pins: MIC_P, MIC_N)
  - 2: $I^2S$ input line (pin I2S_RXD)
  - 4: hands-free microphone (pins: MIC_P, MIC_N)
- **<downlink_path_num>**
  - 0: normal earpiece (pins: SPK_N, SPK_P)
  - 1: mono headset (pins: SPK_N, SPK_P)
  - 3: loudspeaker (pins: SPK_N, SPK_P)
  - 4: $I^2S$ output line (pin I2S_TXD)

- For both uplink and downlink paths, biquad filters 1-4 are used with speech codec at 8 kHz sampling rate, filters 1-5 are used with speech codec at 16 kHz sampling rate.
- The module supports the following speech codecs for GSM:
  - Full Rate speech codec (8 kHz sampling rate)
  - Enhanced Full Rate speech codec (8 kHz sampling rate)
  - Half Rate speech codec (8 kHz sampling rate)
  - NB-AMR speech codec (8 kHz sampling rate)
  - WB-AMR speech codec (16 kHz sampling rate)
- The module supports the following speech codecs for UMTS:
  - NB-AMR speech codec (8 kHz sampling rate)
  - WB-AMR speech codec (16 kHz sampling rate)
- The *+CLVL* command sets the downlink **Speech Level**
- The *+UDBF* command sets the biquad filters (**DBF**) on the downlink path.
- The *+USGC* command controls the **Scal_Rec** digital gain and the **HS** (headset) analog gain.
- The *+UMGC* command controls the **Scal_Mic** digital gain and the **Microphone** analog gain.
- The *+UUBF* command controls the biquad filters (**UBF**) on the uplink path.
- The *+UHFP* command controls the **Hands-Free** speech processing block.
- The *+USTN* command controls the **Sidetone**.

### 23.1.5 SARA-G340 / SARA-G350

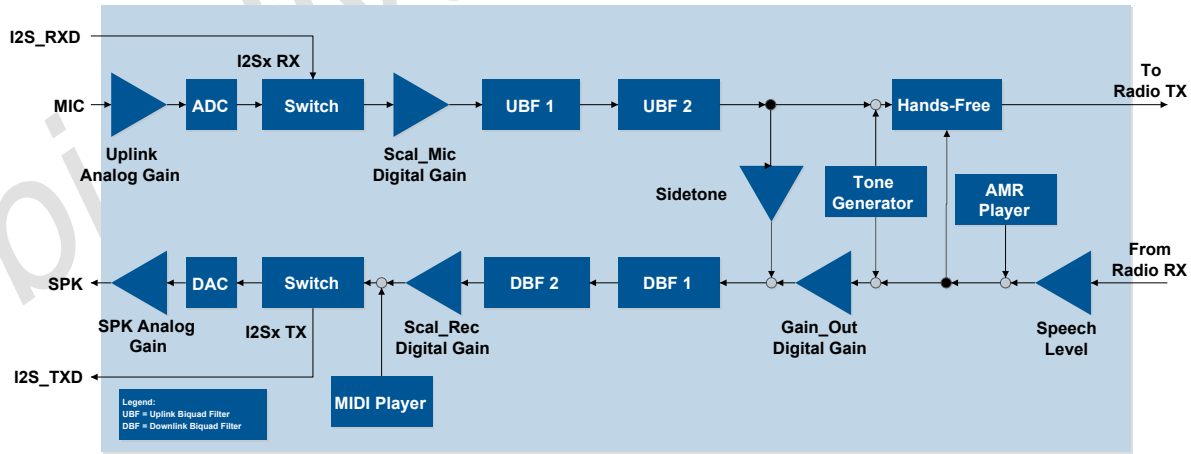



**Figure 15: SARA-G340 / SARA-G350 audio paths**

- Allowed values for audio path tuning:
  - **<uplink_path_num>**
    - 0: handset microphone (pins: MIC_P, MIC_N, MIC_BIAS, MIC_GND)

Objective Specification

  - 1: headset microphone (pins: MIC_P, MIC_N, MIC_BIAS, MIC_GND)
  - 2: $I^2S$ input line (pin I2S_RXD)
  - 4: hands-free microphone (pins: MIC_P, MIC_N, MIC_BIAS, MIC_GND)
- **<downlink_path_num>**
  - 0: normal earpiece (pins: SPK_N, SPK_P)
  - 1: mono headset (pins: SPK_N, SPK_P)
  - 3: loudspeaker (pins: SPK_N, SPK_P)
  - 4: $I^2S$ output line (pin I2S_TXD)

- The module supports the following speech codecs for GSM:
  - Full Rate speech codec (8 kHz sampling rate)
  - Enhanced Full Rate speech codec (8 kHz sampling rate)
  - Half Rate speech codec (8 kHz sampling rate)
  - NB-AMR speech codec (8 kHz sampling rate)
  - All these codecs are based on a 8 kHz sampling rate, thus all the biquad filters work at 8 kHz sampling rate.
- The *+CLVL* command sets the downlink **Speech Level**
- The *+UDBF* command sets the biquad filters (**DBF**) on the downlink path.
- The *+USGC* command controls the **Scal_Rec** and **Gain_out** digital gains and the **SPK** analog gain.
- The *+UMGC* command controls the **Scal_Mic** digital gain and the **Uplink** analog gain.
- The *+UUBF* command controls the biquad filters (**UBF**) on the uplink path.
- The *+UHFP* command controls the **Hands-Free** speech processing block.
- The *+USTN* command controls the **Sidetone**.
- The tone generator generate the tones (see the *+UTGN* command), the pre-defined tones (see the *+UPAR* command), the alarm tone (see the *+CALA* command), the SMS reception tone and service tones (e.g.: Call Waiting tone). They are affected by <Gain_out>, <Scal_Rec> and <Analog_gain> parameters (see the *+USGC* command). The MIDI melodies (see the *+UPAR* command) and ringer tones on an incoming call are generated by the MIDI player and their volume is affected by <Mix_afe> parameter (see the *+USGC* command). The AMR player (see the *+UPLAYFILE* command) is affected by <Gain_out>, <Scal_Rec> and <Analog_gain> parameters (see the *+USGC* command). See also *+CRSL* command and *+CALM* command.

### 23.1.6 LEON-G

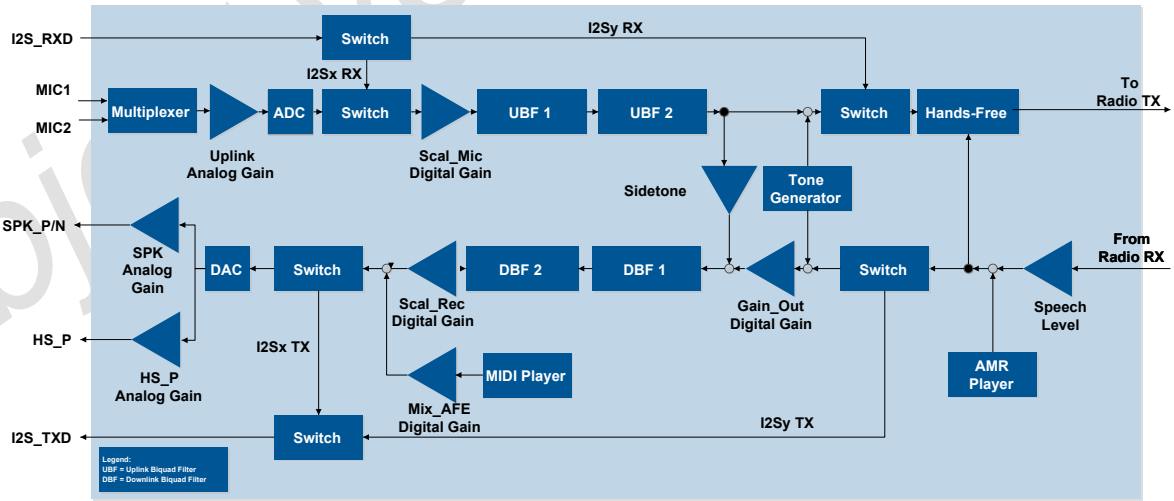



**Figure 16: LEON-G series audio paths**

- Allowed values for audio path tuning:
  - **<uplink_path_num>**

Objective Specification

  - 0: handset microphone (pins: MIC_BIAS1, MIC_GND1)
  - 1: headset microphone (pins: MIC_BIAS2, MIC_GND2)
  - 2: $I^2S$ input line (pin I2S_RXD)
- **<downlink_path_num>**
  - 0: normal earpiece (pins: HS_P, GND)
  - 1: mono headset (pins: HS_P, GND)
  - 3: loudspeaker (pins: SPK_P, SPK_N)
  - 4: $I^2S$ output line (pin I2S_TXD)

- The module supports the following speech codecs for GSM:
  - Full Rate speech codec (8 kHz sampling rate)
  - Enhanced Full Rate speech codec (8 kHz sampling rate)
  - Half Rate speech codec (8 kHz sampling rate)
  - NB-AMR speech codec (8 kHz sampling rate)
  - All these codecs are based on a 8 kHz sampling rate, thus all the biquad filters work at 8 kHz sampling rate.
- The *+CLVL* command sets the downlink **Speech Level**
- The *+UDBF* command sets the biquad filters (**DBF**) on the downlink path.
- The *+USGC* command controls **Scal_Rec** and **Gain_out** digital gains, the **HS_P** (Headset) and the **SPK** (speaker) analog gains.
- The *+UMGC* command controls the **Scal_Mic** digital gain and the **Uplink** analog gain.
- The *+UUBF* command controls the biquad filters (**UBF**) on the uplink path.
- The *+UHFP* command controls the **Hands-Free** speech processing block.
- The *+USTN* command controls the **Sidetone**.
- The tone generator generate the tones (see the *+UTGN* command), the pre-defined tones (see the *+UPAR* command), the alarm tone (see the *+CALA* command), the SMS reception tone and service tones (e.g.: Call Waiting tone). They are affected by <Gain_out>, <Scal_Rec> and <Analog_gain> parameters (see the *+USGC* command). The MIDI melodies (see the *+UPAR* command) and ringer tones on an incoming call are generated by the MIDI player and their volume is affected by <Mix_afe> parameter (see the *+USGC* command). The AMR player (see the *+UPLAYFILE* command) is affected by <Gain_out>, <Scal_Rec> and <Analog_gain> parameters (see the *+USGC* command). See also *+CRSL* command and *+CALM* command.

### 23.1.7 Notes

The tone generator can be routed toward downlink and/or uplink path by <UplinkSending> parameter of *+UTGN* command.

The audio parameters in the factory-programmed profile are stored in static NVM and the user cannot change them.

LISA-U / SARA-U / SARA-G340 / SARA-G350

- Some parameters present on LEON-G series are not available but they are still maintained in the command for backward compatibility. In this case the 'NA' string appears in the information text response to the test command; the NA parameter is not stored in the NVM.
  E.g.:
  AT+USGC?
  +USGC:
  Path 0:
  NA,0,8192,16384,NA
- The range of some parameters is extended respect to LEON-G series:
  E.g: <filter_number> in +UUBF, +UDBF commands.
- Some commands support new parameters. In this case these parameters are optional, for backward compatibility.
  E.g.:

Objective Specification

<ec_nr_coeff_real> in +UHFP command.

The speech level is active on call only (no effect on PCM player if not in call).

# 23.2 Microphone gain (Microphone Gain Control) +UMGC

| +UMGC | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U120 LISA-U130 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | *Profile* | No | - | *+CME Error* |

## 23.2.1 Description

Configures the uplink path gain.

See *Chapter 23.1* for the position of amplifiers in the audio path.

Not all the paths are supported. Check the allowed <uplink_path_num> values in the test command response.

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 parameters could need to be changed to better fit new gain on uplink or downlink path. See the *+UHFP* command description.

## 23.2.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UMGC=<uplink_path_num>,<analog_gain>,<digital_gain> | OK | AT+UMGC=1,12,16000<br>OK |
| Read | AT+UMGC? | +UMGC:<br>Path <uplink_path_num>:<br><analog_gain>,<digital_gain><br>[...]<br>(for all the supported paths)<br>OK | +UMGC:<br>Path 0:<br>10,9384<br>Path 1:<br>12,8192<br>Path 2:<br>6,8192<br>OK |
| Test | AT+UMGC=? | +UMGC: (list of supported <uplink_path_num>s),(list of supported <analog_gain>s),(list of supported <digital_gain>s)<br>OK | +UMGC: (0-9),(0-14),(0-32767)<br>OK |

## 23.2.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <uplink_path_num> | Number | Specifies the uplink path where the gains must be configured.<br>For uplink paths range and physical meaning, see the product specific section in the *Chapter 23.1*:<br>• LEON-G series - *Chapter 23.1.6*<br>• SARA-G340 / SARA-G350 - *Chapter 23.1.5*<br>• LISA-U120 / LISA-U130 - *Chapter 23.1.4*<br>• LISA-U2 series - *Chapter 23.1.3*<br>• SARA-U series - *Chapter 23.1.2* |
| <analog_gain> | Number | Gain for analog audio front end amplifier |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • Range: 0 - 14 (0=0 dB; 14=42 dB; 3 dB/step)<br>LISA-U2 / SARA-U<br>The parameter is not available: 'NA' is provided in the test command. |
| <digital_gain> | Number | Gain for Scal_mic digital amplifier<br>• Range: 0 - 32767 (8192=0 dB; 32767=12 dB; linear) |

### 23.2.4 Notes

**LISA-U2 / SARA-U**

- <analog_gain> is unused and not mandatory. If not omitted, a value belonging to the range must be provided in the set command. 'NA' is provided in the information text response to the read command.
- The factory-programmed values for all the paths are set to NA (<analog_gain> parameter) and 8192 (<digital_gain>).

**LISA-U120 / LISA-U130**

- The factory-programmed values are set as follows:
  - Path 0: <analog_gain>=12 and <digital_gain>=8192.
  - Path 1: <analog_gain>=12 and <digital_gain>=8192.
  - Path 2: <analog_gain>=6 and <digital_gain>=8192.
  - Path 4: <analog_gain>=13 and <digital_gain>=8192.

**SARA-G340 / SARA-G350**

- The factory-programmed values are set as follows:
  - Path 0: <analog_gain>=10 and <digital_gain>=8192.
  - Path 1: <analog_gain>=10 and <digital_gain>=8192.
  - Path 2: <analog_gain>=6 and <digital_gain>=8192.
  - Path 4: <analog_gain>=10 and <digital_gain>=8192.

**LEON-G**

- <uplink_path_num>=4 is not supported.
- The factory-programmed values are set as follows:
  - Path 0: <analog_gain>=10 and <digital_gain>=9384.
  - Path 1: <analog_gain>=12 and <digital_gain>=8192.
  - Path 2: <analog_gain>=6 and <digital_gain>=8192.

## 23.3 Speaker Gain (Speaker Gain Control) +USGC

| +USGC | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U120 LISA-U130 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | *Profile* | No | - | *+CME Error* |

### 23.3.1 Description

Configures the audio downlink path gain.

See *Chapter 23.1* for the position of amplifiers in the audio path.

Not all the paths are supported, see *+USPM* command description for the supported paths.

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 parameters could need to be changed to better fit new gain on uplink or downlink path. See the *+UHFP* command description).

Objective Specification

### 23.3.2 Syntax

| 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<br>OK |
| Read | AT+USGC? | +USGC:<br>Path<downlink_path_num>:<br><SPK_analog_gain>,<HS_analog_gain>,<scal_rec>, <Mix_afe>,<Gain_Out><br>[...]<br>(for all the supported path)<br>OK | +USGC:<br>Path 0:<br>6,6,16000,16000,22000<br>Path 1:<br>6,0,8192,16384,10240<br>Path 3:<br>0,6,8192,16384,8191<br>Path 4:<br>6,6,8192,16384,8191<br>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)<br>OK | +USGC: (0-9),(0-6),(0-6),(0-32767),(0-32767),(0-32767)<br>OK |

### 23.3.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <downlinkpath_num> | Number | Specifies the downlink path where the gains must be configured.<br>For downlink paths range and physical meaning, see the product specific section in the *Chapter 23.1*:<br>• LEON-G series - *Chapter 23.1.6*<br>• SARA-G340 / SARA-G350 - *Chapter 23.1.5*<br>• LISA-U120 / LISA-U130 - *Chapter 23.1.4*<br>• LISA-U2 series - *Chapter 23.1.3*<br>• SARA-U series - *Chapter 23.1.2* |
| <SPK_analog_gain> | Number | Gain of analog audio amplifier for SPK_P/SPK_N outputs<br>• LEON-G series - the range goes from 0 to 6 (-3 dB/step; 0=+9 dB to 6=-9 dB)<br>• SARA-G340 / SARA-G350 - the range goes from 0 to 5 (-3 dB/step; 0=+9 dB to 5=-6 dB) |
| <HS_analog_gain> | Number | Gain of analog audio amplifier for SPK_P/SPK_N outputs<br>• LISA-U120 / LISA-U130 / LEON-G series - the range goes from 0 to 6 (-3 db/step; 0=0 dB to 6= -18 dB) |
| <scal_rec> | Number | Gain of the Scal_rec digital amplifier (speech and tone generator)<br>• Range: 0 - 32767 (8192=0 dB; 32767=12 dB; linear) |
| <Mix_afe> | Number | Gains of the Mix_afe digital amplifier (synthesizers)<br>• Range: 0 - 32767 (16384=0 dB; 32767=6 dB; linear) |
| <Gain_out> | Number | Gain of the Gain_Out digital amplifier (speech)<br>• Range: 0 - 32767 (8192=0 dB; 32767=12 dB; linear) |

### 23.3.4 Notes

#### LISA-U1

- <SPK_analog_gain> and <Gain_out> are unused and not mandatory. 'NA' is provided in the test command.
- The factory-programmed values are set as follows:
  - <SPK_analog_gain> not available for all the paths.

Objective Specification

- <HS_analog_gain>= 0 for the path 0, <HS_analog_gain>= 1 for the path 1, <HS_analog_gain>= 0 for the path 3, <HS_analog_gain>= 3 for the path 4.
- <scal_rec>= 8192 for all the paths.
- <Mix_afe>= 16384 for all the paths.
- <Gain_out> not available for all the paths.

**LISA-U2 / SARA-U**

- <SPK_analog_gain>, <HS_analog_gain> and <Gain_out> are unused and not mandatory. If not omitted, a value belonging to the range must be provided in the set command. 'NA' is provided in the information text response to the read command.
- The factory-programmed values are set as follows:
  - <SPK_analog_gain> not available for all the paths.
  - <HS_analog_gain> not available for all the paths.
  - <scal_rec>= 8192 for all the paths.
  - <Mix_afe>= 16384 for all the paths.
  - <Gain_out> not available for all the paths.

**SARA-G340 / SARA-G350**

- <HS_analog_gain> and <Mix_afe> are unused and not mandatory. 'NA' is provided in the test command.
- The factory-programmed values are set as follows:
  - <SPK_analog_gain>=3 for path 0, 1, 3 and <SPK_analog_gain>=5 for path 4.
  - <HS_analog_gain>=3 for path 0, 1, 3 and <SPK_analog_gain>=0 for path 4.
  - <scal_rec>= 8192 for all the paths.
  - <Mix_afe>= 16384 for all the paths.
  - <Gain_out>= 8192 for all the paths.

**LEON-G**

- The factory-programmed values are set as follows:
  - <SPK_analog_gain>=6 for path 0, 1, 4 and <SPK_analog_gain>=0 for path 3.
  - <HS_analog_gain>=1 for path 0, <HS_analog_gain>=0 for path 1, <HS_analog_gain>=6 for path 3 and 4.
  - <scal_rec>= 8192 for all the paths.
  - <Mix_afe>= 16384 for all the paths.
  - <Gain_out>= 8192 for path 0, <Gain_out>= 10240 for path 1, <Gain_out>= 8191 for path 3 and 4.

# 23.4 Sidetone configuration +USTN

| +USTN | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U120 LISA-U130 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *Profile* | No | - | *+CME Error* |

## 23.4.1 Description

Configure the sidetone gain for a specific downlink path. The 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.

Not all the paths are supported, see *Chapter 22.1* for the supported paths.

See *Chapter 23.1* for the position of sidetone gain in the audio path.

Objective Specification

### 23.4.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+USTN=<downlink_path_num>,<sidetone_gain> | OK | AT+USTN=1,1000<br>OK |
| Read | AT+USTN? | +USTN:<br>Path<downlink_path_num>:<br><sidetone_gain><br>[...] (all the supported paths)<br>OK | +USTN:<br>Path 0:<br>2249<br>Path 1:<br>2249<br>.....<br>OK |
| Test | AT+USTN=? | +USTN: (list of supported <downlink_path_num>s),(list of supported <sidetone_gain>s)<br>OK | +USTN: (0-9),(0-32767)<br>OK |

### 23.4.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <downlink_path_num> | Number | Specifies the downlink path where the sidetone must be configured.<br>For downlink paths range and physical meaning, see the product specific section in the *Chapter 23.1*:<br>• LEON-G series - *Chapter 23.1.6*.<br>• SARA-G340 / SARA-G350 - *Chapter 23.1.5*<br>• LISA-U120 / LISA-U130 - *Chapter 23.1.4*<br>• LISA-U2 series - *Chapter 23.1.3*<br>• SARA-U series - *Chapter 23.1.2* |
| <sidetone_gain> | Number | Gain for sidetone digital amplifier<br>• Range: 0 - 32767: (16384=0 dB; 32767=6 dB; linear) |

## 23.5 Uplink Digital Filters (Uplink Biquad Filters) +UUBF

| +UUBF | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U120 LISA-U130 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | *Profile* | No | - | *+CME Error* |

### 23.5.1 Description

Sets the digital audio filters parameters for a specific uplink path.

See *Chapter 23.1* for the position of the filters in the audio path.

Not all the paths are supported, see *+USPM* command description for the supported paths.

### 23.5.2 Syntax

| 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<br>OK |
| Read | AT+UUBF? | +UUBF:<br>Path =<uplinkpath_num>: | +UUBF:<br>Path 0: |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | Filter1: a1:<a1>, b1:<b1>, a2:<a2>, b2:<b2>, a0:<a0><br>Filter2: a1:<a1>, b1:<b1>, a2:<a2>, b2:<b2>, a0:<a0><br>Filter3: a1:<a1>, b1:<b1>, a2:<a2>, b2:<b2>, a0:<a0><br>Filter4: a1:<a1>, b1:<b1>, a2:<a2>, b2:<b2>, a0:<a0><br>[...]<br>(for all the supported paths)<br>OK | Filter1: a1:0, b1:0, a2:0, b2:0, a0:32767<br>Filter2: a1:0, b1:0, a2:0, b2:0, a0:32767<br>Filter3: a1:0, b1:0, a2:0, b2:0, a0:32767<br>Filter4: a1:0, b1:0, a2:0, b2:0, a0:32767<br>Filter5: a1:0, b1:0, a2:0, b2:0, a0:32767<br>Filter6: a1:0, b1:0, a2:0, b2:0, a0:32767<br>Filter7: a1:0, b1:0, a2:0, b2:0, a0:32767<br>Filter8: a1:0, b1:0, a2:0, b2:0, a0:32767<br>[repeated for each path]<br>OK |
| 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)<br>OK | +UUBF: (0-9),(1-8),(-32768:32767),(-32768:32767),(-32768:32767),(-32768:32767),(-32768:32767)<br>OK |

## 23.5.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <uplink_path_num> | Number | Specifies the uplink path where the digital filters must be configured.<br>For uplink paths range and physical meaning, see the product specific section in the *Chapter 23.1*:<br>• LEON-G series - *Chapter 23.1.6*<br>• SARA-G340 / SARA-G350 - *Chapter 23.1.5*<br>• LISA-U120 / LISA-U130 - *Chapter 23.1.4*<br>• LISA-U2 series - *Chapter 23.1.3*<br>• SARA-U series - *Chapter 23.1.2* |
| <filter_number> | Number | • LEON-G series - Two digital biquad filters in cascade are available for each uplink path (Filter1, Filter2). See *Chapter 23.1.6* for the filter position. The range goes from 1 to 2<br>• SARA-G340 / SARA-G350 - Two digital biquad filters in cascade are available for each uplink path (Filter1, Filter2). See *Chapter 23.1.5* for the filter position. The range goes from 1 to 2.<br>• LISA-U1 series - Four digital biquad filters in cascade are available for each uplink path. See *Chapter 23.1.4* for the filter position. Filters 1-4 are used for Narrow Band speech (8 kHz sampling rate i.e. with HR, FR, EFR, NB-AMR codec). Filters 1-5 are used for Wide Band speech (16 kHz sampling rate i.e. with WB-AMR). The range goes from 1 to 8.<br>• LISA-U2 series - Four digital biquad filters in cascade are available for each uplink path. See *Chapter 23.1.3* for the filter position on LISA-U2. Filters 5-8 are used if the $I^2S$ sampling rate is 16 kHz. Filters 1-4 are used if the $I^2S$ sampling rate is other than 16 kHz.<br>• SARA-U series - Four digital biquad filters in cascade are available for each uplink path. See *Chapter 23.1.2* for the filter position on SARA-U. Filters 5-8 are used if the $I^2S$ sampling rate is 16 kHz. Filters 1-4 are used if the $I^2S$ sampling rate is other than 16 kHz. |
| <a1>,<b1>,<a2>,<b2>, <a0> | Number | Biquad filter coefficients. The range goes from -32768 to 32767.<br>The factory-programmed value for a1, b1, a2 and b2 is 0 and for a0 is 32767. |

## 23.5.4 Notes

The biquad filter transfer function is

$$H(z) = \frac{A_0 + 2A_1 z^{-1} + A_2 z^{-2}}{1 + 2B_1 z^{-1} + B_2 z^{-2}}$$

Objective Specification

with coefficients $A_0$, $A_1$, $A_2$, $B_1$, $B_2$ in the range -1:1

The command parameters are filter coefficients 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 * $A_0$

For the computation of the coefficients, consider the corresponding sampling rate for each product (according to speech codec in use, as explained in *Chapter 23.1*).

**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

**LISA-U2 / SARA-U**

- 16 kHz sampling rate for <filter_number>= (5-8). These filters are used if the $I^2S$ sampling rate is 16 kHz.
- Same sampling rate of $I^2S$ in use, for <filter_number>= (1-4). These filters are used if the $I^2S$ sampling rate is other than 16 kHz.

**LISA-U120 / LISA-U130**

- 8 kHz sampling rate for <filter_number>= (1-4). These filters are used when speech codec is HR, FR, EFR or NB-AMR (speech sampling rate is 8 kHz), thus filters are 'Narrow Band' (0 - 4 kHz).
- 16 kHz sampling rate for <filter_number>= (5-8). These filters are used when speech codec is WB-AMR (speech sampling rate is 16 kHz), thus filters are 'Wide Band' (0 - 8 kHz).

**SARA-G340 / SARA-G350 / LEON-G**

- 8 kHz sampling rate. Filters are 'Narrow Band' (0 - 4 kHz)

**LEON-G**

- <uplink_path_num>=4 is not supported.
- The factory-programmed values are as follows:
  - 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

Objective Specification

# 23.6 Downlink Digital Filters (Downlink Biquad Filters) +UDBF

| +UDBF | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U120 LISA-U130 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *Profile* | No | - | *+CME Error* |

## 23.6.1 Description

Configures the digital audio filters parameters for a specific downlink path.

See *Chapter 23.1* for the position of the filters in the audio path.

Not all paths are supported, see *+USPM* command description for the supported paths.

## 23.6.2 Syntax

| 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<br>OK |
| Read | AT+UDBF? | +UDBF:<br>Path =<downlinkpath_num>:<br>Filter1: a1:<a1>, b1:<b1>, a2:<a2>, b2:<b2>, a0:<a0><br>Filter2: a1:<a1>, b1:<b1>, a2:<a2>, b2:<b2>, a0:<a0><br>Filter3: a1:<a1>, b1:<b1>, a2:<a2>, b2:<b2>, a0:<a0><br>Filter4: a1:<a1>, b1:<b1>, a2:<a2>, b2:<b2>, a0:<a0><br>[...] (for all the supported paths)<br>OK | +UDBF:<br>Path 0:<br>Filter1: a1:0, b1:0, a2:0, b2:0, a0:32767<br>Filter2: a1:0, b1:0, a2:0, b2:0, a0:32767<br>Filter3: a1:0, b1:0, a2:0, b2:0, a0:32767<br>Filter4: a1:0, b1:0, a2:0, b2:0, a0:32767<br>Filter5: a1:0, b1:0, a2:0, b2:0, a0:32767<br>Filter6: a1:0, b1:0, a2:0, b2:0, a0:32767<br>Filter7: a1:0, b1:0, a2:0, b2:0, a0:32767<br>Filter8: a1:0, b1:0, a2:0, b2:0, a0:32767<br>[repeated for each path]<br>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)<br>OK | +UDBF: (0-9),(1-8),(-32768:32767),(-32768:32767),(-32768:32767),(-32768:32767),(-32768:32767)<br>OK |

## 23.6.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <downlinkpath_num> | Number | Specifies the downlink path where the digital filters must be configured.<br>For downlink paths range and phisical meaning, see the product specific section in the *Chapter 23.1*:<br>• LEON-G series - *Chapter 23.1.6*<br>• SARA-G340 / SARA-G350 - *Chapter 23.1.5*<br>• LISA-U120 / LISA-U130 - *Chapter 23.1.4*<br>• LISA-U2 series - *Chapter 23.1.3*<br>• SARA-U series - *Chapter 23.1.2* |
| <filter_number> | Number | • LEON-G series - two digital biquad filters in cascade are available for each uplink path (Filter1, Filter2). See the *Chapter 23.1.6* for the filter position. The range goes from 1 to 2. |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • SARA-G340 / SARA-G350 series - two digital biquad filters in cascade are available for each uplink path (Filter1, Filter2). See the *Chapter 23.1.5* for the filter position. The range goes from 1 to 2.<br>• LISA-U1 series - four digital biquad filters in cascade are available for each downlink path. See the *Chapter 23.1.4* for the filter position. Filters 1-4 are used for Narrow Band speech (8 kHz sampling rate i.e. with HR, FR, EFR, NB-AMR codec). Filters 1-5 are used for Wide Band speech (16 kHz sampling rate i.e. with WB-AMR). The range goes from 1 to 8.<br>• LISA-U2 series - four digital biquad filters in cascade are available for each downlink path. See the *Chapter 23.1.3* for the filter position on LISA-U2. Filters 1-4 are used for Narrow Band speech (8 kHz sampling rate i.e. with HR, FR, EFR, NB-AMR codec). Filters 1-5 are used for Wide Band speech (16 kHz sampling rate i.e. with WB-AMR). The range goes from 1 to 8.<br>• SARA-U series - four digital biquad filters in cascade are available for each downlink path. See the *Chapter 23.1.2* for the filter position on SARA-U. Filters 1-4 are used for Narrow Band speech (8 kHz sampling rate i.e. with HR, FR, EFR, NB-AMR codec). Filters 1-5 are used for Wide Band speech (16 kHz sampling rate i.e. with WB-AMR). The range goes from 1 to 8. |
| <a1>,<b1>,<a2>,<b2>, <a0> | Number | Biquad filter coefficient. The range goes from -32768 to 32767.<br>The factory-programmed value for a1, b1, a2 and b2 is 0 and for a0 is 32767. |

## 23.6.4 Notes

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 coefficients 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 * $A_0$

For the computation of the coefficients, consider the following sampling rate for each product (according to speech codec in use, as explained in *Chapter 23.1*).

**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

**LISA-U / SARA-U**

- 8 kHz sampling rate for <filter_number>= (1-4). These filters are used when speech codec is HR, FR, EFR or NB-AMR (speech sampling rate is 8 kHz), thus filters are 'Narrow Band' (0 - 4 kHz).
- 16 kHz sampling rate for <filter_number>= (5-8). These filters are used when speech codec is WB-AMR (speech sampling rate is 26 kHz), thus filters are 'Wide Band' (0 - 8 kHz).

Objective Specification

**SARA-G340 / SARA-G350**

- 8 kHz sampling rate. Filters are 'Narrow Band'(0 - 4 kHz)

**LEON-G**

- 8 kHz sampling rate. Filters are 'Narrow Band'(0 - 4 kHz)
- The factory-programmed values are as follows:
  - 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

# 23.7 Hands-Free Parameters (Hands-Free Parameters) +UHFP

| +UHFP | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U120 LISA-U130 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | *Profile* | No | - | *+CME Error* |

## 23.7.1 Description

Sets the parameters that control the hands-free audio application for a specific uplink path. The hands-free application consists of:

- Echo Canceller (EC)
- Automatic Gain Control (AGC)
- Noise Reduction (NR)

The corresponding module audio application note describes in detail the HF algorithm tuning.

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 / EC algorithm could change and parameters could need to be changed to better fit new gain on uplink or downlink path

The command syntax differs between different module series. In *Chapter 23.7.2* and *Chapter 23.7.4* the different descriptions are provided.

## 23.7.2 Command syntax for LEON-G 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<br>OK |
| Read | AT+UHFP? | +UHFP: | +UHFP: |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | 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>,<br>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><br>[...]<br>(for all the supported paths)<br>OK | Path 0:<br>HF_algorithm_init:0x01fd, HF_Algorithm_Restart:0x016e, Step_Width:2200, LMS_Length:250, LMS_Offset:3, Block_Length:5, RXTX_Relation:150,<br>Add_Atten:0, Min_Atten:0, Max_Atten:500, NR_sw_2:4096, NR_u_fak_0:16384, NR_u_fak:16384<br>Path 1:<br>HF_algorithm_init:0x01fd, HF_Algorithm_Restart:0x016e, Step_Width:2200, LMS_Length:250, LMS_Offset:3, Block_Length:5, RXTX_Relation:150,<br>Add_Atten:0, Min_Atten:0, Max_Atten:500, NR_sw_2:4096, NR_u_fak_0:16384, NR_u_fak:16384<br>Path 2:<br>HF_algorithm_init:0x01fd, HF_Algorithm_Restart:0x016e, Step_Width:2200, LMS_Length:250, LMS_Offset:8, Block_Length:5, RXTX_Relation:150,<br>Add_Atten:0, Min_Atten:0, Max_Atten:500, NR_sw_2:4096, NR_u_fak_0:16384, NR_u_fak:16384<br>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)<br>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)<br>OK |

## 23.7.3 Defined values for LEON-G series

| Parameter | Type | Description |
|---|---|---|
| <uplink_path_num> | Number | • 0: handset_mic<br>• 1: headset_mic<br>• 2: I2S_rx |
| <hf_algorithm_init> | Number | The SWITCH parameter controls the activity and the initialization of the EC, AGC, NR blocks<br>• Bit #0 set: Echo Canceller (EC) initialization<br>• Bit #1 set: EC restart (without coefficient initialization)<br>• Bit #2 set: EC on<br>• Bit #3 set: EC adaptation on<br>• Bit #4 set: noise reduction initialization<br>• Bit #5 set: noise reduction on<br>• Bit #6 set: noise reduction works with additional AGC<br>• Bit #7 set: automatic Gain Control (AGC) initialization<br>• Bit #8 set: AGC on<br>Setting the bits is not mutually exclusive; more than one bit can be set at the same time. |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • Range: 0x0000 to 0x01FF (hexadecimal format only) |
| <hf_algorithm_restart> | Number | This bit mask allows to restart the activity of the EC, AGC, NR blocks without initialization. For the bit map see the <hf_algorithm_init>. It is used when the algorithm is automatically restarted by the driver (i.e. after an handover)<br>• Range: 0x0000 to 0x01FF (hexadecimal format only) |
| <step_width> | Number | The higher this value, the faster the echo characteristic gets adapted<br>Limit: <step_width>*<block_length><=2*32767<br>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=50 ms)<br>Limit:<br>2<= <lms_length>+ <lms_offset><=400 (DSP memory limit)<br>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<br>Range: 0 to 400 |
| <block_length> | Number | LMS coefficient adaptation block length. The higher this number, the slower but more accurate the adaptation converges<br>Allowed values are: 2, 4, 5, 8 |
| <rxtx_relation> | Number | Checks the power relation between Rx (loudspeaker) and Tx (microphone) signals to recognize the double talk condition from the echo condition. The system is considered to be in double talk condition when the TX power (mic signal) is higher that the maximum expected echo power:<br>Tx(dB) > Rx (dB) - RxTx(dB) with RxTx(dB)=<rxtx_relation>*3/32<br>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, the adaptation of FIR and AGC are suspended.<br>Range: -960 to 960 |
| <add_atten> | Number | When AGC decides to attenuate, <add_atten> is added to the calculated attenuation<br>• Attenuation Level(dB)=3/32* <add_atten><br>• Range: 0 to 960 |
| <min_atten> | Number | Minimal attenuation of the mic signal allowed for the AGC<br>• Attenuation Level (dB)=3/32* <min_atten><br>• Range: 0 to 960 |
| <max_atten> | Number | Maximal attenuation of the mic signal allowed for the AGC<br>• Attenuation Level (dB)=3/32* <max_atten><br>• Range: 0 to 960 |
| <nr_sw_2> | Number | Max NR attenuation. Linear; 32767 means 1 (0 dB)<br>• Ex. 16384= 0.5 = -6 dB<br>• Range: 0 to 32767 |
| <nr_u_fak_0> | Number | Factor of NR in the band 0 (0 Hz - 250 Hz)<br>• Linear; 16384 means 1 (0 dB)<br>• Range: 0 to 16384 |
| <nr_u_fak> | Number | Factor of NR in the bands 1 to 7 (250 Hz - 3750 Hz)<br>• Linear; 16384 means 1 (0 dB)<br>• A factor lower than 1 causes a better NR but also speech distortion and lowering of SLR.<br>• Range: 0 to 16384 |

## 23.7.4 Command syntax for LISA-U / SARA-U / SARA-G340 / SARA-G350 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_ | OK | AT+UHFP=1,0x01Fd,,,,,,0,50,450,8000,7000,7000,4,220,220,220,100,100,100<br>OK |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | 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>]]]]]]]) | | |
| Read | AT+UHFP? | +UHFP:<br>Path <uplink_path_num>:<br>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>,<br><ec_block_length>,<ec_nr_coeff_real>, <ec_nr_coeff_complex1>,<ec_nr_coeff_complex2>,<ec_nr_coeff_complex3>,<br><ec_nr_coeff_complex4>,<ec_nr_coeff_complex5><br>[...]<br>(for all the supported paths)<br>OK | +UHFP:<br>Path 0:<br>HF_algorithm_init:0x01fd, HF_Algorithm_Restart:NA, Step_Width:NA, LMS_Length:NA, LMS_Offset:NA, Block_Length:NA, RXTX_Relation:NA,<br>Add_Atten:0, Min_Atten:0, Max_Atten:500, NR_sw_2:8192, NR_u_fak_0:7500, NR_u_fak:7500,<br>EC_block_length:2, EC_nr_coeff_real:100, EC_nr_coeff_complex1:100, EC_nr_coeff_complex2:100,<br>EC_nr_coeff_complex3:60, EC_nr_coeff_complex4:60, EC_nr_coeff_complex5:60<br>[...] (for all the supported paths)<br>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),<br>OK | +UHFP: (0-9),(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),(2:2000),(1:1000),(1:1000),(1:1000),(1:1000),(1:1000)<br>OK |

## 23.7.5 Defined values for SARA-U LISA-U SARA-G340 SARA-G350

| Parameter | Type | Description |
|---|---|---|
| <uplink_path_num> | Number | Specifies the uplink path where the hands free parameters must be configured.<br>For uplink paths range and physical meaning, see the product specific section in the chapter introduction:<br>• SARA-G340 / SARA-G350 - *Chapter 23.1.5*<br>• LISA-U2 - *Chapter 23.1.3*<br>• LISA-U120 / LISA-U130 - *Chapter 23.1.4*<br>• SARA-U - *Chapter 23.1.2* |
| <hf_algorithm_init> | Number | The SWITCH parameter controls the activity and initialization of the EC, AGC, NR blocks |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | On SARA-G340 / SARA-G350 series<br>• Bit #0 set: Echo Canceller (EC) initialization<br>• Bit #1 set: EC restart (without coefficient initialization)<br>• Bit #2 set: EC on<br>• Bit #3 set: noise reduction initialization<br>• Bit #4 set: noise reduction on<br>• Bit #5 set: dynamic Echo Suppression INIT<br>• Bit #6 set: dynamic Echo Suppression ACTIVE<br>• Bit #7 set: automatic Gain Control (AGC) initialization<br>• Bit #8 set: AGC on<br>• Bit #9 set: reconfigure<br>• Bit #10 set: unused<br>• Bit #11 set: unused<br>• Bit #12 set: Spectral Echo Reduction (SER) Initialization<br>• Bit #13 set: SER on<br>Range: 0x0000 to 0x3FFF (hexadecimal format only).<br>On LISA-U1 series<br>• Bit #0 set: Echo Canceller (EC) initialization<br>• Bit #1 set: EC restart (without coefficient initialization)<br>• Bit #2 set: EC on<br>• Bit #3 set: unused<br>• Bit #4 set: noise reduction initialization<br>• Bit #5 set: noise reduction on<br>• Bit #6 set: unused<br>• Bit #7 set: Automatic Gain Control (AGC) initialization<br>• Bit #8 set: AGC on<br>• Bit #9 set: dynamic Echo Suppression INIT<br>• Bit #10 set: dynamic Echo Suppression ACTIVE<br>Range: 0x0000 to 0x07FF (hexadecimal format only).<br>On LISA-U2 / SARA-U series<br>• Bit #0 set: unused<br>• Bit #1 set: unused<br>• Bit #2 set: Echo Canceller (EC) initialization and on<br>• Bit #3 set: unused<br>• Bit #4 set: unused<br>• Bit #5 set: Noise Reduction initialization and on<br>• Bit #6 set: unused<br>• Bit #7 set: unused<br>• Bit #8 set: Automatic Gain Control (AGC) initialization and on<br>• Bit #9 set: unused<br>• Bit #10 set: Spectral Echo Reduction (SER) initialization and on<br>Range: 0x0000 to 0x07FF (hexadecimal format only).<br>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' is provided in the test command<br>In the set command, the range is checked but the value is not used<br>• SARA-G340 / SARA-G350 - the range goes from 0x0000 to 0x03FF (hexadecimal format only)<br>• LISA-U / SARA-U - the range goes from 0x0000 to 0x07FF (hexadecimal format only) |
| <step_width> | Number | Not Available. 'NA' is provided in the test command.<br>• In the set command, the range is checked but the value is not used<br>• Range: 0 to 32767 |
| <lms_length> | Number | Not Available. 'NA' is provided in the test command.<br>• In the set command, the range is checked but the value is not used<br>• Range: 2 to 400 |
| <lms_offset> | Number | Not Available. 'NA' is provided in the test command. |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • In the set command, the range is checked but the value is not used<br>• Range: 0 to 400 |
| <block_length> | Number | Not Available. 'NA' is provided in the test command.<br>• In the set command, the range is checked but the value is not used<br>• Allowed values: 2, 4, 5, 8 |
| <rxtx_relation> | Number | Not Available. 'NA' is provided in the test command.<br>• In the set command, the range is checked but the value is not used<br>• Range : -960 to 960 |
| <add_atten> | Number | When AGC decides to attenuate, <add_atten> is added to the calculated attenuation.<br>• Attenuation Level(dB)=0,05* <add_atten><br>• Range: -960 to 960 |
| <min_atten> | Number | Minimal attenuation of the mic signal allowed for the AGC.<br>• Attenuation Level(dB)=0,05* <min_atten><br>• Range: 0 to 960 |
| <max_atten> | Number | Maximal attenuation of the mic signal allowed for the AGC.<br>• Attenuation Level(dB)=0,05* <max_atten><br>• Range: 0 to 960 |
| <nr_sw_2> | Number | Maximum NR attenuation. Linear; 32767 means 1 (0 dB).<br>• Ex. 16384= 0.5 = -6 dB<br>• Range: 0 to 32767 |
| <nr_u_fak_0> | Number | Factor of NR in the band 0 (0 Hz - 500 Hz).<br>• Linear; 16384 means 1 (0 dB)<br>• Range: 0 to 16384 |
| <nr_u_fak> | Number | Factor of NR in the higher bands (-f > 500 Hz).<br>• Linear; 16384 means 1 (0 dB)<br>• A factor lower than 1 causes a better NR but also speech distortion and lowering of SLR.<br>• Range: 0 to 16384 |
| <ec_block_length> | Number | LMS coefficient adaptation block length. The higher this number, the slower but more accurate the adaptation converges.<br>Allowed values are: 1, 2, 4, 5, 8. |
| <ec_nr_coeff_real> | Number | Number of coefficients of the filter in the sub-band EC, for real sub band (in Narrow Band mode: 0-0.8 kHz in Wide Band mode: 0-0.73 kHz)<br>• SARA-G340 / SARA-G350 - Range: 0 to 1100<br>• LISA-U2 / SARA-U - Range: 2 to 2000<br>• LISA-U1 - Range: 2 to 1100<br>Limit on SARA-G340 / SARA-G350 series: <ec_nr_coeff_real>+2*(<ec_nr_coeff_complex1> +<ec_nr_coeff_complex2>) <1100<br>Limit on LISA-U / SARA-U series: <ec_nr_coeff_real>+2*(<ec_nr_coeff_complex1>+<ec_ nr_coeff_complex2> +<ec_nr_coeff_complex3>+ <ec_nr_coeff_complex4>+<ec_nr_coeff_ complex5>) <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)<br>• SARA-G340 / SARA-G350 - Range: 0 to 1100<br>• LISA-U2 / SARA-U - Range: 1 to 1000<br>• LISA-U1 - Range: 1 to 1100<br>See the <ec_nr_coeff_real> parameter description for the limit value. |
| <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)<br>• SARA-G340 / SARA-G350 - Range: 0 to 1100<br>• LISA-U2 / SARA-U - Range: 1 to 1000<br>• LISA-U1 - Range: 1 to 1100<br>See the <ec_nr_coeff_real> parameter description for the limit value. |
| <ec_nr_coeff_ complex3> | Number | Number of coefficients of the filter in the sub-band EC, for complex sub band 3 (in Narrow Band mode: ignored; in Wide Band mode: 3.64-5.09 kHz) |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • LISA-U2 / SARA-U - Range: 1 to 1000<br>• LISA-U1 - Range: 1 to 1100<br>On SARA-G340 / SARA-G350 series the parameter is not in use and is set to its default value (0).<br>See the <ec_nr_coeff_real> parameter description for the limit value. |
| <ec_nr_coeff_complex4> | Number | Number of coefficients of the filter in the sub-band EC, for complex sub band 4 (in Narrow Band mode: ignored; in Wide Band mode: 5.09-6.56 kHz)<br>• LISA-U2 / SARA-U - Range: 1 to 1000<br>• LISA-U1 - Range: 1 to 1100<br>On SARA-G340 / SARA-G350 series the parameter is not in use and is set to its default value (0).<br>See the <ec_nr_coeff_real> parameter description for the limit value. |
| <ec_nr_coeff_complex5> | Number | Number of coefficients of the filter in the sub-band EC, for complex sub band 5 (in Narrow Band mode: ignored; in Wide Band mode: 6.56-8 kHz)<br>• LISA-U2 / SARA-U - Range: 1 to 1000<br>• LISA-U1 - Range: 1 to 1100<br>On SARA-G340 / SARA-G350 series the parameter is not in use and is set to its default value (0).<br>See the <ec_nr_coeff_real> parameter description for the limit value. |

## 23.7.6 Notes

### LISA-U / SARA-U / SARA-G340 / SARA-G350

- Parameters <ec_nr_coeff_complex3>, <ec_nr_coeff_complex4> and <ec_nr_coeff_complex5> are used only in Wide Band speech (16 kHz sampling rate i.e. with WB-AMR codec) and ignored in Narrow Band speech (8 kHz sampling rate i.e. with HR, FR, EFR, NB-AMR codec). For the supported speech codec see notes in *Chapter 23.1*.
- Not all paths are supported, see *+USPM* for the supported paths.
- <hf_algorithm_restart>, <step_width>, <lms_length>, <lms_offset>, <block_length>, <rxtx_relation> parameters are maintained for back compatibility with LEON-G series; they are not used and optional.
- 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.

### LEON-G

- Examples:
  - 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.
  - SWITCH =0x016E =bin 000101101110 means EC on, EC adaptation on, EC restart noise reduction on, Automatic Gain Control on and working with NR.
  - SWITCH =0x0000 means EC, AGC and NR all off.
  - 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

Objective Specification

# 23.8 Audio parameters tuning +UAPT

| +UAPT | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *Profile* | No | - | *+CME Error* |

## 23.8.1 Description

Audio signals are processed by signal processing blocks available on the audio paths (see block diagram in *TOBY-L2 series audio paths*).

Each signal processing block (e.g.: Echo Cancellation, Residual Echo Suppression) is characterized by a set of audio parameters.

The command provides an interface for tuning the audio parameters; command performs these tasks:

- **Reload** (<op_code>=0): the voice parameters and configuration are retrieved from the module memory into the signal processing blocks in the DSP. This operation can take place both in voice idle or active states.
- **Get processing block identifiers** (<op_code>=5): queries the available/existing blocks and their enable state in the affected audio path. The related information text response returns the processing block identifiers and the corresponding enable-state for each available block.
- **Modify a processing block state** (<op_code>=6): modifies the state of a processing block in a requested input or output audio path with a new value.
- **Get parameters list** (<op_code>=7): queries the parameter values in a requested input or output audio path, processing block and rate (8 kHz or 16 kHz). The related information text response returns a list which includes the parameter values.
- **Modify parameters** (<op_code>=8): this operation modifies parameters (one or more) of a processing block with new values.

## 23.8.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| **Generic syntax** | | | |
| Set | AT+UAPT=<op_code>[,<param1>,<param2>,<param3>[,<param4>,<param5>[,<param6>,<param7>,<param8>,...]]] | OK | AT+UAPT=8,0,0,1,3,0,0,7,1,4096,0,0,4096,0,0<br>OK |
| **Load audio parameters** | | | |
| Set | AT+UAPT=0 | OK | AT+UAPT=0<br>OK |
| **Get processing blocks states** | | | |
| Set | AT+UAPT=5,<profile>,<app>,<direction> | +UAPT:<br><blockID>,<enableState><br>[...] (for all the supported block identifier on current profile, path)<br>OK | AT+UAPT=5,3,0,0<br>+UAPT:<br>2,1<br>3,0<br>4,1<br>5,1<br>6,1<br>7,1<br>OK |
| **Modify processing block state** | | | |
| Set | AT+UAPT=6,<profile>,<app>,<direction>,<blockID>,<enableState> | OK | AT+UAPT=6,0,0,1,3,0<br>OK |
| **Get parameters list** | | | |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UAPT=7,<profile>,<app>,<direction>,<blockID>,<rate> | +UAPT:<br><parameterOffset>,<paramValue><br>[...] (for all the supported parameters in the requested <blockID>)<br>OK | AT+UAPT=7,0,0,1,3,0<br>+UAPT:<br>0,1<br>1,4096<br>2,0<br>3,0<br>4,4096<br>5,0<br>6,0<br>OK |
| **Modify parameters** | | | |
| Set | AT+UAPT=8,<profile>,<app>,<direction>,<blockID>,<rate>,<parameterOffset>,<numberOfParameters>,<newValue1>[,<newValue2>,<newValue3>, ..] | OK | AT+UAPT=8,0,0,1,3,0,0,7,1,4096,0,0,4096,0,0<br>OK |
| Test | AT+UAPT=? | AT+UAPT: 0<br>AT+UAPT: 5,(list of supported <profile>'s),(list of supported <app>'s),(list of supported <direction>'s)<br>AT+UAPT: 6,(list of supported <profile>'s),(list of supported <app>'s),(list of supported <direction>'s),(list of supported <blockID>'s),(list of supported <enableState>'s)<br>AT+UAPT: 7,(list of supported <profile>'s),(list of supported <app>'s),(list of supported <direction>'s),(list of supported <blockID>'s),(list of supported <rate>'s)<br>AT+UAPT: 8,(list of supported <profile>'s),(list of supported <app>'s),(list of supported <direction>'s),(list of supported <blockID>'s),(list of supported <rate>'s),(list of supported <parameterOffset>'s),(list of supported <numberOfParameters>'s),(list of supported <newValue1>'s),...<br>OK | AT+UAPT=?<br>+UAPT: 0<br>+UAPT: 5,(0-4),(0),(0-1)<br>+UAPT: 6,(0-4),(0),(0-1),(0-8),(0-1)<br>+UAPT: 7,(0-4),(0),(0-1),(0-8),(0-1)<br>+UAPT: 8,(0-4),(0),(0-1),(0-8),(0-1),(0-30),(1-31),(-32768:32767),...<br>OK |

## 23.8.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <op_code> | Number | Allowed values:<br>• 0 ("reloads"): reloads voice parameters and configurations from the memory.<br>• 5 ("get list of available processing blocks identifiers and their state"): queries available/existing blocks and their state (enable/disabled) in a given profile and application pair and a given path (RX or TX)<br>• 6 ("modify a processing state"): modifies block's state (enable/disable) in a profile and application pair element with a new value.<br>• 7 ("get parameters value list"): queries the parameter values in a requested profile and application pair element and a given path, moduleID and rate (8 kHz or 16 kHz).<br>• 8 ("modify block's parameters value"): modifies processing block parameters (1 or more) with new values. |
| <profile> | Number | Acoustic profile. It identifies the set of parameters loaded from memory in the speech processing blocks when an audio path is enabled. See <main_uplink>, <main_downlink> description in *+USPM*. |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| <app> | Number | Application. Allowed value:<br>• 0: speech |
| <direction> | Number | Audio path direction. Allowed values:<br>• 0: TX path (input)<br>• 1: RX path (output) |
| <blockID> | Number | Signal processing block identifier. (See block diagram in *TOBY-L2 series audio paths*). Allowed values:<br>• 0: Echo Cancellation ("EC")<br>• 1: Residual Echo Suppression ("RES")<br>• 2: Noise Suppression ("NS")<br>• 3: Low Pass Filter ("LPF")<br>• 4: High Pass Filter ("HPF")<br>• 5: Equalizer ("EQU")<br>• 6: Additional Gain Control ("AGC")<br>• 7: Dynamic Range Compression ("DRC")<br>• 8: Microphone Levels ("ML") |
| <enableState> | Number | State. Allowed values:<br>• 0: processing block state is disabled<br>• 1: processing block state is enabled |
| <rate> | Number | Rate. Allowed values:<br>• 0: 8 kHz<br>• 1: 16 kHz |
| <parameterOffset> | Number | Offset of the affected parameter |
| <numberOfParameters> | Number | Number of affected parameters, starting from the one specified by <parameterOffset> . |
| <paramValue><br><newValue1><br><newValue2><br>[...] | Number | Value of parameter. See TOBY-L2 Audio Application Note *[104]* for the ranges and default values of parameters |

# 23.9 Volume gain control +UVGC

| +UVGC | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *Profile* | No | - | *+CME Error* |

## 23.9.1 Description

Sets the gain of the uplink and downlink path and the sidetone (feedback from uplink to downlink path) on the external voice codec Maxim MAX9860, if connected.

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 the EC algorithm performance could change and the parameters could need to be changed to better fit the new gain on uplink or downlink path. See the *+UAPT* command description).

## 23.9.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UVGC=<componentID>,<gainID>,<gainValue> | OK | AT+UVGC=0,2,30<br>OK |
| Read | AT+UVGC=<componentID>,<gainID> | +UVGC: <gainApplied><br>OK | AT+UVGC=0,3<br>+UVGC: 4<br>OK |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| Test | AT+UVGC=? | +UVGC: (list of supported <componentID>'s),(list of supported <gainID>'s),(list of supported <gainValue>'s)<br>OK | +UVGC: (0),(0-3),(-99999:+99999)<br>OK |

### 23.9.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <componentID> | Number | 0: external codec Maxim MAX9860 |
| <gainID> | Number | See *Table 59* for the allowed gain control. |
| <gainValue> | Number | See *Table 59* for the allowed gain value available on each gain control. The range goes from -99999 to +99999 |
| <gainApplied> | Number | See *Table 59* for the applied gain values corresponding to each gain control. The values is expressed in dB. |

### 23.9.4 Notes

In *Table 59* the name of the gain controls refer to the Maxim MAX9860 voice codec datasheet.

| <gainID> | Gain control name | <gainApplied> |
|---|---|---|
| 0 | DVA (DAC Level Adjust on Maxim MAX9860 codec) | Resolution: 1 dB/step. The default and factory-programmed value is -5 dB<br>Mute if <gainValue> < -90<br>3 dB if <gainValue> > 3<br><gainValue> dB otherwise |
| 1 | DVST (Sidetone Level on Maxim MAX9860 codec) | Resolution: 2 dB/step. The default and factory-programmed value is OFF<br>OFF if <gainValue> < -60<br>0 dB if <gainValue> > 0<br><gainValue> rounded to higher even number (dB), otherwise |
| 2 | PAM (Microphone Preamplifier on Maxim MAX9860 codec) | The default and factory-programmed value is 20 dB<br>OFF if 0 < <gainValue><br>0 dB if 0 =< <gainValue> < 10<br>20 dB if 10 =< <gainValue> < 25<br>30 dB if <gainValue> >= 25 |
| 3 | PGAM (Microphone Amplifier on Maxim MAX9860 codec) | Resolution: 1 dB/step. The default and factory-programmed value is 4 dB<br>0 dB if <gainValue> < 0<br>20 dB if <gainValue> > 20<br><gainValue> dB otherwise |

**Table 59: Gain controls**

See the block diagram in *Figure 17* for position of controls in the audio chain.

Objective Specification

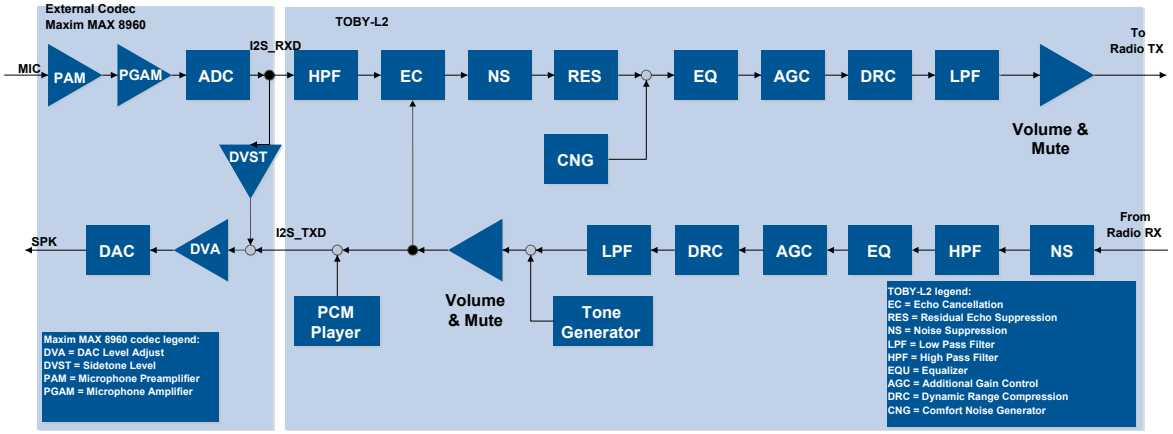



**Figure 17: External codec controls**

# 23.10 Record audio file +URECFILE

| +URECFILE | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | *Up to 10 s* | *+CME Error* |

## 23.10.1 Description

Record audio samples for *audio parameters tuning* and audio test purposes.

The command is intended as a tool to support audio parameter setting during device development and audio test/debug phase only. It is recommended to use it for these purposes only. It is not reccomended for applications.

Recording can be done in different points on the RX or TX audio path (refer to <recording_point> and see below block diagram: Recording points) and it is stored in a file in the file system with tag "AUDIO". Recorded files can be listed by *AT+ULSTFILE=0,"AUDIO"* command. For more details about file system description see the *File System Introduction*.

The audio file format is WAV: Signed 16 bit PCM samples, Little endian, mono, 8 or 16 kHz sampling rate.

Response time depends on recording time, parameter <recording_time>. After recording is complete this URC is provided:

- +URECFILE: <filename>

See the block diagram below for recording points in the audio chain.

Objective Specification

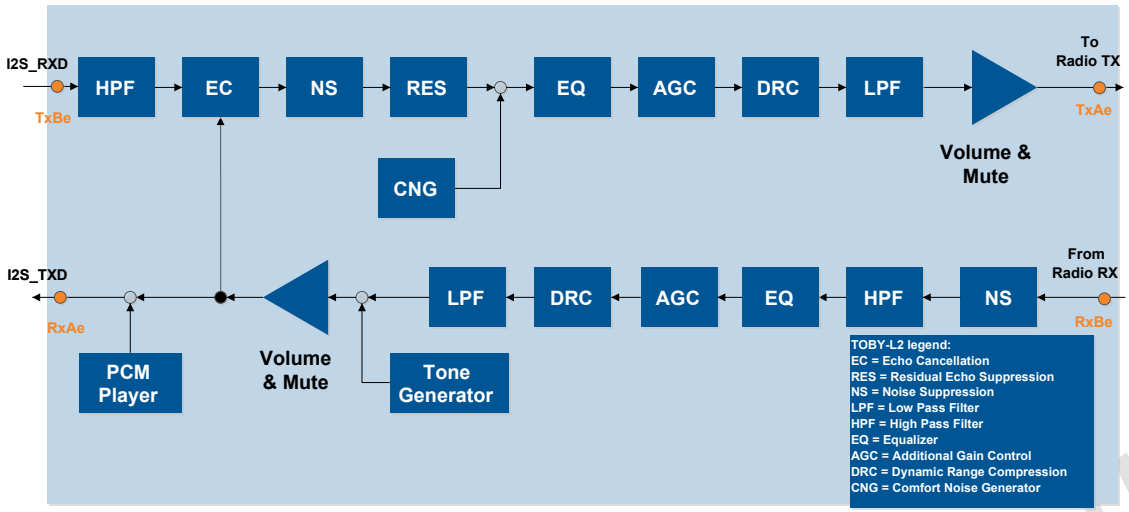



**Figure 18: Recording points**

## 23.10.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+URECFILE=<recording_point>[,<recording_time>[,<samplerate>]] | OK | AT+URECFILE=0,6,1<br>OK |
| Test | AT+URECFILE=? | +URECFILE: (list of supported <recording_point>s),(list of supported <recording_time>s),(list of supported <samplerate>s)<br>OK | +URECFILE: (0-4),(2-10),(1-2)<br>OK |
| URC | | +URECFILE: <filename> | +URECFILE: TxBe.wav |

## 23.10.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <recording_point> | Number | Specifies the point of recording (see figure)<br>• 0: Uplink before enhancement (TxBe)<br>• 1: Uplink after enhancement (TxAe)<br>• 2: Downlink before enhancement (RxBe)<br>• 3: Downlink after enhancement (RxAe)<br>• 4: Uplink before enhancement and downlink after enhancement mixed (RxAe_TxBe) |
| <recording_time> | Number | Recording time in seconds. Allowed values are 2-10. The default values is 6 s. |
| <samplerate> | Number | Recording sample rate<br>• 1: 8000 samples per second (default value)<br>• 2: 16000 samples per second |
| <namefile> | String | Name of the file recorded<br>• TxBe.wav: recorded for <recording_point>=0<br>• TxAe.wav: recorded for <recording_point>=1<br>• RxBe.wav: recorded for <recording_point>=2<br>• RxAe.wav: recorded for <recording_point>=3<br>• RxAe_TxBe.wav: recorded for <recording_point>=4 |
| <error> | Number | This error result code will be provided if *+CMEE* is set to 2:<br>• "+CME ERROR: operation not supported": the number of parameters provided is incorrect or their values are out of the defined range. |

Objective Specification

# 24 DNS

DNS service requires the user to define and activate a connection profile, either PSD or CSD. Refer to *+UCSD*, *+UCSDA* and *+UCSND* AT commands for establishing a CSD connection and to *+UPSD*, *+UPSDA* and *+UPSND* AT commands for establishing a PSD connection.

When this command reports an error which is not a +CME ERROR, the error class and code is provided through *+USOER* AT command.

## 24.1 Resolve name / IP number through DNS +UDNSRN

| +UDNSRN | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | *< 70 s* | *TCP/UDP/IP Error* |

### 24.1.1 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. The network usually provides them after the GPRS activation or the CSD establishment. They are automatically used in the resolution process if available. The resolutor will use first the primary DNS, otherwise if there is no answer, the second DNS will be involved. The user can replace each network provided DNS by setting its own DNS. In this case the command AT+UPSD 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.

Usage of the network provided DNSs is recommended.

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).

### 24.1.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UDNSRN=<resolution_type>,<domain_ip_string> | +UDNSRN: <resolved_ip_address><br>OK<br>or<br>+UDNSRN: <resolved_domain_name><br>OK | AT+UDNSRN=0,"www.google.com"<br>+UDNSRN: "216.239.59.147"<br>OK |

### 24.1.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <resolution_type> | Number | Type of resolution operation<br>• 0: domain name to IP address<br>• 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 |

Objective Specification

## 24.2 Dynamic DNS update +UDYNDNS

| +UDYNDNS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U260-02S LISA-U270-02S LISA-U270-62S LISA-U270-63S LISA-U270-68S SARA-U | | | | | |
| | SARA-G340 SARA-G350 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - (except URC) | *DynDNS Error* *+CME Error* |

### 24.2.1 Introduction

The IP address assigned to a module by the network provider is often dynamic; this means the IP address changes every time a PDP context is enabled.

This could be a problem when it is needed to identify an internet host with a domain name, because they are usually used with static IP address that never changes (or rarely changes).

To solve this problem, the dynamic DNS services provide a way to assign a domain name to a host that owns a dynamic IP address, but they require a client that sends the latest IP given by the network to these services, to update their DNS tables.

With the +UDYNDNS command u-blox cellular modules can access to dynamic DNS services.

This functionality is disabled by default, but once configured and enabled it automatically sends updates to the configured Dynamc DNS service every time the module IP address change. The functionality only works for internal PDP context (see *Chapter 18.50*).

### 24.2.2 Description

Sets up the dynamic DNS client functionality. This command is part of the internal TCP/IP stack so it only works for internal PDP contexts (managed by +UPSD and +UPSDA command; refer to *Chapter 18.50*).

The command configuration is stored into the NVM: if enabled, it automatically works after a reboot.

The following dynamic DNS providers are supported:

- TZO.com
- DynDNS.org
- DynDNS.it
- No-IP.org
- DNSDynamic.org

During the service subscription phase the dynamic DNS provider gives a domain name, a username and a password that the AT application will use later.

If the DYNDNS client is enabled when an internal PDP connection is already active, the DYNDNS client starts working on the next PDP context activation.

This functionality is only available for the PDP context enabled with +UPSDA command.

Before changing the dynamic DNS client configuration it is required to stop (deactivate) it. Any attempt to reconfigure an already running DNS client raises an error.

The dynamic DNS update is not allowed during the first 60 s after module power on. If a PDP connection is established before this time, a URC notifies that the update has been delayed. In this case the update is performed once the 60 s are elapsed.

The dynamic DNS protocol does not allow more than one update every 60 s, anyhow the module's DYNDNS client will respect specific timing rules depending on the selected provider policies.

Objective Specification

Due to the various caches involved in the DNS resolution process, the time since the DNS update is done until it is available for a user, can significally change among different internet providers.

### 24.2.3 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UDYNDNS=<on_off>[,<service_id>,<domain_name>,<username>,<password>] | OK | Enable the dynamic DNS client using the TZO DNS service and the domain name "remote001.tzo.net".<br>AT+UDYNDNS=1,0,"remote001.tzo.net","dummy_username","dummy_password"<br>OK<br>Disable the dynamic DNS client:<br>AT+UDYNDNS=0<br>OK |
| Read | AT+UDYNDNS? | +UDYNDNS: <on_off>,<service_id>,<domain_name>,<username>,<password><br>OK | +UDYNDNS: 1,0,"remote001.tzo.net","dummy_username","dummy_password"<br>OK |
| Test | AT+UDYNDNS=? | +UDYNDNS: (list of supported <on_off>),(list of supported <service_id>),<domain_name>,<username>,<password>)<br>OK | +UDYNDNS: (0-1),(0-4),"domain_name","username","password"<br>OK |
| URC | | +UUDYNDNS: <status>,<code> | +UUDYNDNS: 1,0 |

### 24.2.4 Defined values

| Parameter | Type | Description |
|---|---|---|
| <on_off> | Number | Enable / Disable the dynamic DNS client<br>• 0 (factory-programmed value): disable the client<br>• 1: enable the client |
| <service_id> | Number | Indicates which dynamic DNS service provider to use<br>• 0 (factory-programmed value): TZO.com<br>• 1: DynDNS.org<br>• 2: DynDNS.it<br>• 3: No-IP.org<br>• 4: DynamicDNS.org<br>Mandatory parameter with <on_off >=1, not allowed with <on_off >=0 |
| <domain_name> | String | Indicates which domain name should be associated with the module IP address. The dynamic DNS service provider provides this value.<br>Maximum length: 64 bytes<br>Mandatory parameter with <on_off >=1, not allowed with <on_off >=0<br>The factory-programmed value is an empty string |
| <username> | String | The username used for the client authentication<br>Maximum length: 64 charaters<br>Mandatory parameter with <on_off >=1, not allowed with <on_off >=0<br>The factory-programmed value is an empty string |
| <password> | String | The password used for the client authentication.<br>Maximum length: 32 charaters<br>Mandatory parameter with <on_off >=1, not allowed with <on_off >=0<br>The factory-programmed value is an empty string |
| <status> | Number | This is the internal status of the dynamic DNS client. Each time the internal status changes or there is an error the URC +UUDYNDNS is issued<br>• 0: client inactive/stopped |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 1: client enabled/active<br>• 2: DNS update successfully executed<br>• 3: DNS update failed<br>• 4: DNS update delayed<br>• 5: No DNS update is required<br>• 6: Self deactivation: the dynamic DNS client will stop due to internal error or DynDNS protocol specification |
| <code> | Number | This is the code returned by the +UUDYNDNS URC. The meaning of the <code> value is described in Dynamic DNS unsolicited indication codes (see *Appendix A.6*) |

### 24.2.5 Notes

- In case of self deactivation (+UUDYNDNS status = 6), the client is disabled (saving the disabled setting into the NVM); the customer has then to identify the cause (usually bad configuration of the client) and manually re-activate it. After a self deactivation it is always required to re-activate the client.

### 24.2.6 DynDNS client behavior in case of error

When the error code is in range 1-10 and 100-108 the client waits for 60 s before allowing any update operation.

In all the other cases (error in range from 40 to 57) the following behaviors are applied:

For TZO.com:

| DynDNS Client error code | Provider Error code | Client action |
|---|---|---|
| 40 | 200 | Next update will be possible after 60 s |
| 41 | 304 | Next update will be possible after 10 minutes |
| 45 | 401 | Client self deactivation |
| 53 | 403 | Client self deactivation |
| 55 | 414 | Next update will be possible after 60 s |
| 46 | 405 | Client self deactivation |
| 54 | 407 | Client self deactivation |
| 56 | 415 | Client self deactivation |
| 57 | 480 | Next update will be possible after 24 hours |

For DynDNS.org, DynDNS.it, No-IP.org and DNSDynamic.org:

| DynDNS Client error code | Provider Error code | Client action |
|---|---|---|
| 40 | good | Next update will be possible after 60 s |
| 41 | nochg | Next update will be possible after 10 minutes |
| 45 | badauth | Next update will be possible after 24 hours |
| 47 | !donator | Next update will be possible after 24 hours |
| 42 | notfqdn | Client self deactivation |
| 43 | nohost | Client self deactivation |
| 44 | numhost | Client self deactivation |
| 48 | abuse | Client self deactivation |
| 46 | badagent | Client self deactivation |
| 49 | dnserr | Next update will be possible after 30 minutes |
| 50 | 911 | Next update will be possible after 30 minutes |
| 51 | badsys | Client self deactivation |
| 52 | !yours | Client self deactivation |

Objective Specification

# 25 TCP/IP UDP/IP

## 25.1 Introduction

Before using TCP/IP services, a connection profile (either PSD or CSD) must be defined and activated. See the *+UCSD*, *+UCSDA* and *+UCSND* AT commands for establishing a CSD connection and *+UPSD*, *+UPSDA* and *+UPSND* AT commands for establishing a PSD connection. The sockets can be managed independently and simultaneously over the same bearer (either PSD or CSD). AT commands for both reading and writing data on sockets are provided and the URC notifies the external application of incoming data and transmission result, no need for polling.

When these commands report an error result code which is not a +CME ERROR, the error code can be queried using the *+USOER* or *+USOCTL* (specifying the socket ID and with <param_id>=1) AT commands.

The maximum number of sockets that can be managed are 7.

The UDP protocol has not any flow control mechanism and packets might be lost in the following scenarios:

- No network signal is available
- Unreliable radio interface (e.g. mobility in GPRS, where cell reselections can lead to data loss, that can be contrasted with the usage of LLC ack reliability QoS parameter

LEON-G
The maximum number of sockets that can be managed are 16.

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 (see the *+USOSO* AT command).

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
- On LEON-G1 series, stop sending TCP packet (and check with the *+USOCTL* command that the outgoing buffer is empty) when expecting to receive UDP data

LEON-G
IP dotted notation does not support a leading 0 in an IP address (e.g. IP = 010.128.076.034 is not supported, 10.128.76.34 is supported).

LEON-G
The *+UPING* command uses the TCP/IP resources in an exclusive way. All the other TCP/IP operations executed after the execution of the *+UPING* AT command will wait for the execution of this command.

## 25.2 IPv4/IPv6 addressing

### 25.2.1 Introduction

The section describes the IP addressing formats and IP address rules used by TCP/IP UDP/IP enabled applications.

### 25.2.2 IPv4

**Format:**

- 32 bits long in dot-decimal notation (without leading 0 notation).
- All the decimal numbers must be in range 0-255.
- The dot-octal notation is not supported.

Objective Specification

- The dot-hexadecimal notation is not supported.

**Examples:**

| IPv4 address | Remarks |
|---|---|
| 254.254.254.254 | Valid address |
| 010.228.76.34 | Invalid address; first decimal number prefixed with a leading zero |
| 257.228.76.34 | Invalid address; first decimal number greater than 255 |
| 0010.0344.0114.0042 | Invalid address; dot-octal notation; decimals given as octal numbers |
| 0x10.0xE4.0x4C.0x22 | Invalid address; dot-hexadecimal notation; decimals given as hexadecimal numbers |

**Table 60: IPv4 address format examples**

### 25.2.3 IPv6

**Format:**

- 128 bits long represented in 8 groups of 16 bits each.
- The 16 bits of a group are represented as 2 concatenated hexadecimal numbers.
- The groups are separated by a colon character (:).
- The leading 0 in a group is supported.
- A group containing 4 zeros can be abbreviated with one 0.
- Continuous groups (at least 2) with zeroes can be replaced with a double colon (::).
- The double colon can appear only once in an IPv6 address.

**Examples:**

| IPv6 address | Remarks |
|---|---|
| 2001:0104:0000:0000:0000:0104:0000:0000 | Full version, with leading zeros |
| 2001:104:0000:0000:0000:104:0000:0000 | Abbreviated version, leading zero abbreviation |
| 2001:104:0:0:0:104:0:0 | Abbreviated version, zero group abbreviation |
| 2001:104::104:0:0 | Abbreviated version, one double colon abbreviation |

**Table 61: IPv6 address format examples**

LISA-U / SARA-U / SARA-G / LEON-G
The internet suite applications do not support the IPv6 address format.

The following AT commands support the IPv6 address format:

- Dynamic DNS update: *+UDYNDNS*
- Connect Socket: *+USOCO*
- SendTo command: *+USOST*
- Receive From command: *+USORF*
- Set Listening Socket: *+USOLI*
- IP Change Notification: *+UIPCHGN*
- FTP service configuration: *+UFTP*
- HTTP control: *+UHTTP*

Objective Specification

# 25.3 Create Socket +USOCR

| +USOCR | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | No | No | - | *TCP/UDP/IP Error* *+CME Error* |

## 25.3.1 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 7 sockets can be created. It is possible to specify the local port to bind within the socket in order to send data from a specific port. The bind functionality is supported only for UDP sockets.

The socket creation operation can be performed only after the PDP context activation on one of the defined profiles.

LEON-G
Up to 16 sockets can be created.

SARA-G340 / SARA-G350
The bind functionality is available for both TCP and UDP sockets.

## 25.3.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+USOCR=<protocol>[,<local_port>] | +USOCR: <socket> | AT+USOCR=17 |
| | | OK | +USOCR: 2 |
| | | | OK |

## 25.3.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <protocol> | Number | • 6: TCP<br>• 17: UDP |
| <socket> | Number | Socket identifier to be used for any future operation on that socket. The range goes from 0 to 6 |
| <local_port> | Number | Local port to be used while sending data. The range goes from 1 to 65535. |

## 25.3.4 Notes

**LEON-G**

- The socket creation operation can be performed even if the PDP context has not been activated.
- The range of <socket> parameter goes from 0 to 15.

Objective Specification

# 25.4 SSL/TLS mode configuration on TCP socket +USOSEC

| +USOSEC | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U201 SARA-U260-03S SARA-U270-03S SARA-U270-53S SARA-U280-03S | | | | | |
| | SARA-G340-02S SARA-G350-02A SARA-G350-02S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | *< 10 s* | *+CME Error* |

## 25.4.1 Description

Enables or disables the use of SSL/TLS connection on a TCP socket. The configuration of the SSL/TLS properties is provided with an SSL/TLS profile managed by USECMNG.

The <usecmng_profile_id> parameter is listed in the information text response to the read command only if the SSL/TLS is enabled on the interested socket.

This operation is only available for TCP sockets.

The enable or disable operation can be performed only after the socket has been created with *+USOCR* AT command.

The SSL/TLS is supported only with *+USOCO* command (socket connect command). The SSL/TLS is not supported with *+USOLI* command (socket set listen command is not supported and the *+USOSEC* settings will be ignored).

## 25.4.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+USOSEC=<socket>,<ssl_tls_status>[,<usecmng_profile_id>] | OK | AT+USOSEC=0,1,1<br>OK |
| Read | AT+USOSEC=<socket> | +USOSEC=<socket>,<ssl_tls_status>[,<usecmng_profile_id>]<br>OK | AT+USOSEC=0<br>+USOSEC=0,1,1<br>OK |
| Test | AT+USOSEC=? | +USOSEC: (list of supported <socket>s),(list of supported <ssl_tls_status>s),(list of supported <usecmng_profile_id>s)<br>OK | +USOSEC: (0-6),(0,1),(0-4)<br>OK |

## 25.4.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <socket> | Number | Socket identifier defined by the *AT+USOCR* command. The range goes from 0 to 6. |
| <ssl_tls_status> | Number | • 0 (default value): disable the SSL/TLS on the socket.<br>• 1: enable the SSL/TLS on the socket; a USECMNG profile can be specified with the <usecmng_profile_id> parameter. |
| <usecmng_profile_id> | Number | Defines the USECMNG profile which specifies the SSL/TLS properties to be used for the SSL/TLS connection. The range goes from 0 to 4. If no profile is set a default USECMNG profile is used (see *USECMNG* section). |

Objective Specification

# 25.5 Set socket option +USOSO

| +USOSO | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *TCP/UDP/IP Error* *+CME Error* |

## 25.5.1 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.

Issue a set command to set each parameter.

## 25.5.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+USOSO=<socket>,<level>,<opt_name>,<opt_val>[,<opt_val2>] | OK | AT+USOSO=2,6,1,1<br>OK |

## 25.5.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <socket> | Number | Socket identifier. The range goes from 0 to 6 |
| <level> | Number | • 0: IP protocol<br><opt_name> for IP protocol level may be:<br>o 1: type of service (TOS)<br><opt_val>: 8 bitmask that represents the flags of IP TOS. The range is 0-255 (the default value is 0). For more information see the RFC 791 *[27]*<br>o 2: time-to-live (TTL)<br><opt_val>: unsigned 8 bit value representing the TTL. The range is 0-255 (the default value is 255)<br>• 6: TCP protocol<br><opt_name> for TCP protocol level may be:<br>o 1: no delay option; do not delay send to coalesce packets;<br><opt_val>: numeric parameter, it enables/disables the "no delay" option<br>- 0 (default value): disabled<br>- 1: enabled<br>o 2: keepidle option: send keepidle probes when it is idle for <opt_val> milliseconds<br><opt_val>: signed 32 bit numeric parameter representing the milliseconds for "keepidle" option. The range is 0-2147483647. The default value is 7200000 (2 hours)<br>• 65535: socket<br><opt_name> for socket level options may be:<br>o 4: local address re-use.<br><opt_val>: numeric parameter, it configures the "local address re-use" option.<br>- 0 (default value): disabled<br>- 1: enabled<br>o 8: keep connections alive.<br><opt_val>: numeric parameter, it configures "keep connections alive" option.<br>- 0 (default value): disabled<br>- 1: enabled<br>o 32: sending of broadcast messages.<br><opt_val>: numeric parameter, it configures "sending of broadcast messages".<br>- 0 (default value): disabled<br>- 1: enabled |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | o 128: linger on close if data present.<br><opt_val>: numeric parameter, it configures the "linger" option.<br>- 0 (default value): disabled<br>- 1: enabled<br><opt_val2>: signed 16 bit numeric parameter, it sets the linger time, the range goes from 0 to 32767 in milliseconds. The default value is 0.<br>o 512: local address and port re-use.<br><opt_val>: numeric parameter, it configures the "local address and port re-use".<br>- 0 (default value): disabled<br>- 1: enabled |
| <opt_name> | Number | Type and supported content depend on related <level> (details are given above). |
| <opt_val> | Number | Type and supported content depend on related <level> (details are given above). |
| <opt_val2> | Number | Type and supported content depend on related <level> (details are given above). |

### 25.5.4 Notes

#### TOBY-L2 / MPCI-L2

- It is not possible to change the settings of bit 6 and 7 for Type of Service (<level>=0 and <opt_name>= 1, i.e. AT+USOSO=0,0,1,<opt_val>)

#### LEON-G

- The range of <socket> parameter goes from 0 to 15.

## 25.6 Get Socket Option +USOGO

| +USOGO | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *TCP/UDP/IP Error*<br>*+CME Error* |

### 25.6.1 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.

### 25.6.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+USOGO=<socket>,<level>,<opt_name> | +USOGO: <opt_val>[,<opt_val2>]<br>OK | AT+USOGO=0,0,2<br>+USOGO: 255<br>OK |

### 25.6.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <socket> | Number | Socket identifier. The range goes from 0 to 6 |
| <level> | Number | • 0: IP Protocol<br><opt_name> for IP Protocol level may be:<br>o 1: type of service<br><opt_val>: 8 bit mask that represents the flags of IP TOS. For more information see the RFC 791 *[27]*. The range is 0-255. The default value is 0<br>o 2: time-to-live<br><opt_val>: unsigned 8 bit value representing the TTL. The range is 0-255. The default value is 0. |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 6: TCP Protocol<br><opt_name> for TCP protocol level may be:<br>o 1: no delay option: do not delay send to coalesce packets<br><opt_val>: numeric parameter, it enables/disables the "no delay" option<br>- 0 (default value): disabled<br>- 1: enabled<br>o 2: keepidle option: send keepidle probes when idle for <opt_val> milliseconds<br><opt_val>: signed 32 bit number value representing the milliseconds for "keepidle" option. The range 0-2147483647. The default value is 7200000 (2 hours)<br>• 65535: socket<br><opt_name> for the socket level options may be:<br>o 4: local address re-use<br><opt_val>: numeric parameter, it configures the "local address re-use" option:<br>- 0 (default value): disabled<br>- 1: enabled<br>o 8: keep connections alive<br><opt_val>: numeric parameter, it configures the "keep connections alive" option:<br>- 0 (default value): disabled<br>- 1: enabled<br>o 32: sending of broadcast messages<br><opt_val>: numeric parameter, it configures the "sending of broadcast messages":<br>- 1: enabled<br>- 0 (default value): disabled<br>o 128: linger on close if data present<br><opt_val>: numeric parameter, it sets on/off the "linger" option.<br>- 0 (default value): disabled<br>- 1: enabled<br><opt_val2>: signed 16 bit numeric value, linger time, the range goes from 0 to 32767 in milliseconds. The default value is 0.<br>o 512: local address and port re-use<br><opt_val>: numeric parameter, it enables/disables "local address and port re-use":<br>- 0 (default value): disabled<br>- 1: enabled |

### 25.6.4 Notes

#### LEON-G

- The range of <socket> parameter goes from 0 to 15.

## 25.7 Close Socket +USOCL

| +USOCL | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | No | No | *< 10s (except URC)* | *+CME Error* |

### 25.7.1 Description

Closes the specified socket, like the BSD close routine. In case of remote socket closure the user is notified via the URC.

### 25.7.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+USOCL=<socket> | OK | AT+USOCL=2 |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | | OK |
| URC | | +UUSOCL: <socket> | +UUSOCL: 2 |

### 25.7.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <socket> | Number | Socket identifier. The range goes from 0 to 6 |

### 25.7.4 Notes

**LEON-G**

- The range of <socket> parameter goes from 0 to 15.

## 25.8 Get Socket Error +USOER

| +USOER | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *TCP/UDP/IP Error* *+CME Error* |

### 25.8.1 Description

Retrieves the last error occurred in the last socket operation, stored in the BSD standard variable error.

### 25.8.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | AT+USOER | +USOER: <socket_error> | +USOER: 104 |
| | | OK | OK |

### 25.8.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <socket_error> | Number | Code of the last error occurred in a socket operation. The allowed values are listed in *Appendix A.7*<br>• 0: no error |

## 25.9 Connect Socket +USOCO

| +USOCO | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | No | No | *< 20 s* | *TCP/UDP/IP Error* *+CME Error* |

### 25.9.1 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

Objective Specification

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.

### 25.9.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+USOCO=<socket>,<remote_addr>,<remote_port> | OK | AT+USOCO=3,"151.63.16.9",1200<br>OK |

### 25.9.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <socket> | Number | Socket identifier. The range goes from 0 to 6 |
| <remote_addr> | String | Remote host IP address or domain name of the remote host. For IP address format reference see the *IP addressing*. |
| <remote_port> | Number | Remote host port, in range 1-65535 |

### 25.9.4 Notes

**TOBY-L2 / MPCI-L2**

- If the *+UPSD* command sets the PSD profile protocol type to IPv6, an IPv6 address shall be used for the remote host IP address parameter.

**LEON-G**

- The range of <socket> parameter goes from 0 to 15.

## 25.10 Write socket data +USOWR

| +USOWR | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | No | No | *< 10 s* | *TCP/UDP/IP Error*<br>*+CME Error* |

### 25.10.1 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. The command applies to UDP sockets too, after a *+USOCO* command.

There are three kinds of syntax:

- Base syntax normal: writing simple strings to the socket, some characters are forbidden
- Base syntax HEX: writing hexadecimal strings to the socket, the string will be converted in binary data and sent to the socket; see the *AT+UDCONF=1* command description to enable it
- Binary extended syntax: mandatory for writing any character in the ASCII range [0x00, 0xFF]

Some notes about the **TCP socket**:

- If no network signal is available, the TCP packets are enqueued until the network will become available again. If the TCP queue is full the +USOWR command will return an error result code. To get the last socket error use the *+USOCTL=1* command. If the error code returned is 11, it means that the queue is full.
- If the connection is closed by the remote host, the *+UUSOCL* URC is not sent until all received data is read using the *AT+USORD* command. If AT+USOWR command is used in this situation, an error result code is returned. See also the *Notes* section about the specific product behaviour

Objective Specification

- If the connection is closed by the remote host and binary interface started with AT+USOWR command is still waiting for data, an error result code is returned indicating that the binary interface was closed. After the error result code a *+UUSOCL* URC is reported indicating that the socket was closed.

Some notes about the **UDP socket**:

- Due to the UDP specific AT commands, it is preferred to use the *+USOST* command to send data via UDP socket. This command does not require the usage of *+USOCO* before sending data.
- If no network signal is available, out going UDP packet may be lost.

The information text response indicates that data has been sent to lower level of protocol stack. This is not an indication of an acknowledgement received by the remote server the socket is connected to.

## 25.10.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| **Base syntax** | | | |
| Set | AT+USOWR=<socket>,<length>,<data> | +USOWR: <socket>,<length><br>OK | AT+USOWR=3,12,"Hello world!"<br>+USOWR: 3,12<br>OK |
| **Binary syntax** | | | |
| Set | AT+USOWR=<socket>,<length> | @<data><br>+USOWR: <socket>,<length><br>OK | AT+USOWR=3,16<br>@16 bytes of data<br>+USOWR: 3,16<br>OK |

## 25.10.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <socket> | Number | Socket identifier. The range goes from 0 to 6. |
| <length> | Number | Number of data bytes to write:<br>• Base syntax normal mode: range 0-1024<br>• Base syntax HEX mode: range 0-512<br>• Binary extended syntax: range 0-1024 |
| <data> | String | Data bytes to be written. Not all of the ASCII charset can be used. |

## 25.10.4 Notes

- For base syntax:
  - Allowed ASCII characters: 0x20, 0x21 and from 0x23 to 0xFF, all the alphanumeric set, the symbols and extended ASCII charset from 0x80 to 0xFF.
  - Forbidden ASCII characters: 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 the 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 provides the final result code. 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.
  - After the @ prompt reception, wait for a minimum of 50 ms before sending data.
  - The binary extended syntax is the only way for the system to accept control characters as data; for the AT command specifications 3GPP TS 27.005 *[16]*, characters like <CR>, <CTRL-Z>, quotation marks,

Objective Specification

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 the module does not display the echo of data bytes.
  - Binary syntax is not affected by HEX mode option.
- For <data> parameter not all of the ASCII charset can be used.

**TOBY-L2 / LEON-G**

- **TCP socket**: A write operation performed when the remote host has closed its part of the TCP connection (FIN packet received by the module) - but there is still data to be read from the socket - is accepted. This behaviour differs from LISA-U / SARA-U series, where this operation returns an error. It is suggested to read all the socket data before triggering a write command, to avoid this situation.

**SARA-G / LEON-G**

- The range of <length> parameter is
  - Base syntax normal mode: 0-512
  - Base syntax HEX mode: 0-250

**LEON-G**

- The range of <socket> parameter goes from 0 to 15.
- For the binary syntax in binary mode the module displays the echo of data bytes.

# 25.11 SendTo command (UDP only) +USOST

| +USOST | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | *< 10 s* | *TCP/UDP/IP Error +CME Error* |

## 25.11.1 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 recommended 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, outcoming UDP packet may be lost.

To enable the base syntax HEX mode, see the *AT+UDCONF=1* command description.

## 25.11.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set (Base) | AT+USOST=<socket>,<remote_addr>,<remote_port>,<length>,<data> | +USOST: <socket>,<length><br>OK | AT+USOST=3,"151.9.34.66",449,16,"16 bytes of data" |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | | +USOST: 3,16<br>OK |
| Set (Binary) | AT+USOST=<socket>,<remote_addr>,<remote_port>,<length><br>After the"@" prompt <length> bytes of data are entered | @<data><br>+USOST: <socket>,<length><br>OK | AT+USOST=3,"151.9.34.66",449,16<br>@16 bytes of data<br>+USOST: 3,16<br>OK |

## 25.11.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <socket> | Number | Socket identifier. The range goes from 0 to 6 |
| <remote_addr> | String | Remote host IP address or domain name of the remote host. For IP address format reference see the *IP addressing*. |
| <remote_port> | Number | Remote host port |
| <length> | Number | Number of data bytes to write<br>• Base syntax normal mode: range 0-1024<br>• Base syntax HEX mode: range 0-512<br>• Binary syntax mode: range 0-1024 |
| <data> | String | Data bytes to be written (not all of the ASCII charset can be used) |

## 25.11.4 Notes

- 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 final result code. 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 the module does not display the echo of data bytes
  - Binary syntax is not affected by HEX mode option

**TOBY-L2 / MPCI-L2**

- If the *+UPSD* command sets the PSD profile protocol type to IPv6, an IPv6 address shall be used for the remote host IP address.

**LISA-U1 / LISA-U200-00S / LISA-U200-01S / LISA-U200-02S / LISA-U200-52S / LISA-U200-62S / LISA-U200-82S / LISA-U230 / LISA-U260 / LISA-U270 / SARA-U260-00S / SARA-U270-00S / SARA-U270-00X / SARA-U280-00S / SARA-G / LEON-G**

- For <remote_addr> parameter only IP address is allowed.

**SARA-G / LEON-G**

- The range of <length> parameter is

Objective Specification

- Base syntax: 0-512
- Base syntax HEX mode: 0-250

**LEON-G**

- The range of <socket> parameter goes from 0 to 15.
- For the binary syntax in binary mode the module displays the echo of data bytes.

# 25.12 Read Socket Data +USORD

| +USORD | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | *< 10s (except URC)* | *TCP/UDP/IP Error +CME Error* |

## 25.12.1 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 does not 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 will not be possible to receive any packet if a previous write operation is not performed.

If the HEX mode is enabled (refer to *AT+UDCONF=1* command) the received data will be displayed using an hexadecimal string.

## 25.12.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+USORD=<socket>,<length> | +USORD: <socket>,<length>,<data in the ASCII [0x00,0xFF] range><br>OK | AT+USORD=3,16<br>+USORD: 3,16,"16 bytes of data"<br>OK |
| URC | | +UUSORD: <socket>,<length> | +UUSORD: 3,16 |

## 25.12.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <socket> | Number | Socket identifier. The range goes from 0 to 6 |
| <length> | Number | Number of data bytes<br>• to read stored in buffer, in range 0-1024 in the set command<br>• read from buffer, in range 0-1024<br>• stored in buffer for the URC |
| <data> | String | Data bytes to be read |

Objective Specification

### 25.12.4 Notes

- 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.

  **Example:** 23 unread bytes in the socket
  AT+USORD=3,0
  +USORD: 3,23
  OK
- If the HEX mode is enabled, the length of <data> will be 2 times <length>.

**LEON-G**

- The range of <socket> parameter goes from 0 to 15.

## 25.13 Receive From command (UDP only) +USORF

| +USORF | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | *< 10s (except URC)* | *TCP/UDP/IP Error +CME Error* |

### 25.13.1 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.

If the HEX mode is enabled (see *+UDCONF=1*) the received data will be displayed using an hexadecimal string.

### 25.13.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+USORF=<socket>,<length> | +USORF: <socket>,<remote_ip_addr>,<remote_port>,<length>,<data in the ASCII [0x00,0xFF] range><br>OK | AT+USORF=3,16<br>+USORF: 3,"151.9.34.66",2222,16,"16 bytes of data"<br>OK |
| URC | | +UUSORF: <socket>,<length> | +UUSORF: 3,16 |

Objective Specification

### 25.13.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <socket> | Number | Socket identifier. The range goes from 0 to 6 |
| <remote_ip_addr> | String | Remote host IP address. For IP address format reference see the *IP addressing*. |
| <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 |

### 25.13.4 Notes

- 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.

  **Example:** 23 unread bytes in the socket
  AT+USORF=3,0
  +USORF: 3,23
  OK
- If the HEX mode is enabled, the length of <data> will be 2 times <length>.

**TOBY-L2 / MPCI-L2**

- If the *+UPSD* command sets the PSD profile protocol type to IPv6, an IPv6 address will be reported in the remote host IP address.
- The +UUSORD URC does report the length of next packet in UDP RX buffer only (and not the total amount of received data present in the UDP RX buffer for the specified socket).

**LEON-G**

- The range of <socket> parameter goes from 0 to 15.

## 25.14 Set Listening Socket +USOLI

| +USOLI | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | *< 10s (except URC)* | *TCP/UDP/IP Error +CME Error* |

### 25.14.1 Description

Sets the specified socket in listening mode on the specified port of service, waiting for incoming connections (TCP) or data (UDP).

Objective Specification

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.

## 25.14.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+USOLI=<socket>,<port> | OK | **TCP sockets**<br>AT+USOLI=2,1200<br>OK<br>+UUSOLI: 3,"151.63.16.7",1403,2,"82.89.67.164",1200<br>**UDP sockets**<br>AT+USOLI=0,1182<br>OK<br>+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>,<length> | +UUSORF: 1,967 |

## 25.14.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <socket> | Number | Socket identifier. 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). For IP address format reference see the *IP addressing*. |
| <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). For IP address format reference see the *IP addressing*. |
| <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. |

## 25.14.4 Notes

- In case of notification via the URC +UUSOLI <port> is intended as the remote port.

**TOBY-L2 / MPCI-L2**

- If the *+UPSD* command sets the PSD profile protocol type to IPv6, an IPv6 address shall be reported in the remote host and TE IP address.

**LEON-G**

- The range of <socket> parameter goes from 0 to 15.

Objective specification

# 25.15 Firewall control +UFRW

| +UFRW | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 25.15.1 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.

The firewall applies for incoming connections only (i.e. listening sockets set by means of +USOLI command).

## 25.15.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UFRW=<action>[,<white_ip_addr_mask>] | OK | AT+UFRW=0<br>OK |
| Read | AT+UFRW? | +UFRW: <firewall_status>[,<white_ip_addr_mask1>[,<white_ip_addr_mask2>[,...]]]<br>OK | |
| Test | AT+UFRW=? | +UFRW: (list of supported <action>s)<br>OK | +UFRW: (0-4)<br>OK |

## 25.15.3 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<br>• 1: enable internal firewall. The parameter <white_ip_addr_mask> is not allowed in this case: if present error message will be returned<br>• 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.<br>• 3: remove specified IP address mask from firewall white list. The parameter <white_ip_addr_mask> is mandatory<br>• 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<br>• 1: enabled |

Objective Specification

# 25.16 HEX mode configuration +UDCONF=1

| +UDCONF=1 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 25.16.1 Description

Enables/disables the HEX mode for *+USOWR*, *+USOST*, *+USORD* and *+USORF* AT commands.

## 25.16.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UDCONF=1,<hex_mode_disable> | OK | AT+UDCONF=1,0<br>OK |
| Read | AT+UDCONF=1 | +UDCONF: 1,<hex_mode_disable><br>OK | AT+UDCONF=1<br>+UDCONF: 1,1<br>OK |

## 25.16.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <hex_mode_disable> | Number | Enables/disables the HEX mode for *+USOWR*, *+USOST*, *+USORD* and *+USORF* AT commands.<br>Allowed values:<br>• 0 (factory-programmed value): HEX mode disabled<br>• 1: HEX mode enabled |

# 25.17 Set socket in Direct Link mode +USODL

| +USODL | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | *< 10 s* | *+CME Error* |

## 25.17.1 Description

Establishes a transparent end to end communication with an already connected TCP or UDP socket via the serial interface. The data can be sent to the socket and can be received via the serial interface: the HW flow control usage is strongly recommended to avoid data loss.

The transparent TCP/UDP connection mode can be exited via the +++ sequence, entered after at least 2 s of suspension of transmission to the port. The socket will remain connected and communication can be re-established any time.

The *+UDCONF=5*, *+UDCONF=6*, *+UDCONF=7*, *+UDCONF=8* commands allow the configuration of UDP and TCP direct link triggers.

When using Direct Link with UDP sockets, if no network signal is available, outgoing UDP packet may be lost.

Objective Specification

## 25.17.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+USODL=<socket> | CONNECT | AT+USODL=0<br>CONNECT |

## 25.17.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <socket> | Number | Socket identifier. The range goes from 0 to 6. |

## 25.17.4 Notes

**LISA-U200-00S / LISA-U200-01S / LISA-U230 / LISA-U260-01S / LISA-U270-01S**

- The *+UDCONF=2* and *+UDCONF=3* commands allow the UDP direct link configuration.

**LISA-U1**

- During a 3G connection on the UART interface, the data rate must be at least 115200 b/s.
- The *+UDCONF=2* and *+UDCONF=3* commands allow UDP direct link configuration.

**SARA-G340-02S / SARA-G350-02A / SARA-G350-02S**

- On the AUX UART interface, the command is not supported.

**LEON-G**

- The UDP Direct Link is not supported.
- The range of <socket> parameter goes from 0 to 15.

## 25.17.5 Enhanced Direct Link

LISA-U1 / LISA-U200-00S / LISA-U2x0-01S / LEON-G
Not supported.

The enhanced DL functionality allows the user set up to three kinds of trigger for data transmission:

- Timer Trigger
- Data Length Trigger
- Character Trigger

The triggers can be applied independently to each socket. A socket may be set with more than one trigger.

The trigger must be set after the socket creation and before switching to direct link mode.

By default Timer Trigger and Data Length Trigger are enabled for UDP sockets.

By default no triggers are enabled for TCP sockets.

See the *+UDCONF=5*, *+UDCONF=6*, *+UDCONF=7*, *+UDCONF=8* commands description for the transmission triggers configuration.

### 25.17.5.1 Timer Trigger (TT)

The user can configure a timeout for sending the data. The timer starts every time a character is read from the serial interface. When the timer expires, buffered data is sent.

The timer range is between 100 and 120000 ms; the special value 0 (zero) means that the timer is disabled.

By default the timer trigger is disabled for TCP sockets and enabled with a value of 500 ms for UDP sockets.

The *+UDCONF=5* command can configure the timer trigger.

### 25.17.5.2 Data Length Trigger (DLT)

The user can configure a maximum buffered data length to reach before sending the data. When this length is reached the data is sent.

Objective Specification

The minimum data length is 3, the maximum data length is 2048 bytes for TCP and 1472 bytes for UDP. If the data length is set to 0 (zero) the trigger is disabled (every data chunk received from the serial port is immediately sent to the network).

By default the data length trigger is disabled for TCP sockets and set to 1024 for UDP sockets.

The *+UDCONF=6* command can configure the data length trigger.

#### 25.17.5.3 Character Trigger (CT)

The user can configure a character that will trigger the data transmission. When the character is detected the data (including the trigger character) is sent.

If the specified character is -1, the character trigger is disabled.

By default it is disabled for both TCP and UDP sockets.

The *+UDCONF=7* command can configure the character trigger.

#### 25.17.5.4 Combined Triggers

The user can enable multiple triggers together. The triggers work with an OR logic. This means that the first trigger reached fires the data transmission.

#### 25.17.5.5 About serial data chunks

A data chunk is the amount of data that SIO recognizes as a single data transmission.

If the baud rate is lower than 115200 b/s the time to receive 255 characters is always calculated with timings for 115200 b/s.

**SARA-G340 / SARA-G350 / LEON-G**

- A data transmission starts when the first byte is received and it finishes when no data is received in the time required for the reception of 255 bytes at the current serial port speed.

#### 25.17.5.6 Data from the network

The data received from the network is immediately forwarded to the serial interface.

#### 25.17.5.7 Congestion timer

Is it also possible to set a congestion timer after which, in case of network congestion, the module exits from direct link.

The timer range is between 1000 and 720000 ms, the special value 0 (zero) means that the timer is disabled.

By default the congestion timer is set to 60000 (60 s) for both TCP and UDP sockets.

The *+UDCONF=8* command can configure the congestion timer.

## 25.18 UDP Direct Link Packet Size configuration +UDCONF=2

| +UDCONF=2 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U1 LISA-U200-00S LISA-U200-01S LISA-U230 LISA-U260-01S LISA-U270-01S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 25.18.1 Description

Set the packet size for the UDP direct link packet.

### 25.18.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UDCONF=2,<socket_id>,<packet_size> | OK | AT+UDCONF=2,1,1024<br>OK |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| Read | AT+UDCONF=2,<socket_id> | +UDCONF: 2,<socket_id>,<packet_size><br>OK | AT+UDCONF=2,1<br>+UDCONF: 2,1,1024<br>OK |

### 25.18.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <socket_id> | Number | Socket identifier; used when changing the UDP Direct Link settings.<br>Valid range is 0-6 |
| <packet_size> | Number | Packet size (in bytes) for UDP direct link; valid range is 100-1472; the factory-programmed value is 1024 bytes |

## 25.19 UDP Direct Link Sending timer configuration +UDCONF=3

| +UDCONF=3 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U1 LISA-U200-00S LISA-U200-01S LISA-U230 LISA-U260-01S LISA-U270-01S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 25.19.1 Description

Configures the UDP direct link set sending timer.

### 25.19.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UDCONF=3,<socket_id>,<sending_timer_timeout> | OK | AT+UDCONF=3,1,1000<br>OK |
| Read | AT+UDCONF=3,<socket_id> | +UDCONF: 3,<socket_id>,<sending_timer_timeout><br>OK | AT+UDCONF=3,1<br>+UDCONF: 3,1,1000<br>OK |

### 25.19.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <socket_id> | Number | Socket identifier; used when changing the UDP Direct Link settings.<br>Allowed range is 0-6 |
| <sending_timer_timeout> | Number | Sending timer (in milliseconds) for UDP direct link; valid range is 100-120000; the default value is 1000 ms |

## 25.20 Timer Trigger configuration for Direct Link +UDCONF=5

| +UDCONF=5 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-83S LISA-U201 LISA-U260-02S LISA-U270-02S SARA-U | | | | | |
| | SARA-G340 SARA-G350 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 25.20.1 Description

Sets the timer trigger of the interested socket identifier for the data transmission enhanced Direct Link.

Objective Specification

### 25.20.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UDCONF=5,<socket_id>,<timer_trigger> | OK | AT+UDCONF=5,0,500<br>OK |
| Read | AT+UDCONF=5,<socket_id> | +UDCONF: 5,<socket_id>,<timer_trigger><br>OK | AT+UDCONF=5,0<br>+UDCONF: 5,0,500<br>OK |

### 25.20.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <socket_id> | Number | Socket identifier; used when changing the UDP Direct Link settings.<br>Valid range is 0-6 |
| <timer_trigger> | Number | Enhanced Direct Link sending timer trigger (in milliseconds); valid range is 0, 100 120000; the factory-programmed value is 500 ms for UDP, 0 for TCP, 0 means trigger disabled |

## 25.21 Data Length Trigger configuration for Direct Link +UDCONF=6

| +UDCONF=6 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-83S LISA-U201 LISA-U260-02S LISA-U270-02S SARA-U | | | | | |
| | SARA-G340 SARA-G350 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 25.21.1 Description

Sets the data length trigger of the interested socket identifier for the data transmission enhanced Direct Link.

### 25.21.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UDCONF=6,<socket_id>,<data_length_trigger> | OK | AT+UDCONF=6,0,1024<br>OK |
| Read | AT+UDCONF=6,<socket_id> | +UDCONF: 6,<socket_id>,<data_length_trigger><br>OK | AT+UDCONF=6,0<br>+UDCONF: 6,0,1024<br>OK |

### 25.21.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <socket_id> | Number | Socket identifier; used when changing the UDP Direct Link settings.<br>Valid range is 0-6 |
| <data_length_trigger> | Number | Enhanced Direct Link data length trigger in bytes, valid range is 0, 3 1472 for UDP and 0, 3-2048 for TCP, the factory-programmed value is 1024 for UDP, 0 for TCP, 0 means trigger disabled |

Objective Specification

# 25.22 Character trigger configuration for Direct Link +UDCONF=7

| +UDCONF=7 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-83S LISA-U201 LISA-U260-02S LISA-U270-02S SARA-U | | | | | |
| | SARA-G340 SARA-G350 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 25.22.1 Description

Sets the character trigger of the interested socket identifier for the data transmission enhanced Direct Link.

## 25.22.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UDCONF=7,<socket_id>,<character_trigger> | OK | AT+UDCONF=7,0,13<br>OK |
| Read | AT+UDCONF=7,<socket_id> | +UDCONF: 7,<socket_id>,<character_trigger><br>OK | AT+UDCONF=7,0<br>+UDCONF: 7,0,13<br>OK |

## 25.22.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <socket_id> | Number | Socket identifier; used when changing the Direct Link settings.<br>The allowed range is 0-6 |
| <character_trigger> | Number | Enhanced Direct Link character trigger, the value represents the ASCII code (in base 10) of the character to be used as character trigger. The allowed range is -1, 0-255, the factory-programmed value is -1; -1 means trigger disabled |

# 25.23 Congestion timer configuration for Direct Link +UDCONF=8

| +UDCONF=8 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-83S LISA-U201 LISA-U260-02S LISA-U270-02S SARA-U | | | | | |
| | SARA-G340 SARA-G350 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 25.23.1 Description

Sets the congestion timer of the interested socket identifier for the data transmission enhanced Direct Link.

## 25.23.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UDCONF=8,<socket_id>,<congestion_timer> | OK | AT+UDCONF=8,0,120000<br>OK |
| Read | AT+UDCONF=8,<socket_id> | +UDCONF: 8,<socket_id>,<congestion_timer><br>OK | AT+UDCONF=8,0<br>+UDCONF: 8,0,120000<br>OK |

Objective Specification

### 25.23.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <socket_id> | Number | Socket identifier; used when changing the Direct Link settings.<br>Valid range is 0-6 |
| <congestion_timer> | Number | Enhanced Direct Link congestion timer (in milliseconds); valid range is 0, 1000-720000; the factory-programmed value is 60000, 0 means trigger disabled |

## 25.24 Direct Link disconnect DSR line handling +UDCONF=10

| +UDCONF=10 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U201 SARA-U260-03S SARA-U270-03S SARA-U270-53S SARA-U280-03S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 25.24.1 Description

The Direct Link functionality changes the DSR line state according to the *&S* configuration. If the *&S* configuration = 1 (default and factory programmed value), DSR line transitions will occur as follow:

- From LOW to HIGH when module enters into Direct Link mode
- From HIGH to LOW when module exits from Direct Link mode

The +UDCONF=10 command allows to configure the behaviour of the DSR line when the module exits from Direct Link. In fact, the transition (from HIGH to LOW) can be configured to occur prior to or after the output of the "<CR><LF>DISCONNECT<CR><LF>" string.

This command has no effect when the *&S* configuration = 0.

### 25.24.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UDCONF=10,<dl_dsr_line_behaviour> | OK | AT+UDCONF=10,1<br>OK |
| Read | AT+UDCONF=10 | +UDCONF: 10,<dl_dsr_line_behaviour><br>OK | AT+UDCONF=10<br>+UDCONF: 10,1<br>OK |

### 25.24.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <dl_dsr_line_behaviour> | Number | Behaviour of the DSR transition when the module exits from Direct Link. Allowed values:<br>• 0 (factory-programmed value): DSR line transition (HIGH to LOW) is performed after the output of the "<CR><LF>DISCONNECT<CR><LF>" string<br>• 1: DSR line transition (HIGH to LOW) is performed before (~20 ms) the output of the "<CR><LF>DISCONNECT<CR><LF>" string |

## 25.25 Socket control +USOCTL

| +USOCTL | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | No | No | - | *+CME Error* |

### 25.25.1 Description

Allows interaction with the low level socket layer.

Objective Specification

## 25.25.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+USOCTL=<socket>,<param_id> | +USOCTL: <socket>,<param_id>,<param_val>[,<param_val2>]<br>OK | AT+USOCTL=0,2<br>+USOCTL: 0,2,38<br>OK |

## 25.25.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <socket> | Number | Socket identifier. The range goes from 0 to 6 |
| <param_id> | Number | Control request identifier. Possible values are:<br>• 0: query for socket type<br>• 1: query for last socket error<br>• 2: get the total amount of bytes sent from the socket<br>• 3: get the total amount of bytes received by the socket<br>• 4: query for remote peer IP address and port<br>• 10: query for TCP socket status (only TCP sockets)<br>• 11: query for TCP outgoing unacknowledged data (only TCP sockets)<br>• 5-9, 12-99: RFU |
| <param_val> | Number / String | This value may assume different means depending on the <param_id> parameter.<br>If <param_id>= 0, <param_val> can assume these values:<br>• 6 TCP socket<br>• 17: UDP socket<br>If <param_id>= 1, <param_val> can assume these values:<br>• N: last socket error<br>If <param_id>= 2, <param_val> can assume these values:<br>• N: the total amount (in bytes) of sent (acknowledged + unacknowledged) data<br>If <param_id>= 3, <param_val> can assume these values:<br>• N: the total amount (in bytes) of received (read) data<br>If <param_id>= 4, <param_val> can assume these values:<br>• A string representing the remote peer IP address expressed in dotted decimal form<br>If <param_id>= 10, <param_val> can assume these values:<br>• 0: the socket is in INACTIVE status (it corresponds to CLOSED status defined in RFC793 "TCP Protocol Specification" *[111]*)<br>• 1: the socket is in LISTEN status<br>• 2: the socket is in SYN_SENT status<br>• 3: the socket is in SYN_RCVD status<br>• 4: the socket is in ESTABILISHED status<br>• 5: the socket is in FIN_WAIT_1 status<br>• 6: the socket is in FIN_WAIT_2 status<br>• 7: the sokcet is in CLOSE_WAIT status<br>• 8: the socket is in CLOSING status<br>• 9: the socket is in LAST_ACK status<br>• 10: the socket is in TIME_WAIT status<br>If <param_id>= 11, <param_val> can assume these values:<br>• N: the total amount of outgoing unacknowledged data |
| <param_val2> | Number | This value is present only when <param_id> is 4. It represents the remote peer IP port. For IP address format reference see the *IP addressing*. |

## 25.25.4 Notes

### TOBY-L2 / MPCI-L2

- If the *+UPSD* command sets the PSD profile protocol type to IPv6, an IPv6 address shall be reported in the remote peer IP address.

Objective specification

**LEON-G**

- The range of <socket> parameter goes from 0 to 15.

# 25.26 IP Change Notification +UIPCHGN

| +UIPCHGN | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U260-02S LISA-U270-01S LISA-U270-62S LISA-U270-63S LISA-U270-68S SARA-U | | | | | |
| | SARA-G340 SARA-G350 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *UUIPGHGN Error* *+CME Error* |

## 25.26.1 Description

Enable, disables or forces the IP change notification (CN) functionality. This command only works for internal PDP context activation (refer to *+UCSD*, *+UCSDA* and *+UCSND* AT commands for establishing a CSD connection and to *+UPSD*, *+UPSDA* and *+UPSND* AT commands for establishing a PSD connection).

The IP CN notifies a remote server about changes in the module IP address.

The following information is delivered to the destination server:

- Current IP address of the module
- IMEI of the module (optional)
- IMSI of the inserted SIM card (optional)
- Username (optional)
- MD5 hash of user password (hex format) (optional)
- Custom information (up to 128 bytes)

The notification is sent via a HTTP GET request.

The GET request format is the following:

```
GET    /<path>?myip=<ip>&imei=<imei>&imsi=<imsi>&user=<username>&pass=<md5paswd>&cust=<cust_info>
 HTTP/1.0{CRLF}
```

```
Host: <domain_name>{CRLF}
```

```
User-Agent: u-blox IP Change Notification Agent 1.0{CRLF}
```

```
{CRLF}
```

<ip>, <imei> (if enabled) and <imsi> (if enabled) fields inside the HTTP request are automatically inserted by the module, <domain_name>, <path>, <username>, <password> and <cust_info> fields must be provided by the application through the +UIPCHGN AT command.

{CRLF} is a placeholder for hexadecimal character 0x0D (CR) and 0x0A (LF).

The HTTP response from the server is parsed to recognize the HTTP response code and the text between the <ipchgn_r> and the </ipchgn_r> tags inside the response body. This text is not mandatory and can be freely customized by the customer (up to 64 printable characters).

A real world example follows:

Objective Specification

Request (from the module)

```
GET     /modemipnotify.php?myip=123.56.214.2&imei=992237050009739&imsi=992105301545971&user=test_
user&pass=16ec1ebb01fe02ded9b7d5447d3dfc65&cust=Product%3A+Tracker+v.1.0 HTTP/1.0{CRLF}

Host: somedomain.com {CRLF}

User-Agent: u-blox IP Change Notification Agent 1.0{CRLF}

{CRLF}
```

Where

| Field | Content | Comment |
|---|---|---|
| server | somedomain.com | Specified via +UIPCHGN AT command |
| path | modemipnotify.php | Specified via +UIPCHGN AT command |
| myip | 123.56.214.2 | |
| imei | 992237050009739 | |
| imsi | 992105301545971 | |
| user | test_user | Specified via +UIPCHGN AT command |
| pass | 16ec1ebb01fe02ded9b7d5447d3dfc65 | MD5 hash of "test_password"Specified via +UIPCHGN AT command |
| cust_info | Product%3A+Tracker+v.1.0 | URL encoding of the string "Product: Tracker v.1.0". Specified via +UIPCHGN AT command |

Response (from the server)

```
HTTP/1.0 200 OK {CRLF}

Content-Type: text/html {CRLF}

Content-Length: 31 {CRLF}

Connection: close {CRLF}

{CRLF}

<ipchgn_r>IP_UPDATED</ipchgn_r>
```

Another real world example (without custom information, username and password):

```
GET     /modemipnotify.php?myip=123.56.214.2&imei=992237050009739&imsi=992105301545971&user=&pass=
&cust= HTTP/1.0{CRLF}

Host: somedomain.com {CRLF}

User-Agent: u-blox IP Change Notification Agent 1.0{CRLF}

{CRLF}
```

Where:

| Field | Content | Comment |
|---|---|---|
| server | somedomain.com | |
| path | modemipnotify.php | |
| myip | 123.56.214.2 | |
| imei | 992237050009739 | |
| imsi | 992105301545971 | |
| user | | (empty) |
| pass | | (empty) |
| cust_info | | (empty) |

Objective Specification

Response (from the server)

```
HTTP/1.0 200 OK {CRLF}
Content-Type: text/html {CRLF}
Content-Length: 31 {CRLF}
Connection: close {CRLF}
{CRLF}
<ipchgn_r>IP_UPDATED</ipchgn_r>
```

Password hashing and URL encoding are performed by the module, so parameters < password> and <cust_info> must be inserted in plain text in the +UIPCHGN command (See command parameters below).

The command configuration is stored in the NVM; if enabled, the command automatically works after a reboot and the +UUIPCHGN: 0 URC is sent to all terminals in this case.

If the IP CN feature is enabled, the notification is performed at each PDP context activation. If the client is enabled when a PDP connection is already active, it starts to update IP address on the next PDP context activation.

The custom information field (< cust_info >) is URL encoded into the HTTP request, this means that the final custom information inside the HTTP GET request may be longer than 128 bytes.

The IP CN feature only works for PDP connections configured and enabled by +UPSD and +UPSDA command.

The username and password are not compulsory, but it is encouraged to use them for security reasons.

## 25.26.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UIPCHGN=<action>[,<server>,<port>,<path>,<send_imei>,<send_imsi>,<username>,<password>,<cust_info>] | OK | To enable the IP CN feature:<br>AT+UIPCHGN=1,"somedomain.com",80,"modemipnotify.php",1,1,"test_user","test_password","Product: Tracker v.1.0"<br>OK<br>To force another IP CN to the remote server (CN must be previously enabled):<br>AT+UIPCHGN=2<br>OK<br>To disable the IP CN feature:<br>AT+UIPCHGN=0<br>OK |
| Read | AT+UIPCHGN? | +UIPCHGN: <status>[,<server>,<port>,<path>,<send_imei>,<send_imsi>,<username>,<password>,<cust_info>]<br>OK | +UIPCHGN: 1,"somedomain.com",80,"/modemipnotify.php",1,1,"test_user","test_password","Product: Tracker v.1.0"<br>OK |
| Test | AT+UIPCHGN=? | +UIPCHGN: (list of supported <action>s),<server>,(list of supported <port>s),<path>,(list of supported <send_imei>s),(list of supported <send_imsi>s),<username>,<password>,<cust_info>)<br>OK | +UIPCHGN: (0 2),"server",(1 65535),"path",(0 1),(0 1),"username","password","cust_info"<br>OK |
| URC | | +UUIPCHGN: <code>[,<reply_str>] | +UUIPCHGN: 200,"IP_UPDATED" |

Objective Specification

### 25.26.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <action> | Number | Disable / Enable / Force the Update of IP CN feature<br>• 0 (factory-programmed value): disable the feature<br>• 1: enable the feature<br>• 2: force IP notification update<br>Note: < action > = 2 could be used when the +UUIPCHGN URC returns a code different from 200. |
| <server> | String | Indicates the remote host to which the HTTP GET request must be sent to notify the IP change event.<br>It can be either a domain name (e.g. "somedomain.com") or an IP address in numeric format (e.g. "173.194.35.145"), always between double quotes.<br>Maximum length: 64 characters<br>Mandatory parameter with < action>=1, ignored with < action>=0 or < action>=2 |
| <port> | Number | Indicates the server port to which the HTTP GET request must be sent.<br>Valid range: from 1 to 65535<br>Mandatory parameter with < action> =1, ignored with < action> =0 or < action> =2 |
| <path> | String | Indicates the server path to be used inside the HTTP GET request. The insertion of the starting "/" is not mandatory (the software automatically adds it if omitted). The string must be enclosed between double quotes.<br>Maximum length: 64 characters<br>Mandatory parameter with < action> =1, ignored with < action> =0 or < action> =2 |
| <username> | String | Indicates the username to be sent inside the HTTP request. The string must be enclosed between double quotes.<br>Max length: 64 characters<br>Mandatory parameter with < action> =1, ignored with < action> =0 or < action> =2<br>If no username is required, this parameter must be inserted as empty string ("") |
| <send_imei> | Number | Indicates if the notification must send the modem IMEI inside the notification HTTP GET request<br>• 0: do not send IMEI<br>• 1: send IMEI<br>Mandatory parameter with < action> =1, ignored with < action> =0 or < action> =2 |
| <send_imsi> | Number | Indicates if the notification must send the modem IMSI inside the notification HTTP GET request<br>Valid range: 0-1<br>• 0: do not send IMSI<br>• 1: send IMSI<br>Mandatory parameter with < action> =1, ignored with < action> =0 or < action> =2 |
| <password> | String | Indicates the password whose MD5 hash is to be sent inside the HTTP request. The string must be enclosed between double quotes.<br>Maximum length: 32 characters<br>Mandatory parameter with <action>=1, ignored with <action>=0 or <action>=2<br>If no password is required, this parameter must be inserted as empty string ("") |
| <cust_info> | String | Indicates the custom information to send inside the HTTP GET request. The string must be enclosed between double quotes.<br>Maximum length: 128 characters<br>Mandatory parameter with <action>=1, ignored with <action>=0 or <action>=2<br>If no custom information is required, this parameter must be inserted as empty string ("") |
| <status> | Number | This value indicates the status of the IP CN feature<br>• 0: disabled<br>• 1: enabled |
| <code> | Number | This is the code returned by the +UUIPCHGN URC. Values lower than 100 should be interpreted as internal error according to the IP CN error table.<br><code> values greater than 100 must be interpreted as HTTP server response code.<br>If error is not present the code returned by the +UUIPCHGN should be 200. |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | The +UUIPCHGN: 0 URC is sent to all terminals at boot if the IP CN feature is enabled from a previous working session. |
| <reply_str> | String | This is the text inserted between the <ipchgn_r> and </ipchgn_r> tags into the response body from the server. The string is enclosed between double quotes.<br>The maximum length of this string is 64 bytes; if the server sends a longer string, it will be truncated.<br>The parameter is only provided when the information is present in the HTTP response from the remote server and not if an internal error occurred. |

# 25.27 Socket Always On +USOAO

| +USOAO | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U260-02S LISA-U270-02S LISA-U270-62S LISA-U270-63S LISA-U270-68S SARA-U | | | | | |
| | SARA-G340 SARA-G350 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - (except URC) | *+CME Error* |

## 25.27.1 Description

Allows the configuration of the Socket Always On feature.

The Socket Always On (SAO) causes the module to try establishing an automatic Direct Link (DL) IP connection (or to start listening on an IP port, and in case establish a DL connection) over the UART interface as soon as the module is powered on, so that "dumb" terminals (equipments without the logic to send AT commands and parse the responses) can directly use an IP connection.

The Direct Link connection used by SAO cannot be established over the USB or SPI physical interfaces but over the UART physical interface only.

SAO may work in "client" and "server" modes:

- Client mode: the module establishes a Direct Link IP connection with a defined remote server
- Server mode: the module waits for an incoming connection request on a defined IP port; when an acceptable remote client is recognized, the Direct Link is established

For client mode, the user must specify these parameters:

- Internal PDP profile to be used for GPRS connection
- Destination host IP number or hostname
- Destination host port

For server mode, the user must specify these parameters:

- Internal PDP profile to be used for GPRS connection
- Listening port
- White list of remote hosts (optional)

If the feature is enabled, it starts working at the next module power on.

When using SAO in server mode and the network dynamically assigns an IP address (which is most often the case), then it is advisable to enable also the IP Change Notification feature to inform a remote server about the assigned IP address. See the *+UIPCHGN* command description.

When using SAO in server mode, the network dynamically assigns an IP address and the remote client uses an IP hostname rather than a numerical IP address to connect to the module, then it is advisable to enable the dynamic DNS feature. See the *+UDYNDNS* command description.

A usage example for client mode configuration follows:

| AT command | Comment |
|---|---|
| **PSD connection settings** | |

Objective Specification

| AT command | Comment |
|---|---|
| AT+UPSD=0,1,"your.apn" | Configures the APN for internal PDP profile 0; "your.apn" is an example |
| AT+UPSDA=0,1 | Stores the parameters of PDP profile 0 to NVM |
| **Socket Always On configuration** | |
| AT+USOAO=1,0 | Sets PDP profile 0 as default connection to be activated after module start-up |
| AT+USOAO=2,0 | Sets client mode |
| AT+USOAO=3,"somehost.somedomain.com" | Sets the remote host for the TCP connection. The value can also be an IP address. |
| AT+USOAO=4,8084 | Sets the remote port for the TCP connection |
| AT+USOAO=0,1 | Enables the Socket Always On functionality. |
| AT+CPWROFF | Shuts down the module. On the next boot the functionality is active. |
| | After modem start-up (wait around 15 s) |
| +UUSOAOC: "122.26.56.55",8084 | This is a notification of the connection establishment to the remote host. The IP address shown is the IP address got after the DNS resolution of the hostname. The IP shown here is for example purpose only. The module is connected in direct link mode (the data sent to the UART port is forwarded to the network and vice-versa). If the connection drops, it is automatically re established |

A usage example for server mode configuration follows:

| AT command | Comment |
|---|---|
| **PSD connection settings** | |
| AT+UPSD=0,1,"your.apn" | Configures the APN for internal PDP profile 0; "your.apn" is an example |
| AT+UPSDA=0,1 | Stores the parameters of PDP profile 0 to NVM |
| **Socket Always On configuration** | |
| AT+USOAO=1,0 | Sets PDP profile 0 as default connection to be activated after module start up |
| AT+USOAO=2,1 | Sets server mode |
| AT+USOAO=4,2000 | Sets the listening port |
| AT+USOAO=20,"143.22.33.0" | Sets the first host in white list (optional, up to 10 host can be added) |
| AT+USOAO=21,"143.22.33.1" | Sets the second host in white list (optional, up to 10 host can be added) |
| AT+USOAO=0,1 | Enables the Socket Always On functionality. If any of the previous settings is not performed the command returns error. |
| AT+UIPCHGN=1,"somedomain.com",80,"modemipnotify.php",1,1,"test_user","test_password" | Configures the IP Change notification feature (optional but recommended for server mode). Refer to *+UIPCHGN* command description for details |
| AT+CPWROFF | Shuts down the module. On the next boot the functionality is active. |
| | After module start-up (wait around 15 s) |
| +UUIPCHGN: 200,"msg" | IP Change Notification result (it is not be prompted if IP change notification is disabled) |
| +UUSOAOL: "151.22.34.66",2000 | Notifies the Socket Always On is enabled in server mode and listening on IP 151.22.34.66 and port 2000 |
| | A new connection is accepted... |
| +UUSOAOC: "143.22.33.1",5996 | Notifies a new connection has been accepted from IP 143.22.33.01 and port 5996. Now it is possible to exchange data with the remote host. The data sent to the UART port is forwarded to the network and vice-versa.<br>If the remote host disconnects, the modem keeps in DL mode waiting for new incoming connections (which are not notified) |

The module never exits from direct link mode; if the remote client disconnects or the network is no longer available, the connection will be re-established automatically and transparently.

In order for SAO to work, the following conditions must be true:

- the SIM PIN must be disabled, or the right PIN must be provided via the +USOAO=10 sub-command

Objective Specification

- the UART must be correctly configured for speed (see the *+IPR*) and flow control (see the *+IFC*)
- the PSD connection parameters must be configured with the *+UPSD* command and stored in NVM
- the automatic or manual network registration must be enabled (see *+COPS* command description).

If any of the SAO settings are wrong (e.g. setting the server mode when using UDP protocol), the SAO can be enabled but will not start.

When connected in server mode, if a new connection from an acceptable client address is received, the current connection is silently dropped and the new one is accepted.

The Direct Link connection used by SAO is affected by the triggers (as specified in *Enhanced Direct Link*). If they are not explicitly modified, the default triggers will apply.

When the module boots with SAO enabled, the PSD and TCP/IP commands cannot be reliably used (their functionalities are being used by the SAO). The only safe option is to disable SAO and reboot (with AT +USOAO=0,0 and *AT+CPWROFF*).

When the module boots with SAO enabled, the MUX protocol (see *+CMUX* command description) must not be enabled on UART interface.

## 25.27.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| **Socket Always On generic syntax** | | | |
| Set | AT+USOAO=<op_code>,<param1> | OK | AT+USOAO=0,1<br>OK |
| Read | AT+USOAO=<op_code> | +USOAO: <op_code>,<param1><br>OK | +USOAO: 0,1<br>OK |
| **Enable/disable Socket Always On** | | | |
| Set | AT+USOAO=0,<enable> | OK | AT+USOAO=0,1<br>OK |
| Read | AT+USOAO=0 | +USOAO: 0,<enable><br>OK | +USOAO: 0,0<br>OK |
| **PSD connection setting** | | | |
| Set | AT+USOAO=1,<profile_id> | OK | AT+USOAO=1,5<br>OK |
| Read | AT+USOAO=1 | +USOAO: 1,<profile_id><br>OK | +USOAO: 1,6<br>OK |
| **Client or server mode configuration** | | | |
| Set | AT+USOAO=2,<server_mode> | OK | AT+USOAO=2,0<br>OK |
| Read | AT+USOAO=2 | +USOAO: 2,<server_mode><br>OK | +USOAO: 2,0<br>OK |
| **Remote host (for client mode) configuration** | | | |
| Set | AT+USOAO=3,<remote_host> | OK | AT+USOAO=3,"www.remotehost.it"<br>OK |
| Read | AT+USOAO=3 | +USOAO: 3,<remote_host><br>OK | +USOAO: 3,"www.remotehost.it"<br>OK |
| **IP port number configuration** | | | |
| Set | AT+USOAO=4,<ip_port> | OK | AT+USOAO=4,8088<br>OK |
| Read | AT+USOAO=4 | +USOAO: 4,<ip_port><br>OK | +USOAO: 4,8088<br>OK |
| **IP protocol configuration** | | | |
| Set | AT+USOAO=5,<protocol> | OK | AT+USOAO=5,17<br>OK |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| Read | AT+USOAO=5 | +USOAO: 4,<protocol> | +USOAO: 5,17 |
| | | OK | OK |
| **SIM PIN configuration** | | | |
| Set | AT+USOAO=10,<pin> | OK | AT+USOAO=10,"123456" |
| | | | OK |
| Read | AT+USOAO=10 | +USOAO: 10,******** | +USOAO: 10,******** |
| | | OK | OK |
| **Set the i-th element of the white list of IP addresses (i=0..9)** | | | |
| Set | AT+USOAO=20+i,<client_address> | OK | AT+USOAO=22,"123.156.0.2" |
| | | | OK |
| Read | AT+USOAO=20+i | +USOAO: 20+i,<client_address> | +USOAO: 22,"123.156.0.2" |
| | | OK | OK |
| Test | AT+USOAO=? | +USOAO: (list of supported <op_code>'s) | +USOAO: (0-5,10,20-29) |
| | | OK | OK |
| URC | (listening URC) | +UUSOAOL: <local_ip>,<local_port> | +UUSOAOL: "151.22.34.66",2000 |
| URC | (connection URC) | +UUSOAOC: <remote_ip>,<remote_port> | +UUSOAOC: "122.26.56.55",8084 |

## 25.27.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <op_code> | Number | Identifier of the meaning of the next parameter(s). Allowed values/ranges are: 0-5, 10 and 20-29.<br>Meanings:<br>• 0: enable/disable the socket always on feature<br>• 1: configure the default PSD connection<br>• 2: client/server mode<br>• 3: remote host (for client mode only)<br>• 4: remote host port for client mode or local listening port for server mode<br>• 5: socket type: UDP (for client mode only) or TCP<br>• 10: SIM PIN<br>• 20-29: white list items (for server mode only) |
| <enable> | Number | Configures the Socket Always On feature at the next power on:<br>• 0 (factory-programmed value): feature disabled<br>• 1: feature enabled |
| <profile_id> | Number | This is the same <profile_id> used in *+UPSD* command. Range between 0 and 6.<br>The factory-programmed value is 0. |
| <server_mode> | Number | Defines the client or server module behavior. Allowed values:<br>• 0 (factory-programmed value): client mode<br>• 1: server mode |
| <remote_host> | String | The remote server IP address or hostname to connect to while in client mode. This value is ignored for server configuration.<br>The factory-programmed value is an empty string (""). |
| <ip_port> | Number | In client mode it represents the remote port to connect to.<br>In server mode it represents the local port on which the module must wait incoming connection.<br>The range 1-65535. The factory-programmed value is 2000. |
| <protocol> | Number | Protocol type to be used for socket creation. Allowed values:<br>• 6 (factory-programmed value): TCP<br>• 17: UDP (not valid for server mode) |
| <pin> | String | SIM PIN: 4-to-8 characters long string of decimal digits. It is used if the SIM requires it and only if there are 3 attempts left.<br>If empty, no PIN is attempted. The factory-programmed value is an empty string (no PIN).<br>The PIN cannot be revealed - the read command AT+USOAO=10 only returns a string of asterisks "********". |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| <client_address> | String | An entry in the "white list" of remote clients IP addresses, in quoted numerical format (e.g. "123.45.67.89"). If the list is non-empty (i.e. it does not contain only null addresses), only connection requests from the listed addresses is accepted. An empty IP address ("0.0.0.0") is a null address.<br><br>The factory-programmed value is an empty IP address. |
| <local_ip> | String | Local IP address. Only used in +UUSOAOL URC (when the module is in server mode). |
| <local_port> | Number | Local IP port. Range between 1 and 65535. Used only in +UUSOAOL URC (when the module is in server mode). |
| <remote_ip> | String | IP address of the remote host connected to the module. Used in +UUSOAOC URCs. |
| <remote_port> | Number | IP port of the remote host connected to the module. Range between 1 and 65535.<br><br>Used in +UUSOAOC URCs |
| <param1> | Number | Type and supported content depend on the related <op_code> parameter; see the <op_code> specification |

## 25.27.4 Notes

- +UUSOAOL and +UUSOAOC URCs are displayed only if the socket always on connection is active.
- +UUSOAOL URC is only displayed if socket always on is set in server mode.
- Only the UART interface displays +UUSOAOL and +UUSOAOC.

Objective Specification

# 26 SSL/TLS

## 26.1 Introduction

SSL/TLS provides a secure connection between two entities using TCP socket for communication (i.e. HTTP/FTP server and HTTP/FTP client).

The SSL/TLS with digital certificates support provides different connection security aspects:

- **Server authentication**: use of the server certificate verification against a specific trusted certificate or a trusted certificates list;
- **Client authentication**: use of the client certificate and the corresponding private key;
- **Data security and integrity**: data encryption and Hash Message Authentication Code (HMAC) generation.

The security aspects used in the current connection depend on the SSL/TLS configuration and features supported by the communicating entities.

u-blox cellular modules support all the described aspects of SSL/TLS security protocol with these AT commands:

- *AT+USECMNG*: import, removal, list and information retrieval of certificates or private keys;
- *AT+USECPRF*: configuration of USECMNG profiles used for an SSL/TLS connection.

The USECMNG provides a default SSL/TLS profile which cannot be modified. The default USECMNG profile provides the following SSL/TLS settings:

| Setting | Value | Meaning |
|---|---|---|
| Certificates validation level | Level 0 | The server certificate will not be checked or verified. |
| Minimum SSL/TLS version | Any | The server can use any of the TLS1.0/TLS1.1/TLS1.2 versions for the connection. |
| Cipher suite | Automatic | The cipher suite will be negotiated in the handshake process. |
| Trusted root certificate internal name | "" (none) | No certificate will be used for the server authentication. |
| Expected server host-name | "" (none) | No server host-name is expected. |
| Client certificate internal name | "" (none) | No client certificate will be used. |
| Client private key internal name | "" (none) | No client private key will be used. |
| Client private key password | "" (none) | No client private key password will be used. |
| Pre-shared key | "" (none) | No pre-shared key key password will be used. |

## 26.2 SSL/TLS certificates and private keys manager +USECMNG

| +USECMNG | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U201 SARA-U260-03S SARA-U270-03S SARA-U270-53S SARA-U280-03S | | | | | |
| | SARA-G340-02S SARA-G350-02A SARA-G350-02S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 26.2.1 Description

Manages the X.509 certificates and private keys with the following functionalities:

- Validation and import of certificates and private keys
- List and information retrieval of imported certificates and private keys
- Removal of certificates and private keys
- MD5 calculation of imported certificate or private key

The command accepts certificates and private keys both in DER (Distinguished Encoding Rules) and in PEM (Privacy-Enhanced Mail) format. If the provided format is PEM, the imported certificate or private key will be automatically converted in DER format for the internal storage.

Objective specification

☞ The certificates and private keys are kept in DER format and are not retrievable (i.e. cannot be downloaded from the module); for data validation purposes an MD5 hash string of the stored certificate of DER private key can be retrieved.

☞ Up to 16 certificates or private keys can be imported.

☞ Data for certificate or private key import can be provided with a stream of byte similar to *+UDWNFILE* or from a file stored on the FS.

☞ When using the stream of byte import functionality:
- If the data transfer is stopped before its competition, a guard timer of 20 s will ensure the termination of the data transmission. In this case the prompt will switch back in AT command mode and an error result code will be returned.
- If the module shuts down during the data transfer, all the bytes are discarded.
- If any error occurs during the data transfer, all bytes are discarded.
- The RTS/CTS DTE flow control must be enabled (see *&K* command description).

☞ All the imported certificates or private keys are listed if the type of the security data is omitted.

☞ The import of these private keys is not supported for these formats:
- PKCS1 RSA formatted encrypted private key
- PKCS8 unencrypted private key
- PKCS8 encrypted private key

## 26.2.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| ***Generic syntax:*** | | | |
| Action | AT+USECMNG=<op_code>,[<type>[,<internal_name>[,<param1>]]] | OK | - |
| ***Import a certificate or private key from serial I/O:*** | | | |
| Action | AT+USECMNG=0,<type>,<internal_name>,<data_size> | > | AT+USECMNG=0,0,"AddTrustCA",1327 |
| | | Start transfer of data ... | >-----BEGIN CERTIFICATE----- |
| | | +USECMNG: 0,<type>,<internal_name>,<md5_string> | (...other certificate data bytes...) |
| | | OK | +USECMNG: 0,0,"AddTrustCA","7710 7370ec4db40a08a6e36a64a1435b" |
| | | | OK |
| ***Import a certificate or private key from a file stored on FS:*** | | | |
| Action | AT+USECMNG=1,<type>,<internal_name>,<filename> | +USECMNG: 1,<type>,<internal_name>,<md5_string> | AT+USECMNG=1,0,"AddTrustCA","addtrust.cert" |
| | | OK | +USECMNG: 1,0,"AddTrustCA","7710 7370ec4db40a08a6e36a64a1435b" |
| | | | OK |
| ***Remove an imported certificate or private key:*** | | | |
| Action | AT+USECMNG=2,<type>,<internal_name> | OK | AT+USECMNG=2,0,"AddTrustCA" |
| | | | OK |
| ***List imported certificates or private keys:*** | | | |
| Read | AT+USECMNG=3[,<type>] | <type>,<internal_name>[,<common_name>,<expiration_date>] | AT+USECMNG=3 |
| | | ... | "CA","AddTrustCA","AddTrust External CA Root","?2020/05/30" |
| | | OK | "CA","GlobalSignCA","GlobalSign","2029/03/18" |
| | | | "CC","JohnDoeCC","GlobalSign","2010/01/01" |
| | | | "PK","JohnDoePK" |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | | OK |
| ***Retrieve the MD5 of an imported certificate or private key:*** | | | |
| Read | AT+USECMNG=4,<type>,<internal_name> | +USECMNG: 4,<type>,<internal_name>,<md5_string><br>OK | AT+USECMNG=4,0,"AddTrustCA"<br>+USECMNG: 4,0,"AddTrustCA","7710 7370ec4db40a08a6e36a64a1435b"<br>OK |
| Test | AT+USECMNG=? | +USECMNG: (list of supported <op_code>s),(list of supported <type>s)<br>OK | +USECMNG: (0-4),(0-2)<br>OK |

### 26.2.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <op_code> | Number | Type of operation:<br>• 0: import a certificate or a private key (data provided by the stream of byte)<br>• 1: import a certificate or a private key (data provided from a file on FS)<br>• 2: remove an imported certificate or private key<br>• 3: list imported certificates or private keys<br>• 4: retrieve the MD5 of an imported certificate or private key |
| <type> | Number | Type of the security data:<br>• 0: trusted root CA (certificate authority) certificate<br>• 1: client certificate<br>• 2: client private key |
| <internal_name> | String | Unique identifier of an imported certificate or private key. If an existing name is used the data will be overridden. The maximum length is 200 characters. |
| <data_size> | Number | Size in bytes of a certificate or private key being imported. The maximum allowed size is 8192 bytes. |
| <filename> | String | Name of the FS file containing the certificate or private key data to be imported. The maximum allowed file size is 8192 bytes. |
| <md5_string> | String | MD5 formatted string. |
| <common_name> | String | Certificate subject (issued to) common name; applicable only for trusted root and client certificates. |
| <expiration_date> | String | Certificate expiration (valid to date); applicable only for trusted root and client certificates. |
| <param1> | Number/String | Type and supported content depend on the related <op_code> parameter; see the <op_code> specification. |

## 26.3 SSL/TLS security layer profile manager +USECPRF

| +USECPRF | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U201 SARA-U260-03S SARA-U270-03S SARA-U270-53S SARA-U280-03S | | | | | |
| | SARA-G340-02S SARA-G350-02A SARA-G350-02S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 26.3.1 Description

Manages security profiles for the configuration of the following SSL/TLS connections properties:

- **Certificate validation level:**
  - Level 0: no certificate validation; the server certificate will not be checked or verified. No additional certificates are needed.
  - Level 1: certificate validation against a specific or a list of imported trusted root certificates.
  - Level 2: certificate validation with an additional URL integrity check (the server certificate common name must match the server hostname).

Objective Specification

  - Level 3: certificate validation with an additional check on the certificate validity date.

  CA certificates should be imported with the command *AT+USECMNG*
- **Minimum SSL/TLS version to be used:**
  - Any
  - TLS 1.0
  - TLS 1.1
  - TLS 1.2
- **Exact cipher suite to be used** (the cipher suite register of Internet Assigned Numbers Authority (IANA) is provided in brackets):
  - (0x002f) TLS_RSA_WITH_AES_128_CBC_SHA
  - (0x003C) TLS_RSA_WITH_AES_128_CBC_SHA256
  - (0x0035) TLS_RSA_WITH_AES_256_CBC_SHA
  - (0x003D) TLS_RSA_WITH_AES_256_CBC_SHA256
  - (0x000a) TLS_RSA_WITH_3DES_EDE_CBC_SHA
  - (0x008c) TLS_PSK_WITH_AES_128_CBC_SHA
  - (0x008d) TLS_PSK_WITH_AES_256_CBC_SHA
  - (0x008b) TLS_PSK_WITH_3DES_EDE_CBC_SHA
  - (0x0094) TLS_RSA_PSK_WITH_AES_128_CBC_SHA
  - (0x0095) TLS_RSA_PSK_WITH_AES_256_CBC_SHA
  - (0x0093) TLS_RSA_PSK_WITH_3DES_EDE_CBC_SHA
  - (0x00ae) TLS_PSK_WITH_AES_128_CBC_SHA256
  - (0x00af) TLS_PSK_WITH_AES_256_CBC_SHA384
  - (0x00b6) TLS_RSA_PSK_WITH_AES_128_CBC_SHA256
  - (0x00b7) TLS_RSA_PSK_WITH_AES_256_CBC_SHA384
- **Certificate to be used for server and mutual authentication:**
  - The trusted root certificate. The CA certificate should be imported with the *AT+USECMNG* command.
  - The client certificate that should be imported with the *AT+USECMNG* command.
  - The client private key that should be imported with the *AT+USECMNG* command.
- **Expected server hostname, when using certificate validation level 2 or 3.**
- **Password for the client private key, if it is password protected.**
- **Pre-shared key used for connection. Defines a pre-shared key and key-name (PSK) , when a TLS_PSK_* cipher suite is used.**
- **SNI (Server Name Indication).** SNI is a feature of SSL/TLS which uses an additional SSL/TLS extension header to specify the server name to which the client is connecting to. The extension was introduced to support the certificate handling used with virtual hosting provided by the various SSL/TLS enabled servers mostly in cloud based infrastructures. With the SNI a server has the opportunity to present a different server certificate (or/and whole SSL/TLS configuration) based on the host indicated by the SNI extension.

To set all the parameters in security profile, a set command for each <op_code> needs to be issued (e.g. certificate validation level, minimum SSL/TLS version, ...).

To reset (set to factory programmed value) all the parameters of a specific security profile, issue the AT +USECPRF=<profile_id> command.

## 26.3.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+USECPRF=<profile_id>[,<op_code>[,<param_val>]] | OK | AT+USECPRF=0,0,0<br>OK |
| Read | AT+USECPRF=<profile_id>,<op_code> | +USECPRF: <profile_id>,<op_code>,<param_val><br>OK | AT+USECPRF=0,0<br>+USECPRF: 0,0,0<br>OK |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| Test | AT+USECPRF=? | +USECPRF: (list of supported <profile_id>s),(list of supported <op_code>s)<br>OK | +USECPRF: (0-4),(0-9)<br>OK |

### 26.3.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <profile_id> | Number | USECMNG security profile identifier, in range 0-4; if it is not followed by other parameters the profile settings will be reset (set to factory programmed value). |
| <op_code> | Number | • 0: certificate validation level; allowed values for <param_val>:<br>o 0 (factory-programmed value): Level 0 - No validation; the server certificate will not be checked or verified. The server in this case is not authenticated.<br>o 1: Level 1 - Root certificate validation without URL integrity check. The server certificate will be verified with a specific trusted certificates or with each of the imported trusted root certificates.<br>o 2: Level 2 - Root certificate validation with URL integrity check. Level 1 validation with an additional URL integrity check.<br>o 3: Level 3 - Root certificate validation with check of certificate validity date. Level 2 validation with an additional check of certificate validity date.<br>• 1: minimum SSL/TLS version; allowed values for <param_val>:<br>o 0 (factory-programmed value): any; server can use any version for the connection.<br>o 1: TLSv1.0; connection allowed only to TLS/SSL servers which support TLSv1.0/TLSv1.1/TLSv1.2<br>o 2: TLSv1.1; connection allowed only to TLS/SSL servers which support TLSv1.1/TLSv1.2<br>o 3: TLSv1.2; connection allowed only to TLS/SSL servers which support TLSv1.2<br>• 2: cipher suite; allowed values for <param_val> define which cipher suite will be used:<br>o 0 (factory-programmed value): (0x0000) Automatic the cipher suite will be negotiated in the handshake process<br>o 1: (0x002f) TLS_RSA_WITH_AES_128_CBC_SHA<br>o 2: (0x003C) TLS_RSA_WITH_AES_128_CBC_SHA256<br>o 3: (0x0035) TLS_RSA_WITH_AES_256_CBC_SHA<br>o 4: (0x003D) TLS_RSA_WITH_AES_256_CBC_SHA256<br>o 5: (0x000a) TLS_RSA_WITH_3DES_EDE_CBC_SHA<br>o 6: (0x008c) TLS_PSK_WITH_AES_128_CBC_SHA<br>o 7: (0x008d) TLS_PSK_WITH_AES_256_CBC_SHA<br>o 8: (0x008b) TLS_PSK_WITH_3DES_EDE_CBC_SHA<br>o 9: (0x0094) TLS_RSA_PSK_WITH_AES_128_CBC_SHA<br>o 10: (0x0095) TLS_RSA_PSK_WITH_AES_256_CBC_SHA<br>o 11: (0x0093) TLS_RSA_PSK_WITH_3DES_EDE_CBC_SHA<br>o 12: (0x00ae) TLS_PSK_WITH_AES_128_CBC_SHA256<br>o 13: (0x00af) TLS_PSK_WITH_AES_256_CBC_SHA384<br>o 14: (0x00b6) TLS_RSA_PSK_WITH_AES_128_CBC_SHA256<br>o 15: (0x00b7) TLS_RSA_PSK_WITH_AES_256_CBC_SHA384<br>• 3: trusted root certificate internal name;<br>o <param_val> (string) is the internal name identifying a trusted root certificate; the maximum length is 200 characters. The factory programmed value is an empty string.<br>• 4: expected server hostname;<br>o <param_val> (string) is the hostname of the server, used when certificate validation level is set to Level 2; the maximum length is 256 characters. The factory programmed value is an empty string.<br>• 5: client certificate internal name;<br>o <param_val> (string) is the internal name identifying a client certificate to be sent to the server; the maximum length is 200 characters. The factory programmed value is an empty string.<br>• 6: client private key internal name;<br>o <param_val> (string) is the internal name identifying a private key to be used; the maximum length is 200 characters. The factory programmed value is an empty string.<br>• 7: client private key password;<br>o <param_val> (string) is the password for the client private key if it is password protected; the maximum length is 128 characters. The factory programmed value is an empty string.<br>• 8: pre-shared key;<br>o <param_val> (string) is the pre-shared key used for connection; the maximum length is 64 characters. The factory programmed value is an empty string. |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 9: pre-shared key name;<br>o <param_val> (string) is the pre-shared key name used for connection; the maximum length is 128 characters. The factory programmed value is an empty string. |

### 26.3.4 Notes

**TOBY-L200-02S / TOBY-L210-02S / TOBY-L210-62S / TOBY-L220 / TOBY-L280-02S / MPCI-L200-02S / MPCI-L210-02S / MPCI-L280 / SARA-G340-02S / SARA-G350-02A / SARA-G350-02S**

- <op_code>=7 is not supported.

**LISA-U200-03S / LISA-U200-83S / LISA-U201 / SARA-U260-03S / SARA-U270-03S / SARA-U270-53S / SARA-U280-03S**

- The <op_code>=3 with a specific Root CA internal name is supported for certificates issued directly from Root certificate authorities without intermediate certificate authorities. For the certificates issued by intermediate authorities the <param_val> parameter should be omitted.
- <op_code>=7 is not supported.

**TOBY-L2 / MPCI-L2 / LISA-U / SARA-U / SARA-G**

- The SSL/TLS security profile does not support the configuration of SNI (Server Name Indication) SSL/TLS negotiation headers. As The SNI is not used the modules might receive a non host specific SSL/TLS configuration (version/ciphersuites/certificate) when used with virtual hosts.

## 26.4 AT+USECMNG command example

| Command | Response | Description |
|---|---|---|
| ***Step 1: Import a trusted root certificate using the stream of byte similar to +UDWNFILE*** | | |
| AT+USECMNG=0,0,"ThawteCA",1516 | > | Start the data transfer using the stream of byte. |
| *PEM encoded trusted root certificate data.* | +USECMNG: 1,0,"ThawteCA","8ccadc0b22cef5be72ac411a11a8d812"<br>OK | Input PEM formatted trusted root certificate data bytes. Output MD5 hash string of the stored trusted root certificate DER. |
| ***Step 2: List all available certificates and private keys*** | | |
| AT+USECMNG=3 | CA, "ThawteCA","thawte Primary Root CA","2036/07/17"<br>OK | List all available certificates and private keys. |
| ***Step 3: Set the security profile 2 validation level to trusted root*** | | |
| AT+USECPRF=2,0,1 | OK | Security profile 2 has the validation level set to trusted root. |
| ***Step 4: Set the security profile 2 trusted root certificate to the CA certificate imported as "ThawteCA"*** | | |
| AT+USECPRF=2,3,"ThawteCA" | OK | Security profile 2 will use the CA certificate imported as "ThawteCA" for server certificate validation. |
| ***Step 5: Use the configured USECMNG profile 2 with the UHTTP application*** | | |
| AT+UHTTP=0,1,"www.ssl_tls_test_server.com" | OK | Configure the UHTTP server name. |
| AT+UHTTP=0,6,1,2 | OK | Enable the SSL/TLS for the UHTTP profile #0 and specify the SSL/TLS security profile 2. |
| AT+UHTTPC=0,1,"/","https.resp" | OK | Execute the HTTP GET command. |
| | +UUHTTPCR: 0,1,1 | HTTP GET URC response. |

In the above example the following PEM encoded trusted certificate is used:

```
-----BEGIN CERTIFICATE-----
MIIEIDCCAwigAwIBAgIQNE7VVyDV7exJ9C/ON9srbTANBgkqhkiG9w0BAQUFADCB
qTELMAkGA1UEBhMCVVMxFTATBgNVBAoTDHRoYXd0ZSwgSW5jLjEoMCYGA1UECxMf
Q2VydGlmaWNhdGlvbiBTZXJ2aWNlcyBEaXZpc2lvbjE4MDYGA1UECxMvKGMpIDIw
MDYgdGhhd3RlLCBJbmMuIC0gRm9yIGF1dGhvcml6ZWQgdXNlIG9ubHkxHzAdBgNV
```



Objective Specification

```
BAMTFnRoYXd0ZSBQcmltYXJ5IFJvb3QgQ0EwHhcNMDYxMTE3MDAwMDAwWhcNMzYw
NzE2MjM1OTU5WjCBqTELMAkGA1UEBhMCVVMxFTATBgNVBAoTDHRoYXd0ZSwgSW5j
LjEoMCYGA1UECxMfQ2VydGlmaWNhdGlvbiBTZXJ2aWNlcyBEaXZpc2lvbjE4MDYG
A1UECxMvKGMpIDIwMDYgdGhhd3RlLCBJbmMuIC0gRm9yIGF1dGhvcml6ZWQgdXNl
IG9ubHkxHzAdBgNVBAMTFnRoYXd0ZSBQcmltYXJ5IFJvb3QgQ0EwggEiMA0GCSqG
SIb3DQEBAQUAA4IBDwAwggEKAoIBAQCsoPD7gFnUnMekz52hWXMJEEUMDSxuaPFs
W0hoSVk3/AszGcJ3f8wQLZU0HObrTQmnHNK4yZc2AreJ1CRfBsDMRJSUjQJib+ta
3RGNKJpchJAQeg29dGYvajig4tVUROsdB58Hum/u6f1OCyn1PoSgAfGcq/gcfomk
6KHYcWUNo1F77rzSImANuVud37r8UVsLr5iy6S7pBOhih94ryNdOwUxkHt3Ph1i6
Sk/KaAcdHJ1KxtUvkcx8cXIcxcBn6zL9yZJclNqFwJu/U30rCfSMnZEfl2pSy94J
NqR32HuHUETVPm4pafs5SSYeCaWAe0At6+gnhcn+Yf1+5nyXHdWdAgMBAAGjQjBA
MA8GA1UdEwEB/wQFMAMBAf8wDgYDVR0PAQH/BAQDAgEGMB0GA1UdDgQWBBR7W0XP
r87Lev0xkhpqtvNG61dIUDANBgkqhkiG9w0BAQUFAAOCAQEAeRHAS7ORtvzw6WfU
DW5FvlXok9LOAz/t2iWwHVfLHjp2oEzsUHboZHIMpKnxuIvW1oeEuzLlQRHAd9mz
YJ3rG9XRbkREqaYB7FViHXe4XI5ISXycO1cRrK1zN44veFyQaEfZYGDm/Ac9IiAX
xPcW6cTYcvnIc3zfFi8VqT79aie2oetaupgf1eNNZAqdE8hhuvU5HIe6uL17In/2
/qxAeeWsEG89jxt5dovEN7MhGITlNgDrYyCZuen+MwS7QcjBAvlEYyCegc5C09Y/
LHbTY5xZ3Y+m4Q6gLkH3LpVHz7z9M/P2C2F+fpErgUfCJzDupxBdN49cOSvkBPB7
jVaMaA==
-----END CERTIFICATE-----
```

Objective Specification

# 27 FTP

Proprietary u-blox AT commands. FTP AT commands set can be used for 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 FTP server are as well possible. PSD or CSD connection must be activated before using FTP client services refer to *+UCSD*, *+UCSDA* and *+UCSND* AT commands for establishing a CSD connection and to *+UPSD*, *+UPSDA* and *+UPSND* AT commands for establishing a PSD connection.

Basically, two AT commands are necessary for an FTP client service: one AT command (*+UFTP*) to configure the FTP profile, a second AT command to execute a specific FTP command (*+UFTPC*). The final result of an FTP command will be notified through the +UUFTPCR URC whereas data will be provided through +UUFTPCD URC.

When these commands report an error which is not a +CME ERROR, the error code can be queried using the *+UFTPER* AT command.

## 27.1 FTP service configuration +UFTP

| +UFTP | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | No | No | - | *Appendix A.8.1* |

### 27.1.1 Description

Sets up a parameter for FTP service, or resets a parameter to its factory-programmed value. The set/reset command needs to be executed for each single <op_code>. The 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).

If the set command is issued without <param1> parameter, the corresponding <op_code> parameter is reset to the default value.

### 27.1.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| **Generic syntax** | | | |
| Set | AT+UFTP=<op_code>[,<param1>[,<param2>]] | OK | AT+UFTP=7,21<br>OK |
| **FTP server IP address** | | | |
| Set | AT+UFTP=0[,<IP_address>] | OK | AT+UFTP=0,"192.168.1.0"<br>OK |
| **FTP server name** | | | |
| Set | AT+UFTP=1[,<server_name>] | OK | AT+UFTP=1,"ftp.server.com"<br>OK |
| **Username** | | | |
| Set | AT+UFTP=2[,<username>] | OK | AT+UFTP=2,"user_test"<br>OK |
| **Password** | | | |
| Set | AT+UFTP=3[,<password>] | OK | AT+UFTP=3,"PWD"<br>OK |
| **Account** | | | |
| Set | AT+UFTP=4[,<account>] | OK | AT+UFTP=4,"test"<br>OK |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| **Inactivity timeout** | | | |
| Set | AT+UFTP=5[,<timeout>] | OK | AT+UFTP=5,21<br>OK |
| **FTP mode** | | | |
| Set | AT+UFTP=6[,<FTP_mode>] | OK | AT+UFTP=6,1<br>OK |
| **FTP server port** | | | |
| Set | AT+UFTP=7[,<FTP_server_port>] | OK | AT+UFTP=7,30<br>OK |
| **FTP Secure option in explicit mode** | | | |
| Set | AT+UFTP=8[,<FTP_secure>[,<USECMNG_profile>]] | OK | AT+UFTP=8,1,2<br>OK |
| Read | AT+UFTP? | +UFTP: 0,<IP_address><br>+UFTP: 1,<server_name><br>+UFTP: 2,<username><br>+UFTP: 4,<account><br>+UFTP: 5,<timeout><br>+UFTP: 6,<FTP_mode><br>+UFTP: 7,<FTP_server_port><br>[+UFTP: 8,<FTP_secure>[,<USECMNG_profile>]]<br>OK | +UFTP: 0,"216.239.59.147"<br>+UFTP: 1,""<br>+UFTP: 2,"username"<br>+UFTP: 4,"account"<br>+UFTP: 5,0<br>+UFTP: 6,0<br>+UFTP: 7,21<br>+UFTP: 8,0<br>OK |
| Test | AT+UFTP=? | +UFTP: (list of supported <param_tag>s)<br>OK | +UFTP: (0-8)<br>OK |

## 27.1.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <op_code> | String | FTP parameter:<br>• 0: FTP server IP address<br>• 1: FTP server name<br>• 2: FTP username<br>• 3: FTP password<br>• 4: FTP additional user account<br>• 5: FTP inactivity timeout period<br>• 6: FTP mode<br>• 7: Remote FTP server listening port<br>• 8: FTP secure |
| <IP_address> | String | FTP server IP address. The default value is an empty string. For IP address format reference see the *IP addressing*. |
| <server_name> | String | FTP server name (e.g. "ftp.server.com"). The maximum length is 128 characters. The default value is an empty string. |
| <username> | String | User name (the maximum length is 30 characters) for the FTP login procedure. The default value is an empty string. |
| <password> | String | Password (the maximum length is 30 characters) for the FTP login procedure. The default value is an empty string. |
| <account> | String | Additional user account (if required) for the FTP login procedure. The maximum length is 30 characters. The default value is an empty string. |
| <timeout> | Number | Inactivity timeout period in seconds. The range goes 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. |
| <FTP_mode> | Number | FTP mode:<br>• 0 (default value): active<br>• 1: passive |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| <FTP_server_port> | Number | Remote FTP server listening port; it must be a valid TCP port value. The range goes from 1 to 65535; the default value is 21. |
| <FTP_secure> | Number | Enables / disables the Secure option (explicit mode) of FTP client service. FTP Secure option in explicit mode (SSL encryption of FTP control channel; FTP data channel is not encrypted):<br>• 0 (default value): no SSL encryption<br>• 1: enable SSL encryption of FTP control connection |
| <USECMNG_profile> | Number | USECMNG profile (number). Defines the USECMNG profile which specifies the SSL/TLS properties to be used for the SSL/TLS connection. The range goes from 0 to 4. If no profile is set a default USECMNG profile is used (see *USECMNG* section). |
| <param1> | Number / String | Type and supported content depend on related <op_code> (details are given above). If <param1> is not specified the value of the corresponding parameter <op_code> is reset to default value. |
| <param2> | Number / String | Type and supported content depend on related <op_code> (details are given above). If <param2> is not specified the value of the corresponding parameter <op_code> is reset to default value. |

## 27.1.4 Notes

- The information text response to the read command does not display the password.
- The FTP server IP address and the FTP server name are mutually exclusive. If value for <op_code>=0 is specified by user, then value for <op_code>=1 is reset or vice versa.
- Some network operators do not allow incoming connections. Due to these limitations introduced by network operators it is possible to encounter problems using FTP active mode. If the FTP active mode fails to exchange files, try the passive mode to solve the problem.
- Some network operators do not allow FTPS. In this case the *+UFTPC=1* command (FTP login) will return a failure response via *+UUFTPCR* URC after an SSL timeout of 30 s.

**TOBY-L2 / MPCI-L2**

- If the *+UPSD* command sets the PSD profile protocol type to IPv6, an IPv6 address shall be used for parameter FTP server IP address.

**TOBY-L201 / MPCI-L201**

- <op_code>=8 is not supported.

**LISA-U / SARA-U**

- During connection to FTP remote server (via FTP login command) the FTP profile parameters cannot be changed or reset to factory-programmed values until disconnection takes place (FTP logout). Only <op_code>=5 (inactivity timeout), and <op_code>=6 (FTP mode), can be updated while the FTP connection is on the go.

**LISA-U1 / LISA-U200-00S / LISA-U200-01S / LISA-U200-02S / LISA-U200-52S / LISA-U200-62S / LISA-U200-82S / LISA-U230 / LISA-U260 / LISA-U270 / SARA-U260-00S / SARA-U270-00S / SARA-U280-00S**

- The <USECMNG_profile> parameter is not supported.

**SARA-G340-00S / SARA-G350-00S / SARA-G350-00X / LEON-G**

- <op_code>=8 is not supported.

**SARA-G340-01S / SARA-G350-01B / SARA-G350-01S**

- The server IP or name shall be inserted prior to the SSL encryption option (<op_code>=8).
- The <USECMNG_profile> parameter is not supported.

Objective Specification

# 27.2 FTP command +UFTPC

| +UFTPC | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | No | No | - | *Appendix A.8.1* |

## 27.2.1 Description

Triggers the FTP actions corresponding to the <op_code> parameter. The final result code indicates if sending the command request to the FTP process was successful or not. The +UUFTPCR (FTP command result) URC returns to the user the final result of the FTP command previously sent with *+UFTPC*. As well, the +UUFTPCD FTP unsolicited data URC provides the data requested by the user (e.g. file or directory lists) and received from the FTP server.

LISA-U / SARA-U
If the SSL option is enabled and the network operator does not allow FTPS, the +UUFTPCR URC notifies the command failure after an SSL timeout of 30 s.

TOBY-L2 / LISA-U / SARA-U
The +UUFTPCD URC is displayed only on the AT terminal that issued the +UFTPC related command.

TOBY-L200-02S / TOBY-L210-02S / TOBY-L210-62S / TOBY-L220 / TOBY-L280-02S / MPCI-L200-02S / MPCI-L210-02S / MPCI-L280 / SARA-G340-02S / SARA-G350-02A / SARA-G350-02S
FTPC data commands use the extended EPSV/EPRT which supports IPv6 adressing. If the FTP server implementation of the EPSV/EPRT commands response is non-standard the FTPC data commands fail.

## 27.2.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| **General syntax** | | | |
| Set | AT+UFTPC=<op_code>[,<param1>[,<param2>[,<param3>]]] | OK | AT+UFTPC=4,"data.zip","data.zip"<br>OK |
| **FTP logout** | | | |
| Set | AT+UFTPC=0 | OK | AT+UFTPC=0<br>OK |
| **FTP login** | | | |
| Set | AT+UFTPC=1 | OK | AT+UFTPC=1<br>OK |
| **Delete the file from the FTP server** | | | |
| Set | AT+UFTPC=2,<file_name> | OK | AT+UFTPC=2,"mytest"<br>OK |
| **Rename a file of FTP server** | | | |
| Set | AT+UFTPC=3,<file_name>,<new_file_name> | OK | AT+UFTPC=3,"old_name","final_name"<br>OK |
| **Retrieve the file from the FTP server** | | | |
| Set | AT+UFTPC=4,<remote_file_name>,<local_file_name>[,<retrieving_mode>] | OK | AT+UFTPC=4,"data.zip","data.zip"<br>OK |
| **Store the file on the FTP server** | | | |
| Set | AT+UFTPC=5,<local_file_name>,<remote_file_name>[,<number_of_byte>] | OK | AT+UFTPC=5,"data.zip","data.zip",30<br>OK |
| **Retrieve a file from the FTP server using direct link mode** | | | |
| Set | AT+UFTPC=6,<remote_file_name>[,<number_of_byte>] | OK | AT+UFTPC=6,"data.zip",30<br>OK |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| **Send a file to the FTP server using the direct link mode** | | | |
| Set | AT+UFTPC=7,<remote_file_name>[,<number_of_byte>] | OK | AT+UFTPC=7,"data.zip",30<br>OK |
| **Change the working directory to the specified one** | | | |
| Set | AT+UFTPC=8,<directory_name> | OK | AT+UFTPC=8,"data_folder"<br>OK |
| **Create a directory on the FTP host** | | | |
| Set | AT+UFTPC=10,<directory_name> | OK | AT+UFTPC=10,"new_data_folder"<br>OK |
| **Remove the directory from the remote FTP server** | | | |
| Set | AT+UFTPC=11,<directory_name> | OK | AT+UFTPC=11,"data_folder"<br>OK |
| **Information of a file or a directory** | | | |
| Set | AT+UFTPC=13[,<file_directory_name>] | OK | AT+UFTPC=13,"data_folder"<br>OK |
| **List the file names in a specified directory** | | | |
| Set | AT+UFTPC=14[,<file_directory_name>] | OK | AT+UFTPC=14,"data.zip"<br>OK |
| **Retrieve the FOTA update file** | | | |
| Set | AT+UFTPC=100,<remote_file_name> | OK | AT+UFTPC=100,"data.zip"<br>OK |
| Test | AT+UFTPC=? | +UFTPC: (list of supported <op_code>s)<br>OK | +UFTPC: (0-5,8,10,11,13,14,100)<br>OK |
| URC | | +UUFTPCD: <op_code>,<ftp_data_len>,<ftp_data> | +UUFTPCD: 13,16,"16 bytes of data" |
| URC | | +UUFTPCR: <op_code>,<ftp_result>[,<md5_sum>] | +UUFTPCR: 1,1 |

## 27.2.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <op_code> | Number | FTP command request. Allowed values:<br>• 0: FTP logout; terminates the FTP session by performing a logout.<br>• 1: FTP login; connects to the FTP server using the parameters of the current FTP profile (set via *AT+UFTP* command).<br>• 2: deletes the file from the FTP server.<br>• 3: renames the file. This AT command just sends requests to the FTP process.<br>• 4: retrieves the file from the FTP server.<br>• 5: stores the file on the FTP server.<br>• 6: retrieves a file from the FTP server using direct link mode. This command handles the initial steps of the 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 result code, the file content will be directly sent to the serial interface. When the data transfer is completed, the module will automatically exit from direct link mode (no need to send +++ sequence).<br>• 7: sends a file to the FTP server using the direct link mode. This command handles the initial steps of the 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 result code, the user can send the file content via the 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 the FTP protocol<br>• 8: changes the working directory to the specified one.<br>• 9: RFU.<br>• 10: creates a directory on the FTP host.<br>• 11: removes the directory from the remote FTP server. |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 12: RFU.<br>• 13: information of a file or a directory. The URC +UUFTPCD returns the information of the specified file or directory from the FTP server.<br>• 14: lists the file names in a specified directory. The URC +UUFTPCD returns the list of the file names received from FTP server. If the directory name is omitted, the list of the files names of current working directory is requested.<br>• 100: retrieves the FOTA update file. The downloaded file will not be accessible to the user. The +UUFTPCR URC will display the MD5 checksum of the downloaded file. |
| <file_name> | String | File name to be deleted/renamed from the FTP host. For the limit of the length of the string, see *Command line*. |
| <new_file_name> | String | New file name. For the limit of the length of the string, see *Command line*. |
| <remote_file_name> | String | Remote file name to be retrieved from the FTP host or stored in it. |
| <local_file_name> | String | Local file name (module file system) text string to be stored/sent on the file system. For the limit of the length of the string, see the *Command line*. |
| <retrieving_mode> | Number | Allowed values:<br>• 0 (default value): the file is retrieved from beginning.<br>• 1: restart the data retrieving from the last data received during the previous download interrupted due to error. |
| <number_of_byte> | Number | Represents the number of bytes already sent to the FTP server or received from it.<br>• During a file retrieval the server writes the file from the offset indicated with this parameter.<br>• During a file storing the server sends the data from the value indicated with this parameter. |
| <directory_name> | String | Directory name on the FTP server. For the limit of the length of the string, see *Command line*. |
| <file_directory_name> | String | 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, see *Command line*.<br>• <param1> optional parameter; the text string of the path (file or directory) to be name listed. If not specified, the list of the files names of current working directory is requested. |
| <ftp_data_len> | Number | Amount of data in bytes |
| <ftp_data> | String | Data available from the 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. The 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. |
| <ftp_result> | Number | • 0: fail<br>• 1: success |
| <md5_sum> | String | MD5 checksum of the FOTA update file downloaded via *+UFTPC=100* AT command. This parameter is issued only for *+UFTPC=100* AT command. |
| <param1> | String | Content depend on related <op_code> (details are given above) |
| <param2> | String | Content depend on related <op_code> (details are given above) |
| <param3> | String | Content depend on related <op_code> (details are given above) |

## 27.2.4 Notes

- If <op_code>=6 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 the command also handles the final steps of the FTP protocol.

**LISA-U / SARA-U / SARA-G / LEON-G**

- <op_code> = 100 is not supported.
- <md5_sum> is not supported.

**LISA-U1 / LISA-U200-00S / LISA-U200-01S / LISA-U230 / LISA-U260-01S / LISA-U270-01S / SARA-G340-00S / SARA-G340-01S / SARA-G350-00S / SARA-G350-00X / SARA-G350-01B / SARA-G350-01S / LEON-G**

- <number_of_byte> is not supported if <op_code>=6 or <op_code>=7.

Objective Specification

## 27.3 FTP error +UFTPER

| +UFTPER | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *Appendix A.8.1* |

### 27.3.1 Description

This command retrieves the error class and code of the last FTP operation.

### 27.3.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | AT+UFTPER | +UFTPER: <error_class>,<error_code> | +UFTPER: 1,1 |
| | | OK | OK |

### 27.3.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <error_class> | Number | Value of error class. Values are listed in *Appendix A.8* |
| <error_code> | Number | Value of class-specific error code (reply code if <error_class> is 0). The values are listed in *Appendix A.8.1* |

Objective Specification

# 28 HTTP

The section describes the u-blox proprietary AT commands that can be used for sending requests to a remote HTTP server, receiving the server response and transparently storing it in the file system. The supported methods are: HEAD, GET, DELETE, PUT, POST file and POST data. A PSD or CSD connection must be activated before using HTTP AT commands.

For establishing a CSD connection see the *+UCSD*, *+UCSDA* and *+UCSND* AT commands.

For establishing a PSD connection see the *+UPSD*, *+UPSDA* and *+UPSND* AT commands.

When these commands report an HTTP error, the error code can be queried using the *+UHTTPER* AT command.

LISA-U1 / LISA-U200-00S / LISA-U200-01S / LISA-U200-02S / LISA-U200-52S / LISA-U200-62S / LISA-U200-82S / LISA-U230 / LISA-U260 / LISA-U270 / LEON-G
If using CellLocate® and HTTP commands HTTP profiles in the range 1-3 must be used.

## 28.1 HTTP control +UHTTP

| +UHTTP | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | No | No | - | *Appendix A.8* |

### 28.1.1 Description

Configures, reads or resets (to the factory-programmed values) the HTTP application profile parameters. Up to 4 different HTTP profiles can be defined. To set all the parameters in an HTTP profile a set command for each <op_code> needs to be issued.

The configured HTTP profile parameters are not saved in the non volatile memory.

The read command has two possible usages. The functionality of the command differs with the number of command parameters issued:

- Only the first command parameter (<profile_id>) issued: the module resets all the profile parameters (to the factory-programmed values) for the profile specified with <profile_id>
- Only the first and second command parameters used (<profile_id>, <op_code>): the module returns the current value of the profile parameter specified with <op_code> and related to the profile specified with <profile_id>

### 28.1.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| **Generic syntax** | | | |
| Set | AT+UHTTP=<profile_id>,<op_code>,<param_val>[,<param_val1>] | OK | AT+UHTTP=2,0,"125.24.51.133"<br>OK |
| Read | AT+UHTTP=<profile_id>,<op_code> | +UHTTP: <profile_id>,<op_code>,<param_val>[,<param_val1>]<br>OK | AT+UHTTP=2,0<br>+UHTTP: 2,0,"125.24.51.133"<br>OK |
| **HTTP server IP address** | | | |
| Set | AT+UHTTP=<profile_id>,0,<HTTP_server_IP_address> | OK | AT+UHTTP=2,0,"125.24.51.133"<br>OK |
| Read | AT+UHTTP=<profile_id>,0 | +UHTTP: <profile_id>,0,<HTTP_server_IP_address> | AT+UHTTP=2,0<br>+UHTTP: 2,0,"125.24.51.133" |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | OK | OK |
| **HTTP server name** | | | |
| Set | AT+UHTTP=<profile_id>,1,<HTTP_server_name> | OK | AT+UHTTP=2,1,"www.u-blox.com"<br>OK |
| Read | AT+UHTTP=<profile_id>,1 | +UHTTP: <profile_id>,1,<HTTP_server_name><br>OK | AT+UHTTP=2,1<br>+UHTTP: 2,1,"www.u-blox.com"<br>OK |
| **Username** | | | |
| Set | AT+UHTTP=<profile_id>,2,<username> | OK | AT+UHTTP=2,0,"my_user"<br>OK |
| Read | AT+UHTTP=<profile_id>,2 | +UHTTP: <profile_id>,2,<username><br>OK | AT+UHTTP=2,2<br>+UHTTP: 2,2,"my_user"<br>OK |
| **Password** | | | |
| Set | AT+UHTTP=<profile_id>,3,<password> | OK | AT+UHTTP=2,3,"pwd"<br>OK |
| Read | AT+UHTTP=<profile_id>,3 | +UHTTP: <profile_id>,3,<password><br>OK | AT+UHTTP=2,3<br>+UHTTP: 2,3,"pwd"<br>OK |
| **Authentication type** | | | |
| Set | AT+UHTTP=<profile_id>,4,<HTTP_authentication> | OK | AT+UHTTP=2,4,1<br>OK |
| Read | AT+UHTTP=<profile_id>,4 | +UHTTP: <profile_id>,4,<HTTP_authentication><br>OK | AT+UHTTP=2,4<br>+UHTTP: 2,4,1<br>OK |
| **HTTP server port** | | | |
| Set | AT+UHTTP=<profile_id>,5,<HTTP_port> | OK | AT+UHTTP=2,5,30<br>OK |
| Read | AT+UHTTP=<profile_id>,5 | +UHTTP: <profile_id>,5,<HTTP_port><br>OK | AT+UHTTP=2,5<br>+UHTTP: 2,5,30<br>OK |
| **HTTP secure option** | | | |
| Set | AT+UHTTP=<profile_id>,6,<HTTP_secure>[,<USECMNG_profile>] | OK | AT+UHTTP=2,6,1<br>OK |
| Read | AT+UHTTP=<profile_id>,6 | +UHTTP: <profile_id>,6,<HTTP_secure>[,<USECMNG_profile>]<br>OK | AT+UHTTP=2,6<br>+UHTTP: 2,6,1<br>OK |
| Read | AT+UHTTP=<profile_id> | OK | AT+UHTTP=2<br>OK |
| Test | AT+UHTTP=? | +UHTTP: (list of supported <profile_id>s),(list of supported <op_code>s)<br>OK | +UHTTP: (0-3),(0-9)<br>OK |

## 28.1.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <profile_id> | Number | HTTP profile identifier, in range 0-3 |
| <op_code> | Number | • 0: HTTP server IP address;<br>• 1: HTTP server name;<br>• 2: username<br>• 3: password |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 4: authentication type<br>• 5: HTTP server port<br>• 6: HTTP Secure option (SSL encryption)<br>• 7: reserved for internal use only<br>• 8: reserved for internal use only<br>• 9: reserved for internal use only |
| <HTTP_server_IP_address> | String | HTTP server IP address; The factory-programmed value is an empty text string. For IP address format reference see the *IP addressing*. |
| <HTTP_server_name> | String | HTTP server name; the maximum length is 128 characters (e.g. "http.server.com"). The factory-programmed value is an empty text string. |
| <username> | String | User name; the maximum length is 30 characters; it is used for the HTTP login procedure if the authentication is used. The factory-programmed value is an empty text string. |
| <password> | String | Password; the maximum length is 30 characters; it is used for the HTTP login procedure if the authentication is used. The factory-programmed value is an empty text string. |
| <HTTP_authentication> | Number | HTTP authentication method; the allowed values are:<br>• 0 (factory-programmed value): no authentication<br>• 1: basic authentication (the password and username must be set) |
| <HTTP_port> | Number | HTTP server port; range 1-65535. It means the HTTP server port to be used in a HTTP request; the factory-programmed value is 80. |
| <HTTP_secure> | Number | HTTP Secure option (SSL encryption). It enables or disables the HTTPS (SSL secured connection for HTTP application) usage:<br>• 0 (factory-programmed value): HTTPS (SSL encryption) disabled and the HTTP server port set to 80<br>• 1: HTTPS (SSL encryption) enabled and the HTTP server port set to 443; an USECMNG profile can be specified with an additional parameter. |
| <USECMNG_profile> | Number | Defines the USECMNG profile which specifies the SSL/TLS properties to be used for the SSL/TLS connection. The range goes from 0 to 4. If no profile is set a default USECMNG profile is used |
| <param_val> | Number / String | Type and supported content depend on the related <op_code> parameter; details are given above |
| <param_val1> | Number / String | Type and supported content depend on the related <op_code> parameter; details are given above. |

## 28.1.4 Notes

- HTTP server IP address and HTTP server name are mutually exclusive. If the HTTP server IP address is specified by the user, then the value for the HTTP server name is reset, or vice versa.

**TOBY-L2 / MPCI-L2**

- If the *+UPSD* command sets the PSD profile protocol type to IPv6, an IPv6 address shall be used for parameter HTTP server IP address.

**TOBY-L201 / MPCI-L201**

- <op_code>=6 is not supported.

**LISA-U1 / LISA-U200-00S / LISA-U200-01S / LISA-U200-02S / LISA-U200-52S / LISA-U200-62S / LISA-U200-82S / LISA-U230 / LISA-U260 / LISA-U270 / SARA-U260-00S / SARA-U270-00S / SARA-U270-00X / SARA-U280-00S / SARA-G340-01S / SARA-G350-01B / SARA-G350-01S**

- <USECMNG_profile> parameter is not supported.

**SARA-U260-00S / SARA-U270-00S / SARA-U280-00S / SARA-G340-01S / SARA-G350-01B / SARA-G350-01S / LEON-G**

- When HTTP Secure option is enabled, the default HTTP port is automatically set to 443. If the port is manually set (with the <op_code>=5) to a custom port other than 80 prior to enabling the secure option the custom port setting will not be modified.

**SARA-G340-00S / SARA-G350-00S / SARA-G350-00X / LEON-G**

- <op_code>=6 is not supported.

Objective Specification

# 28.2 HTTP advanced control+UHTTPAC

| +UHTTPAC | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U201 SARA-U260-03S SARA-U270-03S SARA-U270-53S SARA-U280-03S | | | | | |
| | SARA-G340-02S SARA-G350-02A SARA-G350-02S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *Appendix A.8* |

## 28.2.1 Description

Configures, reads or resets (to the factory-programmed values) the HTTP application profile advanced parameters.

The configured HTTP profile advanced parameters are not saved in the non volatile memory.

## 28.2.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UHTTPAC=<profile_id>,<param_tag>,<key>,<value> | OK | AT+UHTTPAC=0,0,0,"UBLX_SESSION_COOKIE_0"<br>OK |
| Read | AT+UHTTPAC=<profile_id>,<param_tag>,<key> | +UHTTPAC: <profile_id>,<param_tag>,<key>,<value><br>OK | AT+UHTTPAC=0,0,0<br>+UHTTP: 0,0,0,"UBLX_SESSION_COOKIE_0"<br>OK |
| Test | AT+UHTTPAC=? | +UHTTPAC: (list of supported <profile_id>s),(list of supported <param_tag>s),(list of supported <key>s)<br>OK | +UHTTPAC: (0-3),(0),(0-3)<br>OK |

## 28.2.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <profile_id> | Number | HTTP profile identifier, in range 0-3 |
| <param_tag> | Number | • 0: HTTP request COOKIES; manage request COOKIES sent to the HTTP server.<br>o <key>: index of the cookie (number); range 0-3. Identifies the cookie to be read if <value> is omitted or configured if <value> is a valid string.<br>o <value>: value of the cookie (string); the maximum length is 256 characters. The cookie values respect the following rules:<br>- Empty string (""): the cookie will be cleared and will not be present in the request;<br>- Simple one-value cookie: the cookie will be set and sent in the request;<br>- Complex multi-value cookie: the cookies will be set and sent in the request. The multiple cookies must be separated by a left-attached semicolon(";") and a space(" "); |
| <key> | Number/String | Content depends on the related <param_tag> (see above). |
| <value> | Number/String | Content depends on the related <param_tag> (see above). |

## 28.2.4 Examples and use cases

In this section some AT+UHTTPAC command examples and use cases are listed.

| Command | Response | Description |
|---|---|---|
| Example 1 | | |
| AT+UHTTPAC=0,0,0,"" | OK | Clear HTTP request cookie at index 0 |
| Example 2 | | |
| AT+UHTTPAC=0,0,0,"SIMPLE_COOKIE" | OK | Set simple HTTP request cookie at index 0 |
| Example 3 | | |
| AT+UHTTPAC=0,0,0,"COMPLEX_COOKIE; COMPLEX_COOKIE" | OK | Overwrite HTTP request cookie at index 0 with a complex cookie |

Objective Specification

# 28.3 HTTP command +UHTTPC

| +UHTTPC | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *Appendix A.8* |

## 28.3.1 Description

Triggers the HTTP command specified with <http_command> parameter, using the HTTP application profile parameters (previously set up by *+UHTTP* AT command), specified with <profile_id>. The response indicates if sending the command request to HTTP process was successful or not. The final result of HTTP command will be returned to the user via the +UUHTTPCR URC.

## 28.3.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UHTTPC=<profile_id>,<http_command>,<path>,<filename>[,<param1>[,<param2>[,<param3>]]] | OK | AT+UHTTPC=0,1,"/path/file.html","responseFilename"<br>OK |
| Test | AT+UHTTPC=? | +UHTTPC: (list of supported <profile_id>s),(list of supported <http_command>s)<br>OK | +UHTTPC: (0-3),(0-5)<br>OK |
| URC | | +UUHTTPCR: <profile_id>,<http_command>,<http_result> | +UUHTTPCR: 0,1,1 |

## 28.3.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <profile_id> | Number | HTTP profile identifier, in range 0-3 |
| <http_command> | Number | • 0: HEAD command; issue an HEAD request to the HTTP server.<br>o <param1>: not allowed<br>o <param2>: not allowed<br>o <param3>: not allowed<br>• 1: GET command; perform a GET request to the HTTP server.<br>o <param1>: not allowed<br>o <param2>: not allowed<br>o <param3>: not allowed<br>• 2: DELETE command; send a DELETE request to the HTTP server.<br>o <param1>: not allowed<br>o <param2>: not allowed<br>o <param3>: not allowed<br>• 3: PUT command; perform a PUT request to the HTTP server.<br>o <param1>: filesystem filename (string). It is a mandatory string representing the file system filename to be sent to the HTTP server within the PUT request. For file system file name and data size limits see *File system limits*.<br>o <param2>: HTTP Content-Type identifier (number); the range is 0-6. It is an optional numeric parameter representing the HTTP Content-Type identifier<br>- 0: application/x-www-form-urlencoded<br>- 1: text/plain<br>- 2: application/octet-stream<br>- 3: multipart/form-data<br>- 4: application/json<br>- 5: application/xml |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | - 6: user defined with <param3><br>o <param3>: used only when <param2>=6 (user defined Content-Type). The maximum length is 64 characters<br>• 4: POST a file command; issue a POST request for sending a file to the HTTP server.<br>o <param1>: filesystem filename (string). It is a mandatory string representing the file system filename to be sent to the HTTP server within the POST request. For file system file name and data size limits see *File system limits*.<br>o <param2>: HTTP Content-Type identifier (number); the range is 0-6. It is a mandatory numeric parameter representing the HTTP Content-Type identifier<br>- 0: application/x-www-form-urlencoded<br>- 1: text/plain<br>- 2: application/octet-stream<br>- 3: multipart/form-data<br>- 4: application/json<br>- 5: application/xml<br>- 6: user defined with <param3><br>o <param3>: used only when <param2>=6 (user defined Content-Type). The maximum length is 64 characters<br>• 5: POST data command; send a POST request to the HTTP server using the data specified in <param1> parameter<br>o <param1>: data (string); the maximum length is 128 bytes. It is a mandatory string representing 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 <param2> parameter.<br>o <param2>: HTTP Content-Type identifier (number); the range is 0-6. It is a mandatory numeric parameter representing the HTTP Content-Type identifier<br>- 0: application/x-www-form-urlencoded<br>- 1: text/plain<br>- 2: application/octet-stream<br>- 3: multipart/form-data<br>- 5: application/xml<br>- 6: user defined with <param3><br>o <param3>: used when <param2> is set to 6 (user defined Content-Type). The maximum length of the user defined content type is 64 characters. |
| <path> | String | Path of HTTP server resource; the maximum length is 128 characters. |
| <filename> | String | Filename where the HTTP server response will be stored. If the file already exists, it will be overwritten. If <filename> is an empty string (""), the default "http_last_response_<profile_id>" filename will be used. For file system file name and data size limits see *File system limits*. |
| <param1> | String | Content depends on the related <http_command> (see above). |
| <param2> | Number | Content depends on the related <http_command> (see above). |
| <param3> | String | Content depends on the related <http_command> (see above). |
| <http_result> | Number | • 0: fail<br>• 1: success |

## 28.3.4 Notes

- The +UHTTPC command has a default timeout setting set to 180 s. The timeout is counted from the last successful network read or send operation performed by the HTTP application, so in a real timeout case the application might be executing a command more than 180 s.
- The 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 character, quotation mark ("), are forbidden.

Objective Specification

- If <http_command>=4 (POST a file) and the <param2>=3 (multipart/form-data), then the module automatically encapsulates the file content in the following multipart/form-data HTTP request:

```
--U1Blox2Http3Unique4Boundary5\r\n
Content-Disposition: form-data; name="file_post"; filename="<param3>"\r\n
Content-Length: <length of file specified with param3>\r\n
Content-Type: application/octet-stream\r\n
\r\n
<content of file specified with param3>\r\n
--U1Blox2Http3Unique4Boundary5--\r\n
\r\n
```

**LISA-U1 / LISA-U200-00S / LISA-U200-01S / LISA-U200-02S / LISA-U200-52S / LISA-U200-62S / LISA-U200-82S / LISA-U230 / LISA-U260 / LISA-U270 / SARA-G340-00S / SARA-G350-00S / SARA-G350-00X / LEON-G**

- <param2> (HTTP Content-Type identifier)= 4, 5 and 6 are not supported.

**SARA-G340-01S / SARA-G350-01B / SARA-G350-01S**

- <param2> (HTTP Content-Type identifier)= 6 is not supported.

**LISA-U1 / LISA-U200-00S / LISA-U200-01S / LISA-U200-02S / LISA-U200-52S / LISA-U200-62S / LISA-U200-82S / LISA-U230 / LISA-U260 / LISA-U270 / SARA-U260-00S / SARA-U270-00S / SARA-U270-00X / SARA-U280-00S / SARA-G300 / SARA-G310 / SARA-G340-00S / SARA-G350-00S / SARA-G350-00X / SARA-G350-01B / LEON-G**

- HTTP parameters <param2> and <param3> are not supported for PUT command.

# 28.4 HTTP protocol error +UHTTPER

| +UHTTPER | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L201 TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L201 MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *Appendix A.8* |

## 28.4.1 Description

Retrieves the error class and code of the latest HTTP operation on the specified HTTP profile.

## 28.4.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UHTTPER=<profile_id> | +UHTTPER: <profile_id>,<error_class>,<error_code><br>OK | AT+UHTTPER=1<br>+UHTTPER: 1,0,0<br>OK |

## 28.4.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <profile_id> | Number | HTTP profile identifier, in range 0-3 |
| <error_class> | Number | List of the allowed values is available in *Appendix A.8* |
| <error_code> | Number | Value of class-specific error codes (reply code if class is 0). When <error_class>=10 (wrong HTTP API usage), the allowed <error_code>; values are listed in *Appendix A.8.2* |

Objective Specification

# 29 SMTP

u-blox proprietary 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.

A PSD or CSD connection must be activated before using SMTP AT commands: refer to *+UCSD*, *+UCSDA* and *+UCSND* AT commands for establishing a CSD connection and to *+UPSD*, *+UPSDA* and *+UPSND* AT commands for establishing a PSD connection.

When these commands report an error which is not a +CME ERROR, the error code can be queried using the *+USMTPER* AT command.

## 29.1 SMTP control +USMTP

| +USMTP | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 29.1.1 Description

Sets up the necessary parameters for SMTP service, or resets parameters to the factory-programmed value. A set command for each <param_tag> needs to be issued to configure the SMTP setting. The read command returns the current setting of all the SMTP parameters except for the password, 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).

In the set command, if only the first parameter is issued, the module resets the parameter to the factory-programmed value.

### 29.1.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| **SMTP control generic syntax** | | | |
| Set | AT+USMTP=<op_code>[,<param1>[,<param2>]] | OK | AT+USMTP=0,"151.9.37.66"<br>OK |
| **SMTP server IP address** | | | |
| Set | AT+USMTP=0[,<SMTP_server_address>] | OK | AT+USMTP=0,"151.9.37.66"<br>OK |
| **SMTP server name** | | | |
| Set | AT+USMTP=1[,<SMTP_server_name>] | OK | AT+USMTP=1,"smtp.mail.yahoo.com"<br>OK |
| **SMTP username** | | | |
| Set | AT+USMTP=2[,<username>] | OK | AT+USMTP=2,"myusername"<br>OK |
| **SMTP password** | | | |
| Set | AT+USMTP=3[,<password>] | OK | AT+USMTP=3,"mypassword"<br>OK |
| **SMTP authentication type** | | | |
| Set | AT+USMTP=4[,<authentication>] | OK | AT+USMTP=4,1<br>OK |
| **SMTP inactivity timeout** | | | |
| Set | AT+USMTP=5[,<inactivity_timeout>] | OK | AT+USMTP=5,50<br>OK |
| **SMTP time zone** | | | |
| Set | AT+USMTP=6[,<hour_differential>,<minute_differential>] | OK | AT+USMTP=6,3,30 |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | | OK |
| **SMTP client port** | | | |
| Set | AT+USMTP=7,<port> | OK | AT+USMTP=7,9025<br>OK |
| Read | AT+USMTP? | +USMTP: 0,<SMTP_server_address><br>+USMTP: 1,<SMTP_server_name><br>+USMTP: 2,<username><br>+USMTP: 4,<authentication><br>+USMTP: 5,<inactivity_timeout><br>+USMTP: 6,<hour_differential>,<minute_differential><br>+USMTP: 7,<port><br>OK | +USMTP: 0,"69.147.102.58"<br>+USMTP: 1,""<br>+USMTP: 2,"username"<br>+USMTP: 4,1<br>+USMTP: 5,0<br>+USMTP: 6,0,0<br>+USMTP: 7,9025<br>OK |
| Test | AT+USMTP=? | +USMTP: (list of supported <param_tag>s)<br>OK | +USMTP: (0-7)<br>OK |

## 29.1.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <op_code> | Number | Type of operation:<br>• 0: SMTP server IP address<br>• 1: SMTP server name<br>• 2: username<br>• 3: password<br>• 4: authentication type<br>• 5: inactivity timeout<br>• 6: time zone, used for the date header field of mails<br>• 7: SMTP port configuration |
| <SMTP_server_address> | String | Represents the SMTP server IP address expressed in dotted decimal notation form |
| <SMTP_server_name> | String | Represents the string of SMTP server name (e.g. "smtp.server.com"). The maximum length is 128 characters |
| <username> | String | Represents the user name (the maximum length is 30 characters) for the SMTP login procedure if the authentication is used |
| <password> | String | Represents the password (the maximum length is 30 characters) for the SMTP login procedure if the authentication is used |
| <authentication> | Number | SMTP authentication method (if any):<br>• 0 (default value): no authentication<br>• 1: plain authentication<br>• 2: login authentication |
| <inactivity_timeout> | Number | Inactivity timeout period expressed 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 |
| <hour_differential> | Number | Represents the value of hour differential, in range [-12; 12] (the default value is 0) |
| <minute_differential> | Number | Represents the value of minute differential, in range [0; 59] (the default value is 0). This is a mandatory parameter if <op_code>=6 and <hour_differential> is specified. |
| <port> | Number | The port used by the SMTP client, in range [1; 65535] (the default value is 25). |
| <param_val1> | | Type and content depend on <op_code> parameter (see details above). If the parameter is not specified, the value for the corresponding <op_code> is reset |
| <param_val2> | | Type and content depend on related <op_code> parameter (see details above) |

## 29.1.4 Notes

- <op_code>=0 and <op_code>=1 are mutually exclusive. If <param_val1> value for <op_code>=0 is specified by the user, then value for <op_code>=1 is reset or viceversa.

Objective Specification

**SARA-G300 / SARA-G310 / SARA-G340-00S / SARA-G340-01S / SARA-G350-00S / SARA-G350-00X / SARA-G350-01B / SARA-G350-01S / LEON-G**

- The <port> parameter is not supported. The default port (25) is used.

# 29.2 SMTP mail control +USMTPM

| +USMTPM | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | *< 10 s* | *Appendix A.8.1* |

## 29.2.1 Description

Sets (or resets) the necessary parameters for envelope and body of a mail for the subsequent transmission via SMTP protocol. To configure the settings for envelope and body of mail the set command needs to be issued for each <param_tag>.

In the set command, if none parameter is issued, the module resets all the internal SMTP buffers to create a new mail.

## 29.2.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | AT+USMTPM | OK | OK |
| **SMTP mail control generic syntax** | | | |
| Set | AT+USMTPM=<op_code>,<param_val1>[,<param_val2>,<param_val3>] | OK | AT+USMTPM=0,"ugo.rossi@u-blox.com"<br>OK |
| **SMTP mail sender address** | | | |
| Set | AT+USMTPM=0,<mail_sender> | OK | AT+USMTPM=0,"ugo.rossi@u-blox.com"<br>OK |
| **SMTP "Reply-To" field** | | | |
| Set | AT+USMTPM=1,<reply_to> | OK | AT+USMTPM=1,"ugo.rossi@u-blox.com"<br>OK |
| **SMTP mail receiver address** | | | |
| Set | AT+USMTPM=2,<mail_receiver> | OK | AT+USMTPM=2,"ugo.rossi@u-blox.com"<br>OK |
| **SMTP mail subject** | | | |
| Set | AT+USMTPM=3,<mail_subject> | OK | AT+USMTPM=3,"This is the subject"<br>OK |
| **SMTP mail text** | | | |
| Set | AT+USMTPM=4,<mail_text> | OK | AT+USMTPM=0,"This is the text"<br>OK |
| **SMTP attachment** | | | |
| Set | AT+USMTPM=5,<mail_attachment_file_name>,<mail_attachment_media_type>,<mail_attachment_media_sub-type> | OK | AT+USMTPM=5,"screenshot.jpg",2,"jpg"<br>OK |
| **SMTP enhanced mode** | | | |
| Set | AT+USMTPM=6<br>@<mail_text><Ctrl-Z> | OK | AT+USMTPM=6<br>@<mail text><Ctrl-Z><br>OK |
| Test | AT+USMTPM=? | +USMTPM: (list of supported <op_code>s)<br>OK | +USMTPM: (0-5)<br>OK |

Objective Specification

### 29.2.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <op_code> | Number | • 0: set the mail sender address<br>• 1: set the "Reply-To" field<br>• 2: add the mail receiver. Up to 10 different recipient addresses can be added for each new mail<br>• 3: set the mail subject<br>• 4: set the mail text<br>• 5: add an attachment. The attachment must be a file stored in the file system and accessible by the SMTP client. Up to 10 attachments can be added for each new mail<br>• 6: set the mail text in enhanced mode: it is possible to write text messages up to 4096 bytes. After having issued 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 automatically exits from the input mode |
| <mail_sender> | String | Mandatory parameter representing the text string of the sender address. It must be in the form "local_part@domain" and not exceed 64 characters |
| <reply_to> | String | Mandatory parameter representing the text string of the address which reply should be sent to. It must be in form "local_part@domain" and not exceed 64 characters |
| <mail_receiver> | String | Mandatory parameter representing recipient address text string. It must be in form "local_part@domain" and not exceed 64 characters. |
| <mail_subject> | String | Mandatory parameter representing the text string of the mail subject. |
| <mail_text> | String | Mandatory parameter representing the text string of the mail text. |
| <mail_attachment_file_name> | String | Mandatory parameter representing the attachment file name |
| <mail_attachment_media_type> | Number | Mandatory parameter of the media type. Allowed values:<br>• 0: undefined media type<br>• 1: text media type<br>• 2: image media type<br>• 3: audio media type<br>• 4: video media type<br>• 5: application media type |
| <mail_attachment_media_sub-type> | String | <param_val3> mandatory parameter, text string of media sub-type |
| <param_val1> | String | Type and content depend on <op_code> (see details above). If <param_val1> is not specified, the value for the corresponding <op_code> is reset |
| <param_val2> | Number | Type and content depend on related <op_code> (see details above) |
| <param_val3> | String | Type and content depend on related <op_code> (see details above) |

### 29.2.4 Notes

- The mail subject must not exceed the maximum length of 64 bytes.
- The mail text must not exceed the maximum length of 512 bytes.
- The allowed ASCII characters for mail subject and text 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 character, quotation mark ("), are forbidden.
- In case <param_val2> = 0 (undefined media type), the empty string ("") can be used as input value for <param_val3> parameter.

Objective Specification

## 29.3 SMTP command +USMTPC

| +USMTPC | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | *< 10 s* | *+CME Error* |

### 29.3.1 Description

Triggers the SMTP action corresponding to <smtp_command> parameter. The response indicates if sending the command request to SMTP process was successful or not. The final SMTP command result will be notified to the user via the +UUSMTPCR URC.

### 29.3.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+USMTPC=<smtp_command> | OK | AT+USMTPC=1<br>OK |
| Test | AT+USMTPC=? | +USMTPC: (list of supported <smtp_command>s)<br>OK | +USMTPC: (0-2)<br>OK |
| URC | | +UUSMTPCR: <smtp_command>,<smtp_result>[,<reject_rcpt_addr1>[,<reject_rcpt_addr2>[,...]]] | +UUSMTPCR: 1,1 |

### 29.3.3 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.<br>• 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.<br>• 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. |
| <smtp_result> | Number | Result code of SMTP operation<br>• 0: Failure<br>• 1: Success<br>• 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. |

## 29.4 SMTP error +USMTPER

| +USMTPER | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *SMTP Errors +CME Error* |

### 29.4.1 Description

Retrieves the error class and code of the last SMTP operation.

### 29.4.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+USMTPER | +USMTPER: <error_class>,<error_code> | AT+USMTPER |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | OK | +USMTPER: 0,0<br><br>OK |

## 29.4.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <error_class> | Number | Value of error class; see *Appendix A.8* |
| <error_code> | Number | Value of class-specific error code (reply code if class is 0). The allowed values are listed in *Appendix A.8.3* |

Objective Specification

# 30 Ping

The ping service requires the user to define and activate a connection profile (either PSD or CSD) before executing the *+UPING* command. See *+UCSD*, *+UCSDA* and *+UCSND* AT commands for establishing a CSD connection and *+UPSD*, *+UPSDA* and *+UPSND* AT commands for establishing a PSD connection.

## 30.1 Ping command +UPING

| +UPING | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error Ping Error* |

### 30.1.1 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 / 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 is not received, it might mean that the remote host is not reachable.

The ping command could be used also to measure e.g. 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 module to a remote peer. The results of the ping command execution is notified by means of these URCs:

- **+UUPING**: it reports the +UPING command result when no error occurred.
- **+UUPINGER**: it is raised if an error is occurred while processing the +UPING command. The URC reports the code of occurred error (see *Ping error codes* to get the meanings of the error result codes).

Some network operators may disallow ICMP packets traffic on their network, this means that the +UPING command may not work.

Some remote hosts might not reply to ICMP echo request for security reasons (e.g. firewall settings).

Some remote hosts might not reply to ICMP echo request if the data size of the echo request is too big.

If a remote peer does not reply to an ICMP echo request, it does not mean that for sure the peer cannot be reached in another way.

### 30.1.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UPING=<remote_host>[,<retry_num>,<p_size>,<timeout>,<ttl>] | OK | AT+UPING="www.google.com"<br>OK |
| Test | AT+UPING=? | +UPING: "remote_host",(list of supported <retry_num>),(list of | +UPING: "remote_host",(1-64),(4-1460),(10-60000),(1-255) |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | supported <p_size>),(list of supported <timeout>),(list of supported <ttl>)<br><br>OK | OK |
| 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 |

## 30.1.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <remote_host> | String | IP address (dotted decimal representation) or domain name of the remote host<br>• Maximum length: 128 characters |
| <retry_num> | Number | Indicates how many times iterate the ping command.<br>• Range: 1-64<br>• Default value: 4 |
| <p_size> | Number | Size in bytes of the echo packet payload.<br>• Range: 4-1460<br>• Default value: 32 |
| <timeout> | Number | The maximum time in milliseconds to wait for a echo reply response.<br>• Range: 10-60000<br>• Default value: 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<br>• Range: 1-255<br>• Default value: 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. |
| <error_code> | Number | The error occurred while processing the +UPING command. See *Ping error codes* for the list of the allowed error result codes. |

## 30.1.4 Notes

- If the +UUPING URC reports <rtt> = -1 the timeout is elapsed (no response received).
- If the first +UUPING URC reports <rtt> = -2 the TTL used in the ping request is too low.
- Some network operators may return an ICMP time exceeded message when the remote host is not reachable. In these cases the first +UUPING URC reports <rtt> = -1 and the subsequent +UUPING URC report <rtt> = -2.

**SARA-G300 / SARA-G310 / SARA-G340-00S / SARA-G340-01S / SARA-G350-00S / SARA-G350-00X / SARA-G350-01B / SARA-G350-01S / LEON-G**

- The first +UUPING URC reporting <rtt> = -2 is not supported. As a consequence a TTL too low hint is not available.

**LEON-G**

- The command uses the TCP/IP resources in an exclusive way. All the other TCP/IP operations executed after the execution of the *+UPING* command will wait for the execution of this command.

Objective Specification

# 30.2 ICMP echo reply configuration +UDCONF=4

| +UDCONF=4 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 30.2.1 Description

Enables/disables the ICMP echo reply (ping response).

Not all the network operators allow the ping traffic on their network.

## 30.2.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UDCONF=4,<icmp_echo_reply> | OK | AT+UDCONF=4,1<br>OK |
| Read | AT+UDCONF=4 | +UDCONF: 4,<icmp_echo_reply><br>OK | AT+UDCONF=4<br>+UDCONF: 4,1<br>OK |

## 30.2.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <icmp_echo_reply> | Number | Enables or disables the ping response when a remote host performs a ping request to the module<br>• 0: ping response disabled (the module does not reply to remote pings)<br>• 1 (factory-programmed value): ping response enabled (the module replies to remote pings) |

Objective Specification

# 31 GNSS

## 31.1 NMEA

u-blox cellular modules support reading NMEA strings from the GNSS receiver through AT commands.

Before being able to read a specific NMEA string, it is necessary to activate the storage of the last value of that particular NMEA string. If storing a particular NMEA string was not activated, the response to the query will be "0,NULL". The last value of a specific NMEA string is saved in RAM and is made available even after the GNSS receiver switch off.

The NMEA standard differentiates between GPS, GLONASS and Multi-GNSS receivers using a different 'Talker ID'. Depending upon device model and system configuration, the u-blox receiver could output messages using any one of these Talker IDs.

By default, the receivers configured to support GPS, SBAS and QZSS use the 'GP' Talker ID, receivers configured to support GLONASS use the 'GL' Talker ID, receivers configured to support BeiDou use the 'GB' Talker ID and receivers configured for any combinations of multiple GNSS use the 'GN' Talker ID.

Even if the NMEA specification indicates that the GGA message is GPS specific, u-blox receivers support the output of a GGA message for each of the Talker IDs.

As a factory-programmed setting, the cellular modules configure the GNSS receiver through +UGPS AT command to not provide the NMEA sentences.

When reading an NMEA message, if the response value is "1,Not available" then the storing of the NMEA string is activated but this information has not been still sent to the user, if this persist check that the relative NMEA message is enabled. To enable it use the +UGUBX command (for further information see the UBX-CFG-MSG message in the u-blox GNSS Protocol Specification).

## 31.2 GNSS power management +UGPS

| +UGPS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U1 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | *< 10 s* | *+CME Error* |

### 31.2.1 Description

Switches on or off a u-blox GNSS receiver connected to the cellular module via a dedicated DDC ($I^2C$) interface. For more details about the connection between cellular module and u-blox GNSS receiver see the corresponding module system integration manual.

Furthermore the command sets the aiding type to be used to enhance GNSS 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:

- Local aiding: the cellular module automatically uploads data such as ephemeris, almanac, last position, time, etc. from the GNSS receiver into its local memory, and restores back the GNSS receiver at the next power up of the GNSS module (if the data are still valid, otherwise it uses GSM information such as country code for a rough position estimation)
- AssistNow Online: a connection profile (either PSD or CSD) must be defined and activated before selecting the AssistNow Online; see the *+UGAOP* and *+UGSRV* command descriptions. If CellLocate® is used, the first HTTP profile will be properly configured

Objective Specification

- AssistNow Offline: a connection profile (either PSD or CSD) must be defined and activated before selecting the AssistNow Offline if the almanac file must be downloaded; see the *+UGAOF* and *+UGSRV* command descriptions.

  LEON-G
  The AssistNow Offline enables AID-ALPSRV UBX message on all the GNSS communication ports.
- AssistNow Autonomous: based on a broadcast ephemeris downloaded from the satellite (or obtained by AssistNow Online) the receiver can autonomously generate an accurate satellite orbit representation («AssistNow Autonomous data») that is usable for navigation much longer than the underlying broadcast ephemeris was intended for. This makes downloading new ephemeris or aiding data for the first fix unnecessary for subsequent start-ups of the receiver.

LISA-U1 / LISA-U200-00S / LISA-U200-01S / LISA-U200-02S / LISA-U200-52S / LISA-U200-62S / LISA-U200-82S / LISA-U230 / LISA-U260 / LISA-U270 / LEON-G
If using CellLocate® and HTTP commands, the HTTP profiles in the range 1-3 must be used.

To establish a CSD connection see the *+UCSD*, *+UCSDA* and *+UCSND* AT commands while to establish a PSD connection see the *+UPSD*, *+UPSDA* and *+UPSND* AT commands.

The AssistNow Autonomous feature may be not fully supported on all Multi-GNSS receivers. For more details on AssistNow Autonomous feature see the corresponding u-blox-GNSS receiver description.

For a more detailed description on aiding modes and possible suggestions, see the GNSS Implementation Application Note *[52]*.

It is possible to combine different aiding modes: to enable them the sum of the <mode> value of the interested aiding modes is needed (e.g.: aiding <mode>=3 means local aiding plus AssistNow Offline). Moreover it is also possible to switch from one aiding mode to another one without powering off the GNSS receiver. If the following sequence is provided (AT+UGPS=1,1 and then AT+UGPS=1,5) at the beginning the GNSS receiver 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 the *+UUGIND* URC for it will not be sent again.

The latest u-blox GNSS products are multi-GNSS receivers capable of receiving and processing signals from multiple Global Navigation Satellite Systems (GNSS). u-blox concurrent GNSS receivers are multi-GNSS receivers that can acquire and track satellites from more than one GNSS system at the same time, and utilize them for positioning. The <GNSS_systems> parameter configures the GNSS receiver into the required mode of operation. It is possible to combine different GNSS systems. The combinations of systems, which can be configured simultaneously depends on the receivers capability to receive several carrier frequencies. See the corresponding GNSS receiver data sheet for the supported GNSS systems. If the Assisted GNSS unsolicited indication is enabled, the *+UUGIND* URC will provide the current activated combinations of systems.

### 31.2.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UGPS=<mode>[,<aid_mode>[,<GNSS_systems>]] | OK | AT+UGPS=1,0,1<br>OK |
| Read | AT+UGPS? | +UGPS: <mode>[,<aid_mode>[,<GNSS_systems>]]<br>OK | +UGPS: 1,0,1<br>OK |
| Test | AT+UGPS=? | +UGPS: (list of supported <mode>s),(list of supported <aid_mode>),(list of supported <GNSS_systems>)<br>OK | +UGPS: (0-1),(0-15),(1-127)<br>OK |

### 31.2.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | • 0 (default value): GNSS receiver powered off<br>• 1: GNSS receiver powered on |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| <aid_mode> | Number | Supported aiding modes; the parameter is mandatory if <mode>=1; all these allowed values can be combined together<br>• 0 (default value): no aiding<br>• 1: automatic local aiding<br>• 2: AssistNow Offline<br>• 4: AssistNow Online<br>• 8: AssistNow Autonomous |
| <GNSS_systems> | Number | Bitmask for combining the supported GNSS types; the parameter is optional and the allowed values can be combined together. The default value is 3 (GPS+SBAS):<br>• 1: GPS<br>• 2: SBAS<br>• 4: Galileo<br>• 8: BeiDou<br>• 16: IMES<br>• 32: QZSS<br>• 64: GLONASS |

### 31.2.4 Notes

- To know the allowed combinations of GNSS type for <GNSS_systems> see the corresponding GNSS receiver documentation.
- An error result code is provided in the following cases:
  - <mode>, <aid_mode> or <GNSS_systems> values are out of range
  - <mode> is set to 1 without <aid_mode> value
  - Attempt to power off the GNSS when it is already off
  - The value of <aid_mode> to be set is equal to the current GNSS aiding mode and the value of <GNSS_systems> to be set is equal to the last requested <GNSS_systems>
- The parameter <GNSS_systems> is displayed in the information text response of the read command only if the connected GNSS receiver supports Multi-GNSS

**LISA-U200-00S / LISA-U200-01S / LISA-U200-02S / LISA-U200-52S / LISA-U200-62S / LISA-U200-82S / LISA-U230 / LISA-U260 / LISA-U270 / SARA-G300 / SARA-G310 / SARA-G340-00S / SARA-G350-00S / SARA-G350-00X / LEON-G**

- The parameter <GNSS_systems> is not supported.

## 31.3 Assisted GNSS unsolicited indication +UGIND

| +UGIND | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U1 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 31.3.1 Description

Enables or disables sending of URCs from MT to TE in the case of GNSS aiding operations. The <mode> parameter controls the processing of URCs specified within this command.

The URC returns the result of an assisted GNSS operation. This information is sent to all the interfaces. The URC is provided only if one or more aiding modes are enabled (for more details see the *+UGPS* and *+UGAOP* command descriptions).

There can be more than a +UUGIND URC 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.

Objective Specification

The commands +UGAOS=0 and +UGAOS=1 both relate to the GNSS local aiding, so the unsolicited message will be +UUGIND=1,x in both cases.

Local aiding and AssistNow Autonomous will produce URC both after GNSS power on and before GNSS power off because some data are transferred from the GNSS receiver to the cellular module.

If the connected GNSS receiver is Multi-GNSS then an additional +UUGIND=0,<GNSS_systems> URC for the currently activated GNSS systems is displayed.

LEON-G
The URCs during GNSS power down phase are generated between the power off command (+UGPS=0) and the actual switch off (OK result code).

## 31.3.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UGIND=<mode> | OK | AT+UGIND=1<br>OK |
| Read | AT+UGIND? | +UGIND: <mode><br>OK | +UGIND: 1<br>OK |
| Test | AT+UGIND=? | +UGIND: (list of supported <mode>'s)<br>OK | +UGIND: (0-1)<br>OK |
| URC | | Current activated GNSS system:<br>+UUGIND: 0,<GNSS_systems> | +UUGIND: 0,3 |
| | | GNSS aiding status:<br>+UUGIND: <aid_mode>,<result> | +UUGIND: 4,5 |

## 31.3.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | URC configuration:<br>• 0 (default value): disabled<br>• 1: enabled |
| <aid_mode> | Number | Provides the supported aiding mode<br>• 0: GNSS system(s)<br>• 1: automatic local aiding<br>• 2: AssistNow Offline<br>• 4: AssistNow Online<br>• 8: AssistNow Autonomous |
| <GNSS_systems> | Number | Current activated GNSS types; the allowed values can be combined together:<br>• 1: GPS<br>• 2: SBAS<br>• 4: Galileo<br>• 8: BeiDou<br>• 16: IMES<br>• 32: QZSS<br>• 64: GLONASS |
| <result> | Number | Represents the result of the aiding operation:<br>• 0: No error<br>• 1: Wrong URL (for AssistNow Offline)<br>• 2: HTTP error (for AssistNow Offline)<br>• 3: Create socket error (for AssistNow Online)<br>• 4: Close socket error (for AssistNow Online)<br>• 5: Write to socket error (for AssistNow Online)<br>• 6: Read from socket error (for AssistNow Online)<br>• 7: Connection/DNS error (for AssistNow Online)<br>• 8: File system error |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 9: Generic error<br>• 10: No answer from GNSS (for local aiding and AssistNow Autonomous)<br>• 11: Data collection in progress (for local aiding)<br>• 12: GNSS configuration failed (for AssistNow Autonomous)<br>• 13: RTC calibration failed (for local aiding)<br>• 14: feature not supported (for AssistNow Autonomous)<br>• 15: feature partially supported (for AssistNow Autonomous)<br>• 16: authentication token missing (required for aiding for u-blox M8 and future versions) |

# 31.4 GNSS profile configuration +UGPRF

| +UGPRF | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U1 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

## 31.4.1 Description

Configures the data flow to and from a u-blox GNSS receiver connected to the cellular module. The data flow is possible to and from the:

- UART (via multiplexer)
- USB (or alternatively AUX UART)
- 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 free TCP socket (the GNSS 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; refer to *+UCSD*, *+UCSDA* and *+UCSND* AT commands for establishing a CSD connection and to *+UPSD*, *+UPSDA* and *+UPSND* AT commands for establishing a PSD connection
- Into a file on the cellular module: A file with GNSS data can be accessed via *+ULSTFILE* command. The file name is automatically chosen by the cellular module as a unique ID based on date and time or a further incremental number (e.g. "GPS_200910061500" or "GPS_20091006_001" according to the used cellular module). 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 GNSS (this will create a new file)

It is possible to send GNSS data to multiple destinations at the same time by summing the <GNSS_I/O_ configuration> values of each required destinations (e.g. if AT+UGPRF=6 the data will be sent on multiplexer and stored in a file in the file system).

The messages to be output by the u-blox GNSS receiver need to be activated separately with UBX-CFG-MSG configuration messages according to the GNSS Receiver Protocol Specification.

It is not possible to select the GNSS data flow to and from USB (or alternatively AUX UART) and multiplexer concurrently.

The configuration of the GNSS profile must be performed only when GNSS is switched off, otherwise an error result code will be displayed.

## 31.4.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UGPRF=<GNSS_I/O_configuration>[,<IP Port>,<server address string>] | OK | AT+UGPRF=0<br>OK |
| Read | AT+UGPRF? | +UGPRF: <GNSS_I/O_configuration>,<IP port>,<server address string><br>OK | +UGPRF: 0,0,""<br>OK |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| Test | AT+UGPRF=? | +UGPRF: (list of supported <GNSS_I/O_ configuration>),(list of supported <IP port>),<server address string><br>OK | +UGPRF: (0-127),(0-65535),"addr"<br>OK |

### 31.4.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <GNSS_IO_ configuration> | Number | • 0 (default value and factory-programmed value): no data flow to multiplexer, file or IP address<br>• 1: GNSS data flow to and from USB (or alternatively AUX UART)<br>• 2: GNSS data flow to and from multiplexer<br>• 4: GNSS data flow saved to file<br>• 8: GNSS data flow over the air to an Internet host<br>• 16: GNSS data ready function<br>• 32: GNSS RTC sharing function<br>• 64: reserved |
| <IP port> | Number | IP port of the server where the GNSS data are sent (default value and factory-programmed value: 0). If GNSS data flow over the air is enabled the parameter is mandatory otherwise is forbidden. |
| <server address string> | String | Address string of the server where the GNSS data are sent (default value and factory-programmed value: ""). If GNSS data flow over the air is enabled the parameter is mandatory otherwise is forbidden. The address could be provided in both URL or IP format and the maximum length of the string is 47 characters. |

### 31.4.4 Notes

**LEON-G**

- The server address string parameter accepts only IP address in dotted notation, thus it has a maximum length of 15 characters.
- A delay time of at least 3 s after the power on is required before issuing this command.
- The USB interface is not supported.
- UBX-AID messages are not passed over the multiplexer if AssistNow Online, AssistNow Offline or Local Aiding is enabled (see *AT+UGPS* command description).

**SARA-G340 / SARA-G350**

- The GNSS data flow on the multiplexer channel is only in output toward the cellular module; the input to the GNSS receiver is not supported.
- The USB interface is not supported.

**SARA-G340-02S / SARA-G350-02A / SARA-G350-02S**

- Configure the AUX UART interface as GNSS tunnelling interface to support the GNSS data flow over it (in the active *+USIO* variant), before the GNSS receiver is switched on (by means of *+UGPS* AT command). See *+USIO* command description for details.

## 31.5 AssistNow Online configuration +UGAOP

| +UGAOP | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U1 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

### 31.5.1 Description

Configures the network connection to an AssistNow Online server. Use of this command is only necessary if changes to the factory-programmed configuration are required.

Objective Specification

The AssistNow Online server is accessed with the User Datagram Protocol (UDP). The GNSS shares the socket pool with the other applications, to execute AssistNow the cellular module will try to open a new socket without dropping any opened socket, if there is no socket available then the GNSS will start and no aiding operation is performed. By default, the cellular module connects to the u-blox' AssistNow Online server. The 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); username and passwords are not required. The access to a proxy server is possible.

Three different modes of operation are supported:

- AssistNow Online data are automatically downloaded from the server when the GNSS receiver is started up (i.e. with command *+UGPS* and <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.

Setting up Internet connection and network registration is not part of this command and must be handled by the user separately to this command; see the *+UCSD*, *+UCSDA* and *+UCSND* AT commands for establishing a CSD connection and to *+UPSD*, *+UPSDA* and *+UPSND* AT commands for establishing a PSD connection.

Where supported, it is preferred to use the *+UGSRV* AT command.

## 31.5.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UGAOP=<hostname>,<server_port>,<latency>,<mode> | OK | AT+UGAOP="eval1-les.services.u-blox.com",46434,1000,0<br>OK |
| Read | AT+UGAOP? | +UGAOP: <hostname>,<server_port>,<latency>,<mode><br>OK | +UGAOP: "eval1-les.services.u-blox.com",46434,1000,0<br>OK |

## 31.5.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <hostname> | String | Host name of the server (factory-programmed value: eval1-les.services.u-blox.com); the maximum length is 47 characters |
| <server_port> | Number | Value in the range 0 - 65535. (factory-programmed value: 46434) |
| <latency> | Number | Expected network latency value from AssistNow Online server to client, in milliseconds. The range goes from 0 to 10000 ms. (factory-programmed value: 1000 ms) |
| <mode> | Number | Mode of operation of AssistNow Online data management<br>• 0 (factory-programmed value): AssistNow Online data are downloaded at GNSS receiver power up<br>• 1: AssistNow Online data automatically kept alive<br>• 2: manual AssistNow Online data download |

## 31.5.4 Notes

### LEON-G

- A delay time of at least 3 s after the power on is required before issuing this command.

Objective Specification

# 31.6 AssistNow Offline configuration +UGAOF

| +UGAOF | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U1 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

## 31.6.1 Description

Configures the network connection to an AssistNow Offline server. Use of this command is only necessary if changes to the factory-programmed configuration are required.

Access to an AssistNow Offline server is done with HTTP/1.1. The GNSS shares the socket pool with the other applications, to execute AssistNow Offline the cellular module will try to open a new socket without dropping any opened socket, if there is no socket available then the GNSS will start and no aiding operation is performed. By default, the cellular 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.

Where supported, it is preferred to use the *+UGSRV* AT command.

## 31.6.2 Syntax

| 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<br>OK |
| Read | AT+UGAOF? | +UGAOF: <file_url>,0,<retry timeout>,<max_retry_attempts><br>OK | +UGAOF: "http://alp.u-blox.com/current_14d.alp",0,1,3<br>OK |

## 31.6.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <file_url> | String | URL of AssistNow Offline file (the maximum length is 255 characters including "http://"). Allows choosing the size/validity of the file. The factory-programmed value is 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) (factory-programmed value: 1) |
| <max_retry_attempts> | Number | Maximum number of attempts in case of failed download (0-5); the factory-programmed value is 3. |

## 31.6.4 Notes

### LEON-G

- A delay time of at least 3 s after the power on is required before issuing this command.

Objective Specification

# 31.7 Aiding server configuration +UGSRV

| +UGSRV | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U | | | | | |
| | SARA-G340-01S SARA-G340-02S SARA-G350-01B SARA-G350-01S SARA-G350-02A SARA-G350-02S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

## 31.7.1 Description

Configures the network connection to a Multi GNSS Assistance (MGA) server. The configuration is saved in NVM and applied at the next GNSS power cycle. The MGA server is accessed with the HTTP. This assistance mode requires a packet data connection to exchange information with u-blox servers. By default, the cellular module connects to u-blox' primary MGA server; if the connection fails then the cellular module connects to u-blox' secondary MGA server. Authorization tokens are used as a means of authorizing access to the u-blox services and for gathering anonymised statistics. To obtain a token customers should use the form in http://www.u-blox.com/services-form.html. The set command registers a token for gathering assistance data from MGA servers. Once a token is set it cannot be cleared so that registered hostnames in *+UGAOP* and *+UGAOF* commands are discarded.

Setting up Internet connection and network registration is not part of this command and must be handled by the user separately to this command; see *+UCSD*, *+UCSDA* and *+UCSND* AT commands for establishing a CSD connection and *+UPSD*, *+UPSDA* and *+UPSND* AT commands for establishing a PSD connection.

## 31.7.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UGSRV=[<mga_primary_server>],[<mga_secondary_server>],<auth_token>[,<days>[,<period>[,<resolution>[,<GNSS_types>[,<mode>[,<datatype>]]]]]] | OK | AT+UGSRV="cell-live1.services.u-blox.com","cell-live2.services.u-blox.com","123456789abcdefghijklm",14,4,1,65,0,1<br>OK |
| Read | AT+UGSRV? | +UGSRV: <mga_primary_server>,<mga_secondary_server>,<auth_token>,<days>,<period>,<resolution>,<GNSS_types>,<mode>,<datatype><br>OK | +UGSRV: "cell-live1.services.u-blox.com","cell-live2.services.u-blox.com","123456789abcdefghijklm",14,4,1,65,0,1<br>OK |
| Test | AT+UGSRV=? | +UGSRV: <mga_primary_server>,<mga_secondary_server>,<auth_token>,(list of supported <days>s),(list of supported <period>s),(list of supported <resolution>s),(list of supported <GNSS_types>s),(list of supported <mode>s),(list of supported <datatype>s)<br>OK | +UGSRV: "srv1","srv2","token",(1,2,3,5,7,10,14),(1-5),(1-3),(1,64,65),(0-2),(0-15)<br>OK |

## 31.7.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mga_primary_server> | String | Host name of the primary MGA server; the maximum length is 254 characters. Empty string is not allowed. The default and factory-programmed value is "cell-live1.services.u-blox.com". If the primary MGA server is omitted, the current stored value is preserved. |
| <mga_secondary_server> | String | Host name of the secondary MGA server; the maximum length is 254 characters. Empty string is not allowed. The default and factory-programmed value is "cell-live2.services.u-blox.com". If the secondary MGA server is omitted, the current stored value is preserved. |
| <auth_token> | String | Authentication Token for MGA server access. |
| <days> | Number | The number of days into the future the Offline data for u-blox 7 and previous version should be valid for. The allowed values are: 1, 2, 3, 5, 7, 10 and 14. The default and factory-programmed value is 14. |
| <period> | Number | The number of weeks into the future the Offline data for u-blox M8 should be valid for. The range of the allowed values goes from 1 to 5. The default and factory-programmed value is 4. |
| <resolution> | Number | Resolution of offline data for u-blox M8. Allowed values: |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 1 (default and factory-programmed value): every day<br>• 2: every other day<br>• 3: every third day |
| <GNSS_types> | Number | Bitmask for combining the desired GNSS for the (offline) aiding<br>• 1: GPS<br>• 64: GLONASS<br>The default and factory-programmed value is all (65). If the parameter is omitted, the current stored value is preserved. |
| <mode> | Number | Mode of operation of AssistNow Online data management<br>• 0 (default and factory-programmed value): AssistNow Online data are downloaded at GNSS receiver power up<br>• 1: AssistNow Online data automatically kept alive<br>• 2: manual AssistNow Online data download |
| <datatype> | Number | Bitmask for combining the desired data types for the (online) aiding<br>• 0: time<br>• 1: position<br>• 2: ephemeris<br>• 4: almanac<br>• 8: auxiliary<br>The default and factory-programmed value is all (15) |

### 31.7.4 Notes

**SARA-U260-00S / SARA-U270-00S / SARA-U270-00X / SARA-U280-00S / SARA-G340-01S / SARA-G340-02S / SARA-G350-01B / SARA-G350-01S / SARA-G350-02A / SARA-G350-02S**

- The <mga_primary_server> parameter is mandatory.

## 31.8 GNSS aiding request command +UGAOS

| +UGAOS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U1 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | *< 10 s* | *+CME Error* |

### 31.8.1 Description

Triggers the manual download of AssistNow Online and AssistNow Offline data from the configured server in case automatic AssistNow operation is not enabled. The command returns only when the received data from the server are valid or an error occurs.

The command is also used to trigger the manual upload of local aiding data (e.g. ephemeris, almanac, last position, time, etc) from a u-blox GNSS receiver prior to shutting it down and to restore it into the receiver after the power up of the GNSS receiver (for more details refer to command +UGPS, *Chapter 31.2*).

### 31.8.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UGAOS=<aid_mode> | OK | AT+UGAOS=0<br>OK |
| Test | AT+UGAOS=? | AT+UGAOS: (list of supported <aid_mode>s)<br>OK | +UGAOS: (0-8)<br>OK |

Objective Specification

### 31.8.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <aid_mode> | Number | • 0: Upload of local aiding data from GNSS receiver to cellular module<br>• 1: Download of local aiding data from the cellular module to the GNSS receiver<br>• 2: AssistNow Offline file download request (file loaded into cellular module)<br>• 4: AssistNow Online data download request (data loaded into the GNSS receiver). This is only needed if AssistNow Online is not used with automatic operation<br>• 8: AssistNow autonomous<br>• Other values are reserved for future use |

## 31.9 Send of UBX string +UGUBX

| +UGUBX | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U1 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | *< 10 s* | *+CME Error* |

### 31.9.1 Description

Sends UBX protocol messages, embedded in an AT command, to a u-blox GNSS receiver. The command is transparent, that is the data is sent to the GNSS receiver without any check: it is up to the user to control if the UBX data is valid. The checksum in +UGUBX command string is ignored, this is calculated when the data is sent to the GNSS receiver.

When the GNSS is off the UBX string is saved in RAM and, later, passed to the GNSS as configuration for "GNSS data ready" function when the GNSS receiver is used. This message is used only if the GNSS receiver HW is unknown (newer than the cellular module FW). In this case the UBX checksum bytes must be filled correctly.

It is recommended to not send UBX messages to reset the GNSS receiver while it is in use, this will cause a misalignment between the configuration of the cellular module and the one of the GNSS receiver. Furthermore it is recommended to not configure the GNSS power saving with the "GNSS data ready" active, because the GNSS receiver could send wrong reading requests to the cellular module.

### 31.9.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UGUBX=<UBX_string> | +UGUBX: <UBX_string_response><br>OK | AT+UGUBX="B562060108000106000 10000000017DA"<br>+UGUBX: "B5620501020006010F38"<br>OK |

### 31.9.3 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 0 0 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 the configuration message will return the corresponding acknowledge or not-acknowledge. See the UBX protocol specification |

### 31.9.4 Notes

- 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.
- The answer can be split in multiple information text responses all starting with "+UGUBX:".

Objective Specification

**LISA-U**

- The command can only be used when the GNSS is used from the AT interface (power on by *AT+UGPS=1,x*).

**LISA-U200-01S / LISA-U230 / LISA-U260-01S / LISA-U270-01S**

- During hybrid positioning the command is used to configure "GNSS data ready" function.

**LEON-G**

- The command can only be used when the GNSS is used from the AT interface (power on by *AT+UGPS=1,x*).

# 31.10 GNSS indications timer +UGTMR

| +UGTMR | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U1 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | *< 10 s* | *+CME Error* |

## 31.10.1 Description

Sets the date and time format. With the <time_zone> parameter is possible to set the time zone value; the time and the date will be updated as the local time. With the action command is possible to synchronize the UTC timing.

## 31.10.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UGTMR=<time_zone> | OK | AT+UGTMR=-1<br>OK |
| Read | AT+UGTMR? | +UGTMR: <time_zone><br>OK | +UGTMR: -1<br>OK |
| Test | AT+UGTMR=? | +UGTMR: (list of supported <time_zone>s)<br>OK | +UGTMR: (-96 - 96)<br>OK |

## 31.10.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <time_zone> | Number | Indicates the time zone value set by the user; the module can provide an error result code if the offset has not been calculated. The factory-programmed time zone value is 0.<br>• -96, 96: defined range |

## 31.10.4 Notes

- The time zone is expressed in quarters of hour.
- The time is updated with the current UTC time plus the time zone and the time zone is unchanged, for example:

| Command | Response | Remarks |
|---|---|---|
| AT+UGTMR=-36 | OK | The command returns the "OK" final result code and sets the new date and time if the GNSS has this information, otherwise a generic error result code is returned. |
| AT+CCLK? | +CCLK: "12/05/23,21:54:21+00" | |

**LEON-G**

- The command returns the "OK" final result code in case the GNSS has no time information, but in this case the date and time are not updated.
- The time zone range goes from -48 to 48.

Objective Specification

# 31.11 Get GNSS time and date +UGZDA

| +UGZDA | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U1 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | *< 10 s* | *+CME Error* |

## 31.11.1 Description

Enables/disables the storing of the last value of NMEA $ZDA messages, and get the current messaging state. If the <state> parameter is enabled, the last value of NMEA $ZDA messages can be retrieved with the read command even when the GNSS is switched off.

The NMEA $ZDA messages are volatile.

## 31.11.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UGZDA=<state> | OK | AT+UGZDA=1<br>OK |
| Read | AT+UGZDA? | +UGZDA: <state>,<$ZDA msg><br>OK | +UGZDA: 1,$GPZDA,142351.00,12,12,2013,00,00*66<br>OK<br>+UGZDA: 0,NULL<br>OK |
| Test | AT+UGZDA=? | +UGZDA: (list of supported <state>s)<br>OK | +UGZDA: (0-1)<br>OK |

## 31.11.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <state> | Number | • 0 (factory-programmed value): disable the NMEA $ZDA messages<br>• 1: enable the NMEA $ZDA messages |
| <$ZDA msg> | String | NMEA $ZDA messages or "Not available" if the NMEA string is enabled, but this information has not been still sent to the user. |

# 31.12 Get GNSS fix data +UGGGA

| +UGGGA | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U1 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | *< 10 s* | *+CME Error* |

## 31.12.1 Description

Enables/disables the storing of the last value of NMEA $GGA messages, and gets the current messaging state. If the <state> parameter is enabled, the last value of NMEA $GGA messages can be retrieved with the read command even when the GNSS is switched off.

The NMEA $GGA messages are volatile.

## 31.12.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UGGGA=<state> | OK | AT+UGGGA=1 |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | | OK |
| Read | AT+UGGGA? | +UGGGA: <state>,<$GGA msg><br>OK | +UGGGA: 1,$GPGGA,142351.00,,,,,0,00,99.99,,,,,,*66<br>OK<br>+UGGGA: 0,NULL<br>OK |
| Test | AT+UGGGA=? | +UGGGA: (list of supported <state>s)<br>OK | +UGGGA: (0-1)<br>OK |

### 31.12.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <state> | Number | • 0 (factory-programmed value): to disable the NMEA $GGA messages<br>• 1: to enable the NMEA $GGA messages |
| <$GGA msg> | String | NMEA $GGA messages or "Not available" if the NMEA string is enabled, but this information has not been still sent to the user. |

## 31.13 Get geographic position +UGGLL

| +UGGLL | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U1 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | *< 10 s* | *+CME Error* |

### 31.13.1 Description

Enables/disables the storing of the last value of NMEA $GLL messages, and gets the current messaging state. If the <state> parameter is enabled, the last value of NMEA $GLL messages can be retrieved with the read command even when the GNSS is switched off.

The NMEA $GLL messages are volatile.

### 31.13.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UGGLL=<state> | OK | AT+UGGLL=1<br>OK |
| Read | AT+UGGLL? | +UGGLL: <state>,<$GLL msg><br>OK | +UGGLL: 1,$GPGLL,,,,,142351.00,V,N*4A<br>OK<br>+UGGLL: 0,NULL<br>OK |
| Test | AT+UGGLL=? | +UGGLL: (list of supported <state>s)<br>OK | +UGGLL: (0-1)<br>OK |

### 31.13.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <state> | Number | • 0 (factory-programmed value): to disable the NMEA $GLL messages<br>• 1: to enable the NMEA $GLL messages |
| <$GLL msg> | String | NMEA $GLL messages or "Not available" if the NMEA string is enabled, but this information has not been still sent to the user. |

Objective Specification

# 31.14 Get number of GNSS satellites in view +UGGSV

| +UGGSV | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U1 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | *< 10 s* | *+CME Error* |

## 31.14.1 Description

Enable/disables the storing of the last value of NMEA $GSV messages, and gets the current messaging state. If the <state> parameter is enabled, the last value of NMEA $GSV messages can be retrieved with the read command even when the GNSS is switched off.

The NMEA $GSV messages are volatile.

## 31.14.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UGGSV=<state> | OK | AT+UGGSV=1<br>OK |
| Read | AT+UGGSV? | +UGGSV: <state>,<$GSV msg><br>OK | +UGGSV: 1,$GPGSV,3,1,11,03,67,298,22,06,88,149,29,07,06,302,,08,05,332,25*73<br>$GPGSV,3,2,11,09,02,334,25,14,02,141,,15,10,041,43,16,46,209,16*7D<br>$GPGSV,3,3,11,18,48,066,35,21,26,070,35,27,80,314,25*40<br>$GLGSV,1,1,03,73,13,248,,74,23,298,20,75,09,348,19*51<br>OK<br>+UGGSV: 0,NULL<br>OK |
| Test | AT+UGGSV=? | +UGGSV: (list of supported <state>s)<br>OK | +UGGSV: (0-1)<br>OK |

## 31.14.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <state> | Number | • 0 (factory-programmed value): to disable the NMEA $GSV messages<br>• 1: to enable the NMEA $GSV messages |
| <$GSV msg> | String | NMEA $GSV messages or "Not available" if the NMEA string is enabled, but this information has not been still sent to the user. |

## 31.14.4 Notes

- Since the $GSV message reports satellite information, the output of the different GNSS systems is not combined, but it is reported in sequence as in the example above with GPS and GLONASS.

Objective Specification

# 31.15 Get recommended minimum GNSS data +UGRMC

| +UGRMC | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U1 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | *< 10 s* | *+CME Error* |

## 31.15.1 Description

Enable/disables the storing of the last value of NMEA $RMC messages, and gets the current messaging state. If the <state> parameter is enabled, the last value of NMEA $RMC messages can be retrieved with the read command even when the GNSS is switched off.

The NMEA $RMC messages are volatile.

## 31.15.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UGRMC=<state> | OK | AT+UGRMC=1<br>OK |
| Read | AT+UGRMC? | +UGRMC: <state>,<$RMC msg><br>OK | +UGRMC: 1,$GPRMC,142351.00,V,,,,,,,121213,,,N*7F<br>OK<br>+UGRMC: 0,NULL<br>OK |
| Test | AT+UGRMC=? | +UGRMC: (list of supported <state>s)<br>OK | +UGRMC: (0-1)<br>OK |

## 31.15.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <state> | Number | • 0 (factory-programmed value): to disable the NMEA $RMC messages<br>• 1: to enable the NMEA $RMC messages |
| <$RMC msg> | String | NMEA $RMC messages or "Not available" if the NMEA string is enabled, but this information has not been still sent to the user. |

# 31.16 Get course over ground and ground speed +UGVTG

| +UGVTG | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U1 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | *< 10 s* | *+CME Error* |

## 31.16.1 Description

Enables/disables the storing of the last value of NMEA $VTG messages, and gets know the current messaging state. If the <state> parameter is enabled, the last value of NMEA $VTG messages can be retrieved with the read command even when the GNSS is switched off.

The NMEA $VTG messages are volatile.

## 31.16.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UGVTG=<state> | OK | AT+UGVTG=1 |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | | OK |
| Read | AT+UGVTG? | +UGVTG: <state>,<$VTG msg> | +UGVTG: 1,$GPVTG,,,,,,,,,N*30 |
| | | OK | OK |
| | | | +UGVTG: 0,NULL |
| | | | OK |
| Test | AT+UGVTG=? | +UGVTG: (list of supported <state>s) | +UGVTG: (0-1) |
| | | OK | OK |

### 31.16.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <state> | Number | • 0 (factory-programmed value): to disable the NMEA $VTG messages<br>• 1: to enable the NMEA $VTG messages |
| <$VTG msg> | String | NMEA $VTG messages or "Not available" if the NMEA string is enabled, but this information has not been still sent to the user. |

## 31.17 Get satellite information +UGGSA

| +UGGSA | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U1 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | *< 10 s* | *+CME Error* |

### 31.17.1 Description

Enables/disables the 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 GNSS is switched off.

The NMEA $GSA messages are volatile.

### 31.17.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UGGSA=<state> | OK | AT+UGGSA=1 |
| | | | OK |
| Read | AT+UGGSA? | +UGGSA: <state>,<$GSA msg> | +UGGSA: 1,$GPGSA,A,1,,,,,,,,,,,,,99.99,99.99,99.99*30 |
| | | OK | OK |
| | | | +UGGSA: 0,NULL |
| | | | OK |
| Test | AT+UGGSA=? | +UGGSA: (list of supported <state>s) | +UGGSA: (0-1) |
| | | OK | OK |

### 31.17.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <state> | Number | • 0 (factory-programmed value): to disable the NMEA $GSA messages<br>• 1: to enable the NMEA $GSA messages |
| <$GSA msg> | String | NMEA $GSA messages or "Not available" if the NMEA string is enabled, but this information has not been still sent to the user. |

Objective Specification

# 31.18 Ask for localization information +ULOC

| +ULOC | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U1 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | *< 10 s* | *+CME Error* |

## 31.18.1 Description

Requests cellular module to provide the location data; the location can be determined using:

- GNSS receiver
- CellLocate® (location based on network cells data)
- Combination of both technologies (hybrid)

The final result code indicates if sending the command request to the localization information process was successful or not. The URC is issued to provide the requested information via +ULOC set command.

The GNSS interface and CellLocate® can be used at the same time: if the GNSS sensor is reserved to another interface an error result code is provided ("+CME ERROR: GPS busy" if *+CMEE*=2).

It is possible to configure the Hybrid Positioning through *+ULOCGNSS* and *+ULOCCELL* AT commands even if it is running: the parameters are stored in NVM and will be applied at the next +ULOC command.

If the +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 data connection cannot be immediately dropped at the +ULOC timeout expiration. This could lead to a delay in the expected response time.

Depending on the aiding chosen, a data connection could be required; see the *AT+UGPS* command description.

If no position is available (no GNSS coverage, no network information and no previous data available) then the <lat> latitude and <long> longitude will be set to '0'.

If the previous position degradated by the elapsed time satisfies the desired accuracy then the sensor '0' is reported in the information text response.

If multi-hypothesis is required the GNSS solution and the CellLocate® solutions are reported, if available. If no GNSS or CellLocate® solutions are present, the previous position degradated is used instead.

If multi-hypothesis is required but the sensor is set to GNSS (<sensor>=1), only one solution will be provided: the GNSS one (or the previous position degradated if GNSS solution not available).

If a valid GNSS fix with an accuracy below the required value (<accuracy>) occurs before the end of the network scan, the GNSS-only solution will be available, even if multi-hypothesis has been required.

## 31.18.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+ULOC=<mode>,<sensor>,<response_type>,<timeout>,<accuracy>[,<num_hypothesis>] | OK | AT+ULOC=2,3,0,120,1<br>OK |
| Read | AT+ULOC? | +ULOC: <mode>,<sensor>,<response_type>,<timeout>,<accuracy>,<num_hypotesis><br>OK | +ULOC: 2,3,1,0,20,0<br>OK |
| Test | AT+ULOC=? | +ULOC: (list of supported <mode>s),(list of supported <sensor>s),(list of supported <response_type>s),(list of supported <timeout>s),(list of supported | +ULOC: (0-2),(0-3),(0-2),(1-999),(1-999999),(1-16)<br>OK |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | <accuracy>s),(list of supported <num_hypotesis>s)<br><br>OK | |
| URC | | If <response_type>=0:<br><br>+UULOC: <date>,<time>,<lat>,<long>,<alt>,<uncertainty> | +UULOC: 13/04/2011,09:54:51.000,45.6334520,13.0618620,49,1 |
| | | If <response_type>=1:<br><br>+UULOC: <date>,<time>,<lat>,<long>,<alt>,<uncertainty>,<speed>,<direction>,<vertical_acc>,<sensor_used>,<SV_used>,<antenna_status>,<jamming_status> | +UULOC: 25/09/2013,10:13:29.000,45.7140971,13.7409172,266,17,0,0,18,1,6,3,9 |
| | | If <response_type>=2, <sensor_used>= 1 and <num_hypothesis>=N:<br><br>+UULOC: <sol>,<num>,<sensor_used>,<date>,<time>,<lat>,<long>,<alt>,<uncertainty>,<speed>,<direction>,<vertical_acc>,<SV_used>,<antenna_status>,<jamming_status> | +UULOC: 1,2,1,08/04/2015,09:02:32.000,45.7141652,13.7410666,266,47,0,0,40,3,0,0 |
| | | If <response_type>=2, <sensor_used> = 2 and <num_hypothesis>=N:<br><br>+UULOC: <sol>,<num>,<sensor_used>,<date>,<time>,<lat>,<long>,<alt>,<lat50>,<long50>,<major50>,<minor50>,<orientation50>,<confidence50>[,<lat95>,<long95>,<major95>,<minor95>,<orientation95>,<confidence95>] | +UULOC: 2,2,2,08/04/2015,09:02:19.000,45.7140665,13.7411681,0,45.7240260,13.7511276,113,10,0,50,45.7240260,13.7511276,143,41,0,95 |
| | | If <response_type>=2, <sensor_used>= 0:<br><br>+UULOC: <sol>,<num>,<sensor_used>,<date>,<time>,<lat>,<long>,<alt>,<uncertainty> | +UULOC: 1,1,0,08/04/2015,09:03:45.000,45.7140290,13.7410695,0,32 |

## 31.18.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | • 0: reserved<br>• 1: reserved<br>• 2: single shot position |
| <sensor> | Number | Sensor selection: it is possible to combine different sensors summing <sensor> values of the selected sensors<br>• 0: use the last fix in the internal database and stop the GNSS receiver<br>• 1: use the GNSS receiver for localization<br>• 2: use CellLocate® location information |
| <response_type> | Number | Type of response<br>• 0: standard (single-hypothesis) response<br>• 1: detailed (single-hypothesis) response<br>• 2: multi-hypotheses response |
| <timeout> | Number | Timeout period in seconds (1 - 999) |
| <accuracy> | Number | Target accuracy in meters (1 - 999999) |
| <num_hypothesis> | Number | Maximum desired number of responses from CellLocate® (up to 16): multiple positions followed by their ellipsoidal uncertainties. This value has to be increased by 1 (GNSS solution) to get the maximum number of possible solutions. This optional parameter can be used only if <response_type>=2. The default value is 1. |
| <date> | String | GPS date[2] (DD/MM/YY) of the estimated position |

[2] Coming either from the CellLocate® server or the GNSS receiver (GPS time)

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| <time> | String | GPS time[2] (hh:mm:ss.sss) of the estimated position |
| <lat> | String | Estimated latitude, in degrees |
| <long> | String | Estimated longitude, in degrees |
| <alt> | Number | Estimated altitude, in meters[3] |
| <uncertainty> | Number | Maximum possible error, in meters (0 - 20000000) |
| <speed> | Number | Speed over ground m/s[3] |
| <direction> | Number | Course over ground in degree (0 deg - 360 deg)(3) |
| <vertical_acc> | Number | Vertical accuracy, in meters[3] |
| <sensor_used> | Number | Sensor used for the position calculation |
| <SV_used> | Number | Number of satellite used to calculate the position[3] |
| <sol> | Number | Solution index (between 1 and <num>) |
| <num> | Number | Total number of the available hypotheses (less than or equal to <num_hypothesis>) |
| <lat50>/<lat95> | String | Estimated latitude (50/95% confidence levels), in degrees |
| <long50>/<long95> | String | Estimated longitude (50/95% confidence levels), in degrees |
| <major50>/<major95> | Number | Semi-major axis of the ellipse (50/95% confidence levels), in meters |
| <minor50>/<minor95> | Number | Semi-minor axis of the ellipse (50/95% confidence levels), in meters |
| <orientation50>/ <orientation95> | Number | Orientation of the ellipse (50/95% confidence levels), in degrees |
| <confidence50>/ <confidence95> | Number | 50/95% confidence levels, in percentage |
| <antenna_status> | Number | Antenna status (0 - 4)(3). For more details see the u-blox GNSS receiver protocol specification |
| <jamming_status> | Number | Jamming status[3]. For more details see the u-blox GNSS receiver protocol specification |

## 31.18.4 Notes

- If AssistNow Online aiding data has been configured by means of the <aiding> parameter of *+ULOCGNSS* AT command, the +ULOC request using <sensor>=1 (GNSS receiver only) can provide a +UULOC URC reporting a CellLocate solution (<sensor_used>=2). This can happen if:
  - a GNSS fix is not available.
  - the CellLocate solution is more accurate (i.e. CellLocate solution's uncertainty is better than the GNSS's one).
- The <jamming_status> value must be ignored if the jamming is disabled through *+ULOCGNSS* command.
- The <date>, <time>, <lat>, <long> values are not enclosed in double quotes in the URC.

**LISA-U1 / LISA-U200-00S / LISA-U200-01S / LISA-U200-02S / LISA-U200-52S / LISA-U200-62S / LISA-U200-82S / LISA-U230 / LISA-U260 / LISA-U270 / SARA-U260-00S / SARA-U270-00S / SARA-U270-00X / SARA-U280-00S / SARA-G**

- The <num_hypothesis> parameter is not supported.

**LEON-G**

- The GNSS receiver is not stopped if the <sensor> is set to 0.
- The GNSS interface and CellLocate® are mutually exclusive; if a +ULOC request is sent when the GNSS is already started with *+UGPS* the command will return an error result code ("+CME ERROR: Invalid operation with GPS ON" if *+CMEE* is set to 2) and vice versa ("+CME ERROR: Invalid operation with LOC running" if *+CMEE* is set to 2). When the +ULOC command has been triggered also *+UGAOP*, *+UGAOF*, *+UGAOS*, *+UGUBX* AT commands will report an error result code, but it is possible to query NMEA strings.
- An error result code will be provided if the hybrid configuration is performed when the hybrid positioning is running.
- The cellular module date and time is not used in the answer, so if no sensor is available these fields are filled with '0'.
- The <num_hypothesis> parameter is not supported.

[3] only for GNSS positioning, 0 in case of CellLocate®

Objective Specification

# 31.19 Localization information request status unsolicited indication +ULOCIND

| +ULOCIND | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U201 SARA-U260-03S SARA-U270-03S SARA-U270-53S SARA-U280-03S | | | | | |
| | SARA-G340-02S SARA-G350-02A SARA-G350-02S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 31.19.1 Description

Configures sending of URCs from MT to TE in the case of *+ULOC* operations. The URC provides the result of the steps of an *+ULOC* operation.

## 31.19.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+ULOCIND=<mode> | OK | AT+ULOCIND=1<br>OK |
| Read | AT+ULOCIND? | +ULOCIND: <mode><br>OK | +ULOCIND: 1<br>OK |
| Test | AT+ULOCIND=? | +ULOCIND: (list of supported <mode>'s)<br>OK | +ULOCIND: (0-1)<br>OK |
| URC | | +UULOCIND: <step>,<result><br>OK | +UULOCIND: 1,0<br>OK |

## 31.19.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | URC configuration:<br>• 0 (default value): disabled<br>• 1: enabled |
| <step> | Number | Informs the user about the operation in progress:<br>• 0: network scan start<br>• 1: network scan end<br>• 2: requesting data to the server<br>• 3: received data from the server<br>• 4: sending feedback to the server |
| <result> | Number | Represents the result of the aiding operation:<br>• 0: no error<br>• 1: wrong URL<br>• 2: HTTP error<br>• 3: create socket error<br>• 4: close socket error<br>• 5: write to socket error<br>• 6: read from socket error<br>• 7: connection/DNS error<br>• 8: authentication token missing or wrong (required for aiding for u-blox M8 and future versions)<br>• 9: generic error<br>• 10: user terminated<br>• 11: no data from server |

Objective Specification

# 31.20 Specify the device autonomous solution +ULOCAID

| +ULOCAID | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U201 SARA-U260-03S SARA-U270-03S SARA-U270-53S SARA-U280-03S | | | | | |
| | SARA-G340-02S SARA-G350-02A SARA-G350-02S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 31.20.1 Description

The user has the possibility to specify its state (position and velocity) at a given time to select one of the multi-hypothesis provided in the previous *+ULOC* request (<sol> parameter) or to insert a location estimate provided by other sensors. These information will be sent to the server with the next *+ULOC* command.

This command influences the amount of data exchanged with the server.

If the parameters of the autonomous solution have to be specified (<index> = 0), the RTC time must have a correct value prior to using the *+ULOCAID* command.

Speed and direction parameters can be inserted (optionally) also if one of the multi-hypotheses has been selected (<index> > 0). Default values are those contained in the hypothesis selected (equal to 0 for CellLocate(R) solutions).

## 31.20.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| **Location estimate from other sensors** | | | |
| Set | AT+ULOCAID=0,<date>,<time>,<lat>,<long>,<major>,<minor>,<orientation>[,<speed>,<direction>] | OK | AT+ULOCAID=0,"10/03/2015","11:37:32.000","45.23456","11.12345",1300,789,34,34,121<br>OK |
| Read | AT+ULOCAID? | +ULOCAID: <index>,<date>,<time>,<lat>,<long>,<major>,<minor>,<orientation>[,<speed>,<direction>]<br>OK | If <speed> and <direction> set:<br>+ULOCAID: 0,"10/03/2015","11:37:32.000","45.23456","11.12345",1300,789,34,34,121<br>OK |
| | | | If <speed> and <direction> unknown:<br>+ULOCAID: 0,"10/03/2015","11:37:32.000","45.23456","11.12345",1300,789,34<br>OK |
| **Location estimate from hypothesis selected (<index> greater than 0)** | | | |
| Set | AT+ULOCAID=<index>[,,,,,,,<speed>,<direction>] | OK | If <speed> and <direction> unknown:<br>AT+ULOCAID=1<br>OK |
| | | | If <speed> and <direction> set:<br>AT+ULOCAID=1,,,,,,,34,121<br>OK |
| Read | AT+ULOCAID? | +ULOCAID: <index>,<date>,<time>,<lat>,<long>,<major>,<minor>,<orientation>[,<speed>,<direction>]<br>OK | If <speed> and <direction> unknown:<br>+ULOCAID: 1,"0/0/0","0:0:0.000","0.000000","0.0000000",0,0,0<br>OK |
| | | | If <speed> and <direction> set:<br>+ULOCAID: 1,"0/0/0","0:0:0.000","0.000000","0.0000000",0,34,121<br>OK |

Objective specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| Test | AT+ULOCAID=? | +ULOCAID: (list of supported <index>s),(list of supported <date>s),(list of supported <time>),(list of supported <lat>),(list of supported <long>),(list of supported <major>),(list of supported <minor>),(list of supported <orientation>),(list of supported <speed>s),(list of supported <direction>s)<br>OK | +ULOCAID: (0-17),"","","","","",(0-6300000),(0-6300000),(0-179),(0-255),(0-359)<br>OK |

### 31.20.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <index> | Number | multi-hypotesis index<br>• 0: location estimate from other sensors (following fields are used)<br>• n: index of the previous CellLocate solution |
| <date> | String | Date (DD/MM/YY) of the estimated position. |
| <time> | String | Time (hh:mm:ss.sss) of the estimated position. |
| <lat> | String | Estimated latitude expressed in degrees. |
| <long> | String | Estimated longitude expressed in degrees. |
| <major> | Number | Semi-major axis of the uncertainty ellipse in meters. |
| <minor> | Number | Semi-minor axis of the uncertainty ellipse in meters. |
| <orientation> | Number | Orientation of the semi-major axis of the ellipse in degrees. |
| <speed> | Number | Estimated speed in meters per second. Default value is 0. |
| <direction> | Number | Direction of the motion in degrees. Default value is 0. |

## 31.21 GNSS sensor configuration +ULOCGNSS

| +ULOCGNSS | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U1 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

### 31.21.1 Description

Configures the GNSS sensor used with the *+ULOC* command.

### 31.21.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+ULOCGNSS=<aiding>[,<psv_mode>[,<minSV>[,<minCNO>[,<ini_3d_fix>[,<staticHoldMode>[,<SBAS>[,<jamming>[,<antenna>[,<BBthreshold>[,<CWthreshold>[,<GNSS_system>[,<reserved1>[,<reserved2>]]]]]]]]]]] | OK | AT+ULOCGNSS=15<br>OK |
| Read | AT+ULOCGNSS? | +ULOCGNSS: <aiding>,<psv_mode>,<minSV>,<minCNO>,<ini_3d_fix>,<staticHoldMode>,<SBAS>,<jamming>,<antenna>,<BBthreshold>,<CWthreshold>,<GNSS_system>,<reserved1>,<reserved2><br>OK | +ULOCGNSS: 15,1,6,8,0,1,1,1,1,1,1,0,0,0<br>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 | +ULOCGNSS: (0-15),(0-1),(3-32),(0-50),(0-1),(0-255),(0-1),(0-1),(0-2),(0-15),(0-31),(1-127),(0),(0)<br>OK |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | <staticHoldMode>),(list of supported <SBAS>),(list of supported <jamming>), (list of supported <antenna>),(list of supported <BBthreshold>),(list of supported <CWthreshold>),(list of supported <GNSS_system>),(0),(0)<br><br>OK | |

## 31.21.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <aiding> | Number | GNSS 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:<br>• 1: local aiding (including RTC sharing)<br>• 2: AssistNow Offline<br>• 4: AssistNow Online<br>• 8: AssistNow Autonomous<br>All the modes (15) are enabled as a factory programmed setting. |
| <psv_mode> | Number | Power Save Mode (UBX-CFG-PM2):<br>• 0 (factory-programmed value): disabled<br>• 1: enabled |
| <minSV> | Number | • Minimum number of satellites for navigation (UBX-CFG-NAVX5). The range goes from 3 to 32. (factory-programmed value: 3) |
| <minCNO> | Number | • Minimum satellite signal level for navigation (UBX-CFG-NAVX5). The range goes from 0 to 50 . (factory-programmed value: 7) |
| <ini_3d_fix> | Number | Initial Fix must be 3D flag (UBX-CFG-NAVX5):<br>• 0 (factory-programmed value): disabled<br>• 1: enabled |
| <staticHoldMode> | Number | Static Hold Mode (UBX-CFG-NAV5). The range goes from 0 to 255 cm/s. (factory-programmed value: 0).<br>If the parameter is omitted, the Static Hold Mode threshold will not be configured to GNSS. |
| <SBAS> | Number | SBAS configuration:<br>• 0 (factory-programmed value): disabled<br>• 1: enabled |
| <jamming> | Number | Jamming indicator (UBX-CFG-ITFM):<br>• 0 (factory-programmed value): disabled<br>• 1: enabled |
| <antenna> | Number | Antenna setting:<br>• 0 (factory-programmed value): unknown<br>• 1: passive<br>• 2: active |
| <BBthreshold> | Number | Broadband jamming detection threshold (dB) (UBX-CFG- ITFM). The range goes from 0 to 15. (factory-programmed value: 0) |
| <CWthreshold> | Number | Continuous wave jamming detection threshold (dB) (UBX-CFG- ITFM). The range goes from 0 to 31. (factory-programmed value: 0) |
| <GNSS_systems> | Number | Supported GNSS types; the parameter is optional, the allowed values can be combined together:<br>• 1 (factory-programmed value): GPS<br>• 2: SBAS<br>• 4: Galileo<br>• 8: BeiDou<br>• 16: IMES<br>• 32: QZSS<br>• 64: GLONASS |
| <Reserved1> | Number | 0 (reserved value) |
| <Reserved2> | Number | 0 (reserved value) |

Objective Specification

### 31.21.4 Notes

- To enable SBAS system opportunely configure both <SBAS> and <GNSS_systems> parameters.
- If a parameter is omitted, the current set value is kept.
- For more details on parameter description see the corresponding u-blox-GNSS receiver description.

**LISA-U / SARA-G300 / SARA-G310 / SARA-G340-00S / SARA-G350-00S / SARA-G350-00X / LEON-G**

- The <GNSS_systems> parameter can only assume the value 0 (factory-programmed value).

## 31.22 Configure cellular location sensor (CellLocate®) +ULOCCELL

| +ULOCCELL | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U1 LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

### 31.22.1 Description

Configures the Cellular location sensor (CellLocate®) used with the *+ULOC* command.

This command influences the amount of data exchanged with the server.

### 31.22.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+ULOCCELL=<scan_mode>[,<reserved1>[,<reserved2>[,<reserved3>[,<reserved4>[,<reserved5>]]]]] | OK | AT+ULOCCELL=0<br>OK |
| Read | AT+ULOCCELL? | +ULOCCELL: <scan_mode>,<reserved1>,<reserved2>,<reserved3>,<reserved4>,<reserved5><br>OK | +ULOCCELL: 0,0,"","",0,0<br>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>)<br>OK | +ULOCCELL: (0-1),(0),"","",(0),(0)<br>OK |

### 31.22.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <scan_mode> | Number | Network scan mode<br>• 0 (factory-programmed value): normal<br>• 1: deep scan |
| <reserved1> | Number | RFU |
| <reserved2> | String | RFU |
| <reserved3> | String | "" (reserved value) |
| <reserved4> | Number | 0 (reserved value) |
| <reserved5> | Number | 0 (reserved value) |

### 31.22.4 Notes

- If the module is registered on 3G RAT, the <scan_mode> setting will be ignored and a deep scan will be performed.

Objective Specification

# 32 Location Services

The Location Services (LCS) reference model allows an LCS Client (which may or may not reside in a Target UE) to interact with an LCS server in order to obtain location information for one or more target UEs. Such information is obtained via a positioning function between the LCS server and the Target UE. See 3GPP TS 22.071 *[106]*.

LCS can be invoked by the network (e.g. during an emergency call) or by the user through the AT commands described in this section. The position of the device is calculated either by network based on the GNSS measurements reported by the device, or by the device itself. To speed up such measurements, a location server provides the mobile with GNSS assistance data, that otherwise should have been downloaded from the satellites e.g. rough location, GPS satellites to look for, Doppler frequencies, etc. This allows fast position fixes, increases sensitivity and reduces module power consumption.

Generally two modes of A-GPS (Assisted GPS) can be distinguished:

- **MS-Assisted**: only pseudo-range values are measured by the GPS system and returned to the network; the position estimation is done within the network and can be reported to the device if it has started the location request;
- **MS-Based**: the network provides aiding for fast satellite acquisition to the GPS through the cellular control plane, i.e. via signalling messages. The position estimate is done by the device's GPS system and returned to the network or used locally if the device has started the location request.

**Standalone** poitioning means that no assistance is involved: GPS will work autonomously.

The LCS feature is linked to the GNSS architecture, but there is no correlation between LCS AT commands and GNSS AT commands. Since they use the same resource, in case of collisions LCS services have higher priority.

The implementation of the LCS AT commands follows the 3GPP standard defined by 3GPP TS 27.007 *[2]*.

The LCS feature is by factory-programmed disabled. After having enabled it through the *+UDCONF=70* AT command, a module reset is needed; after that it is possible to issue the other LCS AT commands.

If the LCS feature is disabled an error result code will be provided after the issuing of the LCS AT commands.

## 32.1 LCS positioning capabilities configuration +UDCONF=70

| +UDCONF=70 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U201 SARA-U260-03S SARA-U270-03S SARA-U270-53S SARA-U280-03S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

### 32.1.1 Description

Configures the LCS positioning capabilities types enabling the standalone, MS-Based and MS-Assisted. It is possible to simultaneously enable them or only a subset.

The setting is saved in NVM and the new configuration will be effective at the next power on.

u-blox cellular modules are certified according to all the capabilities and options stated in the Protocol Implementation Conformance Statement document (PICS) of the module. The PICS, according to 3GPP TS 51.010-2 [*83*], 3GPP TS 34.121-2 [*84*], 3GPP TS 36.521-2 [*114*] and 3GPP TS 36.523-2 [*115*], is a statement of the implemented and supported capabilities and options of a device. If the user changes the command settings during the certification process, the PICS of the application device integrating a u-blox cellular module must be changed accordingly.

Objective Specification

### 32.1.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UDCONF=70,<positioning_ capabilities> | OK | AT+UDCONF=70,1<br>OK |
| Read | AT+UDCONF=70 | +UDCONF: 70,<positioning_capabilities><br>OK | AT+UDCONF=70<br>+UDCONF: 70,1<br>OK |

### 32.1.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <positioning_ capabilities> | Number | Bitmask of LCS positioning capabilities. The allowed range is 0-7 (equivalent to bits 000-111). See *Table 62* for a complete list of the combinations supported. The factory-programmed bitmask is 0 (i.e. all the capabilities are disabled) |

### 32.1.4 Notes

| Bit | Positioning capability type |
|---|---|
| 0 | Standalone |
| 1 | MS-Based |
| 2 | MS-Assisted |

**Table 62: Positioning capabilities bitmask explanation**

## 32.2 Mobile originated location request +CMOLR

| +CMOLR | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U201 SARA-U260-03S SARA-U270-03S SARA-U270-53S SARA-U280-03S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 32.2.1 Description

Initiates/terminates a mobile originated location request (MO-LR) and configures the +CMOLRN URC.

The URC reporting provides the location information in the format of NMEA strings <NMEA-string>.

Additional information about positioning can be found in 3GPP TS 25.305 *[94]*. If positioning data cannot be provided at the expiring of timeout defined by the <timeout> parameter, the *+CMOLRE* URC is provided. See the *Appendix A.11* for possible <err> values.

The <hor-acc-set>, <hor-acc>, <ver-req>, <ver-acc-set>, <ver-acc> and <vel-req> parameters can be used to request a specific accuracy of the MO-LR response.

The parameters <hor-acc> and <ver-acc> are only applicable if, respectively, <hor-acc-set> and <ver-acc-set> are set to 1. In addition, <ver-acc> is applicable only if <ver-req> is set to 1.

It is not allowed to start multiple requests (every request must either have completed, having generated a URC, or be terminated with +CMOLR=0).

Every request can be terminated only from the AT interface on which it was initiated.

The URC +UUGIND=0,256 (meaning "GPS ownership lost") indicates the successful start up of an already activated GPS device.

### 32.2.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CMOLR=<enable>[,<method>[,<hor-acc-set>[,<hor-acc>[,<ver-req>[,<ver-acc- | OK | AT+CMOLR=1 |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | set>[,<ver-acc>[,<vel-req>[,<rep-mode>[,<timeout>[,<interval>[,<shape-rep>[,<plane>[,<NMEA-rep>[,<third-party-address>[,<resp-time-category>]]]]]]]]]]]]]] | | OK |
| Read | AT+CMOLR? | +CMOLR: <enable>,<method>,<hor-acc-set>,[<hor-acc>],<ver-req>,[<ver-acc-set>],[<ver-acc>],<vel-req>,<rep-mode>,<timeout>,[<interval>],<shape-rep>,[<plane>],[<NMEA-rep>],[<third-party-address>],<resp-time-category><br><br>OK | +CMOLR: 0,0,0,,0,,,0,0,0,,,0,"","",0<br><br>OK |
| Test | AT+CMOLR=? | +CMOLR: (list of supported <enable>s),(list of supported <method>s),(list of supported <hor-acc-set>s),(list of supported <hor-acc>s),(list of supported <ver-req>s),(list of supported <ver-acc-set>s),(list of supported <ver-acc>s),(list of supported <vel-req>s),(list of supported <rep-mode>s),(list of supported <timeout>s),(list of supported <interval>s),(list of supported <shape-rep>s),(list of supported <plane>s),(list of supported <resp-time-category>s)<br><br>OK | +CMOLR: (0,1),(0,1,4,5),(0,1),(0-127),(0,1),(0,1),(0-127),(0-4),(0),(1-65535),(1-65535),(),0,(0,1)<br><br>OK |
| URC | | +CMOLRN: <NMEA-string> | +CMOLRN: "$GPRMC,235947.000,V,0000.0000,N,00000.0000,E,,,041299,,*1D" |

## 32.2.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <enable> | Number | Configures the reporting location as a result of a MO-LR. Allowed values:<br>• 0: reporting and positioning disabled. At boot time the reporting is disabled.<br>• 1: enable the NMEA strings reporting through +CMOLRN URC<br>Lack of data when timeout occurs is indicated by *+CMOLRE* URC |
| <method> | Number | Sets the positioning type. Only one positioning type can be enabled at any given time. Allowed values for MO-LR:<br>• 0 (default value): unassisted GPS. Autonomous GPS only, no use of assistance data<br>• 1: Assisted GPS (see *Chapter 32.2.4*)<br>• 4: basic self location (the network determines the position technology)<br>• 5: transfer to third party. The parameters <shape-rep> and <NMEA-rep> are irrelevant (any values are accepted and disregarded). The third party address is given in the parameter <third-party-address> (see *Chapter 32.2.4*) |
| <hor-acc-set> | Number | Horizontal accuracy presence:<br>• 0 (default value): not set/specified<br>• 1: set in parameter <hor-acc> |
| <hor-acc> | Number | Requested accuracy as horizontal uncertainty exponent (see the 3GPP TS 23.032 *[95]* subclause 6.2). The value range is 0-127. The default value is 127, which means that the uncertainty radius is 10 x [(1.1)127 - 1] ~ 1800 km. |
| <ver-req> | Number | Vertical coordinate (altitude) request flag:<br>• 0 (default value): not requested; a 2D location fix is acceptable. The parameters <ver-acc-set> and <ver-acc> do not apply<br>• 1: requested; a 3D location fix is required |
| <ver-acc-set> | Number | Vertical accuracy presence:<br>• 0 (default value): not set/specified<br>• 1: set in parameter <ver-acc> |
| <ver-acc> | Number | Requested accuracy as vertical uncertainty exponent (see the 3GPP TS 23.032 *[95]* subclause 6.4). The value range is 0-127. The default value is 127, which means that the uncertainty radius is 10 x [(1.1)127 - 1] ~ 1800 km. |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| <vel-req> | Number | Requested velocity type (see the 3GPP TS 23.032 *[95]* subclause 8.6):<br>• 0 (default value): velocity not requested<br>• 1: horizontal velocity requested<br>• 2: horizontal velocity and vertical velocity requested<br>• 3: horizontal velocity with uncertainty requested<br>• 4: horizontal velocity with uncertainty and vertical velocity with uncertainty requested |
| <rep-mode> | Number | Reporting mode. The <timeout> parameter specifies the timeout for the MO-LR response request. Allowed value:<br>• 0: single report |
| <timeout> | Number | Indicates how long the MS will wait for a response after a MO-LR. The value range is in seconds from 1 to 65535.<br>For GNSS measurements, the allowed values are 1, 2, 4, 8, 16, 32, 64 and 128 (default value). All other values are truncated to these figures. |
| <interval> | Number | This parameter is ignored. |
| <shape-rep> | Number | Ignored. |
| <plane> | Number | The parameter specifies which communication mode is used for MO-LR. Allowed value:<br>• 0 (default value): control plane |
| <NMEA-rep> | String | Specifies possible restrictions in supported NMEA strings. The supported NMEA strings are specified as a comma separated values inside one string. If the parameter is omitted or an empty string is given, no restrictions apply and all NMEA strings are supported. The default value is that all strings are supported. (Example: "$GPRMC,$GPGSA,$GPGSV") |
| <third-party-address> | String | The parameter is applicable to reporting to third party only, and specifies the address to the third party. This parameter is mandatory when <method> value is set to 5, otherwise it is ignored |
| <NMEA-string> | String | String type in UTF-8. This parameter provides an NMEA-string as defined in IEC 61162 *[107]*. This parameter shall not be subject to conventional character conversion as per *+CSCS*<br>The NMEA string is enclosed in double quotes, without the trailing <CR><LF> characters |
| <resp-time-category> | Number | Response time category of a location request. Allowed values are:<br>• 0: low delay<br>• 1 (default value): delay tolerant |

### 32.2.4 Notes

- For the methods that require assistance data, the assistance data obtained from the network is used for a UE-based GPS location procedure
- If <method>=5 (Transfer to third party) the lack of data at each timeout is not indicated by *+CMOLRE* URC if reporting to third party is specified

## 32.3 Mobile terminated location request notification +CMTLR

| +CMTLR | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U201 SARA-U260-03S SARA-U270-03S SARA-U270-53S SARA-U280-03S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 32.3.1 Description

Configures the Mobile Terminated Location Request (MT-LR) notifications to the TE by an unsolicited result code (URC) through the parameter <subscribe>. It is possible to enable notification of MT-LR performed over the control plane. Relevant location request parameters are provided in the +CMTLR URC. This URC is reported upon arrival of a Mobile Terminated Location Request. To differentiate multiple requests, every request is given a different <handle-id>. This parameter is used when allowing or denying location disclosure with *+CMTLRA*.

### 32.3.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CMTLR=<subscribe> | OK | AT+CMTLR=1 |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | | OK |
| Read | AT+CMTLR? | +CMTLR: <subscribe> | +CMTLR: 1 |
| | | OK | OK |
| Test | AT+CMTLR=? | +CMTLR: (list of supported <subscribe>s) | +CMTLR: (0-1) |
| | | OK | OK |
| URC | | +CMTLR: <handle-id>,<notification-type>,<location-type>,[<client-external-id>],[<client-name>][,<plane>] | |

### 32.3.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <subscribe> | Number | Configures the subscription for MT-LR notifications:<br>• 0: reporting and positioning notifications disabled<br>• 1: notifications of MT-LR over control plane subscribed |
| <handle-id> | Number | ID associated with each MT-LR used to distinguish specific request in case of multiple requests. The value range is 1-255 |
| <notification-type> | Number | Information about the user's privacy:<br>• 0: the subscription may stipulate that positioning the user by a third party is allowed and the network may choose to inform the user as a matter of courtesy<br>• 1: locating the user is allowed if the user ignores the notification<br>• 2: locating the user is forbidden if the user ignores the notification |
| <location-type> | Number | Indicates what type of the location is requested:<br>• 0: current location<br>• 1: current or last known location<br>• 2: initial location |
| <client-external-id> | String | Indicates the external client where the location information is sent to (if required) |
| <client-name> | String | The string identifying the external client requesting the user's location |
| <plane> | Number | The parameter specifies whether the MT-LR came over control plane:<br>• 0: control plane |

## 32.4 Mobile terminated location request disclosure allowance +CMTLRA

| +CMTLRA | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U201 SARA-U260-03S SARA-U270-03S SARA-U270-53S SARA-U280-03S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 32.4.1 Description

Allows or disallows the disclosure of the location of the TE as a result of a former MT-LR.

### 32.4.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CMTLRA=<allow>,<handle_id> | OK | AT+CMTLRA=1,1 |
| | | | OK |
| Test | AT+CMTLRA=? | +CMTLRA: (list of supported <allow>s), (list of supported <handle_id>s) | +CMTLRA: (0,1),(1-255) |
| | | OK | OK |

Objective Specification

### 32.4.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <allow> | Number | Configures the allowance for location disclosure:<br>• 0: location disclosure allowed<br>• 1: location disclosure not allowed |
| <handle_id> | Number | ID associated with each MT-LR used to distinguish specific request in case of multiple requests. The value is given in *+CMTLR*. The value range is 1-255 |

### 32.4.4 Notes

- No error result code is reported if an invalid <handle_id> is used, as long as it is in the range 1-255

## 32.5 Report mobile originated location request error +CMOLRE

| +CMOLRE | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U201 SARA-U260-03S SARA-U270-03S SARA-U270-53S SARA-U280-03S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 32.5.1 Description

Configures the verbose format of the result code +CMOLRE: <err> as an indication of an error relating to the functionality for the mobile originated location request (MO-LR) error reporting format. When enabled, the MT related verbose error cause is given.

### 32.5.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CMOLRE=[<verbose_mode_enable>] | OK | AT+CMOLRE=1<br>OK |
| Read | AT+CMOLRE? | +CMOLRE: <verbose_mode_enable><br>OK | +CMOLRE: 1<br>OK |
| Test | AT+CMOLRE=? | +CMOLRE: (list of supported <verbose_mode_enable>s)<br>OK | +CMOLRE: (0,1)<br>OK |
| URC | | +CMOLRE: <err> | If <verbose_mode_enable>=0<br>+CMOLRE: 2<br>If <verbose_mode_enable>=1<br>+CMOLRE: Not enough satellites |

### 32.5.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <verbose_mode_enable> | Number | • 0 (default value): disabled. The error code is in expressed in numeric format<br>• 1: enabled. The error code is presented with verbose text strings |
| <err> | Number or string | Error numeric code or textual description. See the appendix *Appendix A.11* |

Objective Specification

# 32.6 LCS event notification +ULCSEVT

| +ULCSEVT | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U201 SARA-U260-03S SARA-U270-03S SARA-U270-53S SARA-U280-03S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 32.6.1 Description

Configures the reporting of LCS events via the +UULCSEVT URC.

This is a test command, used for getting informations on LCS internals for debugging purposes. It does not affect the behaviour of LCS or GPS.

The positioning related parameters display invalid values when no fix has been calculated.

## 32.6.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+ULCSEVT=<event_reporting_enable> | OK | AT+ULCSEVT=1<br>OK |
| Read | AT+ULCSEVT? | +ULCSEVT: <event_reporting_enable><br>OK | +ULCSEVT: 1<br>OK |
| Test | AT+ULCSEVT=? | +ULCSEVT: (list of supported <event_reporting_enable>s)<br>OK | +ULCSEVT: (0,1)<br>OK |
| URC | | +UULCSEVT: <AcT>,<latitude>,<longitude>,[<altitude>],[<uncertainty>],<time>,<T1>,<T2>,<T3> | +UULCSEVT: 2,45.713745,13.740721,310,,"15/05/18,12:20:06",7221,32062,2 |

## 32.6.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <event_reporting_enable> | Number | • 0 (default value): URC disabled<br>• 1: URC enabled |
| <AcT> | Number | Indicates the radio access technology:<br>• 0: GSM<br>• 2: UTRAN<br>• 7: LTE |
| <latitude> | Number | Degrees of latitude from -90 to 90 in decimal format |
| <longitude> | Number | Degrees of longitude from -180 to 180 in decimal format |
| <altitude> | Number | Altitude in meters |
| <uncertainty> | Number | Uncertainty in meters from 0 to 1800000 m |
| <time> | String | GPS time in the format "yy/MM/dd,hh:mm:ss", where characters indicate year (two last digits), month, day, hour, minutes, seconds. |
| <T1> | Number | Time in milliseconds from dialling an emergency call to assistance data reception from the network. |
| <T2> | Number | Time in milliseconds from assistance data reception from the network to when the protocol stack receives the fix data from the GPS. |
| <T3> | Number | Time in milliseconds from when the protocol stack receives the fix data from the GPS to when the fix data is sent to the network. |

Objective Specification

# 33 DTMF

## 33.1 DTMF detection +UDTMFD

| +UDTMFD | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S MPCI-L200-02S MPCI-L210-02S MPCI-L280 | | | | | |
| | LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U260-02S LISA-U270-02S LISA-U270-62S LISA-U270-63S LISA-U270-68S SARA-U | | | | | |
| | SARA-G340 SARA-G350 LEON-G100-07S LEON-G100-08S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | No | No | - | *+CME Error* |

### 33.1.1 Description

Enables/disables the DTMF detector and, independently for each specific AT terminal, the related URCs.

During a voice call, the DTMF detector recognizes the presence of DTMF tones in the RX voice channel. The tones are generated by remote party by e.g. digit press on a DTMF keypad.

The +UUDTMFD URC returns the recognized DTMF digits (set {0-9,#,*A,B,C,D}).

Once enabled, the DTMF detector is automatically started at the next call set-up confirmation and stopped at call drop or when it is explicitly disabled.

If the DTMF detector is enabled, the In-Band Modem engine is reserved thus the eCall and other In-Band Modem applications are not available. For more details see the *eCall* section.

If the In-Band Modem engine is reserved by other In-Band Modem applications, the command immediately provides an error result code ("+CME ERROR: 3" if *+CMEE=1* or "+CME ERROR: operation not allowed" if *+CMEE=2*).

URCs are issued at any DTMF digit detection, if the URCs have been enabled on the specific terminal.

**QUICK START:** AT+UDTMFD=1,2 (start in robust mode).

Issue the enabling command before the call set-up, otherwise the detector is not started.

For the complete description of the DTMF detection functionality see the corresponding module audio application note.

### 33.1.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UDTMFD=<urc_en>[,<mode>[,<att_cfg>[,<threshold>[,<immunity>[,<max_int>]]]]] | OK | AT+UDTMFD=1,2<br>OK |
| Read | AT+UDTMFD? | +UDTMF: <urc_en>,<mode>,<att_cfg>,<threshold>,<immunity>,<max_int>,<att><br>OK | +UDTMFD: 1,2,4,100,14,2,4<br>OK |
| Test | AT+UDTMFD=? | +UDTMFD: (list of supported <urc_en>'s),(list of supported <mode>'s),(list of supported <att_cfg>'s),(list of supported <threshold>'s),(list of supported <immunity>'s),(list of supported <max_int>'s)<br>OK | +UDTMFD: (0-1),(0-2),(0-15),(100-10000),(0-20),(1-255)<br>OK |
| URC | | +UUDTMFD: <DTMF> | +UUDTMFD: # |
| URC | | +UUDTMFDE: <errid> | +UUDTMFD: 1 |

Objective Specification

### 33.1.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <urc_en> | Number | URC generation on the current terminal:<br>• 0 (factory-programmed value): disabled<br>• 1: enabled |
| <mode> | Number | DTMF detector configuration:<br>• 0 (factory-programmed value): disabled<br>• 1: enabled/restarted in normal mode<br>• 2: enabled/restarted in robust mode |
| <att_cfg> | Number | Attenuation applied on the signal at decoder input to manage arithmetic operations. The range goes from 0 to 15, 6 dB attenuation each step. The factory-programmed value is 4 (24 dB attenuation). |
| <threshold> | Number | Numeric threshold to detect DTMF tones. The range goes from 100 to 10000:<br>• TOBY-L2 / MPCI-L2 - The factory-programmed value is 800<br>• LISA-U / SARA-U / SARA-G / LEON-G - The factory-programmed value is 400 |
| <immunity> | Number | Speech immunity level. The higher the level, the higher the immunity to speech. The range goes from 0 (minimum immunity) to 20 (maximum immunity). The factory-programmed value is 14. |
| <max_int> | Number | Maximum interruption that a detected DTMF tone may have, such that it is still interpreted as a single digit. In multiples of 20 ms; the range goes from 1 to 255. The factory-programmed value is 2 (40 ms). |
| <att> | Number | Actual attenuation applied on the signal at decoder input. The starting value is <att_cfg>. If an arithmetic overflow occurs, it is automatically increased. |
| <DTMF> | Character | Detected DTMF digits; from the set {0-9,#,*,A-D}. |
| <errid> | Number | DTMF error code:<br>• 1: arithmetic overflow<br>• 2: audio driver error |

### 33.1.4 Notes

- The maximum interruption <max_int> also represents the expected minimum pause between two DTMF tones.
- The detector running in robust mode is less prone to false detections and more sensitive to speech distortions caused by e.g. low bit-rate AMR codec.
- The factory-programmed value of command parameters is set at each module start up.
- If the optional parameters are omitted the settings are left unchanged.

**TOBY-L2**

- If <mode>=1 or 2 the command provides an error result code ("+CME ERROR: operation not allowed" if *+CMEE=2*) if *+UPLAYFILE* is playing an audio file.
- <errid>=2 is not supported.

**LISA-U / SARA-U**

- <errid>=2 is not supported.

**SARA-G340 / SARA-G350-00S / SARA-G350-00X / SARA-G350-01B / SARA-G350-01S / SARA-G350-02S / LEON-G**

- <errid>=2 is not supported.

**SARA-G340-00S / SARA-G340-01S / SARA-G350-00S / SARA-G350-00X / SARA-G350-01B / SARA-G350-01S / LEON-G**

- The <mode> parameter is mandatory.

Objective Specification

# 33.2 Local and in-band DTMF tone generation configuration +UDCONF=31

| +UDCONF=31 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S<br>LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U<br>SARA-G340-02S SARA-G350-02A SARA-G350-02S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 33.2.1 Description

Configures the DTMF tone generation.

The local and in-band DTMF tone generation applies to user-required tones only, i.e. started via *AT+VTS* and *AT+UVTS* commands and not by SIM Toolkit application (aka proactive DTMF tones).

## 33.2.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UDCONF=31,<local_tone_generation> | OK | AT+UDCONF=31,1<br>OK |
| Read | AT+UDCONF=31 | +UDCONF: 31,<local_tone_generation><br>OK | AT+UDCONF=31<br>+UDCONF: 31,1<br>OK |

## 33.2.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <local_tone_generation> | Number | Local DTMF tone generation enable / disable:<br>• 0 (factory-programmed value): Local and In-band DTMF tone generation disabled<br>• 1: Local DTMF tone generation enabled<br>• 2: In-band DTMF tone generation enabled |

## 33.2.4 Notes

### TOBY-L2 / LISA-U / SARA-U

- <local_tone_generation>=2 is not supported.

### SARA-G3

- <local_tone_generation>=1 is not supported.

Objective Specification

# 34 eCall

## 34.1 Introduction

eCall (emergency Call) specification [73] standardizes the transfer of a set of 140 bytes of data, called Minimum Set of Data (**MSD**) during an emergency voice call to a Public Safety Answering Point (**PSAP**). According to 3GPP specifications, the eCall In-band Modem (**eIM**) of the In-Vehicle System (**IVS**) immediately transmits the MSD after the call setup; the MSD is received by the eIM of the PSAP.

In the call setup message the IVS Network Access Device (**NAD**) shall set the "Service Category" information (IE) according to ETSI TS 122 101 [71]. This eCall "flag" enables a serving "Mobile Switching Centre" (MSC) that supports this functionality, to differentiate between speech only Teleservice 12 emergency calls and eCalls. Additionally the MSC may also be able to discriminate between Manually Initiated eCalls and Automatically Initiated eCalls.

When the IVS eIM is in activated state, during the call, the eIM receiver starts monitoring link messages from PSAP eIM by analyzing the audio stream on the downlink speech channel. Once the link with PSAP eIM is established, the IVS eIM enters the so-called data-mode: the IVS microphone and loudspeaker are muted and the eIM starts the MSD transfer. After the data transfer is completed, either successfully or with errors, the IVS switches from data-mode into voice-mode: the microphone and the loudspeaker are un-muted and the voice call between IVS and PSAP proceeds normally. The IVS eIM enters idle-mode and monitors new incoming messages from PSAP eIM.

The eCall standard introduces specific mobility management procedures to be implemented in the IVS NAD. In particular, the IVS NAD is configured at boot time by a valid, eCall-enabled SIM/USIM to work either in "eCall only" mode or in normal mode.

More precisely, the eCall feature is a Release 10 feature that can be enabled on the USIM by NMO. If a USIM is eCall enabled (e.g. service n. 89 is active), the FDN and SDN services may also be used to define how the MS will work, i.e. either as an eCall only device or as eCall-enabled device.

In particular, if the FDN service is enabled and activated, the MS acts as eCall-only device and the FDN phonebook contains 2 entries which are the test and reconfiguration numbers. Only these two numbers can be dialed in addition to the Manually Initiated and Automatically Initiated emergency calls.

If the MS acts as an eCall-enabled device, the SDN service is activated and the SDN phonebook contains the test and reconfiguration numbers in its last 2 entries.

If a MS is equipped with a SIM which is not eCall enabled, it can be set to eCall-only and eCall-enabled device via the *+UECALLSTAT* command. In this case, and if the FDN or SDN phonebooks are not properly configured, test and reconfiguration numbers may be specified via the *+UDCONF=90* command.

### 34.1.1 About eCall AT commands

The 3GPP eCall feature is implemented and controlled by AT interface through a set of dedicated AT commands:

- AT+UECALLSTAT: used to check the eCall SIM configuration / force a configuration (eCall only mode)
- AT+UECALLTYPE: used to configure the eCall flag or Test eCall
- AT+CECALL: used to trigger a Manually Initiated eCall, a Automatically Initiated eCall, a Test or a Reconfiguration call
- AT+UECALLDATA: used to
  - activate the eIM, passing the MSD data
  - update the MSD during the emergency call
  - enable the eIM feature, reserving In-band modem audio resources for eCall
  - enable unsolicited indications
- AT+UECALLVOICE: used to
  - configure the microphone / speaker switching handling

Objective Specification

  - o control and monitor microphone and speaker switching
- +UUECALLDATA: eIM status indications
- +UUECALLVOICE: microphone/loudspeaker status indications

# 34.2 eIM sends and receives data +UECALLDATA

| +UECALLDATA | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U260-02S LISA-U270-02S LISA-U270-62S LISA-U270-63S LISA-U270-68S SARA-U201 SARA-U270 | | | | | |
| | SARA-G340 SARA-G350 LEON-G100-07S LEON-G100-08S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 34.2.1 Description

Activates the IVS eIM for a single emergency call (eCall session) and provides the IVS eIM with the MSD to transfer. If the activation command is issued when there is no call ongoing, the eIM is armed, i.e. the MSD is prepared for transmission. The eIM is then automatically activated as soon as the call setup indication is received. The eIM can be armed/activated once per eCall session. Further activations immediately provide an error result code.

The eIM can be activated in PULL or PUSH mode. In PUSH mode, the IVS eIM sends the INITIATION signal to request to PSAP to pull the MSD, i.e. it asks the PSAP to send the "SEND MSD" signal.

The command can also be used for terminating the eIM: the last +UECALLDATA activation command is aborted.

The command serves also to update the IVS eIM with new MSD data. The update command can be issued at any time during the eCall session and may or may not force an eIM reset.

The terms "SEND MSD", "INITIATION" and "application layer ACK" (AL-ACK), mentioned in EN 16062 [72], correspond to the START signal sent by PSAP to IVS, the START signal sent by IVS to PSAP and the higher-layer ACK (HL-ACK), mentioned in 3GPP TS 26.267 [73].

## 34.2.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| **Generic syntax** | | | |
| Set | AT+UECALLDATA=<op_code>[,<param1>[,<data>]] | OK | AT+UECALLDATA=1,0,"4D5344"<br>OK |
| **In-Band Modem abort** | | | |
| Set | AT+UECALLDATA=0 | OK | AT+UECALLDATA=0<br>OK |
| **eCall In-Band Modem activation** | | | |
| Set | AT+UECALLDATA=1,<PUSH_PULL>,<data> | OK | AT+UECALLDATA=1,0,"4D5344"<br>OK |
| **MSD update** | | | |
| Set | AT+UECALLDATA=2,<update_mode>,<data> | OK | AT+UECALLDATA=2,1,"4D5344"<br>OK |
| **URC enabling** | | | |
| Set | AT+UECALLDATA=3,<urc_state> | OK | AT+UECALLDATA=3,1<br>OK |
| **eCall feature enabling** | | | |
| Set | AT+UECALLDATA=4,<eCall_enabling> | OK | AT+UECALLDATA=4,1<br>OK |
| Read | AT+UECALLDATA? | +UECALLDATA: <state>,<urc_state><br>OK | +UECALLDATA: 0,1<br>OK |
| Test | AT+UECALLDATA=? | +UECALLDATA: (list of supported <op_code>s),(list of supported <param1>s) | +UECALLDATA: (0-4),(0-2)<br>OK |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | OK | |
| URC | | +UUECALLDATA: <urc_id>[,<data>] | +UUECALLDATA: 7,"0B" |

### 34.2.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <op_code> | Number | Operation to perform:<br>• 0: abort. The In-Band Modem is terminated<br>• 1: arm/activate eCall In-Band Modem (eIM)<br>• 2: update MSD<br>• 3: enable/disable URCs<br>• 4: enable/disable the eCall feature |
| <PUSH_PULL> | Number | Specifies the PULL/PUSH mode:<br>• 0: PULL mode<br>• 1: PUSH mode |
| <data> | String | MSD to be sent. Each byte is coded with two characters in hex notation. It shall not exceed 280 characters (140 bytes) |
| <update_mode> | Number | Specifies the update mode:<br>• 0: update in idle only<br>• 1: immediate update / force eIM reset |
| <urc_state> | Number | URCs current state:<br>• 0 (factory-programmed value): URCs disabled<br>• 1: URCs enabled without IVS events (without URCs with id 11-19)<br>• 2: all URCs enabled |
| <eCall_enabling> | Number | • 0 (factory-programmed value): eCall feature disabled<br>• 1: eCall feature enabled. URCs are automatically enabled (same as +UECALLDATA=3,1) |
| <state> | Number | eIM current state:<br>• 0: off<br>• 1: armed/active |
| <urc_id> | Number | Specifies the event type:<br>• 0: MSD correctly sent, HL-ACK check bits received and recorded. <data>: four information bits received through HL-ACKs, returned within single byte hex data (e.g.: +UUECALLDATA: 0,"0B" -> 0xB: 4 information bits)<br>• 1: eIM lost synchronization with PSAP<br>• 2: T6 or T7 timer expired (MSD transfer marked as failure)<br>• 3: Reserved<br>• 4: Reserved<br>• 5: eIM is terminated: audio error<br>• 6: eIM is terminated: fatal error<br>• 7: eIM is terminated: call drop<br>• 8: generic eIM error<br>• 11: IVSEVENT_SENDINGSTART: eIM starts sending the INITIATION signal (only in PUSH mode). Also indicates that the call set-up is completed<br>• 12: IVSEVENT_SENDINGMSD: "SEND MSD" signal received, eIM starts sending MSD<br>• 13: IVSEVENT_RESTARTMSD: "SEND MSD" signal received too often, assume PSAP sync failure<br>• 14: IVSEVENT_CONTROLSYNC: IVS eIM is synchronizing with PSAP eIM<br>• 15: IVSEVENT_CONTROLLOCK: IVS eIM is synched with PSAP eIM<br>• 16: IVSEVENT_LLACKRECEIVED: 2. link-layer ACK received and recorded<br>• 17: IVSEVENT_HLACKRECEIVED: 2. higher-layer ACK received and recorded<br>• 18: IVSEVENT_IDLEPOSTRESET: IVS eIM is idling after a full reset. Reset is done after the sync loss, due to e.g. end of PSAP transmission<br>• 19: IVSEVENT_IDLEPOSTSTART: IVS eIM transmitter is idling after the transmission of the INITIATION signal (PUSH mode)<br>• 20: MSD update request received. MSD update deferred since the IVS is currently transmitting<br>• 21: MSD update done. The IVS transmitter is ready to send the new MSD at next PULL request<br>• 22: MSD update request cannot be processed |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| <param1> | Number | Type and supported content depend on the related <op_code> parameter; see the <op_code> specification |

## 34.3 IVS eIM voice control +UECALLVOICE

| +UECALLVOICE | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U260-02S LISA-U270-02S LISA-U270-62S LISA-U270-63S LISA-U270-68S SARA-U201 SARA-U270 | | | | | |
| | SARA-G340 SARA-G350 LEON-G100-07S LEON-G100-08S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 34.3.1 Description

Configures the control and/or controls the TX and RX voice path connections to voice resources (microphone and loudspeaker respectively) and to eIM transmitter (eIM receiver is not affected by the control). The command serves to handle the switching[4] of the voice resources according to BS EN 16062 [*72*], in particular to configure the HLAP timers to operate according to HLAP specifications [*72*], Annex A, Table of Timings.

With this command, it is possible to implement the voice control following several strategies:

- Internal handling: eIM handles voice path connections in normal eCall transactions and, with HLAP timers, in abnormal eCall transactions. See the *Voice control internal handling* for details
- External handling: the application processor exclusively handles voice path connections. The internal handling must be disabled before the eCall session is started
- Mixed handling: eIM and application processor share handling of voice path connections

The internal handling can be enabled / disabled during the eCall.

*Table 63* summarizes the impact of the voice resource switching on the voice path connections:

| Voice resource | Status | Description |
|---|---|---|
| Microphone | Un-muted | The microphone is connected to the TX voice path. The eIM transmitter is disconnected from the TX voice path |
| | Muted | The microphone is disconnected from the TX voice path. The eIM transmitter is connected to the TX voice path |
| Loudspeaker | Un-muted | Both the loudspeaker and the eIM receiver are connected to the RX voice path |
| | Muted | The loudspeaker is disconnected from the RX voice path. The eIM transmitter is connected to the RX voice path |

**Table 63: Voice path connections as function of the microphone/loudspeaker status**

The microphone and eIM transmitter are exclusively connected to the TX voice path, while the eIM receiver is always connected to the RX voice path (always listening to PSAP). Of course, eIM can be connected to the voice paths only if armed/activated (see the *+UECALLDATA* command).

Loudspeaker switches do not affect the eIM functionality.

The command groups six operations:

1. Internal voice resource control configuration
   When internal voice control is enabled, the eIM takes care to perform microphone/loudspeaker switching during a normal or abnormal eCall transaction. Switching during the normal eCall transaction is operated at pre-defined internal control points. Some of the control points are configurable, i.e. they can be enabled or not to perform the switching (see control points configuration).In particular (NCF: not configurable):
   - NCF - the microphone and loudspeaker are muted at call set-up
   - SP0 - the loudspeaker is muted at call set-up and un-muted after 5 s

[4] A switch performs a muting of un-muted voice resource or vice versa

Objective Specification

- MP0 - the microphone is muted as soon as the eIM transmitter starts sending INITIATION signal
- MP1 - the microphone is muted as soon as the eIM transmitter starts sending MSD
- SP1 - the loudspeaker is muted as soon as the eIM transmitter starts sending MSD
- MP2 - the microphone is un-muted as soon as the eIM receiver receives an LL-ACK message
- SP2 - TH internal timer is started as soon as the eIM receiver receives a HL-ACK message and the loudspeaker un-muted at expiration
- MP3 - the microphone is un-muted as soon as the eIM receiver receives a HL-ACK message
- SP3 - the loudspeaker is un-muted as soon as the eIM goes in idle after reset
- MP4 - the microphone is un-muted as soon as the eIM goes in idle after reset
- MP5 - the microphone is un-muted as soon as the eIM transmitter goes in idle after sending INITIATION signal
- MP6 - the microphone is un-muted as soon as the eIM transmitter stops sending INITIATION signal because of reception of SEND MSD signal

Abnormal eCall transactions are handled by T5, T6 and T7 timers. Enabled internal voice control is a pre-requisite for timers to operate.

For more details see *Voice control internal handling*.

2. Voice resource mute/un-mute command
   This command mutes/un-mutes the microphone or loudspeaker (regardless of voice control configuration). It also provides the voice resource muted/un-muted state.
3. URC enabling - indications of a voice resource switch
   This command enables/disables URCs providing loudspeaker/microphone switching notifications.
4. Internal control points configuration
   This command enables/disables the internal control points MP0-MP6 for microphone and control points SP0-SP2 for loudspeaker switching operations.
5. HLAP timers status configuration
   This command enables/disables timers T5, T6 and T7.
6. HLAP timers value configuration
   This command configures expiry value of timers T5, T6 and T7.

## 34.3.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| **Generic syntax** | | | |
| Set | AT+UECALLVOICE=<op_code>,<param1>,<param2> | OK | |
| Read | AT+UECALLVOICE=<op_code>,<param1> | +UECALLVOICE: <op_code>,<param1>,<param2><br>OK | |
| **Internal voice control** | | | |
| Set | AT+UECALLVOICE=1,<res_id>,<on_off_ctrl> | OK | AT+UECALLVOICE=1,0,1<br>OK |
| Read | AT+UECALLVOICE=1,<res_id> | +UECALLVOICE: 1,<res_id>,<on_off_ctrl><br>OK | AT+UECALLVOICE=1,0<br>+UECALLVOICE: 1,0,1<br>OK |
| **Voice resource mute/un-mute** | | | |
| Set | AT+UECALLVOICE=2,<res_id>,<mute_unmute> | OK | AT+UECALLVOICE=2,0,1<br>OK |
| Read | AT+UECALLVOICE=2,<res_id> | +UECALLVOICE: 2,<res_id>,<res_state><br>OK | AT+UECALLVOICE=2,0<br>+UECALLVOICE: 2,0,1<br>OK |
| **URC enabling** | | | |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UECALLVOICE=3,<res_id>,<urc_state> | OK | AT+UECALLVOICE=3,1,0<br>OK |
| Read | AT+UECALLVOICE=3,<res_id> | +UECALLVOICE: 3,<res_id>,<urc_state><br>OK | AT+UECALLVOICE=3,1<br>+UECALLVOICE: 3,1,0<br>OK |
| **Internal control points configuration** | | | |
| Set | AT+UECALLVOICE=4,<res_id>,<resource_bitmask> | OK | AT+UECALLVOICE=4,1,15<br>OK |
| Read | AT+UECALLVOICE=4,<res_id> | +UECALLVOICE: 4,<res_id>,<resource_bitmask><br>OK | AT+UECALLVOICE=4,1<br>+UECALLVOICE: 4,1,15<br>OK |
| **HLAP timers status configuration** | | | |
| Set | AT+UECALLVOICE=5,<timer>,<timer_status> | OK | AT+UECALLVOICE=5,1,1<br>OK |
| Read | AT+UECALLVOICE=5,<timer> | +UECALLVOICE: 5,<timer>,<timer_status><br>OK | AT+UECALLVOICE=5,0<br>+UECALLVOICE: 5,0,1<br>OK |
| **HLAP timers value configuration** | | | |
| Set | AT+UECALLVOICE=6,<timer>,<timer_value> | OK | AT+UECALLVOICE=6,0,5000<br>OK |
| Read | AT+UECALLVOICE=6,<timer> | +UECALLVOICE: 6,<timer>,<timer_value><br>OK | AT+UECALLVOICE=6,0<br>+UECALLVOICE: 6,0,5000<br>OK |
| Test | AT+UECALLVOICE=? | +UECALLVOICE: (list of supported <op_code>s)<br>OK | +UECALLVOICE: (1-6)<br>OK |
| URC | | +UUECALLVOICE: <res_id>,<res_state> | +UUECALLVOICE: 1,1 |

### 34.3.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <op_code> | Number | Type of operation:<br>• 1: enable/disable internal voice resource control (by eIM)<br>• 2: mute/un-mute voice resource<br>• 3: enable/disable/query URC generation for specific voice resource<br>• 4: configure internal control points of a voice resource<br>• 5: enable/disable timers T5, T6 and T7<br>• 6: configure timers T5, T6 and T7 |
| <res_id> | Number | Voice resource identifier:<br>• 0: microphone<br>• 1: loudspeaker |
| <on_off_ctrl> | Number | Flag to enable or disable the eIM internal control of voice resource:<br>• 0: disabled<br>• 1 (factory-programmed value): enabled |
| <mute_unmute> | Number | Flag to mute or un-mute the voice resource. Allowed values:<br>• 0: mute<br>• 1: unmute |
| <urc_state> | Number | Flag to enable or disable URCs on voice resource status:<br>• 0 (factory-programmed value): disabled (do not receive URCs when resource status changes)<br>• 1: enabled (receive URCs when resource status changes) |
| <res_state> | Number | Voice resource state. Allowed values:<br>• 0: muted (microphone / loudspeaker disconnected) |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 1 (factory-programmed value): un-muted (microphone / loudspeaker connected) |
| <resource_bitmask> | Number | Bitmask representing the internal control points to be enabled. Allowed values:<br>• For the microphone (<res_id>=0) the bitmask is composed by 7 bits.<br>o Bit #0 set: MP0 control point enabled (factory-programmed value: disabled)<br>o Bit #1 set: MP1 control point enabled (factory-programmed value: enabled)<br>o Bit #2 set: MP2 control point enabled (factory-programmed value: enabled)<br>o Bit #3 set: MP3 control point enabled (factory-programmed value: enabled)<br>o Bit #4 set: MP4 control point enabled (factory-programmed value: disabled)<br>o Bit #5 set: MP5 control point enabled (factory-programmed value: disabled)<br>o Bit #6 set: MP6 control point enabled (factory-programmed value: disabled)<br>Range: 0 to 127 (decimal format only). Factory-programmed value: 14<br>• For the loudspeaker (<res_id>=1) the bitmask is composed by 4 bits.<br>o Bit #0 set: SP0 control point enabled (factory-programmed value: disabled)<br>o Bit #1 set: SP1 control point enabled (factory-programmed value: enabled)<br>o Bit #2 set: SP2 control point enabled (factory-programmed value: enabled)<br>o Bit #3 set: SP3 control point enabled (factory-programmed value: disabled)<br>Range: 0 to 15 (decimal format only). Factory-programmed value: 6 |
| <timer> | Number | Timers:<br>• 0: T5 timer<br>• 1: T6 timer<br>• 2: T7 timer |
| <timer_status> | Number | Configures the status of T5, T6 or T7 HLAP timers. Allowed values:<br>• 0: timer disabled<br>• 1 (factory-programmed value): timer enabled |
| <timer_value> | Number | Timer value expressed in milliseconds. The factory-programmed values are:<br>• T5 timer: 5000 ms<br>• T6 timer: 5000 ms<br>• T7 timer: 20000 ms<br>Range: 1000 to 60000 (decimal format only). |
| <param1> | Number | Type and supported content depend on the related <op_code> parameter:<br>• <op_code>=1: type is <res_id><br>• <op_code>=2: type is <res_id><br>• <op_code>=3: type is <res_id><br>• <op_code>=4: type is <res_id><br>• <op_code>=5: type is <timer><br>• <op_code>=6: type is <timer> |
| <param2> | Number | Type and supported content depend on the related <op_code> parameter:<br>• <op_code>=1: type is <on_off_ctrl><br>• <op_code>=2: type is <mute_unmute><br>• <op_code>=3: type is <urc_state><br>• <op_code>=4: type is <resource_bitmask><br>• <op_code>=5: type is <timer_status><br>• <op_code>=6: type is <timer_value> |

### 34.3.4 Notes

**LISA-U120 / LISA-U130 / LISA-U200-02S / LISA-U200-52S / LISA-U200-62S / LISA-U200-82S / LISA-U260 / LISA-U270 / SARA-U270-00S / SARA-G340-00S / SARA-G340-01S / SARA-G350-00S / SARA-G350-00X / SARA-G350-01B / SARA-G350-01S / LEON-G100-07S / LEON-G100-08S**

- <op_code>=4, 5 and 6 are not supported.

### 34.3.5 Voice control internal handling

With voice control internal handling, eIM performs the microphone and/or loudspeaker switches. Microphone and loudspeaker switches or loudspeaker un-muting timer start-up generally occur at IVS URC events (see the *+UECALLDATA Defined Values*), according to the *Table 64*:

Objective Specification

| Event / IVS event | Microphone mute | Microphone un-mute | Loudspeaker mute | Loudspeaker un-mute |
|---|---|---|---|---|
| Call setup notification | NCF | | NCF,SP0 | SP0: Start 5 s timer, un-mute at expiration |
| IVSEVENT_SENDINGSTART | MP0 | | | |
| IVSEVENT_SENDINGMSD | MP1 | | SP1 | |
| IVSEVENT_LLACKRECEIVED | | MP2 | | |
| IVSEVENT_HLACKRECEIVED | | MP3 | | SP2: Start TH timer, un-mute at expiration. Timer value is 1.2 s in fast modulation mode, 2.4 s in robust modulation mode |
| IVSEVENT_IDLEPOSTRESET | | MP4 | | SP3 |
| IVSEVENT_IDLEPOSTSTART | | MP5 | | |
| eIM transmitter interrupts the INITIATION signal since sync has been detected (internal event) | | MP6 | | |

**Table 64: eIM handling of Microphone/loudspeaker switches. Call set-up notification event is externally available as +UCALLSTAT=1,0 URC**

Microphone switches are performed within high-priority 3GPP eIM execution thread.

The purpose of SP2 - TH timer is to keep, during a normal eCall transaction, the loudspeaker muted for the duration of 3 HL-ACKs that are received after the 2nd (recorded) HL-ACK. TH timer is not configurable through AT.

SP0 5 s timer un-mutes only the loudspeaker, while the programmable T5 timer reconnects both the microphone and loudspeaker.

# 34.4 eCall configuration +UECALLSTAT

| +UECALLSTAT | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U120 LISA-U130 LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U260-02S LISA-U270-02S LISA-U270-62S LISA-U270-63S LISA-U270-68S SARA-U201 SARA-U270 | | | | | |
| | SARA-G340 SARA-G350 LEON-G100-07S LEON-G100-08S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | Yes | No | No | - | *+CME Error* |

## 34.4.1 Description

LISA-U120 / LISA-U130
The command is supported with partial functionality and a limited range for testing purposes only.

According to EN 16062 [72], eCall configuration of an eCall-enabled IVS must automatically be read from a valid SIM/USIM that supports the provision of the eCall service (i.e. valid eCall USIM, according to 3GPP TS 31.102 [19]).

The eCall-enabled SIM can be configured only for eCall (referred in EN 16062 [72] as "eCall only"), or a combination of eCall and commercial service provision (referred in 3GPP TS 26.267 [73] as "eCall without registration restrictions"). In particular, an IVS NAD configured in eCall only mode boots up with network registration restriction, i.e. the IVS NAD does not perform the standard mobility management procedures.

In case IVS NAD is configured as eCall only, the MS class is implicitly set to GSM only, i.e. no GPRS service is available by default.

This command serves to:

- Read the eCall configuration from the SIM
- Force the module with a not valid eCall SIM configuration to eCall only or eCall without registration restriction (for testing purposes)

Objective Specification

Forcing a valid eCall SIM to a different eCall state, the module returns the final result code +CME ERROR: 3 (Operation not allowed).

Enabling and disabling eCall only mode with registration restriction (also by restoring SIM settings) can only be performed if the module is unregistered.

If the module does not support the *+CECALL* AT command, the state switches can only be performed if the module is not registered on the network.

### 34.4.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UECALLSTAT=<cmd> | OK | |
| Read | AT+UECALLSTAT? | +UECALLSTAT: <state><br>OK | +UECALLSTAT: 1<br>OK |
| Test | AT+UECALLSTAT=? | +UECALLSTAT: (list of supported <cmd>s)<br>OK | +UECALLSTAT: (0-3)<br>OK |

### 34.4.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <state> | Number | • 0: not valid eCall SIM present (not eCall-enabled)<br>• 1: eCall only with registration restriction<br>• 2: eCall without registration restriction |
| <cmd> | Number | • 0: force to not valid eCall SIM (not eCall-enabled)<br>• 1: force eCall only with registration restriction<br>• 2: force eCall without registration restriction<br>• 3: restore SIM/USIM settings (read from SIM) |

## 34.5 eCall and InBM test configuration +UDCONF=90

| +UDCONF=90 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U201 SARA-U270 | | | | | |
| | SARA-G340-02S SARA-G350-02A SARA-G350-02S LEON-G100-07S LEON-G100-08S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | partial | No | *NVM* | No | - | *+CME Error* |

### 34.5.1 Description

Configures some eCall parameters. It is available in eCall Release 3 and sets the following functionalities:

- eCall test number
- eCall reconfiguration number
- Factory-programmed T3242 timer duration
- Factory-programmed T3243 timer duration

eCall settings cannot be stored to NVM to prevent fake SIM usage.

### 34.5.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| **eCall generic syntax** | | | |
| Set | AT+UDCONF=90,<op_code>,<param1>[,<number>] | OK | |
| Read | AT+UDCONF=90,<op_code> | AT+UDCONF: 90,<op_code>,<param1>[,<number>]<br>OK | |
| **eCall test number** | | | |
| Set | AT+UDCONF=90,1,<ToN>,<number> | OK | AT+UDCONF=90,1,129,"02338456" |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | | OK |
| Read | AT+UDCONF=90,1 | +UDCONF: 90,1,<ToN>,<number> | AT+UDCONF=90,1 |
| | | OK | +UDCONF: 90,1,129,"1234" |
| | | | OK |
| **eCall reconfiguration number** | | | |
| Set | AT+UDCONF=90,2,<ToN>,<number> | OK | AT+UDCONF=90,2,129,"1234" |
| | | | OK |
| Read | AT+UDCONF=90,2 | +UDCONF: 90,2,<ToN>,<number> | AT+UDCONF=90,2 |
| | | OK | +UDCONF: 90,2,129,"1234" |
| | | | OK |
| **eCall T3242 timer duration** | | | |
| Set | AT+UDCONF=90,11,<timer_duration> | OK | AT+UDCONF=90,11,43200 |
| | | | OK |
| Read | AT+UDCONF=90,11 | +UDCONF: 90,11,<timer_duration> | AT+UDCONF=90,11 |
| | | OK | +UDCONF: 90,11,43200 |
| | | | OK |
| **eCall T3243 timer duration** | | | |
| Set | AT+UDCONF=90,12,<timer_duration> | OK | AT+UDCONF=90,12,43200 |
| | | | OK |
| Read | AT+UDCONF=90,12 | +UDCONF: 90,12,<timer_duration> | AT+UDCONF=90,12 |
| | | OK | +UDCONF: 90,12,43200 |
| | | | OK |

### 34.5.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <op_code> | Number | Class of eCall/IBM parameter (values lower than 10 corresponds to the USIM settings, NAD settings otherwise). Allowed values:<br>• 1: eCall test number<br>• 2: eCall reconfiguration number<br>• 11: T3242 timer duration<br>• 12: T3243 timer duration |
| <ToN> | Number | Specifies the type of address octet <ToN>:<br>• 145: international number, i.e. when dialling string starts with '+'<br>• 129: national coded number, otherwise |
| <number> | String | eCall Test or Reconfiguration number.<br>• Number in string format <number>. The default value is "". |
| <timer_duration> | Number | Specifies the 32-bit timer duration defined in seconds. The value 0 is not supported. The default value is 43200 (12 hours) |
| <param1> | Number | Type and supported content depend on the related <op_code> parameter; see the <op_code> specification |

### 34.5.4 Notes

- If it is not specified with the set command, Test and Reconfiguration numbers are retrieved from FDN or SDN entries, if the USIM is a valid eCall enabled USIM
- If it is specified with the set command, <number> overwrites the USIM eCall Test or Reconfiguration number retrieved from FDN or SDN entries, if any
- If <ToN>= 145, the number specified with <number> shall start with "+"

**SARA-G**

- The test command is not supported.

Objective Specification

**LEON-G**

- The test command is not supported.

# 34.6 eCall type +UECALLTYPE

| +UECALLTYPE | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U120 LISA-U130 LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U260-02S LISA-U270-02S LISA-U270-62S LISA-U270-63S LISA-U270-68S SARA-U201 SARA-U270 | | | | | |
| | SARA-G340 SARA-G350 LEON-G100-07S LEON-G100-08S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 34.6.1 Description

Sets the emergency call service category, i.e. the "eCall flag". According to ETSI TS 122 101 [*71*] and 3GPP TS 24.008 [*12*], an eCall can be either Manually Initiated (MIeC, Manually Initiated eCall) or Automatically Initiated (AIeC, Automatically Initiated eCall), which is configured through specific eCall flag bits. If none of such bits is set, the Mobile Switching Centre (MSC) supporting eCall functionality will operate a speech-only TS12 emergency call.

The "eCall flag" is included in the call set-up message whenever the emergency number is dialed (with *"ATD112;"*).

This command also configures the system to perform Test or Reconfiguration eCalls, according to 3GPP TS 51.010-1 [*74*], section 26.9.6a. When performing *"ATD112;"*, the Test or Reconfiguration numbers read from the eCall Test USIM/SIM will be respectively dialed.

The default eCall type (<type_of_eCall>=0) cannot be changed if the USIM is not eCall enabled or if the eCall status has not been forced to eCall enabled via *AT+UECALLSTAT* command.

The combination of +UECALLTYPE set command and *ATD112;* trigges an eCall to the network, and functionally complies with the 3GPP eCall initiation command *+CECALL*.

If the eCall is disabled (see the *+UECALLSTAT* command), the set command returns the error result code +CME ERROR: 3 (Operation not allowed).

If the module supports *+CECALL* AT command, the +UCALLTYPE is set to zero after the eCall of the selected type has been released. This reduces the possibility that eCalls are originated accidentally.

If the module supports *+CECALL* AT command, the set command with <type_of_eCall> 3 or 4 returns the error result code +CME ERROR: 1806 if test or reconfiguration numbers are not available or not properly encoded.

## 34.6.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UECALLTYPE=<type_of_eCall> | OK | |
| Read | AT+UECALLTYPE? | +UECALLTYPE: <type_of_eCall><br>OK | +UECALLTYPE: 1<br>OK |
| Test | AT+UECALLTYPE=? | +UECALLTYPE: (list of supported <type_of_eCall>s)<br>OK | +UECALLTYPE: (0-4)<br>OK |

## 34.6.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <type_of_eCall> | Number | • 0 (factory-programmed value): speech only TS12<br>• 1: Emergency Service Category Value (MIeC) (octet 3) Bit 6=1<br>• 2: Emergency Service Category Value (AIeC) (octet 3) Bit 7=1<br>• 3: Test eCall; use eCall Test number<br>• 4: Reconfiguration eCall; use eCall Reconfiguration number |

Objective Specification

### 34.6.4 Notes

**LISA-U120 / LISA-U130**

- The command is supported with partial functionality and a limited range for testing purposes only.

## 34.7 Initiate eCall +CECALL

| +CECALL | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U200-03S LISA-U200-83S LISA-U201 SARA-U201 SARA-U270 | | | | | |
| | SARA-G340-02S SARA-G350-02A SARA-G350-02S LEON-G | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 34.7.1 Description

According to ETSI TS 127 007 [*82*], the set command triggers an eCall to the network. Based on the configuration selected, it can be used to either trigger a test call, a reconfiguration call, a manually initiated eCall or an automatically initiated eCall.

The read command returns the type of eCall currently in progress, if any. If an eCall is not in progress, the read command returns the error result code +CME ERROR: 3 (Operation not allowed).

The test command returns the supported values and ranges.

The command behavior depends on whether a valid eCall USIM is used or not.

- Valid eCall USIM: the command fails when the test/reconfiguration calls are started and there is no valid test/reconfiguration number on the eCall USIM. The *+UDCONF=90* command can overwrite the test/reconfiguration numbers values read from the USIM (see *+UDCONF=90*, eCall/InBM test configuration). The *+UDCONF=90* values are volatile: they are lost at next power on or reset.
- Not Valid eCall USIM: starting an eCall via +CECALL AT command with a not eCall USIM is possible, provided that the eCall status has been enabled via *+UECALLSTAT* AT command. In addition, the test and reconfiguration numbers should be provided through *+UDCONF=90* command. Otherwise, +CECALL AT command fails if a test/reconfiguration call is started.

### 34.7.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+CECALL=<type_of_eCall> | OK | AT+CECALL=1<br>OK |
| Read | AT+CECALL? | +CECALL: <type_of_eCall><br>OK | +CECALL: 1<br>OK |
| Test | AT+CECALL=? | +CECALL: (list of supported <type_of_eCall>s)<br>OK | +CECALL: (0-3)<br>OK |

### 34.7.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <type_of_eCall> | Number | • 0: test call<br>• 1: reconfiguration call<br>• 2: manually initiated eCall (MIeC)<br>• 3: automatically initiated eCall (AIeC) |

### 34.7.4 Notes

- The set command is functionally equivalent to the combination of *+UECALLTYPE* and *ATD112*.
- The set command with <type_of_eCall> 0 or 1 returns the error result code +CME ERROR: 1806 if test or reconfiguration numbers are not available or not properly encoded.

Objective Specification

# 35 I²C

## 35.1 Introduction

The I²C AT commands support communication with more than one connected device via one of the controllers, but require opening and closing a logical channel for each connected device. Only one logical channel at a time can be opened.

The availability and hardware description of the I²C interfaces are out of the scope of this document and are described in a separate document. Refer to the corresponding module System Integration Manual.

The procedure for communicating with two different devices is:

- Open the logical channel for device1 (with *AT+UI2CO*)
- Read/write to/from device1 (with *AT+UI2CR*, *AT+UI2CW* and *+UI2CREGR*)
- Close the logical channel for device1 (with *AT+UI2CC*)
- Open the logical channel for device2 (with *AT+UI2CO*)
- Read/write to/from device2 (with *AT+UI2CR*, *AT+UI2CW* and *+UI2CREGR*)
- Close the logical channel for device2 (with *AT+UI2CC*)

Once the controller has been configured, it is possible to start I²C communication (read/write) with I²C slave peripherals.

The I²C controllers available on the u-blox cellular modules module work only in Master Mode so they can be connected to slave devices only.

In case of a controller/device malfunction, the command's response is only "ERROR".

## 35.2 I²C open logical channel +UI2CO

| +UI2CO | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S | | | | | |
| | LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 35.2.1 Description

Changes the hardware and logical configuration of the selected I²C controller.

It is only possible to configure the I²C controller in Master Mode.

This command selects:

- One of the two controllers available in the u-blox cellular module
- The bus mode type
- The bit rate
- The address size (7-10 bit address)
- The slave device address

Once the selected controller has been configured, a logical channel between it and the selected slave device is set up and there is no need to further specify it. All the following I²C write, read and close commands refer to the currently opened logical channel. It is not possible to use the I²C write, read and open commands for writing or reading to/from a different slave device without first closing the I²C logical channel.

Objective Specification

### 35.2.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UI2CO=<I2C_controller_number>,<bus_mode>,<bit_rate>,<device_address>,<address_width> | OK | AT+UI2CO=1,0,0,0x42,0<br>OK |
| Test | AT+UI2CO=? | +UI2CO: (list of supported <I2C_controller_number>s),(list of supported <bus_mode>s),(list of supported <bit_rate>),(<device_address> range),(list of supported <address_width>s)<br>OK | +UI2CO: (1),(0-1),(0-1),(0x000-0x3FF),(0-1)<br>OK |

### 35.2.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <I2C_controller_number> | Number | $I^2C$ HW controller to use:<br>• 1: controller 1<br>• 2: controller 2 (RFU) |
| <bus_mode> | Number | $I^2C$ bus mode type:<br>• 0: Bus Mode Standard (0 - 100 kbaud)<br>• 1: Bus Mode Fast (0 - 400 kbaud) |
| <bit_rate> | Number | $I^2C$ bit rate:<br>• 0: 100 kb/s<br>• 1: 400 kb/s |
| <device_address> | Hex Number | Device address in HEX format |
| <address_width> | Number | $I^2C$ size of the controller address:<br>• 0: 7 bit address<br>• 1: 10 bit address |

## 35.3 $I^2C$ write to peripheral +UI2CW

| +UI2CW | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S<br>LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 35.3.1 Description

Writes the HEX data to the $I^2C$ slave device of the current logical channel. The HEX data formats are without 0x prefix (see example).

### 35.3.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UI2CW=<hex_data>,<nof_byte_to_write> | OK | AT+UI2CW="0011AABBCCDDEEFF",8<br>OK |
| Test | AT+UI2CW=? | +UI2CW: (byte to write),(range of supported <nof_byte_to_write>)<br>OK | +UI2CW: "data", (1-100)<br>OK |

### 35.3.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <hex_data> | String | Hex data sequence without prefix 0x, enclosed in double quotes, to be written to the $I^2C$ slave device |
| <nof_bytes_to_write> | Number | Number of byte to write to the slave $I^2C$ device. Range: 1-100 |

Objective Specification

# 35.4 I²C read from peripheral +UI2CR

| +UI2CR | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S | | | | | |
| | LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 35.4.1 Description

Reads <nof_bytes_to_read> of data from the I²C slave device of the current logical channel and prints them in HEX format in separate rows.

## 35.4.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Read | AT+UI2CR=<nof_bytes_to_read> | +UI2CR: <index_1>: <byte_1> | AT+UI2CR=3 |
| | | [+UI2CR: <index_n>: <byte_n> | +UI2CR: 0: 0xA3 |
| | | [..]] | +UI2CR: 1: 0x0F |
| | | OK | +UI2CR: 2: 0xDB |
| | | | OK |
| Test | AT+UI2CR=? | +UI2CR: (list of supported <nof_byte_to_read>s) | +UI2CR: (1-100) |
| | | | OK |
| | | OK | |

## 35.4.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <nof_bytes_to_read> | Number | Number of bytes to read from the slave I²C device. The range goes from 1 to 100. |
| <index1>,...,<index_n> | Number | Index of the byte being printed. |
| <byte_1>,...,<byte_n> | Number | n-th byte of the data, in hex mode (unquoted, prefixed by 0x). |

# 35.5 I²C read from peripheral register +UI2CREGR

| +UI2CREGR | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S | | | | | |
| | LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 35.5.1 Description

Reads <nof_bytes_to_read> of data from the slave register of the I²C slave device of the current logical channel and prints them in HEX format in separate rows.

## 35.5.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Read | AT+UI2CREGR=<register_address>,<nof_bytes_to_read> | +UI2CREGR: <index_1>: <byte_1> | AT+UI2CREGR=0x42,3 |
| | | [+UI2CREGR: <index_n>: <byte_n> | +UI2CREGR: 0: 0xA3 |
| | | [..]] | +UI2CREGR: 1: 0x0F |
| | | OK | +UI2CREGR: 2: 0xDB |
| | | | OK |
| Test | AT+UI2CREGR=? | +UI2CREGR: (list of supported <register_address>s),(list of supported <nof_bytes_to_read>s) | +UI2CREGR: (0x00-0xFF),(1-100) |
| | | | OK |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | OK | |

### 35.5.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <register_address> | Number | Device address in HEX format |
| <nof_bytes_to_read> | Number | Number of bytes to read from the slave I²C register. The range goes from 1 to 100. |
| <index1>,...,<index_n> | Number | Index of the byte being printed. |
| <byte_1>,...,<byte_n> | Number | n-th byte of the data, in hex mode (unquoted, prefixed by 0x). |

## 35.6 I²C close logical channel +UI2CC

| +UI2CC | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S<br>LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 35.6.1 Description

Closes the I²C logical channel being used.

The logical channel must be closed before opening a new one.

### 35.6.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | AT+UI2CC | OK | AT+UI2CC<br>OK |
| Test | AT+UI2CC=? | OK | OK |

Objective Specification

# 36 SAP

## 36.1 Introduction

The SIM Access Profile (SAP) allows communication between a device electrically connected to a SIM module (SAP Server) and a device using that SIM (SAP Client). The SAP details are specified in the Bluetooth Specification "SIM Access Profile - Interoperability Specification" *[67]*.

u-blox modules support SAP client functionalities using a serial connection to transport the SAP messages defined in the SAP specification: in SAP Client mode, the u-blox cellular module uses a remote SIM, which is physically present in the SAP server, to perform all SIM-related operations; the local SIM card, directly connected to the module (U)SIM interface, is not accessed.

At power on SAP is disabled in the u-blox cellular module i.e. the local SIM card (directly connected to the module (U)SIM interface) is used. It is possible to enter SAP client mode and switch to using a remote SIM via AT commands. At any time, either the local or remote SIM is exclusively used; this is transparent to AT clients: for example when interrogating the IMSI with +CIMI, the result always refers to the "current" SIM: the local SIM's IMSI if SAP is not active or the remote SIM's IMSI if SAP Client mode is active.

URCs are provided to inform the user about the state of both local and remote SIM when SAP mode is active:

- The +UUSAPREMOTE URC reports information related to the "remote" SIM
- The +UUSAPLOCAL URC reports information related to the local SIM card directly connected to the module (U)SIM interface

For more details see *Chapter 36.3*.

*Table 65* shows which indications are to be expected in case of local or remote SIM events (hot removal/insertion):

| Event | SAP client not active | SAP client active |
|---|---|---|
| Local SIM removal/insertion | +CIEV: 12,<value> | +UUSAPLOCAL: <sim_present> |
| Remote SIM removal/insertion | - | +UUSAPREMOTE: <sim_present> |

**Table 65: SIM indications and SAP**

For further details about SAP implementation, see the corresponding module system integration manual.

u-blox cellular modules do not act as SAP server.

## 36.2 SAP mode activation +USAPMODE

| +USAPMODE | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 36.2.1 Description

Changes the SAP connection mode:

- Local SIM: the local SIM is used, the SAP is not active
- SAP client: the module acts as an SAP client, a remote SIM is used

It is not possible to change the SAP mode during a call or with an active PDP context.

When entering the SAP client mode, the SAP communication takes place in a separate dedicated serial channel, according to the <format> indication (currently only binary mode is supported).

The command can only be invoked from a USB or a MUX AT channel.

Objective Specification

When invoked from a USB channel, the dedicated serial channel for SAP is USB channel.

When invoked from a MUX channel, the dedicated serial channel for SAP is MUX channel.

The communication between SAP client and server follows the "Connect" procedure (as specified by SAP specification *[67]*), which uses the <beacon> parameter.

The actual switch between local and remote SIM takes place only when a connection has been established between SAP client and the SAP server. The value of the SAP mode returned by the read command does not change as long as the connection is active.

The SAP client mode terminates when:

- The SAP connection fails (communication lost, unrecoverable error, unsuccessful connect negotiation)
- The SAP server commands a disconnection
- The AT command to move back to local SIM mode is received

The SAP client mode activation may result in an error result code if an SAP connection cannot be established. See the *Appendix A.1* for the allowed error result codes.

### 36.2.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+USAPMODE=<sap_mode>[,<format>[,<beacon>]] | OK | AT+USAPMODE=0<br>OK |
| | | | AT+USAPMODE=1,0,6<br>OK |
| Read | AT+USAPMODE? | +USAPMODE: <sap_mode><br>OK | +USAPMODE: 0<br>OK |
| Test | AT+USAPMODE=? | +USAPMODE: (list of supported <sap_mode>s),(list of supported <format>s),(list of supported <beacon>s)<br>OK | +USAPMODE: (0,1),0,(0-65535)<br>OK |

### 36.2.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <sap_mode> | Number | Specifies the SAP mode. Allowed values:<br>• 0 (default value): internal SIM (SAP disabled)<br>• 1: SAP client |
| <format> | Number | Specifies the SAP communication format. This parameter can be set only if <sap_mode> is 1 or 2. Allowed values:<br>• 0 (default value): binary; SAP messages are exchanged transparently in binary format |
| <beacon> | Number | Period in seconds between consecutive CONNECT_REQ messages during the "Connect" procedure. This parameter can be set only if <sap_mode>= 1. 0 means one shot sending. The default value is 6 s. The allowed range is [0-65535]. |

## 36.3 SAP mode indications +USAPIND

| +USAPIND | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | LISA-U200-01S LISA-U200-02S LISA-U200-03S LISA-U200-52S LISA-U200-62S LISA-U200-82S LISA-U200-83S LISA-U201 LISA-U230 LISA-U260 LISA-U270 SARA-U | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 36.3.1 Description

Enables or disables the URCs generation for the SAP mode status change indication (+UUSAPMODE) and the detection of a local SIM (+UUSAPLOCAL) when SAP client is active.

At the module power-up, the URCs are disabled.

Objective Specification

### 36.3.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+USAPIND=<ind_mode> | OK | AT+USAPIND=0<br>OK |
| Read | AT+USAPIND? | +USAPIND: <ind_mode><br>OK | +USAPIND: 0<br>OK |
| Test | AT+USAPIND=? | +USAPIND: (list of supported <ind_mode>s)<br>OK | +USAPIND: (0,1)<br>OK |
| URC | | +UUSAPMODE: <sap_mode> | +UUSAPMODE: 0 |
| URC | | +UUSAPLOCAL: <sim_present> | +UUSAPLOCAL: 0 |

### 36.3.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <ind_mode> | Number | Specifies whether SAP-related URCs are enabled or disabled. Allowed values:<br>• 0 (default value): disabled<br>• 1: enabled |
| <sap_mode> | Number | Specifies which SAP mode is currently used. Allowed values:<br>• 0 (default value): internal SIM (SAP disabled)<br>• 1: SAP client<br>• 2: SAP server |
| <sim_present> | Number | Specifies the status of locally attached SIM. Allowed values:<br>• 0: local SIM is present<br>• 1: local SIM is not present |

Objective Specification

# 37 Networking

## 37.1 Introduction

### 37.1.1 Parameter definitions

#### 37.1.1.1 <networking_mode> = Router

The IP termination of each packet data context is on the module, which acts as a router. The DTE will send its packet to the module which will then use its routing table to perform the routing of the packet over the right context.

##### 37.1.1.1.1 IPv4

- The DTE will configure its DHCP client over its virtual Ethernet interface and it will assign a private IP and DNS configuration. No public IP address is assigned
- The DTE will access the packet data network using the NAT procedure
- For each active packet data context the module creates an internal IP interface
- In case of multiple packet data contexts (each with an assigned IP address), the module will apply the following routing rules by checking destination IP address of each uplink packet:
  - If the address belongs to the IP subnet of one of the active contexts, then the packet will be sent over that link
  - In all other cases, the packet will be sent over the context which has been activated first (i.e. the default gateway)

☞ In case of multiple contexts the first activated context should be the one associated to the public Internet.

##### 37.1.1.1.2 IPv6

☞ TOBY-L201 / MPCI-L201
The IPv6 in router mode is supported only in Verizon configuration. In this configuration only one data default bearer with IPv6 addressing is supported. See *+UMNOCONF* for further details.

In general terms, the global connectivity configuration of the network node shall be performed automatically by the IPv6 network through the use of IPv6 Neighbor Discovery Protocol (NDP).

If the mobile network supports the IPv6 auto-configuration then the following steps are performed:

- The Router Advertisement (RA) sent from the mobile network is forwarded to the USB virtual Ethernet interface of the DTE. The Router Advertisement holds the prefix of the activated default bearer.
- The DTE processes the RA message and configures its global address and its routing rules. If the procedure is correctly completed then the host is provided with a global IPv6 address and with the IPv6 address (global or local) of the next-hop router.
- Optionally the RA message can provide DNS server addresses. If present then the DTE shall apply the DNS configuration, otherwise the DTE should perform manual configuration.

#### 37.1.1.2 <networking_mode> = Bridge

The IP termination of each context is on the DTE. The module will act as a bridge and forward the IP packets based on the source address.

☞ The user must set the right source address in the IP headers to drive the module's routing over the right context.

##### 37.1.1.2.1 IPv4

- The module does not run any DHCP/DNS server and it does not perform any NAT procedure
- The routing over multiple contexts is done by the module by source IP detection
- For each active context the module creates an IP interface (which takes care of replying to ARP requests); the IP address of such interface can be retrieved via the *+UIPADDR* AT command

Objective Specification

- For each active context the DTE should manually configure its USB virtual ethernet interface in order to
  - Retrieve the associated public IP address via +CGDCONT and assign it as IP alias
  - Retrieve the module's local configuration of the bridged interface (IP address and subnet mask) with *+UIPADDR* and add the required routing rules
- The module will perform routing over contexts using the IP alias set by the DTE

#### 37.1.1.2.2 IPv6

In general terms, the global connectivity configuration of the network node shall be performed automatically by the IPv6 network through the use of IPv6 Neighbor Discovery Protocol (NDP).

- The DTE will create its own link local address for the virtual Ethernet interface
- The module will do the same. Its address can be retrieved with the *+UIPCONF* AT command
- For each active context the module will not create any virtual interface
  - The DTE will receive RA (Routing Advertisement) messages and it will be able to configure its global address
  - The module will perform routing over contexts using the IP alias set by the DTE

The DTE should prevent the transmission of any NS (Neighbor Solicitment).

# 37.2 Change the boot mode configuration +UBMCONF

| +UBMCONF | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

## 37.2.1 Description

Changes the system networking mode. The chosen configuration is stored in NVM and it will be applied after a reboot.

The configuration can be reverted to its default value with AT+UBMCONF=.

## 37.2.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UBMCONF=[<networking_mode>] | OK | AT+UBMCONF=1<br>OK |
| Read | AT+UBMCONF? | +UBMCONF: <networking_mode><br>OK | +UBMCONF: 1<br>OK |
| Test | AT+UBMCONF=? | +UBMCONF: (list of supported <networking_mode>s)<br>OK | +UBMCONF: (1-2)<br>OK |

## 37.2.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <networking_mode> | Number | Networking operating mode of the RNDIS interface:<br>• 1 (default and factory-programmed value): router mode<br>• 2: bridge mode |

Objective Specification

# 37.3 Configure the USB IP network +UIPCONF

| +UIPCONF | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

## 37.3.1 Description

Configures the USB IPv4 network. The user can configure the module's IPv4 address, subnet mask, DHCP server's IPv4 address range. The configuration will be instantly applied and stored in the NVM.

The user should manually renew the DHCP configuration if any change is made to the DHCP server configuration.

The DHCP configuration will be ignored when operating in router mode.

The changes are stored in NVM and they need a reboot to be applied

The configuration can be reverted to its default values with AT+UIPCONF=.

## 37.3.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UIPCONF=[<ipv4_address>,<subnet_mask>,<dhcp_ipv4_start>,<dhcp_ipv4_end>] | OK | AT+UIPCONF="192.168.2.1","255.255.255.0","192.168.2.100","192.168.2.100"<br>OK |
| Read | AT+UIPCONF? | +UIPCONF: <ipv4_address>,<subnet_mask>,<dhcp_ivp4_start>,<dhcp_ipv4_end>,<ipv6_link_local_address><br>OK | +UIPCONF: "192.168.1.1","255.255.255.0","192.168.1.100","192.168.1.100","FE80::58FC:54FF:FE00:CB45/64"<br>OK |
| Test | AT+UIPCONF=? | +UIPCONF:<br>OK | +UIPCONF:<br>OK |

## 37.3.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <ipv4_address> | String | Private IPv4 address of the USB interface. The IPv4 address consists of 4 octects: "ddd.ddd.ddd.ddd". The default value is "192.168.1.1" |
| <subnet_mask> | String | The subnet mask consists of 4 octects: "ddd.ddd.ddd.ddd". The default value is "255.255.255.0" |
| <dhcp_ivp4_start> | String | DHCP IPv4 start of address range.<br>The IPv4 address consists of 4 octects: "ddd.ddd.ddd.ddd". The default value is "192.168.1.100". |
| <dhcp_ipv4_end> | String | DHCP IPv4 end of address range.<br>The IPv4 address consists of 4 octects: "ddd.ddd.ddd.ddd". The default value is "192.168.1.100". |
| <ipv6_link_local_address> | String | Link Local IPv6 address of the USB. It consists of 8 groups of four hexadecimal digits representing 2 octets. The groups are separated by colons. Leading zero suppression and zero compression maybe applied. The network prefix is written in CIDR notation, by appending a slash and the needed decimal digits to the IPV6 address. |

## 37.3.4 Notes

- The <dhcp_ipv4_start> and <dhcp_ipv4_end> parameters must belong to the virtual Ethernet interface's IPv4 subnet.

Objective Specification

# 37.4 Get the USB IP configuration +UIPADDR

| +UIPADDR | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 37.4.1 Description

Returns the current USB IP configuration for the requested active <cid> based on the current <networking_mode>. In the <cid> parameter is omitted, the information text response will display all the active <cid>s.

The module does not create any virtual interface for an active IPv6 <cid> in bridge mode. The IPv6 configuration session is performed between the DTE and the network.

In this case the <cid> will not be reported as configured.

## 37.4.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UIPADDR=[<cid>] | +UIPADDR: <cid>,<if_name>,<ipv4_address>,<subnet_mask>,<ipv6_global_address>,<ipv6_link_local_address><br><br>OK | See *Examples* |
| Test | AT+UIPADDR=? | +UIPADDR: (list of <cid>'s active virtual device)<br><br>OK | +UIPADDR: 1,2<br><br>OK |

## 37.4.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <cid> | Number | Active context. By default the active <cid> is reported. If the <cid> parameter is omitted, all the active <cid>s are reported. |
| <if_name> | String | Interface name. In the router mode the name is "ccinetd", while in the bridge mode it is "usb0:d", where d is a decimal digit. |
| <ipv4_address> | String | IPv4 address of the interface. The IPv4 address consists of 4 octects: "ddd.ddd.ddd.ddd". The default value is "192.168.1.1". |
| <subnet_mask> | String | The subnet mask consists of 4 octects: "ddd.ddd.ddd.ddd". The default value is "255.255.255.0". |
| <ipv6_global_address> | String | Global IPv6 address of the interface. It consists of 8 groups of four hexadecimal digits representing 2 octects. The groups are separated by colons. Leading zero suppression and zero compression maybe applied. The network prefix is written in CIDR notation, by appending a slash and the needed decimal digits to the IPv6 address. |
| <ipv6_link_local_address> | String | Link Local IPv6 address of the interface. It consists of 8 groups of four hexadecimal digits representing 2 octects. The groups are separated by colons. Leading zero suppression and zero compression maybe applied. The network prefix is written in CIDR notation, by appending a slash and the needed decimal digits to the IPv6 address. |

## 37.4.4 Notes

- If the requested <cid> is not active the command will reply with an error result code.

## 37.4.5 Examples

| Description | Command | Response |
|---|---|---|
| **Router mode (IPv4 context)** | AT+UIPADDR=1 | +UIPADDR: 1,"ccinet0","5.168.120.13","255.255.255.0","","""<br><br>OK |
| **Router mode (IPv6 context)** | AT+UIPADDR=2 | +UIPADDR: 2,"ccinet1","","","2001::2:200:FF:FE00:0/64","FE80::200:FF:FE00:0/64"<br><br>OK |
| **Router mode (IPv4v6 context)** | AT+UIPADDR=3 | +UIPADDR: 3,"ccinet2","5.10.100.2","255.255.255.0","2001::1:200:FF:FE00:0/64","FE80::200:FF:FE00:0/64" |

Objective Specification

| Description | Command | Response |
|---|---|---|
| | | OK |
| **Router mode (IPv4v6 context) (all contexts)** | AT+UIPADDR= | +UIPADDR: 1,"ccinet0","5.168.120.242","255.255.255.255","","" |
| | | +UIPADDR: 2,"ccinet1","46.12.30.162","255.255.255.255","","" |
| | | +UIPADDR: 4,"ccinet3","76.18.130.262","255.255.255.255","2001::2:200:FF:FE00:0/64","FE80::200:FF:FE00:0/64""","" |
| | | OK |
| **Router mode (all contexts)** | AT+UIPADDR= | +UIPADDR: 1,"ccinet0","10.24.48.129","255.255.255.0","","" |
| | | +UIPADDR: 2,"ccinet1","10.32.44.135","255.255.255.0","","" |
| | | OK |
| **Bridge mode (IPv4 context)** | AT+UIPADDR=1 | +UIPADDR: 1,"usb0:0","5.168.120.242","255.0.0.0","","" |
| | | OK |
| **Bridge mode (IPv6 context)** | AT+UIPADDR=2 | ERROR |
| **Bridge mode (IPv4v6 context)** | AT+UIPADDR=3 | +UIPADDR: 3,"usb0:2","5.168.120.100","255.255.255.255","","" |
| | | OK |
| **Bridge mode (IPv4v6 context) (all contexts)** | AT+UIPADDR= | +UIPADDR: 1,"usb0:0","5.168.120.242","255.255.255.255","","" |
| | | +UIPADDR: 4,"usb0:3","76.18.130.262","255.255.255.255","","" |
| | | OK |
| **Bridge mode (all contexts)** | AT+UIPADDR= | +UIPADDR: 1,"usb0:0","10.40.184.162","255.255.255.0","","" |
| | | +UIPADDR: 2,"usb0:1","10.92.161.200","255.255.255.0","","" |
| | | OK |
| **Bridge mode (bridge and router mode mixed contexts)** | AT+UIPADDR= | +UIPADDR: 1,"ccinet0","10.98.126.158","255.255.255.0","","" |
| | | +UIPADDR: 2,"usb0:1","10.26.129.73","255.255.255.0","","" |
| | | OK |
| **No virtual devices active** | AT+UIPADDR= | OK |
| **Wrong CID** | AT+UIPADDR=4 | ERROR |

# 37.5 IP routing configuration +UIPROUTE

| **+UIPROUTE** | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 37.5.1 Description

Configures the module's IP routing, using the ROUTE syntax. The new configuration is added to the current one and it is instantly applied.

The configuration is not stored into NVM.

The configuration is allowed in the following cases:

- The module is configured in router mode
- The module is configured in bridge mode but has at least one active PDN in router mode (see the *+UDPDP* command description).

The configuration can be reverted by manually deleting each route previously added or by a power cycle.

This AT command should be mainly used for setting static routing rules for specific networks/hosts.

The usage of default gateway rules is not recommended and can disrupt the module functionality.

The typical user case is the following:

Objective Specification

- The "internet" PDN is activated first and it is the current default gateway
- The user activates another "alternate data" PDN (MMS for example)
- The user wants to connect to a server through the "alternate data" PDN connection but the server's IP address does not belong to the IP subnet of the "alternate data" PDN
- Therefore the user manually must manually add a routing rule to reach the server through the "alternate data" PDN

The usage of default gateway rules is not recommended and can disrupt the module functionality.

TOBY-L200-00S / TOBY-L210-00S / TOBY-L210-60S / MPCI-L200-00S / MPCI-L210-00S / MPCI-L210-60S
The command does not support IPv6 functionality.

### 37.5.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UIPROUTE=<route_raw_input> | [+UIPROUTE: <route_raw_output>]<br>OK | AT+UIPROUTE="add -net 129.56.76.0 netmask 255.255.255.0 dev ccinet2"<br>OK |
| Read | AT+UIPROUTE? | +UIPROUTE:<br>[<route_raw_output>]<br>OK | +UIPROUTE:<br>Kernel IP routing table<br>Destination Gateway Genmask Flags Metric Ref Use Iface<br>192.168.1.0 0.0.0.0 255.255.255.0 U 0 0 0 usb0<br>Kernel IPv6 routing table<br>Destination Next Hop Flags Metric Ref Use Iface<br>fe80::/64 :: U 256 0 0 usb0<br>::1/128 :: U 0 0 1 lo<br>fe80::4483:18ff:feff:328/128 :: U 0 0 1 lo<br>ff00::/8 :: U 256 0 0 usb0<br>OK |
| Test | AT+UIPROUTE=? | +UIPROUTE:<br>OK | +UIPROUTE:<br>OK |

### 37.5.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <route_raw_input> | String | String compliant to ROUTE syntax |
| <route_raw_output> | String | String containing the ROUTE output related to the user's request |

## 37.6 IP tables configuration +UIPTABLES

| +UIPTABLES | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

### 37.6.1 Description

Changes the module's networking configuration, using the IPTABLES syntax. The new configuration is added to the current one and it is applied and instantly saved into NVM.

The configuration is independent from the currently selected <networking_mode>.

The output of the configuration is reported as an IRC before the final OK reply.

Objective Specification

The configuration can be reverted to its default values with AT+UIPTABLES=.

### 37.6.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UIPTABLES=[<iptables_raw_input>] | [+UIPTABLES: <iptables_raw_output>]<br>OK | AT+UIPTABLES="-A INPUT -p ICMP -icmp-type 8 -j DROP"<br>OK |
| | | | AT+UIPTABLES="<wrong_string>"<br>+UIPTABLES: Bad argument <wrong_string><br>OK |
| Read | AT+UIPTABLES? | +UIPTABLES:<br>[<iptables_raw_output>]<br>OK | +UIPTABLES:<br>Chain INPUT (policy DROP)<br>target prot opt source destination<br>ACCEPT all -- anywhere anywhere state RELATED,ESTABLISHED<br>ACCEPT tcp -- anywhere anywhere tcp dpt:http<br>ACCEPT tcp -- anywhere anywhere tcp dpt:https<br>ACCEPT tcp -- anywhere anywhere tcp dpt:bootps<br>ACCEPT udp -- anywhere anywhere udp dpt:bootps<br>ACCEPT udp -- anywhere anywhere udp dpt:domain<br>ACCEPT tcp -- anywhere anywhere tcp dpt:domain<br>ACCEPT udp -- anywhere anywhere udp dpt:12345<br>ACCEPT tcp -- anywhere anywhere tcp dpt:12345<br>ACCEPT udp -- anywhere anywhere udp dpt:30001<br>ACCEPT icmp -- anywhere anywhere icmp echo-request limit: avg 10/sec burst 5<br>DROP icmp -- anywhere anywhere icmp echo-request<br>ACCEPT icmp -- anywhere anywhere<br>ACCEPT tcp -- anywhere anywhere tcp dpt:49152<br>ACCEPT tcp -- anywhere anywhere tcp dpt:49152<br>ACCEPT udp -- anywhere anywhere udp dpt:1900<br>ACCEPT all -- 127.0.0.0/8 anywhere<br>ACCEPT tcp -- anywhere anywhere tcp dpt:5555<br>ACCEPT tcp -- anywhere anywhere tcp dpt:8080<br>Chain FORWARD (policy DROP) |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | | target prot opt source destination |
| | | | FWD_UPNP all -- anywhere anywhere |
| | | | ACCEPT all -- anywhere anywhere |
| | | | Chain OUTPUT (policy ACCEPT) |
| | | | target prot opt source destination |
| | | | OK |
| Test | AT+UIPTABLES=? | +UIPTABLES: | +UIPTABLES: |
| | | OK | OK |

### 37.6.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <iptables_raw_input> | String | String compliant to IPTABLES syntax. The default value is an empty string, meaning reset to the default configuration |
| <iptables_raw_output> | String | String containing the IPTABLES output related to the user's request |

## 37.7 Configure PDP/EPS bearer connection type over USB +UDPDP

| +UDPDP | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 37.7.1 Description

Sets the connection type of a specific context. The default configuration reflects the *+UBMCONF* settings. The command will work only in bridge mode to give connectivity to the internal IP stack.

In the information text response to the read command the dedicated bearer information is provided by means of the <networking_mode>=3 value.

### 37.7.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UDPDP=<cid>[,<networking_mode>] | OK | AT+UDPDP=1,1 |
| | | | OK |
| Read | AT+UDPDP? | For each <cid>: | +UDPDP: 1,1 |
| | | + UDPDP: <cid>,<networking_mode> | +UDPDP: 2,1 |
| | | [.] | +UDPDP: 3,1 |
| | | OK | +UDPDP: 4,1 |
| | | | +UDPDP: 5,1 |
| | | | +UDPDP: 6,1 |
| | | | +UDPDP: 7,1 |
| | | | +UDPDP: 8,1 |
| | | | OK |
| Test | AT+UDPDP=? | +UDPDP: (list of supported <cid>s),(list of supported <networking_mode>s) | +UDPDP: (1-8),(1-2) |
| | | | OK |
| | | OK | |

### 37.7.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <networking_mode> | Number | Configure the state:<br>• 1: router context |

Objective Specification

| Parameter | Type | Description |
|---|---|---|
| | | • 2: bridge context<br>• 3: reference to a dedicated bearer; this value cannot be set but it is provided only in the information text response to the read command |

### 37.7.4 Notes

- A <cid>'s configuration can be reverted to the current *+UBMCONF* <networking_mode> with AT+UDPDP=<cid>.

## 37.8 RNDIS driver optimization configuration +UDCONF=67

| +UDCONF=67 | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L2 MPCI-L2 | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

### 37.8.1 Description

The RNDIS driver optimization allows a data transfer over the RNDIS link to reach the maximum throughput (LTE CAT4). This optimization can cause a lower throughput on some linux based operating systems both in router mode and in bridge mode. To fix this a DTE's kernel modification is needed (see Networking Modes Application Note *[96]*); if this is not possible and using CDC-ECM is not an option then disabling this feature might mitigate the effects in router mode only.

The new configuration is saved in NVM and will be effective at the next power on.

### 37.8.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UDCONF=67,<mode> | OK | AT+UDCONF=67,1<br>OK |
| Read | AT+UDCONF=67 | +UDCONF: 67,<mode><br>OK | +UDCONF: 67,1<br>OK |

### 37.8.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mode> | Number | Configures the RNDIS driver optimization. Allowed values:<br>• 0: RNDIS driver optimization disabled<br>• 1 (factory-programmed value): RNDIS driver optimization enabled |

Objective Specification

# 38 Wi-Fi

## 38.1 Introduction

TOBY-L2 series modules (see the Wi-Fi AT commands applicability for the complete list of product versions supporting Wi-Fi functionalities) can be connected to ELLA-W1 Wi-Fi modules via the Secure Digital Input Output (SDIO) interface to provide Wi-Fi functionalities. The subsystem composed of these u-blox modules can be configured in the following ways:

- **Router mode with Internet access via cellular network -** the cellular module provides Internet connectivity to Wi-Fi clients connected to the Wi-Fi access point. The clients communicate to the TOBY-L2 IP subsystem and the router functionality of the IP subsystem provides them Internet connection.

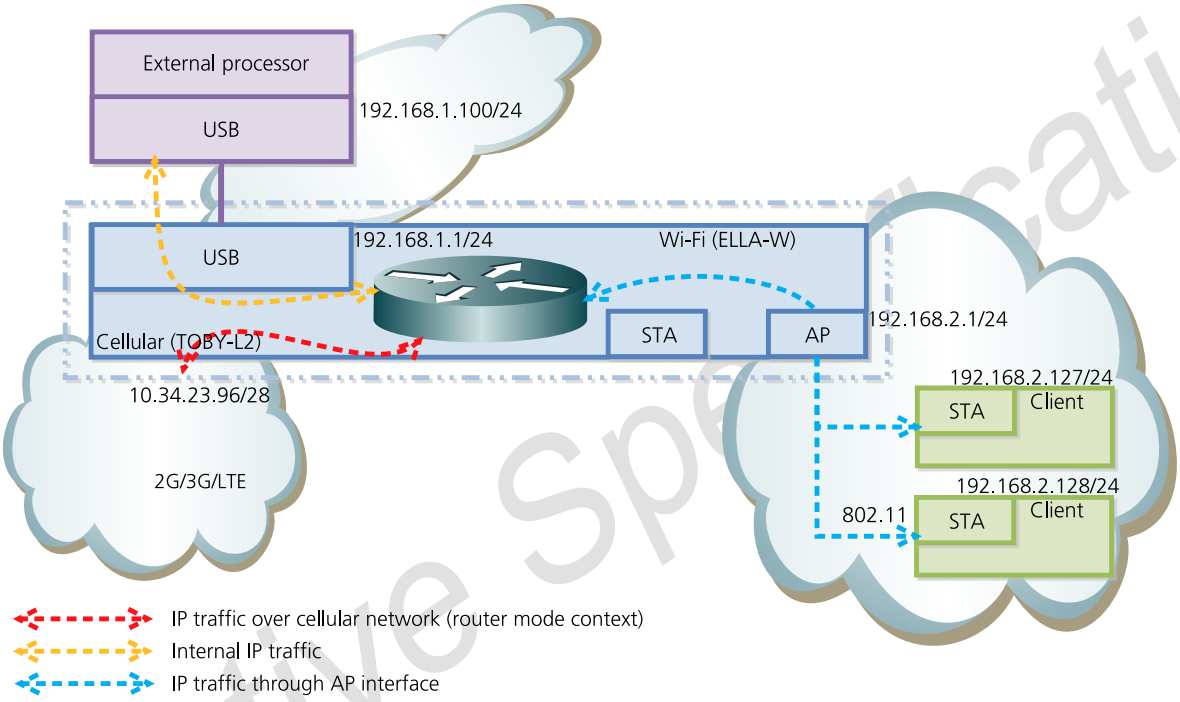



**Figure 19: Router mode with Internet access via cellular network**

- **Router mode with Internet access via external hotspot -** the Wi-Fi module is acting concurrently in two modes: wireless access point (AP) and wireless station (STA), respectively. The Wi-Fi clients are connected through the wireless access point to the TOBY-L2 module IP subsystem. The IP subsystem is connected to an external hotspot through the Wi-Fi interface operating in station mode. The traffic between the Wi-Fi clients and the external hotspot is forwarded through the two Wi-Fi interfaces (AP and STA) of the Wi-Fi module. In this case the Internet connectivity is provided to users by the external hotspot instead of the cellular network. The AP is set on the same channel of the external hotspot, hence they should operate and share the resources available on the channel. The AP channel configuration is ignored, since it operates on the same channel as the STA. This behavior is also present in wireless repeaters (also known as wireless range extenders).

Objective Specification

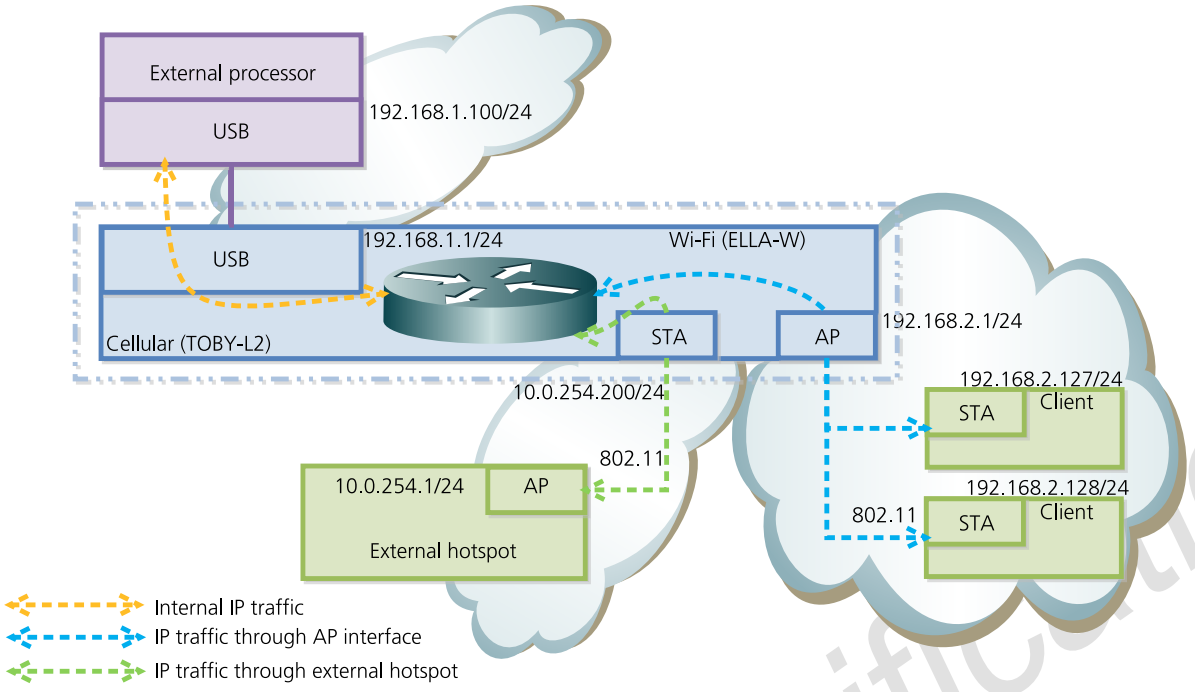



**Figure 20: Router mode with Internet access via external hotspot**

- **Router mode with Internet access either via cellular network or via external hotspot -** the cellular module IP subsystem can provide Internet connection either through the cellular module or through the wireless station interface dynamically switching between the two configurations described above.

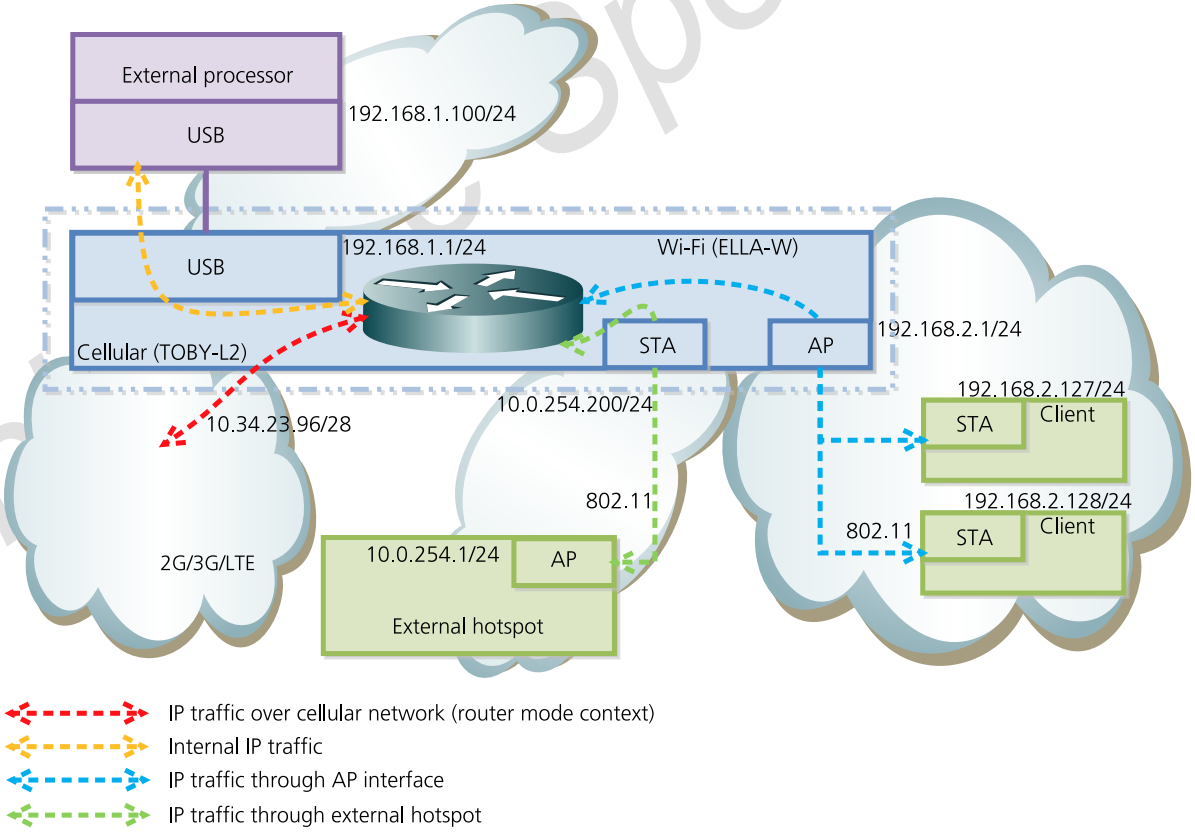



**Figure 21: Router mode with Internet access via cellular network or via external hotspot**

Objective Specification

- **Bridge mode with Internet access either via cellular network or via external hotspot -** in bridge mode the cellular module provides Internet connectivity to the external processor by a bridge PDP contexts/EPS bearers. A bridge PDP context/EPS bearer sets up a bridge between the cellular network and the USB interface. Furthermore, when the module is in bridge mode, several PDP contexts/EPS bearers can be configured as router contexts (see *+UDPDP* for PDP context/EPS bearer configuration). Router PDP contexts/EPS bearers are connected to the module IP subsystem. The cellular module IP subsystem can provide Internet connectivity either through the cellular module (router PDP context/EPS bearer) or through the wireless station interface, switching dynamically between the two options described above. The external processor may connect to the Internet either through the bridge PDP context/EPS bearer or through the USB interface which is connected to the module IP subsystem where connectivity is granted by a router PDP context/EPS bearer or by the wireless station interface.

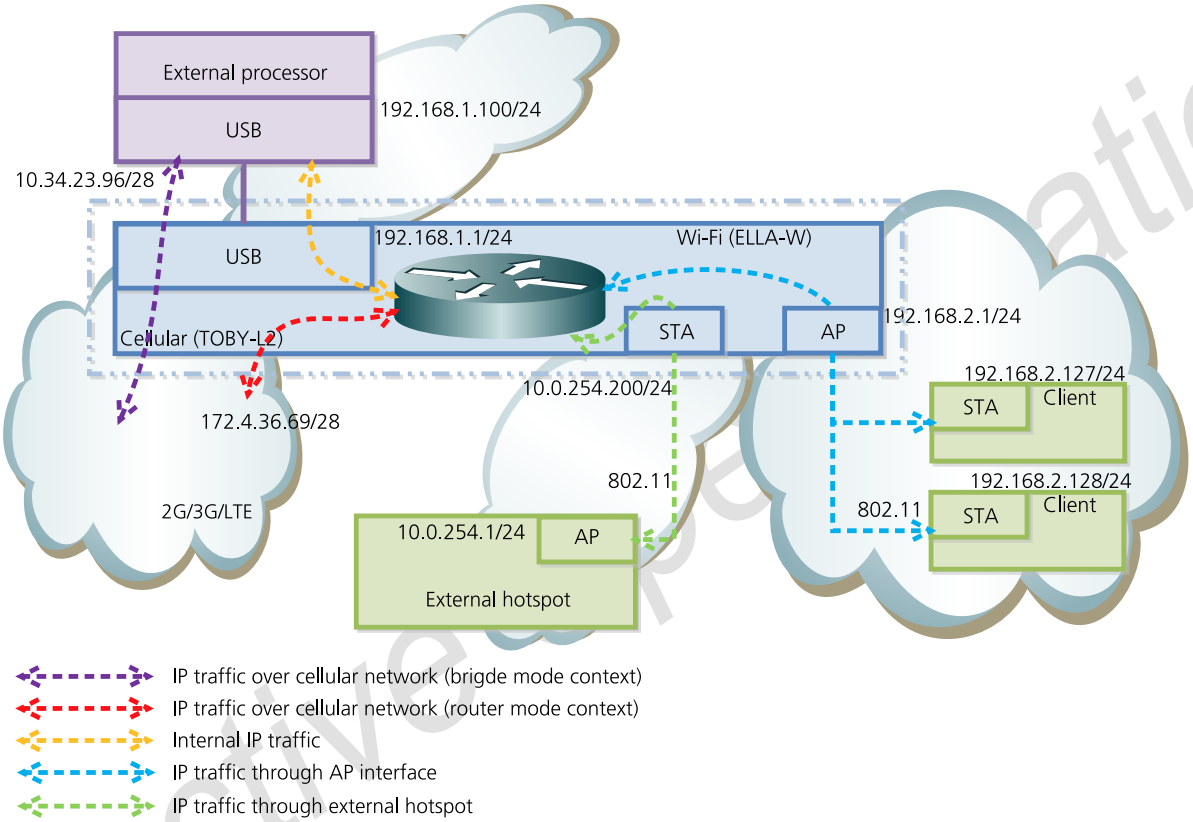



**Figure 22: Bridge mode with Internet access via cellular network or via external hotspot**

The current scenario presents the most complete configuration between cellular and Wi-Fi modules. The only difference respect with the previous scenario is the bridge context / ESP bearer and hence the previous scenarios are a subset of this one.

An external processor can be connected to the Wi-Fi cellular subsystem through these interfaces:

- Ethernet over USB (e.g. RNDIS or CDC-ECM): see *+UUSBCONF* for the USB interface configuration
- UART

The external processor can communicate directly with the wireless stations and access to Internet via cellular network or via the external Wi-Fi interface accordingly to the permitted system configuration.

See Wi-Fi / Cellular Integration Application Note [99] for a complete description of Wi-Fi functionalities and the configurations briefly described above.

The Wi-Fi functionalities can be properly configured by the following AT commands to cover all the previous use-cases:

Objective Specification

- Wi-Fi module management:
  - Power mode configuration: *+UWCFG*
  - Firmware reset: *+UWFWRESET*
  - Maximum allowed output power configuration: *+UWMP*
  - Test mode configuration: *+UWTEST*
- Access point management:
  - Physical layer configuration: *+UWAPCFG*
  - Network layer configuration: *+UWAPIPCFG*
  - MAC address: *+UWAPMACADDR*
  - List of connected stations: *+UWAPSTALIST*
- Wireless station management:
  - Physical layer configuration: *+UWSTACFG*
  - Network layer configuration: *+UWSTAIPCFG*
  - Network scan: *+UWSCAN*

## 38.2 Web User Interface (WebUI)

A graphical Web User Interface is provided for the Wi-Fi / cellular system configuration. In particular, the WebUI is used to configure the cellular and Wi-Fi functionalities. The features configurable with the WebUI are the following:

- Cellular:
  - Cellular network profile (APN, initial EPS bearer APN for LTE networks, roaming, alternative DNS servers, PIN entry, authentication parameters, ...)
  - Routing within the cellular network
- Wi-Fi:
  - Access point physical layer
  - Access point network layer
  - Station physical layer
  - Station network layer
  - Routing within the wireless network
  - Web user interface customization
- Further information:
  - The list of the wireless clients associated to the access point
  - Uplink and downlink traffic counters

Access to the settings is password protected.

The WebUI interface can be properly enabled via the *+UWWEBUI* AT command.

The internal connection manager handles the cellular connectivity. The connection manager can be enabled either by means of the WebUI or the *+UWCFG* AT command. See *+UWCFG* AT command for further information regarding the internal connection manager.

The connection manager ensures the cellular connectivity using the fourth (4-th) CID in the case of LTE networks and the first (1-st) CID in the case of 2G/3G networks. When the connection manager is configured by means of the WebUI, previous configurations of these two CIDs done through AT commands may be overwritten.

The customization of the Web user interface can be performed through the FTP access to certain files of the HTTP server. See *+UWWEBUIFTP* AT command details for further information regarding the customization feature.

Manually refresh the WebUI page if the setting is not accepted during the storing of the configuration due to an invalid setting.

See Wi-Fi / Cellular Integration Application Note *[99]* for a complete description of WebUI functionality and its configuration.

Objective Specification

# 38.3 Wi-Fi module power mode and connection manager +UWCFG

| +UWCFG | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | *< 20 s* | *+CME Error* |

## 38.3.1 Description

Configures the Wi-Fi access point power mode and the connection manager.

The connection manager (also referred to as connection configuration manager) allows the user to check and configure the cellular connectivity through the WebUI: since the AT commands interface is not available to Wi-Fi clients, they shall use the WebUI to configure the basic cellular connectivity.

When the connection manager is enabled, the MT is set to full functionality (*+CFUN: 1*), while when the connection manager is disabled the MT is put to minimum cellular functionality (*+CFUN: 4*). It is worth noticing that the cellular module boots in full functionality (*+CFUN=1*) state and generally in automatic network selection mode (*+COPS=0*), independently from the connection manager state. Hence, in LTE networks, the connectivity may be granted after boot time even if the connection manager is disabled (LTE networks may provide Internet connectivity on the initial EPS bearer).

The command can enable also URC reporting of possible conflicts between the cellular band and the Wi-Fi channels currently in use, that can disrupt the communications of both radio technologies. Depending on the value of the <conflict_ind_mode> parameter, the resolution of such conflict can be up to the user or automatically performed by the connection manager:

- **<conflict_ind_mode>=0**: no URC is shown and the user should handle connectivity issues if they appear
- **<conflict_ind_mode>=1**: a URC indicates the possible situation of conflict and the user is still in charge of handling the possible performance degradation
- **<conflict_ind_mode>=2 (semi automatic algorithm)**: a simple algorithm adjusts the range of channels adopted in the automatic Wi-Fi channel selection
- **<conflict_ind_mode>=3 (full automatic algorithm)**: adjusts the range of channels adopted in the automatic Wi-Fi channel selection and performs an automatic channel re-selection

The URC +UUWCFG reports the detected conflict:

- **<conflict_ind>=1**: the conflict affects LTE working in band 7 and Wi-Fi channels between 10 and 14
- **<conflict_ind>=2**: the conflict affects GSM 850 band and the Wi-Fi channels in the range 11 to 14

If a parameter is omitted in the set command, the current value is kept.

The <conflict_ind_mode> setting is not saved in NVM.

## 38.3.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UWCFG=<wifi_mode>[,<mgr>[,<conflict_ind_mode>]] | OK | AT+UWCFG=2,,1<br>OK |
| Read | AT+UWCFG? | +UWCFG: <wifi_mode>,<mgr>,<conflict_ind_mode><br>OK | +UWCFG: 1,1,0<br>OK |
| Test | AT+UWCFG=? | +UWCFG: (list of supported <wifi_mode>s),(list of supported <mgr>s),(list of supported <conflict_ind_mode>s)<br>OK | +UWCFG: (0-2),(0,1),(0-3)<br>OK |
| URC | | +UUWCFG: <conflict_ind> | +UUWCFG: 1 |

Objective Specification

### 38.3.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <wifi_mode> | Number | Configures the power modes. Allowed values:<br>• 0 (factory-programmed value): wireless off. The wireless access point is turned off<br>• 1: wireless on. The wireless access point is turned on<br>• 2: airplane mode. The wireless access point is turned off (the radio frequency transmission is turned off). If enabled, the Wi-Fi module enters the airplane mode (AP and STA are turned off). |
| <mgr> | Number | Configures the connection manager. Allowed values:<br>• 0 (factory-programmed value): connection manager disabled<br>• 1: connection manager enabled |
| <conflict_ind_mode> | Number | Specifies the configuration of the cellular Wi-Fi conflict reporting URC and which algorithm is adopted:<br>• 0 (factory-programmed value): conflict reporting URC disabled<br>• 1: URC enabled, manual user intervention is required to handle the conflict<br>• 2: URC enabled, semi automatic algorithm<br>• 3: URC enabled, full automatic algorithm |
| <conflict_ind> | Number | Specifies which cellular/Wi-Fi frequency conflict occurs:<br>• 0: no conflict<br>• 1: possible conflict among cellular module working in LTE band 7 and Wi-Fi working in channel range 10-14<br>• 2: possible conflict among cellular module working in GSM 850 band and Wi-Fi working in channel range 11-14 |

### 38.3.4 Notes

- When configuring both AP and STA mode at the same time via +UWCFG and *+UWSTACFG* AT commands, the STA channel setting wins on the AP channel setting.
- When the module works as a Wi-Fi station (STA mode), <conflict_ind_mode>=0 and 1 are supported, while <conflict_ind_mode>=2 and 3 are equivalent to <conflict_ind_mode>=1.

## 38.4 Wi-Fi access point physical layer configuration +UWAPCFG

| +UWAPCFG | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | *< 20 s* | *+CME Error* |

### 38.4.1 Description

Configures the physical layer parameters of the Wi-Fi access point.

Since the regulatory domains block feature is supported, the current Wi-Fi access point physical layer configuration may differ from the one selected by the user. In particular, the reported regulatory domain is the currently applied regulatory domain. In addition, the user is not allowed to set a configuration (e.g. regulatory domain, channel and mode) in violation of the constraints of the currently applied regulatory domain. For further information see the *+UWREGBLOCK* AT command description.

Reboot the cellular / Wi-Fi subsystem to apply the new configuration.

### 38.4.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UWAPCFG=<ssid>,<security>,<psk>,<region>,<channel>,<mode> | OK | AT+UWAPCFG="UBXWifi",2,"ubx-wifi",1,0,3<br>OK |
| Read | AT+UWAPCFG? | +UWAPCFG: <ssid>,<security>,<psk>,<region>,<channel>,<mode><br>OK | +UWAPCFG: "UBXWifi",2,"ubx-wifi",1,0,3<br>OK |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| Test | AT+UWAPCFG=? | +UWAPCFG: <ssid>,(list of supported <security>s),<psk>,(list of supported <region>s),(list of supported <channel>s),(list of supported <mode>s)<br><br>OK | +UWAPCFG: "UBXWifi",(0-3),"password",(0-2),(0-14),(0-4)<br><br>OK |

### 38.4.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <ssid> | String | ESSID of the access point. The maximum length is 32 characters. The factory-programmed value is "UBXWifi". |
| <security> | Number | Wireless authentication method. Allowed values:<br>• 0: OPEN<br>• 1: WPA<br>• 2 (factory-programmed value): WPA2<br>• 3: WPA_WPA2_MIXED |
| <psk> | String | Security passphrase. It can be long from 8 to 64 characters. The factory-programmed value is "ubx-wifi". If <security>="OPEN" the <psk> value is not taken into account and can be omitted |
| <region> | Number | Country code. Supported values:<br>• 0 (TOBY-L210 factory-programmed value): EU<br>• 1 (TOBY-L200 factory-programmed value): US<br>• 2: JP<br>Due to the regulatory domains block feature, this parameter has a limited configurability. |
| <channel> | Number | Wireless channel number. Allowed values:<br>• 0 (factory-programmed value): automatic channel selection<br>• 1-11: 2.4 GHz channel number<br>• 12-13: Europe/Japan only<br>• 14: Japan 11b only |
| <mode> | Number | IEEE standard. Allowed values:<br>• 0: 802.11b<br>• 1: 802.11g<br>• 2: 802.11b/g<br>• 3 (factory-programmed value): 802.11b/g/n<br>• 4: 802.11n |

### 38.4.4 Notes

- If <mode>= 3 or 4 (802.11b/g/n or 802.11n), the <security> is automatically set to 2 (WPA2).
- The <security> can be set to 1 (WPA), only if the <mode> is set to 0, 1, or 2 (802.11b, 802.11g, 802.11b/g).

## 38.5 Wi-Fi access point network layer configuration +UWAPIPCFG

| +UWAPIPCFG | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

### 38.5.1 Description

Configures the network layer parameters of the Wi-Fi access point.

Reboot the cellular / Wi-Fi subsystem to apply the new configuration.

The subnetwork of the USB network function (e.g. RNDIS/CDC-ECM interface) should be different from the subnetwork of the wireless access point. Use the *+UIPCONF* AT command to set the subnetwork of the USB network function. The connectivity between the two subnetworks is granted.

Objective Specification

### 38.5.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UWAPIPCFG=<ip>,<netmask>, <dhcp_start>,<dhcp_end> | OK | AT+UWAPIPCFG="192.168.2.1", "255.255.255.0","192.168.2.100", "192.168.2.200"<br>OK |
| Read | AT+UWAPIPCFG? | +UWAPIPCFG: <ip>,<netmask>,<dhcp_start>,<dhcp_end><br>OK | +UWAPIPCFG: "192.168.2.1", "255.255.255.0","192.168.2.100", "192.168.2.200"<br>OK |
| Test | AT+UWAPIPCFG=? | +UWAPIPCFG: <ip>,<netmask>,<dhcp_start>,<dhcp_end><br>OK | +UWAPIPCFG: "192.168.2.1", "255.255.255.0","192.168.2.100", "192.168.2.200"<br>OK |

### 38.5.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <ip> | String | IP address of the access point. The factory-programmed value is "192.168.2.1". The address must not be a network or broadcast address (see *Notes* for more details).<br>The IP address shall not be in the range of DHCP server. |
| <netmask> | String | Netmask of the access point. The factory-programmed value is "255.255.255.0". The netmask must be a valid address. |
| <dhcp_start> | String | Start IP address of the DHCP range provided by the access point. The factory-programmed value is "192.168.2.100". The address must not be a network or broadcast address (see *Notes* for more details).<br>The parameter value must be equal or lower than the <dhcp_stop> value. |
| <dhcp_stop> | String | Stop IP address of the DHCP range provided by the access point. The factory-programmed value is "192.168.2.200". The address must not be a network or broadcast address (see *Notes* for more details).<br>The parameter value must be equal or greater than the <dhcp_start> value. |

### 38.5.4 Notes

- In the "network" address the last 32-(maskbit) bits are all set to 0.
- In the "broadcast" address the last 32-(maskbit) bits are all set to 1.
- The IP address should not be equal to an "network" or "broadcast" address
- The maskbit is the prefix size of the subnet mask in CIDR (Classless Inter-Domain Routing) notation expressed as a decimal number. (see http://en.wikipedia.org/wiki/Classless_Inter-Domain_Routing#CIDR_notation)

## 38.6 Wi-Fi station physical layer configuration +UWSTACFG

| +UWSTACFG | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | *< 20 s* | *+CME Error* |

### 38.6.1 Description

Enables the STA interface and configures the physical layer parameters of the Wi-Fi station. The parameters configured by means of this command are used to establish the connection between the station and the external hotspot:

- If <enable>= 0, further parameters can be omitted.
- If <enable>= 1, the STA interface will be enabled and turned on.

Objective Specification

### 38.6.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UWSTACFG=<enable>[,<ssid>,<security>,<psk>] | OK | AT+UWSTACFG=1,"external_hotspot_ssid",1,"external_hotspot_security_key"<br>OK |
| Read | AT+UWSTACFG? | +UWSTACFG: <enable>[,<ssid>,<security>]<br>OK | +UWSTACFG: 1,"external_hotspot_ssid",1<br>OK |
| Test | AT+UWSTACFG=? | +UWSTACFG: (list of supported <enable>s),<ssid>,(list of supported <security>s),<psk><br>OK | +UWSTACFG: (0,1),"UBXWifiNet",(0,1),"password"<br>OK |

### 38.6.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <enable> | Number | Configures the station mode of the wireless interface. Allowed values:<br>• 0 (factory-programmed value): disabled<br>• 1: enabled |
| <ssid> | String | ESSID of the access point. The maximum length is 32 characters. |
| <security> | Number | Wireless authentication type. Allowed values:<br>• 0 (default value): OPEN. The <psk> parameter is not mandatory<br>• 1: WPA/WPA2 |
| <psk> | String | Security passphrase. The security passphrase can be long from 8 to 64 characters. If <security>="OPEN" the <psk> value is not taken into account and can be omitted. |

### 38.6.4 Notes

- It is not possible to change the external hotspot if the module is already connected with another external hotspot; *AT+UWSTACFG=0* command shall be issued before reconfiguring the hotspot settings.

## 38.7 Wi-Fi station network layer configuration +UWSTAIPCFG

| +UWSTAIPCFG | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

### 38.7.1 Description

Configures the network layer parameters of the Wi-Fi station. The network layer configuration can be obtained from the DHCP server of the external hotspot. Otherwise, this command can specify a static IP address, netmask, gateway IP address, and IP addresses of two DNS servers.

This command also allows switching between cellular and Wi-Fi connectivity.

If <dhcp>=1 further parameters can be omitted and are not taken into account when given.

Reboot the cellular / Wi-Fi subsystem to apply the new configuration.

The subnetwork of the station mode should be different from the subnetwork of the USB network function (e.g. RNDIS/CDC-ECM interface) and of the Wi-Fi access point. Use the *+UIPCONF* AT command to set the subnetwork of the USB network function and the *+UWAPIPCFG* AT command to set the subnetwork of the Wi-Fi access point. The connectivity between the three subnetworks is granted.

Objective Specification

### 38.7.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UWSTAIPCFG=<routing>,<dhcp>[,<ip>,<netmask>,<gateway>,[<dns1>],[<dns2>]] | OK | AT+UWSTAIPCFG=1,0,"10.254.0.100","255.255.0.0","10.254.0.1","8.8.8.8","208.67.222.222"<br>OK |
| Read | AT+UWSTAIPCFG? | +UWSTAIPCFG: <routing>,<dhcp>[,<ip>,<netmask>,<gateway>,<dns1>,<dns2>]<br>OK | +UWSTAIPCFG: 1,0,"192.168.254.100","255.255.255.0","192.168.254.1","192.168.254.1","192.168.254.1"<br>OK |
| Test | AT+UWSTAIPCFG=? | +UWSTAIPCFG: (list of supported <routing>s),(list of supported <dhcp>s),<ip>,<netmask>,<gateway>,<dns1>,<dns2><br>OK | +UWSTAIPCFG: (0,1),(0,1),"192.168.254.100","255.255.255.0","192.168.254.1","192.168.254.1","192.168.254.1"<br>OK |

### 38.7.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <routing> | Number | Configures the connectivity type:<br>• 0: the connectivity is provided by the cellular network<br>• 1 (factory-programmed value): the connectivity is provided by an external hotspot |
| <dhcp> | Number | Configures the automatic DHCP IP address configuration of the wireless STA interface (the DHCP client is enabled on the STA interface). Allowed values:<br>• 0: disabled<br>• 1 (factory-programmed value): enabled |
| <ip> | String | IP address of the station.<br>The address must not be a network or broadcast address (see *Notes* for more details). |
| <netmask> | String | IP netmask of the station. The netmask must be a valid address. |
| <gateway> | String | IP address of the gateway.<br>The address must not be a network or broadcast address (see *Notes* for more details). |
| <dns1> | String | IP address of the first DNS server. The default value is an empty string.<br>If the parameter belongs to the IP/netmask network, it must not be a network or broadcast address. |
| <dns2> | String | IP address of the second DNS server. The default value is an empty string.<br>If the parameter belongs to the IP/netmask network, it must not be a network or broadcast address. |

### 38.7.4 Notes

- If <dhcp>=1 and the STA interface is associated to the external access point, the read command will provide the IP configuration of the STA interface (IP address, netmask, gateway, IP address of the first DNS server and IP address of the second DNS server).
- The read command does not return the optional parameters if the module cannot connect in STA mode to the Wi-Fi network.
- In the "network" address the last 32-(maskbit) bits are all set to 0.
- In the "broadcast" address the last 32-(maskbit) bits are all set to 1.
- The IP address should not be equal to a "network" or "broadcast" address.
- The maskbit is the prefix size of the subnet mask in CIDR (Classless Inter-Domain Routing) notation expressed as a decimal number. (see http://en.wikipedia.org/wiki/Classless_Inter-Domain_Routing#CIDR_notation).

Objective Specification

# 38.8 Wi-Fi access point connected stations list +UWAPSTALIST

| +UWAPSTALIST | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 38.8.1 Description

Lists all the stations connected to the Wi-Fi access point.

## 38.8.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Read | AT+UWAPSTALIST? | [+UWAPSTALIST: <mac>,<received_signal_level><br>[..]]<br>OK | +UWAPSTALIST: "01:23:45:67:89:ab",-44<br>+UWAPSTALIST: "01:23:45:67:89:cd",-53<br>OK |

## 38.8.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <mac> | String | MAC address of the station |
| <received_signal_level> | Number | Received signal level expressed in dBm. The range goes from -30 to -94 |

# 38.9 Wi-Fi access point MAC address +UWAPMACADDR

| +UWAPMACADDR | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

## 38.9.1 Description

Shows the Wi-Fi access point MAC (physical) address. The same MAC address is also valid for the station mode.

An error result code is provided when the Wi-Fi module is disabled.

## 38.9.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | AT+UWAPMACADDR | +UWAPMACADDR: <access_point_MAC_address><br>OK | +UWAPMACADDR: "00:06:C6:38:1A:B2"<br>OK |
| Test | AT+UWAPMACADDR=? | OK | |

## 38.9.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <access_point_MAC_address> | String | Access point MAC (physical) address. |

Objective Specification

# 38.10 Web user interface configuration +UWWEBUI

| +UWWEBUI | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

## 38.10.1 Description

Configures the access to the Web user interface. See *Web User Interface (WebUI)* for a complete description of Web user interface.

## 38.10.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UWWEBUI=<action> | OK | AT+UWWEBUI=1<br>OK |
| Read | AT+UWWEBUI? | +UWWEBUI: <action><br>OK | +UWWEBUI: 1<br>OK |
| Test | AT+UWWEBUI=? | +UWWEBUI: (list of supported <action>s)<br>OK | +UWWEBUI: (0,1)<br>OK |

## 38.10.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <action> | Number | Configures the access to the Web graphical access. Allowed values:<br>• 0 (factory-programmed value): disabled. Access to the Web user interface is not allowed<br>• 1: enabled. Access to the Web user interface is allowed |

# 38.11 Web user interface customization through FTP service +UWWEBUIFTP

| +UWWEBUIFTP | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

## 38.11.1 Description

Enables or disables the FTP access to certain files of the HTTP server running the Web user interface, in particular HTML pages, CSS stylesheets/images, templates and some config files. The access to the web pages of the HTTP server allows the customization of the user interface layout.

The accessible parts are put in the data partition of the module. The Web user interface can be customized even if it is disabled. See *Web User Interface (WebUI)* for a complete description of the Web user interface.

The FTP access is configurable using this AT command and also on the web page itself. Once the FTP access is enabled, an external FTP client should be used to access the Web user interface data/files.

This AT command and the Web user interface can also be used to revert the Web user interface to the factory-programmed style.

Web page settings for the customization feature can be found on the Settings -> System page of the WebUI. It provides the same options as the AT command, plus a control to clear the template cache. The latter forces the template system to be visible immediately.

Objective Specification

### 38.11.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UWWEBUIFTP=<status> | OK | AT+UWWEBUIFTP=1<br>OK |
| Read | AT+UWWEBUIFTP? | +UWWEBUIFTP: <status><br>OK | +UWWEBUIFTP: 1<br>OK |
| Test | AT+UWWEBUIFTP=? | +UWWEBUIFTP: (list of supported <status>s)<br>OK | +UWWEBUIFTP: (0-2)<br>OK |

### 38.11.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <status> | Number | Configures the access to the Web graphical access. Allowed values:<br>• 0 (factory-programmed value): disabled. Access to the Web user interface is not allowed<br>• 1: enabled. Access to the Web user interface through FTP service is allowed<br>• 2: revert the factory-programmed Web user interface; this value is not stored; the previous <status> remains stored in NVM |

## 38.12 Wi-Fi module firmware reset +UWFWRESET

| +UWFWRESET | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 38.12.1 Description

Resets all the configuration parameters listed in *Table 66* to their factory-programmed settings and automatically restarts the system.

### 38.12.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UWFWRESET=<reset> | OK | AT+UWFWRESET=1<br>OK |
| Test | AT+UWFWRESET=? | +UWFWRESET: (list of supported <reset>s)<br>OK | +UWFWRESET: (1)<br>OK |

### 38.12.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <reset> | Number | Allowed value:<br>• 1: reset user configuration |

### 38.12.4 Notes

A graphical user interface (WebUI) allows the configuration of some parameters. The +UWFWRESET AT command resets the parameters set both with WebUI and the AT command interface. The +UWFWRESET AT command does not revert the layout of the WebUI to the factory-programmed one. The latter operation should be performed with the *+UWWEBUIFTP* AT command; see the command description for further information regarding the WebUI revert operation.

| Parameter | Configurable with | Description |
|---|---|---|
| <ssid> | *+UWAPCFG*, *+UWSTACFG*, WebUI | ESSID of the wireless network |
| <security> | *+UWAPCFG*, *+UWSTACFG*, WebUI | Wireless authentication type |
| <psk> | *+UWAPCFG*, *+UWSTACFG*, WebUI | Security passphrase |

Objective Specification

| Parameter | Configurable with | Description |
|---|---|---|
| <region> | *+UWAPCFG*, WebUI | Country code |
| <channel> | *+UWAPCFG*, *+UWTEST*, WebUI | Wireless channel |
| <mode> | *+UWAPCFG*, WebUI | IEEE standard protocol |
| <enable> | *+UWSTACFG*, WebUI | Wireless station mode |
| <ip> | *+UWAPIPCFG*, *+UWSTAIPCFG*, WebUI | IP address of the wireless interface |
| <netmask> | *+UWAPIPCFG*, *+UWSTAIPCFG*, WebUI | Netmask of the wireless interface |
| <dhcp_start> | *+UWAPIPCFG* | Start IP address of the DHCP server range |
| <dhcp_stop> | *+UWAPIPCFG* | Stop IP address of the DHCP server range |
| <routing> | *+UWSTAIPCFG* | Preferred routing configuration |
| <dhcp> | *+UWSTAIPCFG*, WebUI | DHCP client configuration |
| <gateway> | *+UWSTAIPCFG*, WebUI | Gateway IP address |
| <dns1> | *+UWSTAIPCFG*, WebUI | Primary DNS |
| <dns2> | *+UWSTAIPCFG*, WebUI | Secondary DNS |
| <mac> | *+UWAPSTALIST* | Wireless station MAC |
| <received_signal_level> | *+UWAPSTALIST* | Received signal level from wireless clients |
| <reset> | *+UWFWRESET*, WebUI | Enable factory-programmed reset |
| <wifi_mode> | *+UWCFG* | Wireless power mode configuration |
| <mgr> | *+UWCFG*, WebUI | Connection manager mode |
| <band> | *+UWTEST*, WebUI | Wireless band |
| <rate> | *+UWTEST*, WebUI | Channel bit rate |
| <power> | *+UWTEST*, WebUI | Transmission power of the wireless interface |
| <test_mode> | *+UWTEST*, WebUI | Test mode |
| <bw> | *+UWTEST*, WebUI | Channel bandwidth |
| WebUI password | WebUI | WebUI password |
| Network profile | WebUI | List of available network profiles for the SIM card |
| Connection name | WebUI | Name to identify specific cellular network configuration |
| Reset counter | WebUI | |
| Language | WebUI | Language setting of the WebUI |
| System reset | WebUI | System reboot |
| APN | WebUI | Access Point Name |
| Roaming | WebUI | Roaming configuration |
| PIN | WebUI | PIN entry |
| User | WebUI | User name, if requested by the cellular provider |
| Password | WebUI | Password, if requested by the cellular provider |
| Authentication | WebUI | Authentication mode if a user name and password are required |

**Table 66: List of parameters updated with +UWFWRESET**

# 38.13 Wi-Fi network scan +UWSCAN

| +UWSCAN | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | *< 15 s* | *+CME Error* |

## 38.13.1 Description

Scans the surroundings for wireless networks and provide information on their configuration. The information text response returns one or more lines providing networks in the immediate surroundings.

## 38.13.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Action | AT+UWSCAN | +UWSCAN: <bssid>,<op_mode>,<ssid>,<channel>,<received_signal_level>,<authentication_suites>[,<unicast_ciphers>,<group_ciphers>] | +UWSCAN: "45:94:FC:7D:88:21",1,"test1",1,-72,18,4,4<br>+UWSCAN: "44:94:FC:7A:89:20",1,"test2",11,-83,18,4,4 |

Objective Specification

| Type | Syntax | Response | Example |
|---|---|---|---|
| | | [...]<br>OK | +UWSCAN: "44:04:FC:7D:88:20",1,"test3",9,-48,0<br>+UWSCAN: "44:95:FC:7E:88:20",2,"test4",6,-83,0<br>OK |

### 38.13.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <bssid> | String | The MAC address of the external hotspot |
| <op_mode> | Number | Operation mode of the external hotspot<br>• 1: infrastructured<br>• 2: ad-hoc |
| <ssid> | String | The SSID name of external wireless network |
| <channel> | Number | The channel the external wireless network |
| <received_signal_level> | Number | Signal strength value for the external wireless network in dBm |
| <authentication_suites> | Number | Authentication suite supported by the external wireless network. The number is presented as a hexadecimal value; the meaning of each bit is as follows:<br>• Bit 0: shared secret<br>• Bit 1: PSK<br>• Bit 2: EAP<br>• Bit 3: WPA<br>• Bit 4: WPA2<br>FF string is provided if an unsupported authentication suite is supported by the external wireless network (i.e. enterprise authentication level). |
| <unicast_ciphers> | Number | Unicast ciphers supported by the external wireless network. The number is presented as a hexadecimal value; the meaning of each bit is as follows:<br>• Bit 0: WEP64<br>• Bit 1: WEP128<br>• Bit 2: TKIP<br>• Bit 3: AES/CCMP |
| <group_ciphers> | Number | Group ciphers supported by the external wireless network. The number is presented as a hexadecimal value; the meaning of each bit is as follows:<br>• Bit 0: WEP64<br>• Bit 1: WEP128<br>• Bit 2: TKIP<br>• Bit 3: AES/CCMP |

### 38.13.4 Notes

- <authentication_suites>=FF is provided if an unsupported authentication suite is in use by the external wireless network (i.e. enterprise authentication level).

## 38.14 Maximum allowed output power configuration +UWMP

| +UWMP | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 38.14.1 Description

Configures the maximum allowed output (transmission) power of the Wi-Fi module.

The configuration is applied at run time.

Objective Specification

### 38.14.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UWMP=<max_output_power> | OK | AT+UWMP=4<br>OK |
| Read | AT+UWMP? | +UWMP: <max_output_power><br>OK | +UWMP: 4<br>OK |
| Test | AT+UWMP=? | +UWMP: (list of supported <max_output_power>s)<br>OK | +UWMP: (4-18)<br>OK |

### 38.14.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <max_output_power> | Number | Output power in dBm. Allowed range is in [4,18]. The factory-programmed value is 18. |

## 38.15 Wi-Fi regulatory domains block configuration +UWREGBLOCK

| +UWREGBLOCK | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | *NVM* | No | - | *+CME Error* |

### 38.15.1 Description

Configures the Wi-Fi regulatory domains block feature.

Since every country applies its own regulations regarding the use of Wi-Fi networks, the Wi-Fi regulatory domains block feature avoids conflicts with the Wi-Fi limitations of the countries where the module will be used. The Wi-Fi regulatory domains block feature is enabled when the Wi-Fi interface is active or when the WebUI is enabled.

Three regulatory domains are defined:

- **"US"** (United States): with the Wi-Fi regulatory domains block feature, this regulatory domain is automatically applied when the module is registered to a North American cellular network;
- **"JP"** (Japan): with the Wi-Fi regulatory domains block feature, this regulatory domain is automatically applied when the module is registered to a Japanese cellular network;
- **"EU"** (Europe / rest of the world): with the Wi-Fi regulatory domains block feature, this regulatory domain is automatically applied when the module is not registered to a North American or a Japanese cellular network.

The limitations defined for every regulatory domain regard the list of available channels, the maximum transmission power and the channel bit rate. In particular, if the previously selected channel falls outside the allowed range of the currently applied domain, an automatic channel selection will be adopted. Further information regarding the allowed settings for every regulatory domain can be found in the *+UWAPCFG* AT command description.

The Wi-Fi regulatory domains block implies the following behavior:

- TOBY-L200 - work in "US" regulatory domain and the domain cannot change;
- TOBY-L210 / TOBY-L280 - start with "EU" regulatory domain as factory-programmed value;
- TOBY-L220 - start with "JP" regulatory domain as factory-programmed value;
- TOBY-L210 / TOBY-L220 / TOBY-L280 - when the module is out of coverage/not registered to any network (this implies that the current position of the module is unknown), the regulatory domain is automatically reverted to the "US" regulatory domain, which is the most restrictive in terms of channel usage, after a configurable <timeout>:
  - the factory-programmed value of the timeout is 60 minutes;
  - the timeout can be set from a minimum value of 10 minutes to a maximum of 60 minutes.

Objective Specification

- during the period in which the module is out-of-coverage/not registered to any network (this implies that the current position of the module is unknown) and the timeout is not elapsed, the physical Wi-Fi setting can differ from the setting shown by the *+UWAPCFG* AT command. The user is able to change the setting referred to the new valid regulatory domain, even if it is not applied. A complete Wi-Fi power cycle will apply the new setting and the timeout will not be taken into account.

The last applied regulatory domain is stored in NVM and it is used for the next Wi-Fi activation; the current regulatory domain can be derived from the <region> parameter returned by *+UWAPCFG* read command.

### 38.15.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UWREGBLOCK=[<timeout>] | OK | AT+UWREGBLOCK=10<br>OK |
| Read | AT+UWREGBLOCK? | +UWREGBLOCK: <timeout><br>OK | +UWREGBLOCK: 10<br>OK |
| Test | AT+UWREGBLOCK=? | +UWREGBLOCK: (list of supported <timeout>s)<br>OK | +UWREGBLOCK: (10-60)<br>OK |

### 38.15.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <timeout> | Number | Duration (in minutes) of the timer set when the module enters in out-of-coverage/not registered state; at its expiration, the Wi-Fi regulatory domain is automatically reverted to "US". The range goes from 10 to 60; the factory-programmed and default value is 60. |

## 38.16 Wi-Fi test mode +UWTEST

| +UWTEST | | | | | | |
|---|---|---|---|---|---|---|
| **Modules** | TOBY-L200-02S TOBY-L210-02S TOBY-L210-62S TOBY-L220 TOBY-L280-02S | | | | | |
| **Attributes** | **Syntax** | **PIN required** | **Settings saved** | **Can be aborted** | **Response time** | **Error reference** |
| | full | No | No | No | - | *+CME Error* |

### 38.16.1 Description

Initiates the Wi-Fi module test mode. A reboot of the Wi-Fi / cellular subsystem is needed to exit the test mode.

Performs one of these procedures to exit from the test mode:

- Reboot the Wi-Fi / cellular subsystem with the *+CFUN* command
- Set the Wi-Fi power mode by the use of *+UWCFG* AT command

If the Wi-Fi / cellular subsystem is rebooted when it is in test mode, at the next boot the Wi-Fi module power mode is disabled; to turn it on issue the *+UWCFG=1* command.

### 38.16.2 Syntax

| Type | Syntax | Response | Example |
|---|---|---|---|
| Set | AT+UWTEST=<band>,<channel>,<rate>,<power>,<test_mode>,<bw> | OK | AT+UWTEST=0,1,1,13,3,0<br>OK |
| Read | AT+UWTEST? | +UWTEST: <version><br>OK | +UWTEST: "SD8787-14.44.35.p213-M2614486-GPL-(FP44)"<br>OK |
| Test | AT+UWTEST=? | +UWTEST: (list of supported <band>s),(list of supported <channel>s),(list of supported <rate>s),(list of supported <power>s),(list of supported <test_mode>s),(list of supported <bw>s)<br>OK | +UWTEST: (0),(1-14),(1-4,6-22),(6-18),(0-3),(0,1)<br>OK |

Objective Specification

### 38.16.3 Defined values

| Parameter | Type | Description |
|---|---|---|
| <band> | Number | Wi-Fi band. Allowed values:<br>• 0: 2.4 GHz band |
| <channel> | Number | 1-14: 2.4 GHz RF channel |
| <rate> | Number | Data rate. Allowed values:<br>• 1-4: 1/2/5.5/11 Mb/s DSSS<br>• 6-14: 6/9/12/18/24/36/48/54/72 Mb/s OFDM<br>• 15-22: MCS0-7 |
| <power> | Number | Output power. Allowed values:<br>• 6-18: Tx power in dBm |
| <test_mode> | Number | Test mode. Allowed values:<br>• 0: continuous Rx<br>• 1: packet Tx<br>• 2: continuous modulated Tx<br>• 3: carrier mode (no modulation) |
| <bw> | Number | Channel bandwidth. Allowed values:<br>• 0: 20 MHz bandwidth<br>• 1: 40 MHz bandwidth |
| <version> | Number | Firmware version of Wi-Fi module |

Objective Specification

# A Appendix: Error result codes

## A.1 Mobile termination error result codes +CME ERROR

| <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 | See the footnote[5], +CCLK |
| 4 | Operation not supported | See the footnote[5], +CCLK, +CMER and +UCIND |
| 5 | PH-SIM PIN required | See the footnote[5] |
| 10 | SIM not inserted | See the footnote[5] |
| 11 | SIM PIN required | See the footnote[5] |
| 12 | SIM PUK required | See the footnote[5] |
| 13 | SIM failure | See the footnote[5] |
| 14 | SIM busy | See the footnote[5] |
| 15 | SIM wrong | See the footnote[5] |
| 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, +CUSD |
| 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, +CRSM |
| 100 | Unknown | |
| 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 |

[5] +CACM, +CALA, +CALD,+CALM, +CAMM,+CAOC, +CBST, +CCFC, +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

Objective Specification

| <err> | Meaning | Resulting from the following commands |
|---|---|---|
| 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 PS/GPRS related commands |
| 149 | PDP authentication failure | +CGACT |
| 150 | Invalid mobile class | all GPRS related commands |
| 156 | User Busy | +UI2CO, +UI2CW, +UI2CREGR, +UI2CR, +UI2CC |
| 254 | Invalid error mapping | |
| 255 | Internal error | |
| 701 | Incorrect security code | |
| 702 | Max attempts reached | |
| 1001 | Unassigned (unallocated) number | |
| 1003 | No route 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 | |
| 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 | |

Objective Specification

| <err> | Meaning | Resulting from the following commands |
|---|---|---|
| 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 |
| 1505 | GPIO busy | +UGPIOC |
| 1520 | Wrong ADC identifier | +UADC |
| 1521 | Read ADC error | +UADC |
| 1530 | IPv4 only allowed | +CGDCONT |
| 1540 | Wrong ringer identifier | +URNG |
| 1548 | PDP activation rejected | +UPSDA |
| 1549 | unknown PDP address or PDP type | +UPSDA |
| 1550 | GPRS generic operation error | +UPSD, +UPSDA |
| 1551 | GPRS invalid APN | +CGACT, +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, +UCEDATA |
| 1556 | CSD generic operation error | +UCSD, +UCSDA, +UCSND |
| 1557 | CSD undefined profile | +UCSDA |
| 1558 | CSD context busy | +UCSD, +UCSDA |
| 1559 | PLMN scan not allowed | +COPS |
| 1600 | FFS error | |
| 1560 | PDP type IPv4 only allowed | +CGACT, +CGDATA |
| 1561 | PDP type IPv6 only allowed | +CGACT, +CGDATA |
| 1612 | FILE NOT FOUND | +UPLAYFILE, +UDELFILE |
| 1613 | Cannot open file | +UDWNFILE, +ULSTFILE |
| 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 |
| 1628 | FFS illegal type | +UDWNFILE |
| 1629 | FFS illegal mode | +UDWNFILE |
| 1630 | FFS file range | +UDWNFILE, +URDBLOCK |
| 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 |

Objective Specification

| <err> | Meaning | Resulting from the following commands |
|---|---|---|
| 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 / GPS Busy | +UGPS |
| 1801 | IBM busy / eCall already armed/active | +UECALLDATA |
| 1802 | IBM feature off / eCall feature off | +UECALLDATA, +UECALLVOICE |
| 1803 | Wrong IBM requested | (RFU) |
| 1804 | Audio resource not available | +UECALLDATA |
| 1805 | ECALL restriction | +COPS[6] |
| 1806 | eCall invalid dial number | +UECALLTYPE, +UDCONF=90, +CECALL |
| 1900 | No SAP Server Connection | +USAPMODE |
| 1901 | SAP Protocol Error | +USAPMODE |
| 1902 | SAP Connection failure | +USAPMODE |
| 1903 | SAP Server Disconnection | +USAPMODE |
| 1904 | SAP Other terminal using service | +USAPMODE |
| 1910 | USECMNG import timeout expired (no input for > 20 s) | +USECMNG |
| 1911 | USECMNG import file size exceeds limit | +USECMNG |
| 1912 | USECMNG no memory available | +USECMNG |
| 1913 | USECMNG invalid certificate/key format | +USECMNG |
| 1914 | USECMNG database full | +USECMNG |
| 1950 | CDC-ECM is not available | +UCEDATA |
| 1951 | CDC-ECM is busy | +UCEDATA |
| 1952 | No DHCP Packets received from the DTE | +UCEDATA |
| 2000 | Command timeout | |
| 3000 | Command aborted | Commands that can be aborted |
| 4000 | APN configuration mismatch | +UPSDA |
| 4001 | IP type configuration mismatch | +UPSDA |

[6] Only on LISA-U2 series modules

Objective Specification

## A.2 Message service error 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 | |
| 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 | |
| 287 | Network failure unspecified | |
| 290 | Network no resource | |
| 296 | Radio Resources not Aailable due to DUAL SIM operation | |

Objective Specification

| <err> | Meaning | Resulting from the following commands |
|---|---|---|
| 297 | Out of service due to DUAL SIM operation | |
| 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 required | all SMS commands |
| 312 | PH-SIM PIN required | 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, +UCMGP |
| 321 | invalid memory index | +CMGR, +CMGL, +UCMGR, +CMGD, +UCMGP |
| 322 | memory full | |
| 330 | SMSC address unknown | |
| 331 | no network service | |
| 332 | network timeout | +CNMA |
| 340 | no +CNMA acknowledgement expected | +CNMA |
| 500 | unknown error | |
| 512 | Relay Protocol Acknowledgement | |
| 513 | SMS timer expired | |
| 514 | SMS forwarding availability failed | |
| 515 | SMS forwarding availability aborted | |
| 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 | |
| 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 | |
| 544 | Service Centre Address(SCA) FDN failed | |
| 545 | Destination Address(DA) FDN failed | |
| 546 | BDN check failed | |

Objective Specification

| <err> | Meaning | Resulting from the following commands |
|---|---|---|
| 547 | Unspecified SMS PP error | |
| 548 | Undefined Result | |

## A.3 +CEER error result codes

The following table lists the 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 case the same <cause> values map to different <error_description> strings on the same product (see for instance <cause> 129 on SARA-G series), they obviously refer to different <type> values, related to CS call control or to PS session management failures.

| <cause> | <error_description> | LEON-G | SARA-G | LISA-U | SARA-U | TOBY-L2 |
|---|---|---|---|---|---|---|
| 0 | No cause information available | | | x | x | x |
| 1 | Unassigned (unallocated) number | x | x | x | x | x |
| 3 | No route to destination | x | x | x | x | x |
| 6 | Channel unacceptable | x | x | x | x | x |
| 8 | Operator determined barring | x | x | x | x | x |
| 16 | Normal call clearing | x | x | x | x | x |
| 17 | User busy | x | x | x | x | x |
| 18 | No user responding | x | x | x | x | x |
| 19 | User alerting, no answer | x | x | x | x | x |
| 21 | Call rejected | x | x | x | x | x |
| 22 | Number changed | x | x | x | x | x |
| 26 | Non selected user clearing | x | x | x | x | x |
| 27 | Destination out of order | x | x | x | x | x |
| 28 | Invalid number format (incomplete number) | x | x | x | x | x |
| 29 | Facility rejected | x | x | x | x | x |
| 30 | Response to STATUS ENQUIRY | x | x | x | x | x |
| 31 | Normal, unspecified | x | x | x | x | x |
| 34 | No circuit/channel available | x | x | x | x | x |
| 38 | Network out of order | x | x | x | x | x |
| 41 | Temporary failure | x | x | x | x | x |
| 42 | Switching equipment congestion | x | x | x | x | x |
| 43 | Access information discarded | x | x | x | x | x |
| 44 | Requested circuit/channel not available | x | x | x | x | x |
| 47 | Resources unavailable, unspecified | x | x | x | x | x |
| 49 | Quality of service unavailable | x | x | x | x | x |
| 50 | Requested facility not subscribed | x | x | x | x | x |
| 55 | Incoming calls barred within the CUG | x | x | x | x | x |
| 57 | Bearer capability not authorized | x | x | x | x | x |
| 58 | Bearer capability not presently available | x | x | x | x | x |
| 63 | Service or option not available, unspecified | x | x | x | x | x |
| 65 | Bearer service not implemented | x | x | x | x | x |
| 68 | ACM equal to or greater than ACMmax | x | x | x | x | x |
| 69 | Requested facility not implemented | x | x | x | x | x |
| 70 | Only restr. digital information bearer capability | x | x | x | x | x |
| 79 | Service or option not implemented, unspecified | x | x | x | x | x |

Objective Specification

| <cause> | <error_description> | LEON-G | SARA-G | LISA-U | SARA-U | TOBY-L2 |
|---|---|---|---|---|---|---|
| 81 | Invalid transaction identifier value | x | x | x | x | x |
| 87 | User not member of CUG | x | x | x | x | x |
| 88 | Incompatible destination | x | x | x | x | x |
| 91 | Invalid transit network selection | x | x | x | x | |
| 95 | Semantically incorrect message | x | x | x | x | x |
| 96 | Invalid mandatory information | x | x | x | x | |
| 97 | Message type non-existent or not implemented | x | x | x | x | x |
| 98 | Message type not compatible with protocol state | x | x | x | x | x |
| 99 | Information element non-existent or not implemented | x | x | x | x | x |
| 100 | Conditional IE error | x | x | x | x | x |
| 101 | Message not compatible with protocol state | x | x | x | x | x |
| 102 | Recovery on timer expiry | x | x | x | x | x |
| 102 | Unknown IMSI | | x | | | |
| 103 | Illegal MS | | x | x | x | x |
| 106 | Illegal ME | | x | x | x | x |
| 107 | GPRS service not allowed | | x | x | x | x |
| 108 | GPRS and non GPRS services not allowed | | x | | | |
| 111 | Protocol error, unspecified | x | x | x | x | x |
| 111 | PLMN not allowed | | | | | x |
| 112 | Location area not allowed | x | | x | x | x |
| 113 | Roaming not allowed in this location area | x | | x | x | x |
| 125 | LLC or SNDCP failure | | x | | | |
| 126 | Insufficient resources | | x | | | x |
| 127 | Missing or unknown APN | | x | | | x |
| 127 | Interworking, unspecified | x | x | x | x | x |
| 129 | Outgoing calls barred within CUG | x | x | | | |
| 129 | User authentication failed | | x | | | x |
| 130 | No CUG selected | x | x | | | |
| 131 | Unknown CUG index | x | x | | | x |
| 131 | Activation reject,unspecified | | x | | | |
| 132 | CUG index incompatible with requested basic service | x | x | | | |
| 132 | Service not supported | | x | x | x | |
| 133 | CUG call failure, unspecified | x | x | | | |
| 133 | Requested service option not subscribed | | x | | | |
| 133 | Service not subscribed | | | x | x | |
| 134 | CLIR not subscribed | x | x | | | |
| 134 | Service option temporarily out of order | | x | | | |
| 134 | Service option temporarily out of order | | | x | x | |
| 135 | CCBS possible | x | x | | | |
| 135 | NSAPI already used | | x | | | x |
| 136 | CCBS not possible | x | x | | | |
| 136 | Regular PDP context deactivation | | x | | | |
| 137 | QoS not accepted | | x | | | x |
| 138 | Network failure | | x | | | x |
| 148 | Unspecified GPRS error | | x | x | x | x |
| 149 | PDP authentication error | | x | x | x | x |
| 256 | Internal, unspecified | | | x | x | x |
| 257 | Out of memory | | | x | x | x |
| 258 | Invalid parameters | | | x | x | x |
| 259 | Data call active | | | x | x | |
| 260 | Speech call active | | | x | x | |
| 262 | Missing ACM information | | | x | x | |
| 263 | Temporary forbidden | | | x | x | |
| 264 | Called party is blacklisted | | | x | x | |
| 265 | Blacklist is full | | | x | x | |

Objective Specification

| <cause> | <error_description> | LEON-G | SARA-G | LISA-U | SARA-U | TOBY-L2 |
|---|---|---|---|---|---|---|
| 266 | No service | | | x | x | |
| 267 | Limited service | | | x | x | |
| 268 | Client conflict | | | x | x | |
| 269 | Dual service call active | | | x | x | |
| 271 | Unknown SIM error | | | x | x | |
| 274 | Active Client is Gone | | | x | x | |
| 277 | SIM status failure | | | x | x | |
| 278 | Rejected by call control | | | x | x | |
| 279 | FDN failed | | | x | x | |
| 280 | BDN failed | | | x | x | |
| 283 | CCBS possible | | | x | x | |
| 285 | LND overflow | | | x | x | |
| 287 | MM network failure unspecified | | | x | x | |
| 288 | MM no service | | | x | x | |
| 289 | MM access class barred | | | x | x | |
| 290 | MM RR no resource | | | x | x | |
| 291 | MM ME busy | | | x | x | |
| 292 | MM unspecified | | | x | x | |
| 301 | MMI not registered | | | x | x | |
| 303 | Rejected by user | | | x | x | |
| 304 | Rejected due to time out | | | x | x | |
| 306 | Disconnected due to SIM-Toolkit call setup | | | x | x | |
| 307 | Pending SIM-Toolkit call setup | | | x | x | |
| 310 | SIM reset | | | x | x | |
| 340 | MM sapi3 release | | | x | x | |
| 341 | MM lower layer failure | | | x | x | |
| 342 | MM authentication failure | | | x | x | |
| 343 | MM PS reject | | | x | x | |
| 344 | MM service rejected | | | x | x | |
| 345 | MM abort by network | | | x | x | |
| 346 | MM timeout | | | x | x | |
| 347 | MM detach | | | x | x | |
| 348 | MM RR connection release | | | x | x | |
| 349 | MM not registered | | | x | x | |
| 350 | MM re-establishment failure | | | x | x | |
| 351 | Failure due to handover | | | x | x | |
| 352 | Link establishment failure | | | x | x | |
| 353 | Random access failure | | | x | x | |
| 354 | Radio link aborted | | | x | x | |
| 355 | Lower layer failure in Layer 1 | | | x | x | |
| 356 | Immediate Assignment Reject | | | x | x | |
| 357 | Failure due to paging | | | x | x | |
| 358 | Abnormal release unspecified | | | x | x | |
| 359 | Abnormal release channel unacceptable | | | x | x | |
| 360 | Abnormal release timer expired | | | x | x | |
| 361 | Abnormal release no act on radio path | | | x | x | |
| 362 | Preemptive release | | | x | x | |
| 363 | UTRAN configuration unknown | | | x | x | |
| 364 | Handover impossible | | | x | x | |
| 365 | Channel mode unacceptable | | | x | x | |
| 366 | Frequency not implemented | | | x | x | |
| 367 | Originator leaving call group area | | | x | x | |
| 368 | Lower layer failure from network | | | x | x | |
| 369 | Call already cleared | | | x | x | |
| 370 | Semantically incorrect message | | | x | x | |

Objective Specification

| <cause> | <error_description> | LEON-G | SARA-G | LISA-U | SARA-U | TOBY-L2 |
|---|---|---|---|---|---|---|
| 371 | Invalid mandatory info | | | x | x | |
| 372 | Message type non existing | | | x | x | |
| 373 | Message type incompatible in state | | | x | x | |
| 374 | Conditional information element error | | | x | x | |
| 375 | No cell allocation available | | | x | x | |
| 376 | Protocol error unspecified | | | x | x | |
| 377 | Normal event | | | x | x | |
| 378 | Unspecified | | | x | x | |
| 379 | Preemptive release | | | x | x | |
| 380 | Congestion | | | x | x | |
| 381 | RE establishment reject | | | x | x | |
| 382 | Directed sig conn establishment | | | x | x | |
| 383 | User inactivity | | | x | x | |
| 384 | Lower layer failure downlink | | | x | x | |
| 385 | Lower layer failure uplink | | | x | x | |
| 386 | Cell barred due to authentication failure | | | x | x | |
| 387 | signalling connection release | | | x | x | |
| 388 | CS connection release triggered by MM | | | x | x | |
| 389 | RRC connection establishment failure | | | x | x | |
| 390 | RRC connection establishment reject with redirection | | | x | x | |
| 391 | resource conflict | | | x | x | |
| 392 | Layer 2 sequence error | | | x | x | |
| 393 | Layer 2 T200 exp N200 plus 1 times | | | x | x | |
| 394 | Layer 2 unsolicited DM resp MFES | | | x | x | |
| 395 | Layer 2 contention resolution | | | x | x | |
| 396 | Layer 2 normal cause | | | x | x | |
| 397 | RR connection release due to BAND change (2G) | | | x | x | |
| 400 | MM RR connection error while release | | | x | x | |
| 500 | Local user disconnect/normal call clearing | | | x | x | |
| 510 | Remote user or NW disconnect\normal call clearing,during any other call state than "CALL PROCEEDING" | | | x | x | |
| 511 | Remote user or NW disconnect\normal call clearing,during the call state "CALL PROCEEDING" | | | x | x | |

# A.4 Firmware install error result codes

The *+UFWINSTALL* command returns an error result code in case of syntax error and in case of some issues during the installation procedure.

## A.4.1 TOBY-L2 / MPCI-L2 error result codes

This table lists the allowed error result codes applicable to TOBY-L2 / MPCI-L2 series modules:

| Error result code | Description |
|---|---|
| md5 not matching, update failed<br>ERROR3 | The md5 calculated from the stored file is not matching with the one provided in the command. The module exits Firmware Install Mode and starts the actual FW |
| short md5, update failed<br>ERROR1 | md5 provided in the command has been detected shorter. The install is not started. The module exits Firmware Install Mode and starts the actual FW |
| long md5, update failed<br>ERROR1 | md5 provided in the command has been detected longer. The install is not started. The module exits Firmware Install Mode and starts the actual FW |
| missing md5, update failed<br>ERROR1 | md5 in missing from the issued AT command. The install is not started. The module exits Firmware Install Mode and starts the actual FW |
| md5 with no hex digits, update failed<br>ERROR1 | md5 provided in the command has been detected with at least one not hex digits. Install is not started. The module exits Firmware Install Mode and starts the actual FW |

Objective Specification

| Error result code | Description |
|---|---|
| update file not found<br>ERROR1 | Update file is not found in the specific folder. The install is not started. The module exits Firmware Install Mode and starts the actual FW |

## A.4.2 LISA-U error result codes

Syntax error resulting from the *+UFWINSTALL* command:

| Numeric code | Verbose description | Description |
|---|---|---|
| 4 | +CME ERROR: not supported | One of the following cases:<br>• wrong serial port number<br>• wrong baud rate<br>• number of parameters not allowed<br>• file name too long |
| 1624 | +CME ERROR: FFS file not found | The delta file is not stored in the module FS or the file name is wrong |

Error result codes during the install procedure resulting from the *+UFWINSTALL* command:

| Error result code | Description |
|---|---|
| 128 | General Success Code |
| 129 | General Failure Code |
| 130 | Error in a run parameter |
| 131 | Expected length error |
| 132 | Structural error |
| 133 | Signature error |
| 134 | Given RAM is not enough |
| 135 | Does not behave as RAM |
| 136 | Memory allocation failure |
| 137 | Flash writing failure |
| 138 | Flash erasing failure |
| 139 | Flash reading failure |
| 140 | One API function is not declared |
| 141 | Backup buffer(s) not sector aligned |
| 142 | Start address is not sector aligned |
| 143 | File does not exist |
| 144 | RO or no access rights |
| 145 | File does not exist |
| 146 | No access rights |
| 147 | Cannot resize file |
| 148 | Cannot read specified size |
| 149 | Cannot close file handle |
| 150 | Failed creating symbolic link |
| 151 | Failed creating directory |
| 152 | Bad operation number for update |
| 153 | Unsupported compression |
| 154 | Can not apply reverse update for delta not generated as reverse delta |
| 155 | Number of backup buffers given to UPI does not match number in delta file |
| 156 | Sector size mismatch between UPI and delta |
| 157 | UPI was not compiled to support reverse update |
| 158 | UPI was not compiled to support IFS on compressed images |
| 159 | UPI was not compiled to support IFS |
| 160 | Source mismatch in scout only operation |
| 161 | There is not enough RAM to run with operation=2 (Dry update) |
| 162 | Delta file too long - corrupted |
| 163 | Mismatch between deletes sig and delta deletes buffers signature |
| 164 | Number of fragments in section is not 1 |
| 165 | Over all number of backup sects too big |

Objective Specification

| Error result code | Description |
|---|---|
| 166 | Delta file is corrupt: signature mismatch between delta header signature and calculated signature |
| 167 | File signature does not match signature |
| 168 | Signature for the target buffer does not match the one stored in the delta file |
| 169 | Too many dirty buffers |
| 170 | UPI version mismatch between UPI and delta |
| 171 | Scout version mismatch between UPI and delta |
| 172 | Partition name is different in delta and in UPI data |
| 173 | There is not enough flash to update or install the files |
| 174 | There is not enough backup space on device |
| 175 | UPI does not support RW file system update |
| 176 | UPI does not support image update |
| 177 | Deployment Package header is invalid |
| 178 | Deployment Package signature is invalid |
| 179 | Deployment Package version is not supported |
| 180 | Requested ordinal does not exist in Deployment Package |
| 181 | Requested component was not found in Deployment Package |

# A.5 FOAT error result codes

See *+UFWUPD* command description.

## A.5.1 TOBY-L2 / MPCI-L2 error result codes

This table lists the allowed error result codes applicable to TOBY-L2 / MPCI-L2 series:

| Error result code | Description |
|---|---|
| too many errors; giving up<br>ERROR1 | General error. The operation has been interrupted before starting to write in flash, the actual FW is unchanged; the module exits Firmware Update Mode and starts the actual FW |
| bad block ones compl | Block number error |
| unexpected block no, #num, expecting #num1 | Unexpected block number |
| crc error, expected num, got num1 | crc error |
| checksum error, expected num, got num1 | checksum error |
| md5 not matching, update failed<br>ERROR3 | Download has been done correctly but the md5 calculated from the downloaded file is not matching with the one provided in the command.The module exits Firmware Update Mode and starts the actual FW |
| short md5, update failed<br>ERROR1 | md5 provided in the command has been detected shorter. The download is not started. The module exits Firmware Update Mode and starts the actual FW |
| long md5, update failed<br>ERROR1 | md5 provided in the command has been detected longer. The download is not started. The module exits Firmware Update Mode and starts the actual FW |
| md5 with no hex digits, update failed<br>ERROR1 | md5 provided in the command has been detected with at least one not hex digits.Download is not started. The module exits Firmware Update Mode and starts the actual FW |
| missing md5, update failed<br>ERROR1 | md5 in missing from provided AT command. The update is not started. The module exits Firmware Update Mode and starts the actual FW |

## A.5.2 LISA-U / SARA-U / SARA-G / LEON-G error result codes

| Error result code | 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 |

Objective Specification

| Error result code | Description |
|---|---|
| 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.6 Dynamic DNS unsolicited indication codes

| <code> | Meaning | Resulting from the following URC |
|---|---|---|
| 0 | Success | +UUDYNDNS |
| 1 | Data connection lost while performing update | +UUDYNDNS |
| 2 | Cannot update dynamic DNS because a private IP address has been assigned to the module | +UUDYNDNS |
| 3 | Connection to dynamic DNS server failed | +UUDYNDNS |
| 4 | Error occurred sending data to dynamic DNS server | +UUDYNDNS |
| 5 | Error occurred reading response from dynamic DNS server | +UUDYNDNS |
| 6 | Timeout while waiting response from dynamic DNS server | +UUDYNDNS |
| 7 | Dynamic DNS server closed connection unexpectedly | +UUDYNDNS |
| 8 | Unexpected response from dynamic DNS server | +UUDYNDNS |
| 9 | Dynamic DNS response seems to be incomplete | +UUDYNDNS |
| 10 | Update has been delayed in order to respect DNS update protocol timing specification | +UUDYNDNS |
| 40 | Dynamic DNS protocol specific: good (TZO code 200) | +UUDYNDNS |
| 41 | Dynamic DNS protocol specific: nochg (TZO code 304) | +UUDYNDNS |
| 42 | Dynamic DNS protocol specific: notfqdn | +UUDYNDNS |
| 43 | Dynamic DNS protocol specific: nohost | +UUDYNDNS |
| 44 | Dynamic DNS protocol specific: numhost | +UUDYNDNS |
| 45 | Dynamic DNS protocol specific: badauth (TZO code 401) | +UUDYNDNS |
| 46 | Dynamic DNS protocol specific: badagent (TZO code 405) | +UUDYNDNS |
| 47 | Dynamic DNS protocol specific: !donator | +UUDYNDNS |
| 48 | Dynamic DNS protocol specific: abuse | +UUDYNDNS |
| 49 | Dynamic DNS protocol specific: dnserr | +UUDYNDNS |
| 50 | Dynamic DNS protocol specific: 911 | +UUDYNDNS |
| 51 | Dynamic DNS protocol specific: badsys | +UUDYNDNS |
| 52 | Dynamic DNS protocol specific: !yours | +UUDYNDNS |
| 53 | Dynamic DNS protocol specific: TZO code 403 | +UUDYNDNS |
| 54 | Dynamic DNS protocol specific: TZO code 407 | +UUDYNDNS |
| 55 | Dynamic DNS protocol specific: TZO code 414 | +UUDYNDNS |
| 56 | Dynamic DNS protocol specific: TZO code 415 | +UUDYNDNS |
| 57 | Dynamic DNS protocol specific: TZO code 480 | +UUDYNDNS |
| 100-108 | Internal errors | +UUDYNDNS |

The meaning of dynamic DNS protocol specific codes depends on the provider used; see the provider documentation.

Errors 45, 46, 53, 54 and 56 trigger a client self deactivation when the provider is TZO.com.

Errors 42, 43, 44, 46, 48, 51 and 52 trigger a client self deactivation when the selected provider is DynDNS.org or DynDNS.it or No-IP.org or DynamicDNS.org.

## A.7 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.

| <err> | Meaning | Resulting from the following commands |
|---|---|---|
| 0 | No error | +USOCR, +USOSO, +USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI |

Objective Specification

| <err> | Meaning | Resulting from the following commands |
|---|---|---|
| 1 | EPERM - Operation not permitted (internal 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 / EAGAIN - Current operation would block, try again | +USOWR |
| 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 |
| 64 | ENONET - Machine is not on the internet | +USOCR, +USOWR, +USOST, +USORD, +USORF, +USOLI |
| 71 | EPROTO - Protocol error | +USOWR, +USOST, +USORD, +USORF |
| 77 | EBADFD - File descriptor in bad state (internal error) | +USOCR, +USOSO, +USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI |
| 78 | EREMCHG - Remote address changed | +USOWR, +USOST, +USORD, +USORF, +USOCL |
| 89 | EDESTADDRREQ - Destination address required | +USOCO, +USOST |
| 91 | EPROTOTYPE - Wrong protocol type for socket | +USOCR |
| 92 | ENOPROTOOPT - Protocol not available | +USOCR |
| 93 | EPROTONOSUPPORT - Protocol not supported | +USOCR |
| 94 | ESOCKTNNOSUPPORT - Socket type not supported | +USOCR |
| 95 | EOPNOTSUPP - Operation not supported on transport endpoint | +USOWR, +USOST, +USORD, +USORF, +USOCL |
| 96 | EPFNOSUPPORT - Protocol family not supported | +USOCR |
| 97 | EAFNOSUPPORT - Address family not supported by protocol | +USOCR |
| 98 | EADDRINUSE - Address already in use | +USOLI |
| 99 | EADDRNOTAVAIL - Cannot assign requested address | +USOCR, +USOLI, +USOCO |
| 100 | ENETDOWN - Network is down | +USOCR, +USOLI, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOCL |
| 101 | ENETUNREACH - Network is unreachable | +USOCO, +USOST, +USORF |
| 102 | ENETRESET - Network dropped connection because of reset | +USOCR, +USOLI, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOCL |
| 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 |
| 106 | EISCONN - Transport endpoint is already connected | +USOCO |
| 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 |
| 111 | ECONNREFUSED - Connection refused | +USOCO |
| 112 | EHOSTDOWN - Host is down | +USOCL, +USOCO, +USOWR, +USOST, +USORD, +USORF |
| 113 | EHOSTUNREACH - No route to host | +USOCO, +USOWR, +USOST, +USORD, +USORF |

Objective Specification

| <err> | Meaning | Resulting from the following commands |
|---|---|---|
| 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.8 Internet suite error classes

The following table lists all allowed error classes that can be provided by the <error_class> parameter for each AT error command (*+UFTPER*, *+UHTTPER*, *+USMTPER*) for FTP, HTTP and SMTP.

| <error_class> | Meaning | <error_codes> | Resulting from the following commands |
|---|---|---|---|
| 0 | OK, no error occurred | | All |
| 1 | FTP Protocol error class | See the *Appendix A.8.1* | +UFTPC, +UFTP, +UFTPER |
| 2 | SMTP Protocol error class | See the *Appendix A.8.3* | +USMTP, +USMTPM, +USMTPC, +USMTPER |
| 3 | HTTP Protocol error class | See the *Appendix A.8.2* | +UHTTP, +UHTTPC, +UHTTPER |
| 4 | Flash File System error class | See the *Appendix A.8.4* | +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) | See the *Appendix A.8.1* | +UFTPC, +UFTP, +UFTPER |
| 9 | Wrong SMTP API usage (e.g. missing/null parameters) | See the *Appendix A.8.3* | +USMTP, +USMTPM, +USMTPC, +USMTPER |
| 10 | Wrong HTTP API usage (e.g. missing/null parameters) | See the *Appendix A.8.2* | +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.8.1 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.

| <err> | Meaning | Resulting from the following commands |
|---|---|---|
| 0 | No error | +UFTPC, +UFTP |
| 1 | User missing | +UFTPC |
| 2 | Password missing | +UFTPC |

Objective Specification

| <err> | Meaning | Resulting from the following commands |
|---|---|---|
| 3 | Account missing | +UFTPC |
| 4 | Server missing | +UFTPC |
| 5 | Directory name missing | +UFTPC |
| 6 | File name missing | +UFTPC |
| 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 |
| 13 | No memory available for allocation | +UFTPC, +UFTP |
| 14 | Reserved internal code | +UFTPC, +UFTP |
| 15 | Length of given web server (address or hostname) too long or too short | +UFTPC, +UFTP |
| 16 | Hostname of given web server invalid | +UFTPC, +UFTP |
| 17 | Address of given web server is invalid | +UFTPC, +UFTP |
| 18 | Username too long or too short | +UFTPC, +UFTP |
| 19 | Password too long or too short | +UFTPC, +UFTP |
| 20 | Account too long or too short | +UFTPC, +UFTP |
| 21 | Operation not allowed because FTP client is busy | +UFTPC |
| 22 | Not possible to connect to FTP server | +UFTPC |
| 23 | Error occurred in FTP request | +UFTPC |
| 24 | Reserved internal code | +UFTPC, +UFTP |
| 25 | FFS filename pointer is null or its length is 0 | +UFTPC |
| 26-30 | Reserved internal code | +UFTPC, +UFTP |
| 31 | Timeout elapsed while performing requested operation | +UFTPC |
| 32 | Internal processing error | +UFTPC, +UFTP |
| 33 | Not logged in | +UFTPC |
| 34 | Login incorrect | +UFTPC |
| 35 | File unavailable (not found or no access) | +UFTPC |
| 36 | File not ready | +UFTPC |
| 37 | Filename not allowed | +UFTPC |
| 38 | Folder not found | +UFTPC |
| 39 | Folder no access | +UFTPC |
| 40 | Operation aborted by user | +UFTPC |
| 41 | Permission denied | +UFTPC |
| 42 | Cannot open FTP data channel | +UFTPC |
| 43 | Socket invalid parameter | +UFTPC |
| 44 | Invalid socket | +UFTPC |
| 45 | No socket available | +UFTPC |
| 46 | Cannot create socket | +UFTPC |
| 47 | Cannot bind socket to network interface | +UFTPC |
| 48 | Cannot resolve hostname | +UFTPC |
| 49 | Cannot connect socket | +UFTPC |
| 50 | Cannot get socket name | +UFTPC |
| 51 | Cannot bind socket to port | +UFTPC |
| 52 | Socket cannot listen | +UFTPC |
| 53 | Soclet cannot accept | +UFTPC |
| 54 | Socket would block | +UFTPC |
| 55 | Socket cannot write | +UFTPC |
| 56 | Socket cannot read | +UFTPC |
| 57 | Reserved internal code | +UFTPC |
| 58 | No socket data to send | +UFTPC |
| 59 | Socket cannot get available data | +UFTPC |
| 60 | No socket data to read | +UFTPC |
| 61 | Socket no response code found | +UFTPC |

Objective Specification

| <err> | Meaning | Resulting from the following commands |
|---|---|---|
| 62 | Socket not connected | +UFTPC |
| 63 | Cannot set secure socket | +UFTPC |
| 64 | Socket cannot decode password | +UFTPC |
| 65 | Socket cannot get size | +UFTPC |
| 66 | FFS Invalid parameter | +UFTPC |
| 67 | FFS invalid handle | +UFTPC |
| 68 | FFS cannot open file | +UFTPC |
| 69 | FFS cannot seek file | +UFTPC |
| 70 | FFS cannot get file size | +UFTPC |
| 71 | FFS cannot read | +UFTPC |
| 72 | FFS bad offset | +UFTPC |
| 73 | FFS cannot write | +UFTPC |
| 74 | Direct link internal error | +UFTPC |
| 75 | Failed to open extended passive mode | +UFTPC |
| 76 | Failed to parse extended passive mode server reply | +UFTPC |
| 77 | Internal error | +UFTPC |
| 78 | Client IP protocol not supported - try passive mode | +UFTPC |
| 79 | Data transfer error. The transferred (received/sent) data is not complete | +UFTPC |
| 226 | Closing data connection; requested file action successful (for example, file transfer or file abort) | +UFTPC |
| 250 | Requested file action okay, completed | +UFTPC |
| 350 | Requested file action pending further information | +UFTPC |
| 421 | Service not available, closing control connection.<br>User limit reached<br>Not authorized to make the connection<br>Maximum connections reached<br>Maximum 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 cancelled, 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. Filename not allowed | +UFTPC |

For all the errors not listed in the table see the RFC 959 [75].

## A.8.2 HTTP class error codes

The following table lists the available values of <error_code> parameter of the last HTTP operation provided through *+UHTTPER* AT command if <error_class>=3 or 10.

| <err> | Meaning | Resulting from the following commands |
|---|---|---|
| 0 | No error | +UHTTP, +UHTTPC |
| 1 | Invalid profile ID | +UHTTP, +UHTTPC |

Objective Specification

| <err> | Meaning | Resulting from the following commands |
|---|---|---|
| 2 | Invalid input | +UHTTP, +UHTTPC |
| 3 | Server hostname too long | +UHTTP |
| 4 | Invalid server hostname | +UHTTP |
| 5 | Invalid server IP address | +UHTTP |
| 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 |
| 23 | Server or proxy hostname lookup failed | +UHTTPC |
| 24 | User authentication failed on server | +UHTTPC |
| 25 | User authentication failed on proxy | +UHTTPC |
| 26 | Connection timed out | +UHTTPC |
| 27 | Request prepare timeout expired | +UHTTPC |
| 28 | Response receive timeout expired | +UHTTPC |
| 29 | Request send timeout expired | +UHTTPC |
| 30 | HTTP operation in progress | +UHTTPC |
| 31 | Invalid HTTP parameter TCP port not in range (1-65535) | +UHTTPC |
| 32 | Invalid HTTP parameter secure | +UHTTPC |
| 33 | Invalid HTTP parameter authentication username | +UHTTPC |
| 34 | Invalid HTTP parameter authentication password | +UHTTPC |
| 35 | Invalid HTTP parameter output filename | +UHTTPC |
| 36 | Invalid HTTP parameter output filename length | +UHTTPC |
| 37 | Invalid HTTP parameter server path | +UHTTPC |
| 38 | Invalid HTTP parameter server path length | +UHTTPC |
| 39 | Invalid HTTP parameter content filename length | +UHTTPC |
| 40 | Invalid custom content type string | +UHTTPC |
| 41 | Output file open error | +UHTTPC |
| 42 | Output file close error | +UHTTPC |
| 43 | Output file write error | +UHTTPC |
| 44 | Connection lost | +UHTTPC |
| 45 | Operation not allowed in current state | +UHTTPC |
| 46 | Internal error | +UHTTPC |
| 47 | Internal error | +UHTTPC |
| 48 | Internal error | +UHTTPC |
| 49 | Internal error | +UHTTPC |
| 50 | Internal error | +UHTTPC |
| 51 | Internal error | +UHTTPC |
| 52 | Internal error | +UHTTPC |
| 53 | Internal error | +UHTTPC |
| 54 | Internal error | +UHTTPC |
| 55 | Internal error | +UHTTPC |
| 56 | Internal error | +UHTTPC |

Objective Specification

| <err> | Meaning | Resulting from the following commands |
|---|---|---|
| 57 | Internal error | +UHTTPC |
| 58 | Internal error | +UHTTPC |
| 59 | Internal error | +UHTTPC |
| 60 | Internal error | +UHTTPC |
| 61 | Internal error | +UHTTPC |
| 62 | Internal error | +UHTTPC |
| 63 | Internal error | +UHTTPC |
| 64 | Internal error | +UHTTPC |
| 65 | Internal error | +UHTTPC |
| 66 | Internal error | +UHTTPC |
| 67 | Internal error | +UHTTPC |
| 68 | Internal error | +UHTTPC |
| 69 | Internal error | +UHTTPC |
| 70 | Internal error | +UHTTPC |
| 71 | Internal error | +UHTTPC |
| 72 | Internal error | +UHTTPC |
| 73 | Secure socket connect error | +UHTTPC |

### A.8.3 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>=2 or 9.

| <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.8.4 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* and *+USMTPER* AT commands if the <error_class> is 4 "Flash File System error class".

| <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 |

Objective Specification

| <err> | Meaning | Resulting from the following commands |
|---|---|---|
| 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.9 IP change notification error result codes

| <code> | Meaning | Resulting from the following URC |
|---|---|---|
| 0 | The IP CN feature was enabled from a previous working session and is active | +UUIPCHGN |
| 10 | Internal PSD data connection is not active | +UUIPCHGN |
| 11 | Invalid IP address assigned to module (e.g. empty string) | +UUIPCHGN |
| 12 | IMEI could not be retrieved | +UUIPCHGN |
| 13 | IMSI could not be retrieved | +UUIPCHGN |
| 14 | Error preparing HTTP GET request for IP CN | +UUIPCHGN |
| 15 | Error creating socket for HTTP connection | +UUIPCHGN |
| 16 | Error connecting to remote HTTP server | +UUIPCHGN |
| 17 | Error sending HTTP GET request to HTTP server | +UUIPCHGN |
| 18 | Error receiving or parsing HTTP GET response from HTTP server | +UUIPCHGN |

## A.10 Ping error result codes

The following table lists the available values of <error_code> parameter of the last ping operation provided through +UUPINGER unsolicited indication (for more details see the *AT+UPING* command description).

| <err> | Meaning | Resulting from the following commands |
|---|---|---|
| 0 | Success (no error) | +UPING |
| 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 |

Objective Specification

| <err> | Meaning | Resulting from the following commands |
|---|---|---|
| 109 | Read for ICMP packet failed | +UPING |
| 110 | Received unexpected ICMP packet | +UPING |
| 111-115 | Internal error (socket level) | +UPING |

## A.11 Mobile termination error result codes

The command *+CMOLRE* (see subclause 9.1a of 3GPP TS 27.007 [2]) configures the <err> parameter in numeric or verbose format.

| Numeric code | Verbose description | Resulting from the following commands |
|---|---|---|
| 0 | Method not supported | +CMOLRE |
| 1 | Additional assistance data required | +CMOLRE |
| 2 | Not enough satellites | +CMOLRE |
| 3 | UE busy[7] | +CMOLRE |
| 4 | Network error | +CMOLRE |
| 5 | Failed to open internet connection, too many connections[8] | +CMOLRE |
| 6 | Failed to open internet connection, too many users[8] | +CMOLRE |
| 7 | Failure due to handover | +CMOLRE |
| 8 | Internet connection failure[8] | +CMOLRE |
| 9 | Memory error | +CMOLRE |
| 10 | Timeout | +CMOLRE |
| 255 | Unknown error | +CMOLRE |

Objective Specification

[7] There is already one ongoing positioning session and the UE does not support multiple simultaneous sessions

[8] Only applicable to SUPL-based transactions. Currently SUPL is not supported

# B Appendix: AT Commands List

| AT command | | Audio interface and tuning | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | +UAPT | +UDBF | +UDCONF=30 | +UDCONF=31 | +UDTMFD | +UEXTDCONF | +UHFP | +UI2S | +UMCLK | +UMGC | +UMSM | +UPAR | +UPLAYFILE | +URECFILE | +URNG | +USAR | +USGC | +USPM | +USTN |
| LEON | G100-06S | | • | | | | | • | • | | • | • | • | • | | • | • | • | • | • |
| | G100-07S / G100-08S | | • | • | | • | | • | • | | • | • | • | • | | • | • | • | • | • |
| SARA | G300-00S / G310-00S | | | | | | | | | | | | | | | | | | | |
| | G340-00S / G350-00S | | • | • | | • | | • | • | | • | • | • | • | | • | • | • | • | • |
| | G350-00X | | • | • | | • | | • | • | | • | • | • | • | | • | • | • | • | • |
| | G340-01S / G350-01S<br>G350-01B | | • | • | | • | | • | • | | • | • | • | • | | • | • | • | • | • |
| | G340-02S / G350-02S<br>G350-02A | | • | • | • | • | | • | • | | • | • | • | • | | • | • | • | • | • |
| | U201-03A / U201-03B<br>U201-03X | | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • |
| | U260-00S / U280-00S | | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • |
| | U270-00S / U270-00X | | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • |
| | U260-03S / U280-03S | | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • |
| | U270-03S | | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • |
| | U270-53S | | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • |
| LISA | U100 / U110 | | | | | | | | | | | | | | | | | | | |
| | U120 / U130 | | • | | | | | • | • | | • | • | • | • | | • | • | • | • | • |
| | U200-00S | | | | | | | | | • | | | | | | | | | | |
| | U200-01S / U260-01S<br>U270-01S | | • | • | • | | • | • | • | • | • | • | • | • | | • | • | • | • | • |
| | U230-01S | | • | • | • | | • | • | • | • | • | • | • | • | | • | • | • | • | • |
| | U200-02S / U260-02S<br>U270-02S | | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • |
| | U200-52S | | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • |
| | U200-62S | | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • |
| | U200-82S | | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • |
| | U270-62S / U270-63S<br>U270-68S | | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • |
| | U200-03S / U201-03S<br>U201-03A | | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • |
| | U200-83S / U201-83S | | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • |
| TOBY | L200-00S / L210-00S | | | | | | | | | | | | | | | | | | | |
| | L200-02S / L210-02S | • | | • | • | • | • | | • | • | | • | • | • | • | | • | | • | |
| | L201-01S | | | | | | | | | | | | | | | | | | | |
| | L210-60S / L280-00S | | | | | | | | | | | | | | | | | | | |
| | L210-62S | • | | • | • | • | • | | • | • | | • | • | • | • | | • | | • | |
| | L280-02S | • | | • | • | • | • | | • | • | | • | • | • | • | | • | | • | |
| | L220-02S | • | | • | • | • | • | | • | • | | • | • | • | • | | • | | • | |
| MPCI | L200-00S / L210-00S | | | | | | | | | | | | | | | | | | | |
| | L201-01S | | | | | | | | | | | | | | | | | | | |
| | L210-60S | | | | | | | | | | | | | | | | | | | |
| | L200-02S / L210-02S | | | | | • | | | | | | | | | | | | | | |
| | L280-02S | | | | | • | | | | | | | | | | | | | | |

Objective Specification

| AT command | | Audio interface and tuning | | | |
|---|---|---|---|---|---|
| | | +USTOPFILE | +UTGN | +UUBF | +UVGC |
| LEON | G100-06S | • | • | • | |
| | G100-07S / G100-08S | • | • | • | |
| SARA | G300-00S / G310-00S | | | | |
| | G340-00S / G350-00S | • | • | • | |
| | G350-00X | • | • | • | |
| | G340-01S / G350-01S<br>G350-01B | • | • | • | |
| | G340-02S / G350-02S<br>G350-02A | • | • | • | |
| | U201-03A / U201-03B<br>U201-03X | • | • | • | |
| | U260-00S / U280-00S | • | • | • | |
| | U270-00S / U270-00X | • | • | • | |
| | U260-03S / U280-03S | • | • | • | |
| | U270-03S | • | • | • | |
| | U270-53S | • | • | • | |
| LISA | U100 / U110 | | | | |
| | U120 / U130 | • | • | • | |
| | U200-00S | | | | |
| | U200-01S / U260-01S<br>U270-01S | • | • | • | |
| | U230-01S | • | • | • | |
| | U200-02S / U260-02S<br>U270-02S | • | • | • | |
| | U200-52S | • | • | • | |
| | U200-62S | • | • | • | |
| | U200-82S | • | • | • | |
| | U270-62S / U270-63S<br>U270-68S | • | • | • | |
| | U200-03S / U201-03S<br>U201-03A | • | • | • | |
| | U200-83S / U201-83S | • | • | • | |
| TOBY | L200-00S / L210-00S | | | | |
| | L200-02S / L210-02S | • | • | | • |
| | L201-01S | | | | |
| | L210-60S / L280-00S | | | | |
| | L210-62S | • | • | | • |
| | L280-02S | • | • | | • |
| | L220-02S | • | • | | • |
| MPCI | L200-00S / L210-00S | | | | |
| | L201-01S | | | | |
| | L210-60S | | | | |
| | L200-02S / L210-02S | | | | |
| | L280-02S | | | | |

Objective Specification

| AT command | | Call control | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | +CHUP | +CMOD | +CSNS | +CSTA | +CSVM | +CVMOD | +UCALLSTAT | +UEMC | +UEMN | +UPROGRESS | +UVTS | +VTD | +VTS | A | D | D> | DL | L | M | P | S0 | T |
| LEON | G100-06S | • | • | • | • | | | • | | | | | • | • | • | • | • | • | • | • | • | • | • |
| | G100-07S / G100-08S | • | • | • | • | | | • | | | | | • | • | • | • | • | • | • | • | • | • | • |
| SARA | G300-00S / G310-00S | • | • | • | • | | | • | | | | | | | • | • | | | | | | • | |
| | G340-00S / G350-00S | • | • | • | • | | | • | | | | | • | • | • | • | • | • | • | • | • | • | • |
| | G350-00X | • | • | • | • | | | • | | | | | • | • | • | • | • | • | • | • | • | • | • |
| | G340-01S / G350-01S G350-01B | • | • | • | • | | | • | | | | | • | • | • | • | • | • | • | • | • | • | • |
| | G340-02S / G350-02S G350-02A | • | • | • | • | | | • | | | | | • | • | • | • | • | • | • | • | • | • | • |
| | U201-03A / U201-03B U201-03X | • | • | • | • | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | U260-00S / U280-00S | • | • | • | • | • | | • | | | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | U270-00S / U270-00X | • | • | • | • | • | | • | | | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | U260-03S / U280-03S | • | • | • | • | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | U270-03S | • | • | • | • | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | U270-53S | • | • | • | • | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| LISA | U100 / U110 | • | • | • | • | • | | • | | | • | | | | • | • | • | • | • | • | • | • | • |
| | U120 / U130 | • | • | • | • | • | | • | | | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | U200-00S | • | • | • | • | • | | • | | | • | • | | | • | • | • | • | • | • | • | • | • |
| | U200-01S / U260-01S U270-01S | • | • | • | • | • | | • | | | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | U230-01S | • | • | • | • | • | | • | | | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | U200-02S / U260-02S U270-02S | • | • | • | • | • | | • | | | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | U200-52S | • | • | • | • | • | | • | | | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | U200-62S | • | • | • | • | • | | • | | | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | U200-82S | • | • | • | • | • | | • | | | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | U270-62S / U270-63S U270-68S | • | • | • | • | • | | • | | | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | U200-03S / U201-03S U201-03A | • | • | • | • | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | U200-83S / U201-83S | • | • | • | • | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| TOBY | L200-00S / L210-00S | • | • | | • | | | | | | | | | | • | • | | | | | | • | |
| | L200-02S / L210-02S | • | • | | • | • | | • | | | • | • | • | • | • | • | | | • | • | • | • | • |
| | L201-01S | • | • | | • | | | • | | | | | | | • | • | | | | | | • | |
| | L210-60S / L280-00S | • | • | | • | | | • | | | | | | | • | • | | | | | | • | |
| | L210-62S | • | • | | • | • | • | • | | | • | • | • | • | • | • | | | • | • | • | • | • |
| | L280-02S | • | • | | • | • | | • | | | • | • | • | • | • | • | | | • | • | • | • | • |
| | L220-02S | • | • | | • | • | | • | | | • | • | • | • | • | • | | | • | • | • | • | • |
| MPCI | L200-00S / L210-00S | • | • | | • | | | • | | | | | | | • | • | | | | | | • | |
| | L201-01S | • | • | | • | | | • | | | | | | | • | • | | | | | | • | |
| | L210-60S | • | • | | • | | | • | | | | | | | • | • | | | | | | • | |
| | L200-02S / L210-02S | • | • | | • | • | | • | | | • | • | • | • | • | • | | | • | • | • | • | • |
| | L280-02S | • | • | | • | • | | • | | | • | • | • | • | • | • | | | • | • | • | • | • |

Objective Specification

| AT command | | Circuit switched data services | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | +CBST | +CR | +CRC | +CRLP | +FCLASS | +UCSD | +UCSDA | +UCSND | +UDCONF=32 |
| LEON | G100-06S | • | • | • | • | • | • | • | • | |
| | G100-07S / G100-08S | • | • | • | • | • | • | • | • | |
| SARA | G300-00S / G310-00S | • | • | • | • | • | | | | |
| | G340-00S / G350-00S | • | • | • | • | • | • | • | • | |
| | G350-00X | • | • | • | • | • | • | • | • | |
| | G340-01S / G350-01S G350-01B | • | • | • | • | • | • | • | • | |
| | G340-02S / G350-02S G350-02A | • | • | • | • | • | • | • | • | |
| | U201-03A / U201-03B U201-03X | • | • | • | • | • | | | | • |
| | U260-00S / U280-00S | • | • | • | • | • | | | | • |
| | U270-00S / U270-00X | • | • | • | • | • | | | | • |
| | U260-03S / U280-03S | • | • | • | • | • | | | | • |
| | U270-03S | • | • | • | • | • | | | | • |
| | U270-53S | • | • | • | • | • | | | | • |
| LISA | U100 / U110 | • | • | • | • | • | | | | |
| | U120 / U130 | • | • | • | • | • | | | | |
| | U200-00S | • | • | • | • | • | | | | |
| | U200-01S / U260-01S U270-01S | • | • | • | • | • | | | | • |
| | U230-01S | • | • | • | • | • | | | | • |
| | U200-02S / U260-02S U270-02S | • | • | • | • | • | | | | • |
| | U200-52S | • | • | • | • | • | | | | • |
| | U200-62S | • | • | • | • | • | | | | • |
| | U200-82S | • | • | • | • | • | | | | • |
| | U270-62S / U270-63S U270-68S | • | • | • | • | • | | | | • |
| | U200-03S / U201-03S U201-03A | • | • | • | • | • | | | | • |
| | U200-83S / U201-83S | • | • | • | • | • | | | | • |
| TOBY | L200-00S / L210-00S | | | • | | • | | | | |
| | L200-02S / L210-02S | | | • | | • | | | | |
| | L201-01S | | | • | | • | | | | |
| | L210-60S / L280-00S | | | • | | • | | | | |
| | L210-62S | | | • | | • | | | | |
| | L280-02S | | | • | | • | | | | |
| | L220-02S | | | • | | • | | | | |
| MPCI | L200-00S / L210-00S | | | • | | • | | | | |
| | L201-01S | | | • | | • | | | | |
| | L210-60S | | | • | | • | | | | |
| | L200-02S / L210-02S | | | • | | • | | | | |
| | L280-02S | | | • | | • | | | | |

Objective Specification

| AT command | | eCall | | | | | |
|---|---|---|---|---|---|---|---|
| | | +CECALL | +UDCONF=90 | +UECALLDATA | +UECALLSTAT | +UECALLTYPE | +UECALLVOICE |
| LEON | G100-06S | • | | | | | |
| | G100-07S / G100-08S | • | • | • | • | • | • |
| SARA | G300-00S / G310-00S | | | | | | |
| | G340-00S / G350-00S | | | • | • | • | • |
| | G350-00X | | | • | • | • | • |
| | G340-01S / G350-01S<br>G350-01B | | | • | • | • | • |
| | G340-02S / G350-02S<br>G350-02A | • | • | • | • | • | • |
| | U201-03A / U201-03B<br>U201-03X | • | • | • | • | • | • |
| | U260-00S / U280-00S | | | | | | |
| | U270-00S / U270-00X | • | • | • | • | • | • |
| | U260-03S / U280-03S | | | | | | |
| | U270-03S | • | • | • | • | • | • |
| | U270-53S | • | • | • | • | • | • |
| LISA | U100 / U110 | | | | | | |
| | U120 / U130 | | | | • | • | |
| | U200-00S | | | | | | |
| | U200-01S / U260-01S<br>U270-01S | | | | | | |
| | U230-01S | | | | | | |
| | U200-02S / U260-02S<br>U270-02S | | | • | • | • | • |
| | U200-52S | | | • | • | • | • |
| | U200-62S | | | • | • | • | • |
| | U200-82S | | | • | • | • | • |
| | U270-62S / U270-63S<br>U270-68S | | | • | • | • | • |
| | U200-03S / U201-03S<br>U201-03A | • | • | • | • | • | • |
| | U200-83S / U201-83S | • | • | • | • | • | • |
| TOBY | L200-00S / L210-00S | | | | | | |
| | L200-02S / L210-02S | | | | | | |
| | L201-01S | | | | | | |
| | L210-60S / L280-00S | | | | | | |
| | L210-62S | | | | | | |
| | L280-02S | | | | | | |
| | L220-02S | | | | | | |
| MPCI | L200-00S / L210-00S | | | | | | |
| | L201-01S | | | | | | |
| | L210-60S | | | | | | |
| | L200-02S / L210-02S | | | | | | |
| | L280-02S | | | | | | |

Objective Specification

| AT command | | FAX class 2 | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | +FAA | +FAP | +FBO | +FBS | +FBU | +FCC | +FCQ | +FCR | +FCS | +FCT | +FDR | +FDT | +FEA | +FFC | +FFD | +FHS | +FIE | +FIP | +FIS | +FIT | +FK | +FLI | +FLO | +FLP | +FMI |
| LEON | G100-06S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | G100-07S / G100-08S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| SARA | G300-00S / G310-00S | | | | | | | | | | | | | | | | | | | | | | | | | |
| | G340-00S / G350-00S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | G350-00X | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | G340-01S / G350-01S G350-01B | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | G340-02S / G350-02S G350-02A | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | U201-03A / U201-03B U201-03X | | | | | | | | | | | | | | | | | | | | | | | | | |
| | U260-00S / U280-00S | | | | | | | | | | | | | | | | | | | | | | | | | |
| | U270-00S / U270-00X | | | | | | | | | | | | | | | | | | | | | | | | | |
| | U260-03S / U280-03S | | | | | | | | | | | | | | | | | | | | | | | | | |
| | U270-03S | | | | | | | | | | | | | | | | | | | | | | | | | |
| | U270-53S | | | | | | | | | | | | | | | | | | | | | | | | | |
| LISA | U100 / U110 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | U120 / U130 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | U200-00S | | | | | | | | | | | | | | | | | | | | | | | | | |
| | U200-01S / U260-01S U270-01S | | | | | | | | | | | | | | | | | | | | | | | | | |
| | U230-01S | | | | | | | | | | | | | | | | | | | | | | | | | |
| | U200-02S / U260-02S U270-02S | | | | | | | | | | | | | | | | | | | | | | | | | |
| | U200-52S | | | | | | | | | | | | | | | | | | | | | | | | | |
| | U200-62S | | | | | | | | | | | | | | | | | | | | | | | | | |
| | U200-82S | | | | | | | | | | | | | | | | | | | | | | | | | |
| | U270-62S / U270-63S U270-68S | | | | | | | | | | | | | | | | | | | | | | | | | |
| | U200-03S / U201-03S U201-03A | | | | | | | | | | | | | | | | | | | | | | | | | |
| | U200-83S / U201-83S | | | | | | | | | | | | | | | | | | | | | | | | | |
| TOBY | L200-00S / L210-00S | | | | | | | | | | | | | | | | | | | | | | | | | |
| | L200-02S / L210-02S | | | | | | | | | | | | | | | | | | | | | | | | | |
| | L201-01S | | | | | | | | | | | | | | | | | | | | | | | | | |
| | L210-60S / L280-00S | | | | | | | | | | | | | | | | | | | | | | | | | |
| | L210-62S | | | | | | | | | | | | | | | | | | | | | | | | | |
| | L280-02S | | | | | | | | | | | | | | | | | | | | | | | | | |
| | L220-02S | | | | | | | | | | | | | | | | | | | | | | | | | |
| MPCI | L200-00S / L210-00S | | | | | | | | | | | | | | | | | | | | | | | | | |
| | L201-01S | | | | | | | | | | | | | | | | | | | | | | | | | |
| | L210-60S | | | | | | | | | | | | | | | | | | | | | | | | | |
| | L200-02S / L210-02S | | | | | | | | | | | | | | | | | | | | | | | | | |
| | L280-02S | | | | | | | | | | | | | | | | | | | | | | | | | |

Objective Specification

| AT command | | FAX class 2 | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | +FMM | +FMR | +FMS | +FND | +FNR | +FNS | +FPA | +FPI | +FPP | +FPS | +FPW | +FRQ | +FRY | +FSA | +FSP |
| LEON | G100-06S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | G100-07S / G100-08S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| SARA | G300-00S / G310-00S | | | | | | | | | | | | | | | |
| | G340-00S / G350-00S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | G350-00X | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | G340-01S / G350-01S<br>G350-01B | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | G340-02S / G350-02S<br>G350-02A | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | U201-03A / U201-03B<br>U201-03X | | | | | | | | | | | | | | | |
| | U260-00S / U280-00S | | | | | | | | | | | | | | | |
| | U270-00S / U270-00X | | | | | | | | | | | | | | | |
| | U260-03S / U280-03S | | | | | | | | | | | | | | | |
| | U270-03S | | | | | | | | | | | | | | | |
| | U270-53S | | | | | | | | | | | | | | | |
| LISA | U100 / U110 | | | | | | | | | | | | | | | |
| | U120 / U130 | | | | | | | | | | | | | | | |
| | U200-00S | | | | | | | | | | | | | | | |
| | U200-01S / U260-01S<br>U270-01S | | | | | | | | | | | | | | | |
| | U230-01S | | | | | | | | | | | | | | | |
| | U200-02S / U260-02S<br>U270-02S | | | | | | | | | | | | | | | |
| | U200-52S | | | | | | | | | | | | | | | |
| | U200-62S | | | | | | | | | | | | | | | |
| | U200-82S | | | | | | | | | | | | | | | |
| | U270-62S / U270-63S<br>U270-68S | | | | | | | | | | | | | | | |
| | U200-03S / U201-03S<br>U201-03A | | | | | | | | | | | | | | | |
| | U200-83S / U201-83S | | | | | | | | | | | | | | | |
| TOBY | L200-00S / L210-00S | | | | | | | | | | | | | | | |
| | L200-02S / L210-02S | | | | | | | | | | | | | | | |
| | L201-01S | | | | | | | | | | | | | | | |
| | L210-60S / L280-00S | | | | | | | | | | | | | | | |
| | L210-62S | | | | | | | | | | | | | | | |
| | L280-02S | | | | | | | | | | | | | | | |
| | L220-02S | | | | | | | | | | | | | | | |
| MPCI | L200-00S / L210-00S | | | | | | | | | | | | | | | |
| | L201-01S | | | | | | | | | | | | | | | |
| | L210-60S | | | | | | | | | | | | | | | |
| | L200-02S / L210-02S | | | | | | | | | | | | | | | |
| | L280-02S | | | | | | | | | | | | | | | |

Objective Specification

| AT command | | File System | | | | |
|---|---|---|---|---|---|---|
| | | +UDELFILE | +UDWNFILE | +ULSTFILE | +URDBLOCK | +URDFILE |
| LEON | G100-06S | • | • | • | • | • |
| | G100-07S / G100-08S | • | • | • | • | • |
| SARA | G300-00S / G310-00S | | | | | |
| | G340-00S / G350-00S | • | • | • | • | • |
| | G350-00X | • | • | • | • | • |
| | G340-01S / G350-01S<br>G350-01B | • | • | • | • | • |
| | G340-02S / G350-02S<br>G350-02A | • | • | • | • | • |
| | U201-03A / U201-03B<br>U201-03X | • | • | • | • | • |
| | U260-00S / U280-00S | • | • | • | • | • |
| | U270-00S / U270-00X | • | • | • | • | • |
| | U260-03S / U280-03S | • | • | • | • | • |
| | U270-03S | • | • | • | • | • |
| | U270-53S | • | • | • | • | • |
| LISA | U100 / U110 | • | • | • | | • |
| | U120 / U130 | • | • | • | | • |
| | U200-00S | • | • | • | | • |
| | U200-01S / U260-01S<br>U270-01S | • | • | • | | • |
| | U230-01S | • | • | • | | • |
| | U200-02S / U260-02S<br>U270-02S | • | • | • | • | • |
| | U200-52S | • | • | • | • | • |
| | U200-62S | • | • | • | • | • |
| | U200-82S | • | • | • | • | • |
| | U270-62S / U270-63S<br>U270-68S | • | • | • | • | • |
| | U200-03S / U201-03S<br>U201-03A | • | • | • | • | • |
| | U200-83S / U201-83S | • | • | • | • | • |
| TOBY | L200-00S / L210-00S | | | | | |
| | L200-02S / L210-02S | • | • | • | • | • |
| | L201-01S | • | • | • | • | • |
| | L210-60S / L280-00S | | | | | |
| | L210-62S | • | • | • | • | • |
| | L280-02S | • | • | • | • | • |
| | L220-02S | • | • | • | • | • |
| MPCI | L200-00S / L210-00S | | | | | |
| | L201-01S | • | • | • | • | • |
| | L210-60S | | | | | |
| | L200-02S / L210-02S | • | • | • | • | • |
| | L280-02S | • | • | • | • | • |

Objective Specification

| AT command | | General commands | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | &H | +CCID | +CGMI | +CGMM | +CGMR | +CGSN | +CIMI | +CLAC | +CSCS | +GCAP | +GMI | +GMM | +GMR | +GSN | +UFGI | A/ | I |
| LEON | G100-06S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • |
| | G100-07S / G100-08S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • |
| SARA | G300-00S / G310-00S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • |
| | G340-00S / G350-00S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • |
| | G350-00X | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • |
| | G340-01S / G350-01S G350-01B | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • |
| | G340-02S / G350-02S G350-02A | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • |
| | U201-03A / U201-03B U201-03X | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • |
| | U260-00S / U280-00S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • |
| | U270-00S / U270-00X | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • |
| | U260-03S / U280-03S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • |
| | U270-03S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • |
| | U270-53S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • |
| LISA | U100 / U110 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • |
| | U120 / U130 | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • |
| | U200-00S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • |
| | U200-01S / U260-01S U270-01S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • |
| | U230-01S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • |
| | U200-02S / U260-02S U270-02S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • |
| | U200-52S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • |
| | U200-62S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • |
| | U200-82S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • |
| | U270-62S / U270-63S U270-68S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • |
| | U200-03S / U201-03S U201-03A | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • |
| | U200-83S / U201-83S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • |
| TOBY | L200-00S / L210-00S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • |
| | L200-02S / L210-02S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | L201-01S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • |
| | L210-60S / L280-00S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • |
| | L210-62S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | L280-02S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | L220-02S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| MPCI | L200-00S / L210-00S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • |
| | L201-01S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • |
| | L210-60S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • |
| | L200-02S / L210-02S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | L280-02S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |

Objective Specification

| AT command | | GPIO interface | | |
|---|---|---|---|---|
| | | +UGPIOC | +UGPIOR | +UGPIOW |
| LEON | G100-06S | • | • | • |
| | G100-07S / G100-08S | • | • | • |
| SARA | G300-00S / G310-00S | | | |
| | G340-00S / G350-00S | • | • | • |
| | G350-00X | • | • | • |
| | G340-01S / G350-01S<br>G350-01B | • | • | • |
| | G340-02S / G350-02S<br>G350-02A | • | • | • |
| | U201-03A / U201-03B<br>U201-03X | • | • | • |
| | U260-00S / U280-00S | • | • | • |
| | U270-00S / U270-00X | • | • | • |
| | U260-03S / U280-03S | • | • | • |
| | U270-03S | • | • | • |
| | U270-53S | • | • | • |
| LISA | U100 / U110 | • | • | • |
| | U120 / U130 | • | • | • |
| | U200-00S | • | • | • |
| | U200-01S / U260-01S<br>U270-01S | • | • | • |
| | U230-01S | • | • | • |
| | U200-02S / U260-02S<br>U270-02S | • | • | • |
| | U200-52S | • | • | • |
| | U200-62S | • | • | • |
| | U200-82S | • | • | • |
| | U270-62S / U270-63S<br>U270-68S | • | • | • |
| | U200-03S / U201-03S<br>U201-03A | • | • | • |
| | U200-83S / U201-83S | • | • | • |
| TOBY | L200-00S / L210-00S | | | |
| | L200-02S / L210-02S | • | • | • |
| | L201-01S | | | |
| | L210-60S / L280-00S | | | |
| | L210-62S | • | • | • |
| | L280-02S | • | • | • |
| | L220-02S | • | • | • |
| MPCI | L200-00S / L210-00S | | | |
| | L201-01S | | | |
| | L210-60S | | | |
| | L200-02S / L210-02S | | | |
| | L280-02S | | | |

Objective Specification

| AT command | | I2C interface | | | | |
|---|---|---|---|---|---|---|
| | | +UI2CC | +UI2CO | +UI2CR | +UI2CREGR | +UI2CW |
| LEON | G100-06S | | | | | |
| | G100-07S / G100-08S | | | | | |
| SARA | G300-00S / G310-00S | | | | | |
| | G340-00S / G350-00S | | | | | |
| | G350-00X | | | | | |
| | G340-01S / G350-01S G350-01B | | | | | |
| | G340-02S / G350-02S G350-02A | | | | | |
| | U201-03A / U201-03B U201-03X | • | • | • | • | • |
| | U260-00S / U280-00S | • | • | • | • | • |
| | U270-00S / U270-00X | • | • | • | • | • |
| | U260-03S / U280-03S | • | • | • | • | • |
| | U270-03S | • | • | • | • | • |
| | U270-53S | • | • | • | • | • |
| LISA | U100 / U110 | | | | | |
| | U120 / U130 | | | | | |
| | U200-00S | | | | | |
| | U200-01S / U260-01S U270-01S | • | • | • | • | • |
| | U230-01S | • | • | • | • | • |
| | U200-02S / U260-02S U270-02S | • | • | • | • | • |
| | U200-52S | • | • | • | • | • |
| | U200-62S | • | • | • | • | • |
| | U200-82S | • | • | • | • | • |
| | U270-62S / U270-63S U270-68S | • | • | • | • | • |
| | U200-03S / U201-03S U201-03A | • | • | • | • | • |
| | U200-83S / U201-83S | • | • | • | • | • |
| TOBY | L200-00S / L210-00S | | | | | |
| | L200-02S / L210-02S | • | • | • | • | • |
| | L201-01S | | | | | |
| | L210-60S / L280-00S | | | | | |
| | L210-62S | • | • | • | • | • |
| | L280-02S | • | • | • | • | • |
| | L220-02S | • | • | • | • | • |
| MPCI | L200-00S / L210-00S | | | | | |
| | L201-01S | | | | | |
| | L210-60S | | | | | |
| | L200-02S / L210-02S | | | | | |
| | L280-02S | | | | | |

Objective Specification

| AT command | | Internet suite | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | +UDCONF=4 | +UDNSRN | +UDYNDNS | +UFTP | +UFTPC | +UFTPER | +UHTTP | +UHTTPAC | +UHTTPC | +UHTTPER | +UPING | +USECMNG | +USECPRF | +USMTP | +USMTPC | +USMTPER | +USMTPM |
| LEON | G100-06S | | • | | • | • | • | • | | • | • | • | | | • | • | • | • |
| | G100-07S / G100-08S | | • | | • | • | • | • | | • | • | • | | | • | • | • | • |
| SARA | G300-00S / G310-00S | | | | | | | | | | | | | | | | | |
| | G340-00S / G350-00S | • | • | • | • | • | • | • | | • | • | • | | | • | • | • | • |
| | G350-00X | • | • | • | • | • | • | • | | • | • | • | | | • | • | • | • |
| | G340-01S / G350-01S G350-01B | • | • | • | • | • | • | • | | • | • | • | | | • | • | • | • |
| | G340-02S / G350-02S G350-02A | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | U201-03A / U201-03B U201-03X | • | • | • | • | • | • | • | • | • | • | • | • | • | | | | |
| | U260-00S / U280-00S | • | • | • | • | • | • | • | | • | • | • | | | | | | |
| | U270-00S / U270-00X | • | • | • | • | • | • | • | | • | • | • | | | | | | |
| | U260-03S / U280-03S | • | • | • | • | • | • | • | • | • | • | • | • | • | | | | |
| | U270-03S | • | • | • | • | • | • | • | • | • | • | • | • | • | | | | |
| | U270-53S | • | • | • | • | • | • | • | • | • | • | • | • | • | | | | |
| LISA | U100 / U110 | | • | | • | • | • | • | | • | • | | | | | | | |
| | U120 / U130 | | • | | • | • | • | • | | • | • | | | | | | | |
| | U200-00S | | • | | • | • | • | • | | • | • | | | | | | | |
| | U200-01S / U260-01S U270-01S | • | • | | • | • | • | • | | • | • | • | | | | | | |
| | U230-01S | • | • | | • | • | • | • | | • | • | • | | | | | | |
| | U200-02S / U260-02S U270-02S | • | • | • | • | • | • | • | | • | • | • | | | | | | |
| | U200-52S | • | • | • | • | • | • | • | | • | • | • | | | | | | |
| | U200-62S | • | • | • | • | • | • | • | | • | • | • | | | | | | |
| | U200-82S | • | • | • | • | • | • | • | | • | • | • | | | | | | |
| | U270-62S / U270-63S U270-68S | • | • | • | • | • | • | • | | • | • | • | | | | | | |
| | U200-03S / U201-03S U201-03A | • | • | • | • | • | • | • | • | • | • | • | • | • | | | | |
| | U200-83S / U201-83S | • | • | • | • | • | • | • | • | • | • | • | • | • | | | | |
| TOBY | L200-00S / L210-00S | | | | | | | | | | | | | | | | | |
| | L200-02S / L210-02S | • | • | • | • | • | • | • | • | • | • | • | • | • | | | | |
| | L201-01S | | • | • | • | • | • | • | • | • | • | | | | | | | |
| | L210-60S / L280-00S | | | | | | | | | | | | | | | | | |
| | L210-62S | • | • | • | • | • | • | • | • | • | • | • | • | • | | | | |
| | L280-02S | • | • | • | • | • | • | • | • | • | • | • | • | • | | | | |
| | L220-02S | • | • | • | • | • | • | • | • | • | • | • | • | • | | | | |
| MPCI | L200-00S / L210-00S | | | | | | | | | | | | | | | | | |
| | L201-01S | | • | • | • | • | • | • | • | • | • | | | | | | | |
| | L210-60S | | | | | | | | | | | | | | | | | |
| | L200-02S / L210-02S | • | • | • | • | • | • | • | • | • | • | • | • | • | | | | |
| | L280-02S | • | • | • | • | • | • | • | • | • | • | • | • | • | | | | |

Objective Specification

| AT command | | IP Multimedia Subsystem (IMS) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | +CASIMS | +CAVIMS | +CDU | +CEVDP | +CIREG | +CVDP | +UIMSCONF | +UIMSRCONF |
| LEON | G100-06S | | | | | | | | |
| | G100-07S / G100-08S | | | | | | | | |
| SARA | G300-00S / G310-00S | | | | | | | | |
| | G340-00S / G350-00S | | | | | | | | |
| | G350-00X | | | | | | | | |
| | G340-01S / G350-01S<br>G350-01B | | | | | | | | |
| | G340-02S / G350-02S<br>G350-02A | | | | | | | | |
| | U201-03A / U201-03B<br>U201-03X | | | | | | | | |
| | U260-00S / U280-00S | | | | | | | | |
| | U270-00S / U270-00X | | | | | | | | |
| | U260-03S / U280-03S | | | | | | | | |
| | U270-03S | | | | | | | | |
| | U270-53S | | | | | | | | |
| LISA | U100 / U110 | | | | | | | | |
| | U120 / U130 | | | | | | | | |
| | U200-00S | | | | | | | | |
| | U200-01S / U260-01S<br>U270-01S | | | | | | | | |
| | U230-01S | | | | | | | | |
| | U200-02S / U260-02S<br>U270-02S | | | | | | | | |
| | U200-52S | | | | | | | | |
| | U200-62S | | | | | | | | |
| | U200-82S | | | | | | | | |
| | U270-62S / U270-63S<br>U270-68S | | | | | | | | |
| | U200-03S / U201-03S<br>U201-03A | | | | | | | | |
| | U200-83S / U201-83S | | | | | | | | |
| TOBY | L200-00S / L210-00S | | | | | | | | |
| | L200-02S / L210-02S | | | | | | | | |
| | L201-01S | • | | | | • | | • | • |
| | L210-60S / L280-00S | | | | | | | | |
| | L210-62S | • | • | • | • | • | • | • | • |
| | L280-02S | | | | | | | | |
| | L220-02S | | | | | | | | |
| MPCI | L200-00S / L210-00S | | | | | | | | |
| | L201-01S | • | | | | • | | • | • |
| | L210-60S | | | | | | | | |
| | L200-02S / L210-02S | | | | | | | | |
| | L280-02S | | | | | | | | |

Objective Specification

| AT command | | Localization features | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | +CMOLR | +CMOLRE | +CMTLR | +CMTLRA | +UDCONF=70 | +UGAOF | +UGAOP | +UGAOS | +UGGGA | +UGGLL | +UGGSA | +UGGSV | +UGIND | +UGPRF | +UGPS | +UGRMC | +UGSRV | +UGTMR | +UGUBX | +UGVTG | +UGZDA | +ULCSEVT | +ULOC | +ULOCAID |
| LEON | G100-06S | | | | | | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | | • | |
| | G100-07S / G100-08S | | | | | | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | | • | |
| SARA | G300-00S / G310-00S | | | | | | | | | | | | | | | | | | | | | | | | |
| | G340-00S / G350-00S | | | | | | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | | • | |
| | G350-00X | | | | | | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | | • | |
| | G340-01S / G350-01S<br>G350-01B | | | | | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | |
| | G340-02S / G350-02S<br>G350-02A | | | | | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • |
| | U201-03A / U201-03B<br>U201-03X | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | U260-00S / U280-00S | | | | | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | |
| | U270-00S / U270-00X | | | | | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | |
| | U260-03S / U280-03S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | U270-03S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | U270-53S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| LISA | U100 / U110 | | | | | | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | | | • | |
| | U120 / U130 | | | | | | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | | | • | |
| | U200-00S | | | | | | | | | | | | | | | | | | | | | | | | |
| | U200-01S / U260-01S<br>U270-01S | | | | | | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | | • | |
| | U230-01S | | | | | | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | | • | |
| | U200-02S / U260-02S<br>U270-02S | | | | | | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | | • | |
| | U200-52S | | | | | | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | | • | |
| | U200-62S | | | | | | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | | • | |
| | U200-82S | | | | | | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | | • | |
| | U270-62S / U270-63S<br>U270-68S | | | | | | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | | • | |
| | U200-03S / U201-03S<br>U201-03A | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | U200-83S / U201-83S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| TOBY | L200-00S / L210-00S | | | | | | | | | | | | | | | | | | | | | | | | |
| | L200-02S / L210-02S | | | | | | | | | | | | | | | | | | | | | | | | |
| | L201-01S | | | | | | | | | | | | | | | | | | | | | | | | |
| | L210-60S / L280-00S | | | | | | | | | | | | | | | | | | | | | | | | |
| | L210-62S | | | | | | | | | | | | | | | | | | | | | | | | |
| | L280-02S | | | | | | | | | | | | | | | | | | | | | | | | |
| | L220-02S | | | | | | | | | | | | | | | | | | | | | | | | |
| MPCI | L200-00S / L210-00S | | | | | | | | | | | | | | | | | | | | | | | | |
| | L201-01S | | | | | | | | | | | | | | | | | | | | | | | | |
| | L210-60S | | | | | | | | | | | | | | | | | | | | | | | | |
| | L200-02S / L210-02S | | | | | | | | | | | | | | | | | | | | | | | | |
| | L280-02S | | | | | | | | | | | | | | | | | | | | | | | | |

Objective Specification

| AT command | | Localization features | | |
|---|---|---|---|---|
| | | +ULOCCELL | +ULOCGNSS | +ULOCIND |
| LEON | G100-06S | • | • | |
| | G100-07S / G100-08S | • | • | |
| SARA | G300-00S / G310-00S | | | |
| | G340-00S / G350-00S | • | • | |
| | G350-00X | • | • | |
| | G340-01S / G350-01S<br>G350-01B | • | • | |
| | G340-02S / G350-02S<br>G350-02A | • | • | • |
| | U201-03A / U201-03B<br>U201-03X | • | • | • |
| | U260-00S / U280-00S | • | • | |
| | U270-00S / U270-00X | • | • | |
| | U260-03S / U280-03S | • | • | • |
| | U270-03S | • | • | • |
| | U270-53S | • | • | • |
| LISA | U100 / U110 | • | • | |
| | U120 / U130 | • | • | |
| | U200-00S | | | |
| | U200-01S / U260-01S<br>U270-01S | • | • | |
| | U230-01S | • | • | |
| | U200-02S / U260-02S<br>U270-02S | • | • | |
| | U200-52S | • | • | |
| | U200-62S | • | • | |
| | U200-82S | • | • | |
| | U270-62S / U270-63S<br>U270-68S | • | • | |
| | U200-03S / U201-03S<br>U201-03A | • | • | • |
| | U200-83S / U201-83S | • | • | • |
| TOBY | L200-00S / L210-00S | | | |
| | L200-02S / L210-02S | | | |
| | L201-01S | | | |
| | L210-60S / L280-00S | | | |
| | L210-62S | | | |
| | L280-02S | | | |
| | L220-02S | | | |
| MPCI | L200-00S / L210-00S | | | |
| | L201-01S | | | |
| | L210-60S | | | |
| | L200-02S / L210-02S | | | |
| | L280-02S | | | |

Objective Specification

| AT command | | Mobile equipment control and status | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | +CALA | +CALD | +CALM | +CCLK | +CEER | +CFUN | +CIND | +CISRVCC | +CLCCS | +CLVL | +CMCCS | +CMEE | +CMER | +CMUT | +CPAS | +CPWROFF | +CRSL | +CSGT | +CTZR | +CTZU | +UCEER | +UCIND |
| LEON | G100-06S | • | • | • | • | • | • | • | | | • | | • | • | • | • | • | • | • | • | • | | |
| | G100-07S / G100-08S | • | • | • | • | • | • | • | | | • | | • | • | • | • | • | • | • | • | • | | |
| SARA | G300-00S / G310-00S | | | | • | • | • | • | | | | | • | • | | • | • | | • | • | • | | |
| | G340-00S / G350-00S | • | • | • | • | • | • | • | | | • | | • | • | • | • | • | • | • | • | • | | |
| | G350-00X | • | • | • | • | • | • | • | | | • | | • | • | • | • | • | • | • | • | • | | |
| | G340-01S / G350-01S G350-01B | • | • | • | • | • | • | • | | | • | | • | • | • | • | • | • | • | • | • | | |
| | G340-02S / G350-02S G350-02A | • | • | • | • | • | • | • | | | • | | • | • | • | • | • | • | • | • | • | | |
| | U201-03A / U201-03B U201-03X | • | • | • | • | • | • | • | | | • | | • | • | • | • | • | • | • | • | • | | • |
| | U260-00S / U280-00S | • | • | • | • | • | • | • | | | • | | • | • | • | • | • | • | • | • | • | | • |
| | U270-00S / U270-00X | • | • | • | • | • | • | • | | | • | | • | • | • | • | • | • | • | • | • | | • |
| | U260-03S / U280-03S | • | • | • | • | • | • | • | | | • | | • | • | • | • | • | • | • | • | • | | • |
| | U270-03S | • | • | • | • | • | • | • | | | • | | • | • | • | • | • | • | • | • | • | | • |
| | U270-53S | • | • | • | • | • | • | • | | | • | | • | • | • | • | • | • | • | • | • | | • |
| LISA | U100 / U110 | • | • | | • | • | • | • | | | | | • | • | | • | • | | • | • | • | • | • |
| | U120 / U130 | • | • | • | • | • | • | • | | | • | | • | • | • | • | • | • | • | • | • | • | • |
| | U200-00S | • | • | | • | • | • | • | | | | | • | • | | • | • | | • | • | • | • | • |
| | U200-01S / U260-01S U270-01S | • | • | • | • | • | • | • | | | • | | • | • | • | • | • | • | • | • | • | | • |
| | U230-01S | • | • | • | • | • | • | • | | | • | | • | • | • | • | • | • | • | • | • | | • |
| | U200-02S / U260-02S U270-02S | • | • | • | • | • | • | • | | | • | | • | • | • | • | • | • | • | • | • | | • |
| | U200-52S | • | • | • | • | • | • | • | | | • | | • | • | • | • | • | • | • | • | • | | • |
| | U200-62S | • | • | • | • | • | • | • | | | • | | • | • | • | • | • | • | • | • | • | | • |
| | U200-82S | • | • | • | • | • | • | • | | | • | | • | • | • | • | • | • | • | • | • | | • |
| | U270-62S / U270-63S U270-68S | • | • | • | • | • | • | • | | | • | | • | • | • | • | • | • | • | • | • | | • |
| | U200-03S / U201-03S U201-03A | • | • | • | • | • | • | • | | | • | | • | • | • | • | • | • | • | • | • | | • |
| | U200-83S / U201-83S | • | • | • | • | • | • | • | | | • | | • | • | • | • | • | • | • | • | • | | • |
| TOBY | L200-00S / L210-00S | • | • | | • | • | • | • | | | | | • | • | | • | • | | • | • | • | | • |
| | L200-02S / L210-02S | • | • | • | • | • | • | • | | | • | | • | • | • | • | • | • | • | • | • | | • |
| | L201-01S | • | • | | • | • | • | • | | | | | • | • | | • | • | | • | • | • | | • |
| | L210-60S / L280-00S | • | • | | • | • | • | • | | | | | • | • | | • | • | | • | • | • | | • |
| | L210-62S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • |
| | L280-02S | • | • | • | • | • | • | • | | | • | | • | • | • | • | • | • | • | • | • | | • |
| | L220-02S | • | • | • | • | • | • | • | | | • | | • | • | • | • | • | • | • | • | • | | • |
| MPCI | L200-00S / L210-00S | • | • | | • | • | • | • | | | | | • | • | | • | • | | • | • | • | | • |
| | L201-01S | • | • | | • | • | • | • | | | | | • | • | | • | • | | • | • | • | | • |
| | L210-60S | • | • | | • | • | • | • | | | | | • | • | | • | • | | • | • | • | | • |
| | L200-02S / L210-02S | • | • | | • | • | • | • | | | | | • | • | | • | • | | • | • | • | | • |
| | L280-02S | • | • | | • | • | • | • | | | | | • | • | | • | • | | • | • | • | | • |

Objective Specification

| AT command | | Network service | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | +CESQ | +CGED | +CNEM | +CNUM | +COPN | +COPS | +CPLS | +CPOL | +CREG | +CSQ | +CSSAC | +PACSP | +UBANDSEL | +UCD | +UCELLINFO | +UCELLLOCK | +UCGED | +UCGOPS | +UCSDETACH | +UDCONF=20 | +UDCONF=61 | +UDCONF=81 | +UDCONF=83 | +UDOPN |
| LEON | G100-06S | | • | | • | • | • | | • | • | • | | | • | • | | | | • | | | | | | • |
| | G100-07S / G100-08S | | • | | • | • | • | | • | • | • | | | • | • | | • | | • | | • | | | | • |
| SARA | G300-00S / G310-00S | | • | | | • | • | | • | • | • | | | • | | | | | • | | • | | | | • |
| | G340-00S / G350-00S | | • | | • | • | • | | • | • | • | | | • | • | | • | | • | | • | | | | • |
| | G350-00X | | • | | • | • | • | | • | • | • | | | • | • | | • | | • | | • | | | | • |
| | G340-01S / G350-01S G350-01B | | • | | • | • | • | | • | • | • | | | • | • | | • | | • | | • | | | | • |
| | G340-02S / G350-02S G350-02A | | • | | • | • | • | | • | • | • | | | • | • | | • | | • | | • | | | • | • |
| | U201-03A / U201-03B U201-03X | | • | | • | • | • | • | • | • | • | | • | • | • | • | • | | • | | • | • | • | | • |
| | U260-00S / U280-00S | | • | | • | • | • | • | • | • | • | | • | • | • | • | • | | • | | • | • | • | | • |
| | U270-00S / U270-00X | | • | | • | • | • | • | • | • | • | | • | • | • | • | • | | • | | • | • | • | | • |
| | U260-03S / U280-03S | | • | | • | • | • | • | • | • | • | | • | • | • | • | • | | • | | • | • | • | | • |
| | U270-03S | | • | | • | • | • | • | • | • | • | | • | • | • | • | • | | • | | • | • | • | | • |
| | U270-53S | | • | | • | • | • | • | • | • | • | | • | • | • | • | • | | • | | • | • | • | | • |
| LISA | U100 / U110 | | • | | • | • | • | • | • | • | • | | • | • | • | • | | | • | | | | | | • |
| | U120 / U130 | | • | | • | • | • | • | • | • | • | | • | • | • | • | | | • | | | | | | • |
| | U200-00S | | • | | • | • | • | • | • | • | • | | • | • | • | • | | | • | | | | | | • |
| | U200-01S / U260-01S U270-01S | | • | | • | • | • | • | • | • | • | | • | • | • | • | | | • | | • | | | | • |
| | U230-01S | | • | | • | • | • | • | • | • | • | | • | • | • | • | | | • | | • | | | | • |
| | U200-02S / U260-02S U270-02S | | • | | • | • | • | • | • | • | • | | • | • | • | • | • | | • | | • | • | • | | • |
| | U200-52S | | • | | • | • | • | • | • | • | • | | • | • | • | • | • | | • | | • | • | • | | • |
| | U200-62S | | • | | • | • | • | • | • | • | • | | • | • | • | • | • | | • | | • | • | • | | • |
| | U200-82S | | • | | • | • | • | • | • | • | • | | • | • | • | • | • | | • | | • | • | • | | • |
| | U270-62S / U270-63S U270-68S | | • | | • | • | • | • | • | • | • | | • | • | • | • | • | | • | | • | • | • | | • |
| | U200-03S / U201-03S U201-03A | | • | | • | • | • | • | • | • | • | | • | • | • | • | • | | • | | • | • | • | | • |
| | U200-83S / U201-83S | | • | | • | • | • | • | • | • | • | | • | • | • | • | • | | • | | • | • | • | | • |
| TOBY | L200-00S / L210-00S | • | | | • | • | • | • | • | • | • | | • | • | | | | • | • | • | | • | | | • |
| | L200-02S / L210-02S | • | | | • | • | • | • | • | • | • | | • | • | | | • | • | • | • | | • | • | | • |
| | L201-01S | • | | | • | • | • | • | • | • | • | | • | • | | | | • | • | • | | • | • | | • |
| | L210-60S / L280-00S | • | | | • | • | • | • | • | • | • | | • | • | | | | • | • | • | | • | | | • |
| | L210-62S | • | | • | • | • | • | • | • | • | • | • | • | • | | | • | • | • | • | | • | • | | • |
| | L280-02S | • | | | • | • | • | • | • | • | • | | • | • | | | • | • | • | • | | • | • | | • |
| | L220-02S | • | | | • | • | • | • | • | • | • | | • | • | | | • | • | • | • | | • | • | | • |
| MPCI | L200-00S / L210-00S | • | | | • | • | • | • | • | • | • | | • | • | | | | • | • | • | | • | | | • |
| | L201-01S | • | | | • | • | • | • | • | • | • | | • | • | | | | • | • | • | | • | • | | • |
| | L210-60S | • | | | • | • | • | • | • | • | • | | • | • | | | | • | • | • | | • | | | • |
| | L200-02S / L210-02S | • | | | • | • | • | • | • | • | • | | • | • | | | • | • | • | • | | • | • | | • |
| | L280-02S | • | | | • | • | • | • | • | • | • | | • | • | | | • | • | • | • | | • | • | | • |

Objective Specification

| AT command | | Network service | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | +UEONS | +UFDAC | +UHOMEZR | +UHSDUPA | +ULTECAT | +UMNOCONF | +UMNOPLMN | +URAT | +WS46 |
| LEON | G100-06S | • | | | | | | | | |
| | G100-07S / G100-08S | • | | | | | | | | |
| SARA | G300-00S / G310-00S | • | | | | | | | | |
| | G340-00S / G350-00S | • | | | | | | | | |
| | G350-00X | • | | | | | | | | |
| | G340-01S / G350-01S G350-01B | • | | | | | | | | |
| | G340-02S / G350-02S G350-02A | • | | | | | | | | |
| | U201-03A / U201-03B U201-03X | • | • | • | • | | | | • | • |
| | U260-00S / U280-00S | • | • | • | • | | | | • | • |
| | U270-00S / U270-00X | • | • | • | • | | | | • | • |
| | U260-03S / U280-03S | • | • | • | • | | | | • | • |
| | U270-03S | • | • | • | • | | | | • | • |
| | U270-53S | • | • | • | • | | | | • | • |
| LISA | U100 / U110 | • | | • | • | | | | • | • |
| | U120 / U130 | • | | • | • | | | | • | • |
| | U200-00S | • | | • | • | | | | • | • |
| | U200-01S / U260-01S U270-01S | • | | • | • | | | | • | • |
| | U230-01S | • | | • | • | | | | • | • |
| | U200-02S / U260-02S U270-02S | • | • | • | • | | | | • | • |
| | U200-52S | • | • | • | • | | | | • | • |
| | U200-62S | • | • | • | • | | | | • | • |
| | U200-82S | • | • | • | • | | | | • | • |
| | U270-62S / U270-63S U270-68S | • | • | • | • | | | | • | • |
| | U200-03S / U201-03S U201-03A | • | • | • | • | | | | • | • |
| | U200-83S / U201-83S | • | • | • | • | | | | • | • |
| TOBY | L200-00S / L210-00S | • | • | | • | | | | • | • |
| | L200-02S / L210-02S | • | • | | • | • | | | • | • |
| | L201-01S | • | • | | • | • | • | • | • | • |
| | L210-60S / L280-00S | • | • | | • | | | | • | • |
| | L210-62S | • | • | | • | • | | | • | • |
| | L280-02S | • | • | | • | • | • | • | • | • |
| | L220-02S | • | • | | • | • | | | • | • |
| MPCI | L200-00S / L210-00S | • | • | | • | | | | • | • |
| | L201-01S | • | • | | • | • | • | • | • | • |
| | L210-60S | • | • | | • | | | | • | • |
| | L200-02S / L210-02S | • | • | | • | • | | | • | • |
| | L280-02S | • | • | | • | • | • | • | • | • |

Objective Specification

| AT command | | Networking | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | +UBMCONF | +UDCONF=67 | +UDPDP | +UIPADDR | +UIPCONF | +UIPROUTE | +UIPTABLES |
| LEON | G100-06S | | | | | | | |
| | G100-07S / G100-08S | | | | | | | |
| SARA | G300-00S / G310-00S | | | | | | | |
| | G340-00S / G350-00S | | | | | | | |
| | G350-00X | | | | | | | |
| | G340-01S / G350-01S<br>G350-01B | | | | | | | |
| | G340-02S / G350-02S<br>G350-02A | | | | | | | |
| | U201-03A / U201-03B<br>U201-03X | | | | | | | |
| | U260-00S / U280-00S | | | | | | | |
| | U270-00S / U270-00X | | | | | | | |
| | U260-03S / U280-03S | | | | | | | |
| | U270-03S | | | | | | | |
| | U270-53S | | | | | | | |
| LISA | U100 / U110 | | | | | | | |
| | U120 / U130 | | | | | | | |
| | U200-00S | | | | | | | |
| | U200-01S / U260-01S<br>U270-01S | | | | | | | |
| | U230-01S | | | | | | | |
| | U200-02S / U260-02S<br>U270-02S | | | | | | | |
| | U200-52S | | | | | | | |
| | U200-62S | | | | | | | |
| | U200-82S | | | | | | | |
| | U270-62S / U270-63S<br>U270-68S | | | | | | | |
| | U200-03S / U201-03S<br>U201-03A | | | | | | | |
| | U200-83S / U201-83S | | | | | | | |
| TOBY | L200-00S / L210-00S | • | • | • | • | • | • | • |
| | L200-02S / L210-02S | • | • | • | • | • | • | • |
| | L201-01S | • | • | • | • | • | • | • |
| | L210-60S / L280-00S | • | • | • | • | • | • | • |
| | L210-62S | • | • | • | • | • | • | • |
| | L280-02S | • | • | • | • | • | • | • |
| | L220-02S | • | • | • | • | • | • | • |
| MPCI | L200-00S / L210-00S | • | • | • | • | • | • | • |
| | L201-01S | • | • | • | • | • | • | • |
| | L210-60S | • | • | • | • | • | • | • |
| | L200-02S / L210-02S | • | • | • | • | • | • | • |
| | L280-02S | • | • | • | • | • | • | • |

Objective Specification

| | AT command | Packet switched data services | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | +CEMODE | +CEREG | +CEUS | +CGACT | +CGANS | +CGATT | +CGAUTO | +CGCLASS | +CGCMOD | +CGCONTRDP | +CGDATA | +CGDCONT | +CGDEL | +CGDSCONT | +CGEQMIN | +CGEQNEG | +CGEQOS | +CGEQOSRDP | +CGEQREQ | +CGEREP | +CGPADDR | +CGPERMACT | +CGPERMSET | +CGPERMSTATE | +CGPIAF |
| LEON | G100-06S | | | | • | | • | | • | | | • | • | | | | | | | | • | • | | | | |
| | G100-07S / G100-08S | | | | • | | • | | • | | | • | • | | | | | | | | • | • | | | | |
| SARA | G300-00S / G310-00S | | | | • | | • | | • | | | • | • | | | | | | | | • | • | | | | |
| | G340-00S / G350-00S | | | | • | | • | | • | | | • | • | | | | | | | | • | • | | | | |
| | G350-00X | | | | • | | • | | • | | | • | • | | | | | | | | • | • | | | | |
| | G340-01S / G350-01S G350-01B | | | | • | | • | | • | | | • | • | | | | | | | | • | • | | | | |
| | G340-02S / G350-02S G350-02A | | | | • | | • | | • | | | • | • | | | | | | | | • | • | | | | |
| | U201-03A / U201-03B U201-03X | | | | • | | • | | • | • | | • | • | | • | • | • | | | • | • | • | | | | |
| | U260-00S / U280-00S | | | | • | | • | | • | • | | • | • | | • | • | • | | | • | • | • | | | | |
| | U270-00S / U270-00X | | | | • | | • | | • | • | | • | • | | • | • | • | | | • | • | • | | | | |
| | U260-03S / U280-03S | | | | • | | • | | • | • | | • | • | | • | • | • | | | • | • | • | | | | |
| | U270-03S | | | | • | | • | | • | • | | • | • | | • | • | • | | | • | • | • | | | | |
| | U270-53S | | | | • | | • | | • | • | | • | • | | • | • | • | | | • | • | • | | | | |
| LISA | U100 / U110 | | | | • | | • | | • | • | | • | • | | • | • | • | | | • | • | • | | | | |
| | U120 / U130 | | | | • | | • | | • | • | | • | • | | • | • | • | | | • | • | • | | | | |
| | U200-00S | | | | • | | • | | • | • | | • | • | | • | • | • | | | • | • | • | | | | |
| | U200-01S / U260-01S U270-01S | | | | • | | • | | • | • | | • | • | | • | • | • | | | • | • | • | | | | |
| | U230-01S | | | | • | | • | | • | • | | • | • | | • | • | • | | | • | • | • | | | | |
| | U200-02S / U260-02S U270-02S | | | | • | | • | | • | • | | • | • | | • | • | • | | | • | • | • | | | | |
| | U200-52S | | | | • | | • | | • | • | | • | • | | • | • | • | | | • | • | • | | | | |
| | U200-62S | | | | • | • | • | • | • | • | | • | • | | • | • | • | | | • | • | • | | | | |
| | U200-82S | | | | • | | • | | • | • | | • | • | | • | • | • | | | • | • | • | | | | |
| | U270-62S / U270-63S U270-68S | | | | • | | • | | • | • | | • | • | | • | • | • | | | • | • | • | • | • | • | |
| | U200-03S / U201-03S U201-03A | | | | • | | • | | • | • | | • | • | | • | • | • | | | • | • | • | | | | |
| | U200-83S / U201-83S | | | | • | | • | | • | • | | • | • | | • | • | • | | | • | • | • | | | | |
| TOBY | L200-00S / L210-00S | • | • | • | • | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | | | • |
| | L200-02S / L210-02S | • | • | • | • | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | | | • |
| | L201-01S | • | • | • | • | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | | | • |
| | L210-60S / L280-00S | • | • | • | • | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | | | • |
| | L210-62S | • | • | • | • | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | | | • |
| | L280-02S | • | • | • | • | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | | | • |
| | L220-02S | • | • | • | • | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | | | • |
| MPCI | L200-00S / L210-00S | • | • | • | • | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | | | • |
| | L201-01S | • | • | • | • | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | | | • |
| | L210-60S | • | • | • | • | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | | | • |
| | L200-02S / L210-02S | • | • | • | • | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | | | • |
| | L280-02S | • | • | • | • | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | | | • |

Objective Specification

| AT command | | Packet switched data services | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | +CGQMIN | +CGQREQ | +CGREG | +CGSCONTRDP | +CGTFT | +CGTFTRDP | +UAUTHREQ | +UCGATT | +UCGCLASS | +UCGDFLT | +UCLASS | +UDCONF=11 | +UDCONF=9 | +UGCNTRD | +UGCNTSET | +UPSD | +UPSDA | +UPSND | +UREG | +UTGSINK | D* | H |
| LEON | G100-06S | • | • | • | | | | | | | | • | | | • | • | • | • | • | | | • | • |
| | G100-07S / G100-08S | • | • | • | | | | | | | | • | | | • | • | • | • | • | | | • | • |
| SARA | G300-00S / G310-00S | • | • | • | | | | | | | | • | | | • | • | | | | | | • | • |
| | G340-00S / G350-00S | • | • | • | | | | | | | | • | | | • | • | • | • | • | | | • | • |
| | G350-00X | • | • | • | | | | | | | | • | | | • | • | • | • | • | | | • | • |
| | G340-01S / G350-01S G350-01B | • | • | • | | | | | | | | • | | | • | • | • | • | • | | | • | • |
| | G340-02S / G350-02S G350-02A | • | • | • | | | | • | | | | • | | | • | • | • | • | • | | | • | • |
| | U201-03A / U201-03B U201-03X | • | • | • | | • | | • | | • | | • | • | | • | • | • | • | • | • | | • | • |
| | U260-00S / U280-00S | • | • | • | | • | | | | • | | • | | | • | • | • | • | • | • | | • | • |
| | U270-00S / U270-00X | • | • | • | | • | | | | • | | • | | | • | • | • | • | • | • | | • | • |
| | U260-03S / U280-03S | • | • | • | | • | | • | | • | | • | | | • | • | • | • | • | • | | • | • |
| | U270-03S | • | • | • | | • | | • | | • | | • | | | • | • | • | • | • | • | | • | • |
| | U270-53S | • | • | • | | • | | • | | • | | • | | | • | • | • | • | • | • | | • | • |
| LISA | U100 / U110 | • | • | • | | • | | | | • | | • | | | • | • | • | • | • | • | | • | • |
| | U120 / U130 | • | • | • | | • | | | | • | | • | | | • | • | • | • | • | • | | • | • |
| | U200-00S | • | • | • | | • | | | | • | | • | | | • | • | • | • | • | • | | • | • |
| | U200-01S / U260-01S U270-01S | • | • | • | | • | | | | • | | • | | | • | • | • | • | • | • | | • | • |
| | U230-01S | • | • | • | | • | | | | • | | • | | | • | • | • | • | • | • | | • | • |
| | U200-02S / U260-02S U270-02S | • | • | • | | • | | | | • | | • | | | • | • | • | • | • | • | | • | • |
| | U200-52S | • | • | • | | • | | | | • | | • | | | • | • | • | • | • | • | | • | • |
| | U200-62S | • | • | • | | • | | | | • | | • | | | • | • | • | • | • | • | | • | • |
| | U200-82S | • | • | • | | • | | | | • | | • | | | • | • | • | • | • | • | | • | • |
| | U270-62S / U270-63S U270-68S | • | • | • | | • | | | | • | | • | | | • | • | • | • | • | • | | • | • |
| | U200-03S / U201-03S U201-03A | • | • | • | | • | | • | | • | | • | | | • | • | • | • | • | • | | • | • |
| | U200-83S / U201-83S | • | • | • | | • | | • | | • | | • | | | • | • | • | • | • | • | | • | • |
| TOBY | L200-00S / L210-00S | • | • | • | • | • | • | • | • | • | • | • | | • | | | | | | • | • | • | • |
| | L200-02S / L210-02S | • | • | • | • | • | • | • | • | • | • | • | | • | | | • | • | • | • | • | • | • |
| | L201-01S | • | • | • | • | • | • | • | • | • | • | • | | • | | | • | • | • | • | • | • | • |
| | L210-60S / L280-00S | • | • | • | • | • | • | • | • | • | • | • | | • | | | | | | • | • | • | • |
| | L210-62S | • | • | • | • | • | • | • | • | • | • | • | | • | | | • | • | • | • | • | • | • |
| | L280-02S | • | • | • | • | • | • | • | • | • | • | • | | • | | | • | • | • | • | • | • | • |
| | L220-02S | • | • | • | • | • | • | • | • | • | • | • | | • | | | • | • | • | • | • | • | • |
| MPCI | L200-00S / L210-00S | • | • | • | • | • | • | • | • | • | • | • | | • | | | | | | • | • | • | • |
| | L201-01S | • | • | • | • | • | • | • | • | • | • | • | | • | | | • | • | • | • | • | • | • |
| | L210-60S | • | • | • | • | • | • | • | • | • | • | • | | • | | | | | | • | • | • | • |
| | L200-02S / L210-02S | • | • | • | • | • | • | • | • | • | • | • | | • | | | • | • | • | • | • | • | • |
| | L280-02S | • | • | • | • | • | • | • | • | • | • | • | | • | | | • | • | • | • | • | • | • |

Objective Specification

| AT command | | Phonebook | | | |
|---|---|---|---|---|---|
| | | +CPBF | +CPBR | +CPBS | +CPBW |
| LEON | G100-06S | • | • | • | • |
| | G100-07S / G100-08S | • | • | • | • |
| SARA | G300-00S / G310-00S | | | | |
| | G340-00S / G350-00S | • | • | • | • |
| | G350-00X | • | • | • | • |
| | G340-01S / G350-01S G350-01B | • | • | • | • |
| | G340-02S / G350-02S G350-02A | • | • | • | • |
| | U201-03A / U201-03B U201-03X | • | • | • | • |
| | U260-00S / U280-00S | • | • | • | • |
| | U270-00S / U270-00X | • | • | • | • |
| | U260-03S / U280-03S | • | • | • | • |
| | U270-03S | • | • | • | • |
| | U270-53S | • | • | • | • |
| LISA | U100 / U110 | • | • | • | • |
| | U120 / U130 | • | • | • | • |
| | U200-00S | • | • | • | • |
| | U200-01S / U260-01S U270-01S | • | • | • | • |
| | U230-01S | • | • | • | • |
| | U200-02S / U260-02S U270-02S | • | • | • | • |
| | U200-52S | • | • | • | • |
| | U200-62S | • | • | • | • |
| | U200-82S | • | • | • | • |
| | U270-62S / U270-63S U270-68S | • | • | • | • |
| | U200-03S / U201-03S U201-03A | • | • | • | • |
| | U200-83S / U201-83S | • | • | • | • |
| TOBY | L200-00S / L210-00S | • | • | • | • |
| | L200-02S / L210-02S | • | • | • | • |
| | L201-01S | • | • | • | • |
| | L210-60S / L280-00S | • | • | • | • |
| | L210-62S | • | • | • | • |
| | L280-02S | • | • | • | • |
| | L220-02S | • | • | • | • |
| MPCI | L200-00S / L210-00S | • | • | • | • |
| | L201-01S | • | • | • | • |
| | L210-60S | • | • | • | • |
| | L200-02S / L210-02S | • | • | • | • |
| | L280-02S | • | • | • | • |

Objective Specification

| AT command | | Security | | | | |
|---|---|---|---|---|---|---|
| | | +CLCK | +CPIN | +CPWD | +UPINCNT | +USIMLCK |
| LEON | G100-06S | • | • | • | • | • |
| | G100-07S / G100-08S | • | • | • | • | • |
| SARA | G300-00S / G310-00S | • | • | • | • | • |
| | G340-00S / G350-00S | • | • | • | • | • |
| | G350-00X | • | • | • | • | • |
| | G340-01S / G350-01S G350-01B | • | • | • | • | • |
| | G340-02S / G350-02S G350-02A | • | • | • | • | • |
| | U201-03A / U201-03B U201-03X | • | • | • | • | • |
| | U260-00S / U280-00S | • | • | • | • | • |
| | U270-00S / U270-00X | • | • | • | • | • |
| | U260-03S / U280-03S | • | • | • | • | • |
| | U270-03S | • | • | • | • | • |
| | U270-53S | • | • | • | • | • |
| LISA | U100 / U110 | • | • | • | • | • |
| | U120 / U130 | • | • | • | • | • |
| | U200-00S | • | • | • | • | • |
| | U200-01S / U260-01S U270-01S | • | • | • | • | • |
| | U230-01S | • | • | • | • | • |
| | U200-02S / U260-02S U270-02S | • | • | • | • | • |
| | U200-52S | • | • | • | • | • |
| | U200-62S | • | • | • | • | • |
| | U200-82S | • | • | • | • | • |
| | U270-62S / U270-63S U270-68S | • | • | • | • | • |
| | U200-03S / U201-03S U201-03A | • | • | • | • | • |
| | U200-83S / U201-83S | • | • | • | • | • |
| TOBY | L200-00S / L210-00S | • | • | • | • | |
| | L200-02S / L210-02S | • | • | • | • | |
| | L201-01S | • | • | • | • | |
| | L210-60S / L280-00S | • | • | • | • | |
| | L210-62S | • | • | • | • | |
| | L280-02S | • | • | • | • | |
| | L220-02S | • | • | • | • | |
| MPCI | L200-00S / L210-00S | • | • | • | • | |
| | L201-01S | • | • | • | • | |
| | L210-60S | • | • | • | • | |
| | L200-02S / L210-02S | • | • | • | • | |
| | L280-02S | • | • | • | • | |

Objective Specification

| AT command | | Serial interface | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | &C | &D | &F | &K | &S | &V | &W | &Y | +CMUX | +ICF | +IFC | +IPR | +UTPB | E | O | Q | S10 | S12 | S2 | S3 | S4 | S5 | S6 |
| LEON | G100-06S | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | • | • | • |
| | G100-07S / G100-08S | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | • | • | • |
| SARA | G300-00S / G310-00S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | G340-00S / G350-00S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | G350-00X | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | G340-01S / G350-01S G350-01B | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | G340-02S / G350-02S G350-02A | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | U201-03A / U201-03B U201-03X | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | U260-00S / U280-00S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | U270-00S / U270-00X | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | U260-03S / U280-03S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | U270-03S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | U270-53S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| LISA | U100 / U110 | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | • | • | • |
| | U120 / U130 | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | • | • | • |
| | U200-00S | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | • | • | • |
| | U200-01S / U260-01S U270-01S | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | • | • | • |
| | U230-01S | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | • | • | • |
| | U200-02S / U260-02S U270-02S | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | • | • | • |
| | U200-52S | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | • | • | • |
| | U200-62S | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | • | • | • |
| | U200-82S | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | • | • | • |
| | U270-62S / U270-63S U270-68S | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | • | • | • |
| | U200-03S / U201-03S U201-03A | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | • | • | • |
| | U200-83S / U201-83S | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | • | • | • |
| TOBY | L200-00S / L210-00S | • | • | • | | • | • | • | | • | • | • | | | • | • | • | • | • | • | • | • | • | • |
| | L200-02S / L210-02S | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | • | • | • |
| | L201-01S | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | • | • | • |
| | L210-60S / L280-00S | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | • | • | • |
| | L210-62S | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | • | • | • |
| | L280-02S | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | • | • | • |
| | L220-02S | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | • | • | • |
| MPCI | L200-00S / L210-00S | • | • | • | | | • | • | • | | • | • | • | | • | • | • | • | • | • | • | • | • | • |
| | L201-01S | • | • | • | • | • | • | • | • | | • | • | • | | • | • | • | • | • | • | • | • | • | • |
| | L210-60S | • | • | • | • | • | • | • | • | | • | • | • | | • | • | • | • | • | • | • | • | • | • |
| | L200-02S / L210-02S | • | • | • | • | • | • | • | • | | • | • | • | | • | • | • | • | • | • | • | • | • | • |
| | L280-02S | • | • | • | • | • | • | • | • | | • | • | • | | • | • | • | • | • | • | • | • | • | • |

Objective Specification

| AT command | | Serial interface | | | | | |
|---|---|---|---|---|---|---|---|
| | | &S7 | &S8 | V | X | Z | \Q |
| LEON | G100-06S | • | • | • | • | • | • |
| | G100-07S / G100-08S | • | • | • | • | • | • |
| SARA | G300-00S / G310-00S | • | • | • | • | • | • |
| | G340-00S / G350-00S | • | • | • | • | • | • |
| | G350-00X | • | • | • | • | • | • |
| | G340-01S / G350-01S<br>G350-01B | • | • | • | • | • | • |
| | G340-02S / G350-02S<br>G350-02A | • | • | • | • | • | • |
| | U201-03A / U201-03B<br>U201-03X | • | • | • | • | • | • |
| | U260-00S / U280-00S | • | • | • | • | • | • |
| | U270-00S / U270-00X | • | • | • | • | • | • |
| | U260-03S / U280-03S | • | • | • | • | • | • |
| | U270-03S | • | • | • | • | • | • |
| | U270-53S | • | • | • | • | • | • |
| LISA | U100 / U110 | • | • | • | • | • | • |
| | U120 / U130 | • | • | • | • | • | • |
| | U200-00S | • | • | • | • | • | • |
| | U200-01S / U260-01S<br>U270-01S | • | • | • | • | • | • |
| | U230-01S | • | • | • | • | • | • |
| | U200-02S / U260-02S<br>U270-02S | • | • | • | • | • | • |
| | U200-52S | • | • | • | • | • | • |
| | U200-62S | • | • | • | • | • | • |
| | U200-82S | • | • | • | • | • | • |
| | U270-62S / U270-63S<br>U270-68S | • | • | • | • | • | • |
| | U200-03S / U201-03S<br>U201-03A | • | • | • | • | • | • |
| | U200-83S / U201-83S | • | • | • | • | • | • |
| TOBY | L200-00S / L210-00S | • | • | • | | • | |
| | L200-02S / L210-02S | • | • | • | | • | • |
| | L201-01S | • | • | • | | • | • |
| | L210-60S / L280-00S | • | • | • | | • | • |
| | L210-62S | • | • | • | | • | • |
| | L280-02S | • | • | • | | • | • |
| | L220-02S | • | • | • | | • | • |
| MPCI | L200-00S / L210-00S | • | • | • | | • | |
| | L201-01S | • | • | • | | • | • |
| | L210-60S | • | • | • | | • | • |
| | L200-02S / L210-02S | • | • | • | | • | • |
| | L280-02S | • | • | • | | • | • |

Objective Specification

| AT command | | Short Messages Service | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | +CGSMS | +CMGD | +CMGF | +CMGL | +CMGR | +CMGS | +CMGW | +CMMS | +CMSS | +CNMA | +CNMI | +CPMS | +CPNER | +CRES | +CSAS | +CSCA | +CSCB | +CSDH | +CSMP | +CSMS | +UCMGL | +UCMGP | +UCMGR | +UCMGS |
| LEON | G100-06S | • | • | • | • | • | • | • | | • | • | • | • | | • | • | • | • | • | • | • | • | | • | • |
| | G100-07S / G100-08S | • | • | • | • | • | • | • | | • | • | • | • | | • | • | • | • | • | • | • | • | | • | • |
| SARA | G300-00S / G310-00S | • | • | • | • | • | • | • | | • | • | • | • | | • | • | • | • | • | • | • | • | | • | • |
| | G340-00S / G350-00S | • | • | • | • | • | • | • | | • | • | • | • | | • | • | • | • | • | • | • | • | | • | • |
| | G350-00X | • | • | • | • | • | • | • | | • | • | • | • | | • | • | • | • | • | • | • | • | | • | • |
| | G340-01S / G350-01S G350-01B | • | • | • | • | • | • | • | | • | • | • | • | | • | • | • | • | • | • | • | • | | • | • |
| | G340-02S / G350-02S G350-02A | • | • | • | • | • | • | • | | • | • | • | • | | • | • | • | • | • | • | • | • | | • | • |
| | U201-03A / U201-03B U201-03X | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | | • | | |
| | U260-00S / U280-00S | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | | • | | |
| | U270-00S / U270-00X | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | | • | | |
| | U260-03S / U280-03S | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | | • | | |
| | U270-03S | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | | • | | |
| | U270-53S | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | | • | | |
| LISA | U100 / U110 | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | | | | |
| | U120 / U130 | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | | | | |
| | U200-00S | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | | | | |
| | U200-01S / U260-01S U270-01S | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | | • | | |
| | U230-01S | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | | • | | |
| | U200-02S / U260-02S U270-02S | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | | • | | |
| | U200-52S | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | | • | | |
| | U200-62S | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | | • | | |
| | U200-82S | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | | • | | |
| | U270-62S / U270-63S U270-68S | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | | • | | |
| | U200-03S / U201-03S U201-03A | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | | • | | |
| | U200-83S / U201-83S | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | | • | | |
| TOBY | L200-00S / L210-00S | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | • | • | • | • | • | | | | |
| | L200-02S / L210-02S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | | |
| | L201-01S | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | • | • | • | • | • | | | | |
| | L210-60S / L280-00S | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | • | • | • | • | • | | | | |
| | L210-62S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | | |
| | L280-02S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | | |
| | L220-02S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | | |
| MPCI | L200-00S / L210-00S | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | • | • | • | • | • | | | | |
| | L201-01S | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | • | • | • | • | • | | | | |
| | L210-60S | • | • | • | • | • | • | • | | • | • | • | • | • | • | • | • | • | • | • | • | | | | |
| | L200-02S / L210-02S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | | |
| | L280-02S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | | |

Objective Specification

| AT command | | Short Messages Service | | |
|---|---|---|---|---|
| | | +UCMGW | +UDCONF=82 | +UMWI |
| LEON | G100-06S | • | | |
| | G100-07S / G100-08S | • | | |
| SARA | G300-00S / G310-00S | • | | |
| | G340-00S / G350-00S | • | | |
| | G350-00X | • | | |
| | G340-01S / G350-01S<br>G350-01B | • | | |
| | G340-02S / G350-02S<br>G350-02A | • | | |
| | U201-03A / U201-03B<br>U201-03X | | • | • |
| | U260-00S / U280-00S | | | • |
| | U270-00S / U270-00X | | | • |
| | U260-03S / U280-03S | | • | • |
| | U270-03S | | • | • |
| | U270-53S | | • | • |
| LISA | U100 / U110 | | | |
| | U120 / U130 | | | |
| | U200-00S | | | |
| | U200-01S / U260-01S<br>U270-01S | | | • |
| | U230-01S | | | • |
| | U200-02S / U260-02S<br>U270-02S | | | • |
| | U200-52S | | | • |
| | U200-62S | | | • |
| | U200-82S | | | • |
| | U270-62S / U270-63S<br>U270-68S | | | • |
| | U200-03S / U201-03S<br>U201-03A | | • | • |
| | U200-83S / U201-83S | | • | • |
| TOBY | L200-00S / L210-00S | | | |
| | L200-02S / L210-02S | | | • |
| | L201-01S | | | |
| | L210-60S / L280-00S | | | |
| | L210-62S | | | • |
| | L280-02S | | | • |
| | L220-02S | | | • |
| MPCI | L200-00S / L210-00S | | | |
| | L201-01S | | | |
| | L210-60S | | | |
| | L200-02S / L210-02S | | | • |
| | L280-02S | | | • |

Objective Specification

| AT command | | SIM functionalities | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | +CCHC | +CCHO | +CGLA | +CLAN | +CRLA | +CRSM | +CSIM | +CUAD | +SATD | +SATE | +SATR | +STKCTRLIND | +STKENV | +STKPRO | +STKPROF | +STKTR | +UBIP | +UBIPAPN |
| LEON | G100-06S | | | | | | • | • | | | | | | • | • | • | • | | |
| | G100-07S / G100-08S | | | | | | • | • | | | | | | • | • | • | • | | |
| SARA | G300-00S / G310-00S | | | | | | • | • | | | | | | • | • | • | • | | |
| | G340-00S / G350-00S | | | | | | • | • | | | | | | • | • | • | • | | |
| | G350-00X | | | | | | • | • | | | | | | • | • | • | • | | |
| | G340-01S / G350-01S G350-01B | | | | | | • | • | | | | | | • | • | • | • | | |
| | G340-02S / G350-02S G350-02A | • | • | • | | • | • | • | • | | | | | • | • | • | • | • | |
| | U201-03A / U201-03B U201-03X | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | U260-00S / U280-00S | | | | • | | • | • | | • | • | • | • | • | • | • | • | | |
| | U270-00S / U270-00X | | | | • | | • | • | | • | • | • | • | • | • | • | • | | |
| | U260-03S / U280-03S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | |
| | U270-03S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | |
| | U270-53S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | |
| LISA | U100 / U110 | | | | • | | • | • | | • | • | • | • | • | • | • | • | | |
| | U120 / U130 | | | | • | | • | • | | • | • | • | • | • | • | • | • | | |
| | U200-00S | | | | • | | • | • | | • | • | • | • | • | • | • | • | | |
| | U200-01S / U260-01S U270-01S | | | | • | | • | • | | • | • | • | • | • | • | • | • | | |
| | U230-01S | | | | • | | • | • | | • | • | • | • | • | • | • | • | | |
| | U200-02S / U260-02S U270-02S | | | | • | | • | • | | • | • | • | • | • | • | • | • | | |
| | U200-52S | | | | • | | • | • | | • | • | • | • | • | • | • | • | | |
| | U200-62S | | | | • | | • | • | | • | • | • | • | • | • | • | • | | |
| | U200-82S | | | | • | | • | • | | • | • | • | • | • | • | • | • | | |
| | U270-62S / U270-63S U270-68S | | | | • | | • | • | | • | • | • | • | • | • | • | • | | |
| | U200-03S / U201-03S U201-03A | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | |
| | U200-83S / U201-83S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | |
| TOBY | L200-00S / L210-00S | • | • | • | • | • | • | • | • | | | | | | | | | | |
| | L200-02S / L210-02S | • | • | • | • | • | • | • | • | | | | | | | | | • | |
| | L201-01S | • | • | • | • | • | • | • | • | | | | | | | | | | |
| | L210-60S / L280-00S | • | • | • | • | • | • | • | • | | | | | | | | | | |
| | L210-62S | • | • | • | • | • | • | • | • | | | | | | | | | • | |
| | L280-02S | • | • | • | • | • | • | • | • | | | | | | | | | • | |
| | L220-02S | • | • | • | • | • | • | • | • | | | | | | | | | • | |
| MPCI | L200-00S / L210-00S | • | • | • | • | • | • | • | • | | | | | | | | | | |
| | L201-01S | • | • | • | • | • | • | • | • | | | | | | | | | | |
| | L210-60S | • | • | • | • | • | • | • | • | | | | | | | | | | |
| | L200-02S / L210-02S | • | • | • | • | • | • | • | • | | | | | | | | | • | |
| | L280-02S | • | • | • | • | • | • | • | • | | | | | | | | | • | |

Objective Specification

| AT command | | SIM functionalities | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | +UCATENV | +UCATPROF | +UCATPROI | +UCATPRON | +UCATTR | +UCSP | +UDCONF=50 | +UDCONF=54 | +UDTMF | +URCATCC | +URCATE | +URCATR | +USAPIND | +USAPMODE | +USIMATR | +USIMSTAT | +UUICC |
| LEON | G100-06S | | | | | | | | | | | | | | | | | |
| | G100-07S / G100-08S | | | | | | | | | | | | | | | | | |
| SARA | G300-00S / G310-00S | | | | | | | | | | | | | | | | | |
| | G340-00S / G350-00S | | | | | | | | | | | | | | | | | |
| | G350-00X | | | | | | | | | | | | | | | | | |
| | G340-01S / G350-01S G350-01B | | | | | | | | | | | | | | | | | |
| | G340-02S / G350-02S G350-02A | | | | | | | | | | | | | | | | | |
| | U201-03A / U201-03B U201-03X | | | | | | • | • | • | • | | | | • | • | • | • | • |
| | U260-00S / U280-00S | | | | | | • | • | | • | | | | • | • | | | • |
| | U270-00S / U270-00X | | | | | | • | • | | • | | | | • | • | | | • |
| | U260-03S / U280-03S | | | | | | • | • | | • | | | | • | • | | • | • |
| | U270-03S | | | | | | • | • | | • | | | | • | • | | • | • |
| | U270-53S | | | | | | • | • | | • | | | | • | • | • | • | • |
| LISA | U100 / U110 | | | | | | • | | | | | | | | | | | • |
| | U120 / U130 | | | | | | • | | | • | | | | | | | | • |
| | U200-00S | | | | | | • | | | | | | | | | | | • |
| | U200-01S / U260-01S U270-01S | | | | | | • | • | | • | | | | • | • | | | • |
| | U230-01S | | | | | | • | • | | • | | | | • | • | | | • |
| | U200-02S / U260-02S U270-02S | | | | | | • | • | | • | | | | | • | | | • |
| | U200-52S | | | | | | • | • | | • | | | | • | • | | | • |
| | U200-62S | | | | | | • | • | | • | | | | • | • | | | • |
| | U200-82S | | | | | | • | • | | • | | | | • | • | | | • |
| | U270-62S / U270-63S U270-68S | | | | | | • | • | | • | | | | • | • | | | • |
| | U200-03S / U201-03S U201-03A | | | | | | • | • | | • | | | | • | • | | • | • |
| | U200-83S / U201-83S | | | | | | • | • | | • | | | | • | • | | • | • |
| TOBY | L200-00S / L210-00S | • | • | • | • | • | • | | | | • | • | • | | | | | • |
| | L200-02S / L210-02S | • | • | • | • | • | • | • | | • | • | • | • | | | | | • |
| | L201-01S | • | • | • | • | • | • | | | | • | • | • | | | | | • |
| | L210-60S / L280-00S | • | • | • | • | • | • | | | | • | • | • | | | | | • |
| | L210-62S | • | • | • | • | • | • | • | | • | • | • | • | | | | | • |
| | L280-02S | • | • | • | • | • | • | • | | • | • | • | • | | | | | • |
| | L220-02S | • | • | • | • | • | • | • | | • | • | • | • | | | | | • |
| MPCI | L200-00S / L210-00S | • | • | • | • | • | • | | | | • | • | • | | | | | • |
| | L201-01S | • | • | • | • | • | • | | | | • | • | • | | | | | • |
| | L210-60S | • | • | • | • | • | • | | | | • | • | • | | | | | • |
| | L200-02S / L210-02S | • | • | • | • | • | • | • | | • | • | • | • | | | | | • |
| | L280-02S | • | • | • | • | • | • | • | | • | • | • | • | | | | | • |

Objective Specification

| AT command | | Supplementary services | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | +CAAP | +CACM | +CAEMLPP | +CAMM | +CAOC | +CCFC | +CCUG | +CCWA | +CCWE | +CHLD | +CLCC | +CLIP | +CLIR | +CNAP | +COLP | +COLR | +CPPS | +CPUC | +CSSN | +CTFR | +CUSD | +CUUS1 |
| LEON | G100-06S | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • |
| | G100-07S / G100-08S | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • |
| SARA | G300-00S / G310-00S | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • |
| | G340-00S / G350-00S | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • |
| | G350-00X | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • |
| | G340-01S / G350-01S G350-01B | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • |
| | G340-02S / G350-02S G350-02A | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • |
| | U201-03A / U201-03B U201-03X | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | |
| | U260-00S / U280-00S | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | |
| | U270-00S / U270-00X | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | |
| | U260-03S / U280-03S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | |
| | U270-03S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | |
| | U270-53S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | |
| LISA | U100 / U110 | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | |
| | U120 / U130 | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | |
| | U200-00S | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | |
| | U200-01S / U260-01S U270-01S | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | |
| | U230-01S | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | |
| | U200-02S / U260-02S U270-02S | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | |
| | U200-52S | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | |
| | U200-62S | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | |
| | U200-82S | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | |
| | U270-62S / U270-63S U270-68S | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | |
| | U200-03S / U201-03S U201-03A | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | |
| | U200-83S / U201-83S | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | |
| TOBY | L200-00S / L210-00S | | • | | • | • | • | • | • | | • | • | • | • | • | • | • | | • | • | • | • | • |
| | L200-02S / L210-02S | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • |
| | L201-01S | | • | | • | • | • | • | • | | • | • | • | • | • | • | • | | • | • | • | • | • |
| | L210-60S / L280-00S | | • | | • | • | • | • | • | | • | • | • | • | • | • | • | | • | • | • | • | • |
| | L210-62S | | | | • | | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • |
| | L280-02S | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • |
| | L220-02S | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • |
| MPCI | L200-00S / L210-00S | | • | | • | • | • | • | • | | • | • | • | • | • | • | • | | • | • | • | • | • |
| | L201-01S | | • | | • | • | • | • | • | | • | • | • | • | • | • | • | | • | • | • | • | • |
| | L210-60S | | • | | • | • | • | • | • | | • | • | • | • | • | • | • | | • | • | • | • | • |
| | L200-02S / L210-02S | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • |
| | L280-02S | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • | • | • |

Objective Specification

| AT command | | System features | | | | | |
|---|---|---|---|---|---|---|---|
| | | *KTF*OPENING | +UADC | +UANT | +UANTR | +UCEDATA | +UCTS |
| LEON | G100-06S | | • | | • | | |
| | G100-07S / G100-08S | | • | | • | | |
| SARA | G300-00S / G310-00S | | | | | | |
| | G340-00S / G350-00S | | | | • | | |
| | G350-00X | | | | • | | |
| | G340-01S / G350-01S<br>G350-01B | | | | • | | |
| | G340-02S / G350-02S<br>G350-02A | | | | • | | • |
| | U201-03A / U201-03B<br>U201-03X | | | | • | • | • |
| | U260-00S / U280-00S | | | | • | | |
| | U270-00S / U270-00X | | | | • | | |
| | U260-03S / U280-03S | | | | • | • | • |
| | U270-03S | | | | • | • | • |
| | U270-53S | • | | | • | • | • |
| LISA | U100 / U110 | | | | • | | |
| | U120 / U130 | | | | • | | |
| | U200-00S | | | | • | | |
| | U200-01S / U260-01S<br>U270-01S | | | | • | | |
| | U230-01S | | | | • | | |
| | U200-02S / U260-02S<br>U270-02S | | | | • | | |
| | U200-52S | | | | • | | |
| | U200-62S | | | | • | | |
| | U200-82S | | | | • | | |
| | U270-62S / U270-63S<br>U270-68S | | | | • | | |
| | U200-03S / U201-03S<br>U201-03A | | | | • | • | • |
| | U200-83S / U201-83S | | | | • | • | • |
| TOBY | L200-00S / L210-00S | | | | | | |
| | L200-02S / L210-02S | | | • | • | | |
| | L201-01S | | | • | | | |
| | L210-60S / L280-00S | | | | | | |
| | L210-62S | | | • | • | | |
| | L280-02S | | | • | • | | |
| | L220-02S | | | • | • | | |
| MPCI | L200-00S / L210-00S | | | | | | |
| | L201-01S | | | • | | | |
| | L210-60S | | | | | | |
| | L200-02S / L210-02S | | | • | | | |
| | L280-02S | | | • | | | |

Objective Specification

| AT command | | System features | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | +UDATACHANNEL | +UDCONF=0 | +UDCONF=40 | +UDCONF=60 | +UDCONF=66 | +UFACTORY | +UFWINSTALL | +UFWUPD | +UNFM | +UNFMCONF | +UNVMMCC | +UNVMPLMN | +UOMADM | +UOMADMALERT | +UOMADMREP |
| LEON | G100-06S | | • | | | | | | • | | | | | | | |
| | G100-07S / G100-08S | | • | | | | | | • | | | | | | | |
| SARA | G300-00S / G310-00S | | • | | | | | | • | | | | | | | |
| | G340-00S / G350-00S | | • | | | | | | • | | | | | | | |
| | G350-00X | | • | | | | | | • | | | | | | | |
| | G340-01S / G350-01S G350-01B | | • | | | | | | • | | | | | | | |
| | G340-02S / G350-02S G350-02A | | • | | | | • | | • | • | • | | | | | |
| | U201-03A / U201-03B U201-03X | • | | • | • | • | • | | • | • | • | • | • | • | • | • |
| | U260-00S / U280-00S | • | | • | • | • | | | • | | | | | | | |
| | U270-00S / U270-00X | • | | • | • | • | | | • | | | • | • | | | |
| | U260-03S / U280-03S | • | | • | • | • | • | | • | • | • | • | • | | | |
| | U270-03S | • | | • | • | • | • | | • | • | • | • | • | | | |
| | U270-53S | • | | • | • | • | • | | • | • | • | • | • | | | |
| LISA | U100 / U110 | • | | | | | | | • | | | | | | | |
| | U120 / U130 | • | | | | | | | • | | | | | | | |
| | U200-00S | • | | | | | | | • | | | | | | | |
| | U200-01S / U260-01S U270-01S | • | | • | • | | | | • | | | | | | | |
| | U230-01S | • | | • | • | | | | • | | | | | | | |
| | U200-02S / U260-02S U270-02S | • | | • | • | | | | • | | | | | | | |
| | U200-52S | • | | • | • | | | | • | | | | | | | |
| | U200-62S | • | | • | • | | | | • | | | | | | | |
| | U200-82S | • | | • | • | | | • | • | | | | | | | |
| | U270-62S / U270-63S U270-68S | • | | • | • | | | | • | | | | | | | |
| | U200-03S / U201-03S U201-03A | • | | • | • | • | • | | • | • | • | • | • | | | |
| | U200-83S / U201-83S | • | | • | • | • | • | • | • | • | • | • | • | | | |
| TOBY | L200-00S / L210-00S | | | | • | • | | | • | | | | | | | |
| | L200-02S / L210-02S | | | • | • | • | • | • | • | | | | | | | |
| | L201-01S | | | | • | • | | • | • | | | | | | | |
| | L210-60S / L280-00S | | | | • | • | | | • | | | | | | | |
| | L210-62S | | | • | • | • | • | • | • | | | | | | | |
| | L280-02S | | | • | • | • | • | • | • | | | | | | | |
| | L220-02S | | | • | • | • | • | • | • | | | | | | | |
| MPCI | L200-00S / L210-00S | | | | • | • | | | • | | | | | | | |
| | L201-01S | | | | • | • | | • | • | | | | | | | |
| | L210-60S | | | | • | • | | | • | | | | | | | |
| | L200-02S / L210-02S | | | • | • | • | • | • | • | | | | | | | |
| | L280-02S | | | • | • | • | • | • | • | | | | | | | |

Objective Specification

| AT command | | System features | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | +UOMASTAT | +UPSV | +URING | +URPM | +URXDIV | +USIO | +USTS | +UTEST | +UUSBCONF | KTCFUN | KTDEVSTAT | KTUBXCONF | KTUCALLREJ | KTUUMTSENV |
| LEON | G100-06S | | • | | | | | • | • | | | | | | |
| | G100-07S / G100-08S | | • | | | | | • | • | | | | | | |
| SARA | G300-00S / G310-00S | | • | | | | | | • | | | | | | |
| | G340-00S / G350-00S | | • | | | | | • | • | | | | | | |
| | G350-00X | | • | | | | | • | • | | | | | | |
| | G340-01S / G350-01S<br>G350-01B | | • | | | | | • | • | | | | | | |
| | G340-02S / G350-02S<br>G350-02A | | • | | • | | • | • | • | | | | | | |
| | U201-03A / U201-03B<br>U201-03X | • | • | • | • | | | • | • | • | | | | | |
| | U260-00S / U280-00S | | • | • | | | | • | • | | | | | | |
| | U270-00S / U270-00X | | • | • | | | | • | • | | | | | | |
| | U260-03S / U280-03S | | • | • | • | | | • | • | • | | | | | |
| | U270-03S | | • | • | • | | | • | • | • | | | | | |
| | U270-53S | | • | • | • | | | • | • | • | • | • | • | • | • |
| LISA | U100 / U110 | | • | | | | | • | • | | | | | | |
| | U120 / U130 | | • | | | | | • | • | | | | | | |
| | U200-00S | | • | | | | | • | • | | | | | | |
| | U200-01S / U260-01S<br>U270-01S | | • | | | | | • | • | | | | | | |
| | U230-01S | | • | | | • | | • | • | | | | | | |
| | U200-02S / U260-02S<br>U270-02S | | • | • | | | | • | • | | | | | | |
| | U200-52S | | • | • | | | | • | • | | | | | | |
| | U200-62S | | • | • | | | | • | • | | | | | | |
| | U200-82S | | • | • | | | | • | • | | | | | | |
| | U270-62S / U270-63S<br>U270-68S | | • | • | | | | • | • | | | | | | |
| | U200-03S / U201-03S<br>U201-03A | | • | • | • | | | • | • | • | | | | | |
| | U200-83S / U201-83S | | • | • | • | | | • | • | • | | | | | |
| TOBY | L200-00S / L210-00S | | • | | | | | | • | • | | | | | |
| | L200-02S / L210-02S | | • | • | | • | | • | • | • | | | | | |
| | L201-01S | | • | | | | | | • | • | | | | | |
| | L210-60S / L280-00S | | • | | | | | | • | • | | | | | |
| | L210-62S | | • | • | | • | | • | • | • | | | | | |
| | L280-02S | | • | • | | • | | • | • | • | | | | | |
| | L220-02S | | • | • | | • | | • | • | • | | | | | |
| MPCI | L200-00S / L210-00S | | • | | | | | | • | • | | | | | |
| | L201-01S | | • | | | | | | • | • | | | | | |
| | L210-60S | | • | | | | | | • | • | | | | | |
| | L200-02S / L210-02S | | • | • | | • | | • | • | • | | | | | |
| | L280-02S | | • | • | | • | | • | • | • | | | | | |

Objective Specification

| AT command | | TCP/IP UDP/IP | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | +UDCONF=1 | +UDCONF=10 | +UDCONF=2 | +UDCONF=3 | +UDCONF=5 | +UDCONF=6 | +UDCONF=7 | +UDCONF=8 | +UFRW | +UIPCHGN | +USOAO | +USOCL | +USOCO | +USOCR | +USOCTL | +USODL | +USOER | +USOGO | +USOLI | +USORD | +USORF | +USOSEC | +USOSO | +USOST | +USOWR |
| LEON | G100-06S | • | | | | | | | | • | | | • | • | • | • | • | • | • | • | • | • | | • | • | • |
| | G100-07S / G100-08S | • | | | | | | | | • | | | • | • | • | • | • | • | • | • | • | • | | • | • | • |
| SARA | G300-00S / G310-00S | | | | | | | | | | | | | | | | | | | | | | | | | |
| | G340-00S / G350-00S | • | | | | • | • | • | • | | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • |
| | G350-00X | • | | | | • | • | • | • | | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • |
| | G340-01S / G350-01S G350-01B | • | | | | • | • | • | • | | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • |
| | G340-02S / G350-02S G350-02A | • | | | | • | • | • | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | U201-03A / U201-03B U201-03X | • | • | | | • | • | • | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | U260-00S / U280-00S | • | | | | • | • | • | • | | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • |
| | U270-00S / U270-00X | • | | | | • | • | • | • | | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • |
| | U260-03S / U280-03S | • | • | | | • | • | • | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | U270-03S | • | • | | | • | • | • | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | U270-53S | • | • | | | • | • | • | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| LISA | U100 / U110 | • | | • | • | | | | | | | | • | • | • | • | • | • | • | • | • | • | | • | • | • |
| | U120 / U130 | • | | • | • | | | | | | | | • | • | • | • | • | • | • | • | • | • | | • | • | • |
| | U200-00S | • | | • | • | | | | | | | | • | • | • | • | • | • | • | • | • | • | | • | • | • |
| | U200-01S / U260-01S U270-01S | • | | • | • | | | | | | • | | • | • | • | • | • | • | • | • | • | • | | • | • | • |
| | U230-01S | • | | • | • | | | | | | | | • | • | • | • | • | • | • | • | • | • | | • | • | • |
| | U200-02S / U260-02S U270-02S | • | | | | • | • | • | • | | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • |
| | U200-52S | • | | | | • | • | • | • | | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • |
| | U200-62S | • | | | | • | • | • | • | | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • |
| | U200-82S | • | | | | | | | | | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • |
| | U270-62S / U270-63S U270-68S | • | | | | | | | | | • | • | • | • | • | • | • | • | • | • | • | • | | • | • | • |
| | U200-03S / U201-03S U201-03A | • | • | | | • | • | • | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | U200-83S / U201-83S | • | • | | | • | • | • | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| TOBY | L200-00S / L210-00S | | | | | | | | | | | | | | | | | | | | | | | | | |
| | L200-02S / L210-02S | • | | | | • | • | • | • | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | L201-01S | • | | | | • | • | • | • | | | | • | • | • | • | • | • | • | • | • | • | | • | • | • |
| | L210-60S / L280-00S | | | | | | | | | | | | | | | | | | | | | | | | | |
| | L210-62S | • | | | | • | • | • | • | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | L280-02S | • | | | | • | • | • | • | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | L220-02S | • | | | | • | • | • | • | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| MPCI | L200-00S / L210-00S | | | | | | | | | | | | | | | | | | | | | | | | | |
| | L201-01S | • | | | | • | • | • | • | | | | • | • | • | • | • | • | • | • | • | • | | • | • | • |
| | L210-60S | | | | | | | | | | | | | | | | | | | | | | | | | |
| | L200-02S / L210-02S | • | | | | • | • | • | • | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | L280-02S | • | | | | • | • | • | • | | • | | • | • | • | • | • | • | • | • | • | • | • | • | • | • |

Objective Specification

| AT command | | Wi-Fi interface | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | +UWAPCFG | +UWAPIPCFG | +UWAPMACADDR | +UWAPSTALIST | +UWCFG | +UWFWRESET | +UWMP | +UWREGBLOCK | +UWSCAN | +UWSTACFG | +UWSTAIPCFG | +UWTEST | +UWWEBUI | +UWWEBUIFTP |
| LEON | G100-06S | | | | | | | | | | | | | | |
| | G100-07S / G100-08S | | | | | | | | | | | | | | |
| SARA | G300-00S / G310-00S | | | | | | | | | | | | | | |
| | G340-00S / G350-00S | | | | | | | | | | | | | | |
| | G350-00X | | | | | | | | | | | | | | |
| | G340-01S / G350-01S<br>G350-01B | | | | | | | | | | | | | | |
| | G340-02S / G350-02S<br>G350-02A | | | | | | | | | | | | | | |
| | U201-03A / U201-03B<br>U201-03X | | | | | | | | | | | | | | |
| | U260-00S / U280-00S | | | | | | | | | | | | | | |
| | U270-00S / U270-00X | | | | | | | | | | | | | | |
| | U260-03S / U280-03S | | | | | | | | | | | | | | |
| | U270-03S | | | | | | | | | | | | | | |
| | U270-53S | | | | | | | | | | | | | | |
| LISA | U100 / U110 | | | | | | | | | | | | | | |
| | U120 / U130 | | | | | | | | | | | | | | |
| | U200-00S | | | | | | | | | | | | | | |
| | U200-01S / U260-01S<br>U270-01S | | | | | | | | | | | | | | |
| | U230-01S | | | | | | | | | | | | | | |
| | U200-02S / U260-02S<br>U270-02S | | | | | | | | | | | | | | |
| | U200-52S | | | | | | | | | | | | | | |
| | U200-62S | | | | | | | | | | | | | | |
| | U200-82S | | | | | | | | | | | | | | |
| | U270-62S / U270-63S<br>U270-68S | | | | | | | | | | | | | | |
| | U200-03S / U201-03S<br>U201-03A | | | | | | | | | | | | | | |
| | U200-83S / U201-83S | | | | | | | | | | | | | | |
| TOBY | L200-00S / L210-00S | | | | | | | | | | | | | | |
| | L200-02S / L210-02S | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | L201-01S | | | | | | | | | | | | | | |
| | L210-60S / L280-00S | | | | | | | | | | | | | | |
| | L210-62S | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | L280-02S | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| | L220-02S | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| MPCI | L200-00S / L210-00S | | | | | | | | | | | | | | |
| | L201-01S | | | | | | | | | | | | | | |
| | L210-60S | | | | | | | | | | | | | | |
| | L200-02S / L210-02S | | | | | | | | | | | | | | |
| | L280-02S | | | | | | | | | | | | | | |

Objective Specification

## B.1 Parameters stored in profiles

The parameter settings of some commands can be stored in the profiles available in the memory module. To store, partially display, activate and de-activate these profiles, see the *AT&W*, *AT&V*, *AT&Y* commands description.

Not all the parameter setting are displayed through *AT&V* command.

Some AT commands have a unique configuration for all the AT interfaces 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.
Some AT command interfaces have a dynamic activation, which means they are not statically activated at boot time (MUX AT channel is activated when the MUX protocol is established, USB AT channel is activated if/when the USB cable is plugged-in, deactivated when it is removed). Since the activation reloads the AT command profile from NVM for the activated interface, the shared "AT interface configurations" could be overwritten. It is suggested to reconfigure them at the requested value if an AT command interface is dynamically activated.

SARA-G340-02S / SARA-G350-02A / SARA-G350-02S
Due to AUX UART interface's limitations, at boot time, the parameter setting of *AT+IPR*, *AT+ICF* and *AT+IFC* commands stored in the profile might be not applicable. In this case, the factory-programmed value is applied.
The same behaviour is experienced in case the *ATZ* or *AT&F* commands are issued by the DTE on the AUX UART interface.

The following table lists the AT commands which setting can be stored in the profiles with their parameters as well as the factory-programmed values.

| AT command | Description | AT interface configuration sharing | Factory-programmed value | 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 | SARA-G / LEON-G On LEON-G / SARA-G: 7,0,1 | On LEON-G / SARA-G series:<br>• Speed: 9600 b/s (V.32)<br>• Name: data circuit asynchronous<br>• Connection element: non-transparent |
| | | | On LISA-U / SARA-U: 71, 0,1 | On LISA-U / SARA-U series:<br>• Speed: 9600 b/s (V110 or X.31 flag stuffing)<br>• Name: data circuit asynchronous<br>• Connection element: non-transparent |
| +CMGF | Preferred message format | Yes | 0 | Format of messages in PDU mode<br>TOBY-L201 / MPCI-L201<br>The default value is 1 (text mode). |
| +CNMI | New message indication | Yes | 1,0,0,0,0 | • Discard indication and reject new received message URCs when MT-DTE link is reserved<br>• No SMS-DELIVER indications are routed to the TE<br>• No CBM indications to the DTE<br>• No SMS-STATUS-REPORTs are routed to the DTE |
| +COPS | Operator selection | Yes | 0,0,FFFF | • Autoregistration enabled (<mode>: 0)<br>• Operator expressed in long alphanumeric format (<format>: 0)<br>• 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 |

Objective Specification

| AT command | Description | AT interface configuration sharing | Factory-programmed value | Comment |
|---|---|---|---|---|
| +CRLP | Radio Link protocol settings | Yes | 61,61,48,7 | Standard configuration for radio link protocol:<br>• IWF to MT window size: 61<br>• MT to IWF window size: 61<br>• Acknowledgement timer: 48<br>• Retransmission attempts: 7 |
| | | | On LEON-G / SARA-G300-00S / SARA-G310-00S / SARA-G340-00S / SARA-G350-00S / SARA-G350-00X / LISA-U1 / LISA-U200-00S / LISA-U200-01S / LISA-U200-02S / LISA-U200-52S / LISA-U200-62S / LISA-U200-82S / LISA-U230 / LISA-U260 / LISA-U270: 61,61,48,6 | Standard configuration for radio link protocol:<br>• IWF to MT window size: 61<br>• MT to IWF window size: 61<br>• Acknowledgement timer: 48<br>• Retransmission attempts: 6 |
| +CSNS | Single numbering scheme | Yes | 0 | The bearer service, used when a mobile terminated single numbering scheme call is established, is voice.<br>LISA-U2x0-02S LISA-U2x0-01S LISA-U200-00S LISA-U1 SARA-G350-01S SARA-G350-01B SARA-G350-00S SARA-G350-00X SARA-G340-01S SARA-G340-00S SARA-G310-00S SARA-G300-00S LEON-G<br>The command setting is not stored in the profile. |
| +ICF | DTE-DCE character framing | No | On LEON-G / SARA-G: 0,0 | On LEON-G / SARA-G series<br>• Framing format autodetected |
| | | | On LISA-U / SARA-U / TOBY-L2: 3,1 | On LISA-U / SARA-U / TOBY-L2 series<br>• Framing format: 8 data 1 stop, no parity |
| +IFC | DTE-DCE local flow control | No | 2,2 | • <DCE_by_DTE> on circuit 106 (CTS)<br>• <DTE_by_DCE> on circuit 105 (RTS) |
| +IPR | Baud rate | No | • TOBY-L2 / LISA-U2 / SARA-U / SARA-G / LEON-G : 0<br>• LISA-U1 / LISA-U200-00S : 115200 | • TOBY-L2 / LISA-U2 / SARA-U / SARA-G / LEON-G : Autobauding enabled<br>• LISA-U1 / LISA-U200-00S : 115200 b/s |
| +UAPT | Audio parameters tuning | Yes | - | See TOBY-L2 Audio Application Note [117] for the factory-programmed values stored in the profiles. |
| +UDBF | Downlink biquad digital filters | Yes | On LEON-G series:<br>Path 0:<br>Filter1: 0, 0, 0, 0, 32767<br>Filter2: 0, 0, 0, 0, 32767<br>Path 1:<br>Filter1: -29322, -29141, 29322, 26240, 29322<br>Filter2: 29322, 29141, 29322, 26240, 29322<br>Path 3:<br>Filter1: 0, 0, 0, 0, 32767<br>Filter2: 0, 0, 0, 0, 32767<br>Path 4:<br>Filter1: 0, 0, 0, 0, 32767<br>Filter2: 0, 0, 0, 0, 32767 | On LEON-G series:<br>Path 0:<br>• Filter1: a1:0, b1:0, a2:0, b2:0, a0:32767<br>• Filter2: a1:0, b1:0, a2:0, b2:0, a0:32767<br>Path 1:<br>• Filter1: a1:-29322, b1:-29141, a2:29322, b2:26240, a0:29322<br>• Filter2: a1:29322, b1:29141, a2:29322, b2:26240, a0:29322<br>Path 3:<br>• Filter1: a1:0, b1:0, a2:0, b2:0, a0:32767<br>• Filter2: a1:0, b1:0, a2:0, b2:0, a0:32767<br>Path 4:<br>• Filter1: a1:0, b1:0, a2:0, b2:0, a0:32767<br>• Filter2: a1:0, b1:0, a2:0, b2:0, a0:32767 |

Objective Specification

| AT command | Description | AT interface configuration sharing | Factory-programmed value | Comment |
|---|---|---|---|---|
| | | | On SARA-G3 / LISA-U / SARA-U series, for all paths, all the filters are set to: 0, 0, 0, 0, 32767 | On SARA-G340 / SARA-G350 and LISA-U / SARA-U series, for all paths, all the filters are set to:<br>• a1:0, b1:0, a2:0, b2:0, a0:32767 |
| +UHFP | Hands-free parameters | Yes | On LEON-G series:<br>Path 0:<br>0x01fd, 0x016e, 2200, 250, 3, 5, 150, 0, 0, 500, 4096, 16384, 16384<br>Path 1:<br>0x01fd, 0x016e, 2200, 250, 3, 5, 150, 0, 0, 500, 4096, 16384, 16384<br>Path 2:<br>0x01fd, 0x016e, 2200, 250, 8, 5, 150, 0, 0, 500, 4096, 16384, 16384 | On LEON-G series:<br>Path 0:<br>• 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<br>Path 1:<br>• 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<br>Path 2:<br>• 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 SARA-G340 / SARA-G350 series:<br>Path 0:<br>0x31fd,NA,NA,NA,NA,NA,NA,0,0,588,8192,16384,16384,2,100,100,100,0,0,0<br>Path 1:<br>0x31fd,NA,NA,NA,NA,NA,NA,0,0,588,8192,16384,16384,2,100,100,100,0,0,0<br>Path 2:<br>0x31fd,NA,NA,NA,NA,NA,NA,0,0,588,8192,16384,16384,2,100,100,100,0,0,0<br>Path 4:<br>0x31fd,NA,NA,NA,NA,NA,NA,0,0,588,8192,16384,16384,2,100,100,100,0,0,0 | On SARA-G340 / SARA-G350:<br>Path 0:<br>• HF_algorithm_init:0x31fd, 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:588, NR_sw_2:8192, NR_u_fak_0:16384, NR_u_fa k:16384, EC_block_length:2, EC_nr_coeff_real:100, EC_nr_coeff_complex1:100, EC_nr_coeff_c omplex2:100, EC_nr_coeff_complex3:0, EC_nr_coeff_complex4:0, EC_nr_coeff_complex5:0<br>Path 1:<br>• HF_algorithm_init:0x31fd, 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:588, NR_sw_2:8192, NR_u_fak_0:16384, NR_u_fa k:16384, EC_block_length:2, EC_nr_coeff_real:100, EC_nr_coeff_complex1:100, EC_nr_coeff_c omplex2:100, EC_nr_coeff_complex3:0, EC_nr_coeff_complex4:0, EC_nr_coeff_complex5:0<br>Path 2:<br>• HF_algorithm_init:0x31fd, 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:588, NR_sw_2:8192, NR_u_fak_0:16384, NR_u_fa k:16384, EC_block_length:2, EC_nr_coeff_real:100, EC_nr_coeff_complex1:100, EC_nr_coeff_c omplex2:100, EC_nr_coeff_complex3:0, EC_nr_coeff_complex4:0, EC_nr_coeff_complex5:0<br>Path 4: |

Objective Specification

| AT command | Description | AT interface configuration sharing | Factory-programmed value | Comment |
|---|---|---|---|---|
| | | | | • HF_algorithm_init:0x31fd, 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:588, NR_sw_2:8192, NR_u_fak_0:16384, NR_u_fa k:16384, EC_block_length:2, EC_nr_coeff_real:100, EC_nr_coeff_complex1:100, EC_nr_coeff_c omplex2:100, EC_nr_coeff_complex3:0, EC_nr_coeff_complex4:0, EC_nr_coeff_complex5:0 |
| | | | On LISA-U120 / LISA-U130 :<br>Paths 0, 1, 2:<br>0x01fd, NA,NA,NA,NA, NA,NA, 0, 0, 500, 8192, 7500, 7500, 2,100, 100, 100, 60, 60, 60<br>Path 4:<br>0x01fd, NA,NA,NA,NA, NA,NA, 50, 100, 500, 8192, 7500, 7500, 2, 220 , 220, 220, 60, 60, 60 | On LISA-U120 / LISA-U130:<br>Paths 0, 1, 2:<br>• 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<br>Path 4:<br>• 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_complex3:60, EC_nr_coeff_complex4:60, EC_nr_coeff_complex5:60 |
| | | | On LISA-U2 / SARA-U series all the paths are set to:<br>0x0124, NA,NA,NA,NA, NA,NA, 0, 0, 500, 8192, 7500, 7500, 2, 100, 100, 100, 60, 60, 60 | On LISA-U2 / SARA-U series all the paths are set to:<br>• HF_algorithm_init: 0x0124, 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 |
| +UMGC | Microphone gain control | Yes | On LEON-G series:<br>Path 0: 10,9384<br>Path 1: 12,8192<br>Path 2: 6,8192 | On LEON-G series:<br>Path 0:<br>• Analog gain:10, Digital gain: 9384<br>Path 1:<br>• Analog gain:12, Digital gain: 8192<br>Path 2:<br>• Analog gain:6, Digital gain: 8192 |
| | | | On SARA-G340 / SARA-G350 series:<br>Path 0:10,8192<br>Path 1:10,8192 | On SARA-G340 / SARA-G350 series:<br>Path 0:<br>• Analog gain:10, Digital gain: 8192<br>Path 1: |

Objective Specification

| AT command | Description | AT interface configuration sharing | Factory-programmed value | Comment |
|---|---|---|---|---|
| | | | Path 2:6,8192<br>Path 4:10,8192 | • Analog gain:10, Digital gain: 8192<br>Path 2:<br>• Analog gain:6, Digital gain: 8192<br>Path 4:<br>• Analog gain:10, Digital gain: 8192 |
| | | | On LISA-U120 / LISA-U130 :<br>Path 0:12,8192<br>Path 1:12,8192<br>Path 2:6,8192<br>Path 4:13,8192 | On LISA-U120 / LISA-U130:<br>Path 0:<br>• Analog gain: 12, Digital gain: 8192<br>Path 1:<br>• Analog gain: 12, Digital gain: 8192<br>Path 2:<br>• Analog gain: 6, Digital gain: 8192<br>Path 4:<br>• Analog gain: 13, Digital gain: 8192 |
| | | | On LISA-U2 / SARA-U series all the paths are set to: NA,8192 | On LISA-U2 / SARA-U series all the paths are set to:<br>• Analog gain: NA, Digital gain: 8192 |
| +UPSV | Power Saving (mode, timeout) | Yes | 0 | Power saving disabled |
| +USGC | Speaker gain control | Yes | On LEON-G series:<br>Path 0: 6, 1, 8192, 16384, 8192<br>Path 1: 6, 0, 8192, 16384, 10240<br>Path 3: 0, 6, 8192, 16384, 8191<br>Path 4: 6, 6, 8192, 16384, 8191 | On LEON-G series:<br>Path 0:<br>• Speaker gain: 6, Headset gain: 1, speech and Tone Generator gain: 8192, Synthesizers gain: 16384, Speech gain: 8192<br>Path 1:<br>• Speaker gain:6, Headset gain:0, speech and Tone Generator gain: 8192, Synthesizers gain: 16384, Speech gain:10240<br>Path 3:<br>• Speaker gain: 0, Headset gain: 6, speech and Tone Generator gain: 8192, Synthesizers gain:16384, Speech gain: 8191<br>Path 4:<br>• Speaker gain: 6, Headset gain: 6, speech and Tone Generator gain: 8192, Synthesizers gain: 16384, Speech gain: 8191 |
| | | | On SARA-G340 / SARA-G350 series:<br>Path 0: 3, 3, 8192, 16384, 8192<br>Path 1: 3, 3, 8192, 16384, 8192<br>Path 3: 3, 3, 8192, 16384, 8192<br>Path 4: 5, 0, 8192, 16384, 8192 | On SARA-G340 / SARA-G350 series:<br>Path 0:<br>• Speaker gain: 3, Headset gain: 3, speech and Tone Generator gain: 8192, Synthesizers gain: 16384, Speech gain: 8192<br>Path 1:<br>• Speaker gain:3, Headset gain:3, speech and Tone Generator gain: 8192, Synthesizers gain: 16384, Speech gain: 8192<br>Path 3:<br>• Speaker gain: 3, Headset gain: 3, speech and Tone Generator gain: 8192, Synthesizers gain: 16384, Speech gain: 8192<br>Path 4:<br>• Speaker gain: 5, Headset gain: 0, speech and Tone Generator gain: 8192, Synthesizers gain: 16384, Speech gain: 8192 |

Objective Specification

| AT command | Description | AT interface configuration sharing | Factory-programmed value | Comment |
|---|---|---|---|---|
| | | | On LISA-U120 / LISA-U130 :<br>Path 0: A,0,8192,16384, NA<br>Path 1: NA,1,8192,16384, NA<br>Path 3: NA,0,8192,16384, NA<br>Path 4: NA,3,8192,16384, NA | On LISA-U120 / LISA-U130:<br>Path 0:<br>• Speaker gain: Not Available, Headset gain: 0, Speech and Tone Generator gain: 8192, Synthesizers gain: 16384, Speech gain: Not Available<br>Path 1:<br>• Speaker gain: Not Available, Headset gain1, speech and Tone Generator gain: 8192, Synthesizers gain: 16384, Speech gain: Not Available<br>Path 3:<br>• Speaker gain: Not Available, Headset gain: 0, speech and Tone Generator gain: 8192, Synthesizers gain: 16384, Speech gain: Not Available<br>Path 4:<br>• Speaker gain: Not Available, Headset gain: 3, speech and Tone Generator gain: 8192, Synthesizers gain: 16384, Speech gain: Not Available |
| | | | On LISA-U2 / SARA-U series all the paths are set to:<br>NA,NA,8192,16384,NA | On LISA-U2 / SARA-U series all paths are set to:<br>• Speaker gain: Not Available, Headset gain: Not Available, speech and Tone Generator gain: 8192, Synthesizers gain: 16384, Speech gain: Not Available |
| +USTN | Sidetone | Yes | On LEON-G series:<br>Path 0: 2249<br>Path 1: 2249<br>Path 3: 0<br>Path 4: 0 | On LEON-G series:<br>Path 0:<br>• Gain for side tone: 2249<br>Path 1:<br>• Gain for side tone: 2249<br>Path 3:<br>• Gain for side tone: 0<br>Path 4:<br>• Gain for side tone: 0 |
| | | | On LISA-U120 / LISA-U130 and SARA-G340 / SARA-G350:<br>Path 0: 512<br>Path 1: 512<br>Path 3: 0<br>Path 4: 0 | On LISA-U120 / LISA-U130 and SARA-G340 / SARA-G350:<br>Path 0:<br>• Gain for side tone: 512<br>Path 1:<br>• Gain for side tone: 512<br>Path 3:<br>• Gain for side tone: 0<br>Path 4:<br>• Gain for side tone: 0 |
| | | | On LISA-U2 / SARA-U series all paths are set to 512 | On LISA-U2 / SARA-U series, for all paths:<br>• Gain for side tone: 512 |
| +USTS | Smart temperature supervisor | Yes | 0 | Smart temperature URC disabled |

Objective Specification

| AT command | Description | AT interface configuration sharing | Factory-programmed value | Comment |
|---|---|---|---|---|
| +UTPB | Parity bit transmission over the air | Yes | 0 | Transmission of the parity bit over the air is disabled |
| +UUBF | Uplink biquad digital filters | Yes | On LEON-G series:<br>Path 0:<br>Filter1: -13915, 2249, 4377, -325, 23450<br>Filter2: 21682, -2312, 17984, -15517, 32767<br>Path 1:<br>Filter1: -29322, -29141, 29322, 26240, 29322<br>Filter2: 29322, 29141, 29322, 26240, 29322<br>Path 2:<br>Filter1: 0, 0, 0, 0, 32767<br>Filter2: 0, 0, 0, 0, 32767 | On LEON-G series:<br>Path 0:<br>• Filter1: a1:-13915, b1:2249, a2:4377, b2:-325, a0:23450<br>• Filter2: a1:21682, b1:-2312, a2:17984, b2:-15517, a0:32767<br>Path 1:<br>• Filter1: a1:-29322, b1:-29141, a2:29322, b2:26240, a0:29322<br>• Filter2: a1:29322, b1:29141, a2:29322, b2:26240, a0:29322<br>Path 2:<br>• Filter1: a1:0, b1:0, a2:0, b2:0, a0:32767<br>• Filter2: a1:0, b1:0, a2:0, b2:0, a0:32767 |
| | | | On SARA-G340 / SARA-G350 and LISA-U / SARA-U series, for all the paths, all filters are set to: 0, 0, 0, 0, 32767 | On SARA-G340 / SARA-G350 and LISA-U / SARA-U series, for all the paths, all filters are set to:<br>a1:0, b1:0, a2:0, b2:0, a0:32767 |
| +UVGC | Volume gain control | Yes | <componentID> 0<br><gainID> 0: -5<br><gainID> 1: OFF<br><gainID> 2: 20<br><gainID> 3: 4 | External codec Maxim MAX9860<br>DVA: -5 dB<br>DVST: OFF<br>PAM: 20 dB<br>PGAM: 4 dB |
| 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 which setting can be stored in the non volatile memory with their parameters and the factory-programmed values.

| AT command | Description | Factory-programmed value | Comment |
|---|---|---|---|
| &Y | Designate a default reset profile | 0 | Profile 0 selected |
| +CALA | Alarm | | No alarms are stored |
| +CALM | Alert sound mode | 0 | Mute disabled |

Objective Specification

| AT command | Description | Factory-programmed value | Comment |
|---|---|---|---|
| +CCLK | Clock | 04/01/01,00:00:00+00 | |
| +CEMODE | UE modes of operation for EPS | • 1 (voice capable devices)<br>• 2 (voice not-capable devices) | • CS/PS mode 1 of operation for voice capable devices<br>• CS/PS mode 2 of operation for voice not-capable devices |
| +CGDCONT | PDP context definition | All contexts are undefined | Not available in LEON-G series<br>The PDP contexts are permanently stored when they are defined or deleted |
| +CGSMS | Select service for MO SMS messages | 1 | CS service selected |
| +CLVL | Loudspeaker volume level | LISA-U / SARA-U / SARA-G / LEON-G SARA-U / LISA-U / SARA-G / LEON-G: 80 | LISA-U / SARA-U / SARA-G / LEON-G SARA-U / LISA-U / SARA-G / LEON-G: 80 |
| | | TOBY-L2 TOBY-L2: 30 | TOBY-L2 TOBY-L2: 30 |
| +CNEM | Network emergency bearer services support | 0 | URCs disabled |
| +CPMS | Preferred message storage | • TOBY-L200-00S / TOBY-L210-00S / TOBY-L210-60S / MPCI-L200-00S / MPCI-L210-00S / MPCI-L210-60S : "SM", "SM", "SM"<br>• TOBY-L200-02S / TOBY-L201 / TOBY-L210-02S / TOBY-L210-60S / TOBY-L210-62S / TOBY-L220 / TOBY-L280 / MPCI-L200-02S / MPCI-L201 / MPCI-L210-02S / MPCI-L280 / LISA-U / SARA-U / SARA-G / LEON-G : "MT", "MT", "MT" | • TOBY-L200-00S / TOBY-L210-00S / TOBY-L210-60S / MPCI-L200-00S / MPCI-L210-00S / MPCI-L210-60S : <mem1>, <mem2> and <mem3> are set to "SM"<br>• TOBY-L200-02S / TOBY-L201 / TOBY-L210-02S / TOBY-L210-60S / TOBY-L210-62S / TOBY-L220 / TOBY-L280 / MPCI-L200-02S / MPCI-L201 / MPCI-L210-02S / MPCI-L280 / LISA-U / SARA-U / SARA-G / LEON-G : <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 |
| +CSGT | Set greeting text | "" | Greeting text is empty |
| +CTZU | Automatic time zone update | 0 | Automatic time zone via NITZ disabled |
| +UBIP | Bearer Independent Protocol status indication | 0 | BIP status indication disabled |
| +UBIPAPN | Default BIP APN configuration | "" | Empty string as default APN for BIP service |
| +UBMCONF | Boot mode configuration | 1 | Router mode |
| +UCD | Jamming detection configuration | 0,255,63 | • Jamming detection disabled<br>• Number of 2G minimum disturbing carriers: 255<br>• Number of 3G minimum disturbing carriers: 63 |
| +UCGATT | Auto attach to PS domain on power on configuration | 1 | Enables the auto attach at the module power on |
| +UCGCLASS | Changing the startup MS class | "B" | <class>="B" |
| +UCGDFLT | Initial PDP context configuration | "IP","",0,0,0,0,0,1,0,0,1,0,,,"" | • <PDP_type>: "IP"<br>• <APN>: ""<br>• <emg_ind>: 0<br>• <ipcp_req>: 0<br>• <pcscf_v6>: 0<br>• <icmn_sig>: 0<br>• <dns_v6>: 0<br>• <ip_via_nas>: 1<br>• <ip_via_dhcp>: 0<br>• <pcscf_v4>: 0<br>• <dns_v4>: 1 |

Objective Specification

| AT command | Description | Factory-programmed value | Comment |
|---|---|---|---|
| | | | • <auth_type>: 0<br>• <auth_user>: NULL<br>• <auth_pass>: NULL<br>• <vendor_specific>: " " |
| +UCLASS | Device class setting | • SARA-G / LEON-G : 10<br>• TOBY-L2 / MPCI-L2 / LISA-U / SARA-U : 12, 12, 11, 11 | • SARA-G / LEON-G : GPRS class 10<br>• TOBY-L2 / MPCI-L2 / LISA-U / SARA-U : GPRS class 12, EGPRS class 12, DTM GPRS class 11, DTM EGPRS class 11 |
| +UCSD | Circuit Switched Data | | Empty profile |
| +UCTS | CTS line state in case of disabled HW flow control | 0 | Legacy behavior (CTS line is set to ON state if HW flow control is disabled) |
| +UDCONF=9 | Uplink user data plane configuration | 1 | Uplink user data plane enabled |
| +UDCONF=20 | Steering of Roaming configuration | On LEON-G / SARA-G series: 0 | SoR is disabled. |
| | | On LISA-U2 / SARA-U series: 1 | SoR enabled. |
| +UDCONF=30 | Speech codec configuration | On LEON-G / SARA-G series: 31 | |
| | | On LISA-U2 / SARA-U series: 3135 | |
| | | On TOBY-L2 series: 3647 | |
| +UDCONF=32 | Connection type groups enable/ disable | 127 | Not supported by LEON-G series or by LISA-U1 series or by LISA-U200-00S version |
| +UDCONF=40 | User defined power reduction | 2,2 | MSPR GPRS and EDGE profile.<br>Not supported by LEON-G / SARA-G series nor by LISA-U1 series and LISA-U200-00S version |
| +UDCONF=50 | SIM hot insertion detection | 0 | Disabled |
| +UDCONF=60 | F-DPCH/enhanced F-DPCH configuration | 2 | F-DPCH and Enhanced F-DPCH enabled |
| | | On LISA-U200-01S / LISA-U230 / LISA-U260-01S / LISA-U270-01S: 0 | F-DPCH and Enhanced F-DPCH disabled |
| +UDCONF=61 | Fast Dormancy configuration | 2 | All the <FD_mode> values are allowed |
| +UDCONF=66 | IPv6 configuration | 1 | Enabled |
| | | On LISA-U / SARA-U / TOBY-L200 / TOBY-L201 / TOBY-L210-60S / TOBY-L210-62S / MPCI-L200 / MPCI-L201 / MPCI-L210-60S: 0 | Disabled |
| +UDCONF=67 | Router mode configuration | 1 | Enabled |
| +UDCONF=70 | LCS positioning capabilities configuration | 0 | • Standalone, MS-Based and MS-Assisted disabled |
| +UDCONF=90 | eCall and InBM test configuration | 0," ",43200 | • Type of address octet: 0<br>• eCall test or reconfiguration number: empty string<br>• 32-bit timer duration: 12 hours |
| +UDTMF | User setting for proactive DTMF tone generation | 1 | Proactive DTMF tone generation available |
| +UDYNDNS | Dynamic DNS | 0,0," "," "," " | Client disabled<br>TZO.com<br>Domain name empty<br>Username empty<br>Password empty |
| +UEXTDCONF | Automatic configuration of the Maxim MAX9860 audio codec | 0 | Disabled |
| +UFACTORY | Restore factory configuration | 0, 0 | No FS factory restore, no NVM factory restore |
| +UFDAC | Fast dormancy activation | 3, 5, 5 | Automatic SCRI transmission request deactivated, FD Delay Timer=5 s, FD Inhibit Timer=5 s |
| | | On LISA-U270-62S / LISA-U270-63S / LISA-U270-68S: 2, 7, 120 | Automatic SCRI transmission request activated, FD Delay Timer=7 s, FD Inhibit Timer=120 s |

Objective Specification

| AT command | Description | Factory-programmed value | Comment |
|---|---|---|---|
| +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<br>One minute of timeout after a fail download<br>Three attempts in case of failed download |
| +UGAOP | AssistNow Online configuration | "eval1-les.services.u-blox.com", 46434,1000,0 | Host name server: "eval1-les.services.u-blox.com"<br>Server port: 46434<br>Expected network latency: 1000 ms<br>AssistNow Online data downloaded at GPS receiver power up |
| +UGGGA | Get GPS fix data | 0 | NMEA $GGA messages disabled |
| +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 |
| +UGPIOC | GPIO functionality setting | On TOBY-L2 series:<br>15, 15, 15, 15, 16, 255, 255, 0, 12, 12, 12, 12, 7, 14 | On TOBY-L2 series:<br>Default setting for <gpio1>, <gpio2>, <gpio3>, <gpio4>, <gpio5>, <gpio6>, <gpio7>, <gpio8>, <gpio9>, <gpio10>, <gpio11>, <gpio12>, <gpio13>, <gpio14> at the first power up. |
| | | On SARA-U2 series:<br>255, 3, 4, 5, 12, 12, 12, 12, 7 | On SARA-U2 series:<br>Default setting for <gpio1>, <gpio2>, <gpio3>, <gpio4>, <gpio5>, <gpio6>, <gpio7>, <gpio8>, <gpio9> at the first power up. |
| | | On LISA-U2 series (except LISA-U200-00S):<br>255, 3, 4, 5, 7, 12, 12, 12, 12, 13, 13, 13, 13, 13 | On LISA-U2 series:<br>Default setting for <gpio1>, <gpio2>, <gpio3>, <gpio4>, <gpio5>, <gpio6>, <gpio7>, <gpio8>, <gpio9>, <gpio10>, <gpio11>, <gpio12>, <gpio13>, <gpio14> at the first power up. |
| | | On LISA-U200-00S:<br>255, 255, 255, 255, 7, 255, 255, 255, 255 | On LISA-U200-00S:<br>Default setting for <gpio1>, <gpio2>, <gpio3>, <gpio4>, <gpio5>, <gpio6>, <gpio7>, <gpio8>, <gpio9> at the first power up. |
| | | On LISA-U1 series:<br>255, 3, 4, 5, 7 | On LISA-U1 series:<br>Default setting for <gpio1>, <gpio2>, <gpio3>, <gpio4>, <gpio5> at the first power up. |
| | | On SARA-G340 / SARA-G350 series:<br>255, 3, 4, 5 | On SARA-G340 / SARA-G350 series:<br>Default setting for <gpio1>, <gpio2>, <gpio3>, <gpio4> at the first power up. |
| | | On LEON-G series:<br>8, 255, 3, 4, 5 | On LEON-G series:<br>Default setting for <gpio1>, <gpio2>, <gpio3>, <gpio4>, <gpio5> at the first power up. |
| +UGPRF | GNSS profile configuration | 0, 0, "" | No data flow on multiplexer, file and IP address<br>IP port not defined<br>Server address string not defined |
| +UGRMC | Get recommended minimum GNSS data | 0 | NMEA $RMC messages disabled |

Objective Specification

| AT command | Description | Factory-programmed value | Comment |
|---|---|---|---|
| +UGSRV | Aiding server configuration | "cell-live1.services.u-blox.com", "cell-live2.services.u-blox.com", 14, 4, 1, 65, 0, 15 | • Primary MGA server: "cell-live1.services.u-blox.com"<br>• Secondary MGA server: "cell-live2.services.u-blox.com"<br>• Number of days for validation of Offline data: 14<br>• Number of weeks for validation of Offline data: 4<br>• Resolution of offline data for MGA: 1<br>• Desired GNSS for the (offline) aiding: GPS and GLONASS<br>• AssistNow Online data are downloaded at GNSS receiver power up<br>• All the desired data types for the (online) aiding are set |
| +UGVTG | Get course over ground and ground speed | 0 | NMEA $VTG messages disabled |
| +UGZDA | Get GPS time and date | 0 | NMEA $ZDA messages disabled |
| +UHSDUPA | HSDPA/HSUPA mode configuration | 1 | HSDPA on |
| | | 8 | Category 8<br>Note that:<br>• - the factory-programmed value is 14<br>• - the factory-programmed value is 24 |
| | | 1 | HSUPA on |
| | | 6 | Category 6 |
| +UI2S | $I^2S$ digital interface mode | On TOBY-L2:<br>21,1,0,3,0 | On TOBY-L2:<br>I2S settings:<br>• Mode: PCM mode 21<br>• Port: I2S is connected to I2Sx connection point<br>• CLK and WA active in dynamic mode<br>• Sample rate: 16 kHz<br>• Master/Slave mode: Master |
| | | On LISA-U2 / SARA-U2 series:<br>1,1,0,3,0<br>1,3,0,3,0 | On LISA-U2 series:<br>I2S settings:<br>• Mode: PCM mode 1<br>• Port: I2S is connected to I2Sx connection point<br>• CLK and WA active in dynamic mode<br>• Sample rate: 16 kHz<br>• Master/Slave mode: Master<br>I2S1 settings:<br>• Mode: PCM mode 1<br>• Port: I2S1 is connected to I2Sx connection point<br>• CLK and WA active in dynamic mode<br>• Sample rate: 16 kHz<br>• Master/Slave mode: Master |
| | | On LISA-U120 / LISA-U130:<br>0,1,0,0,0 | On LISA-U120 / LISA-U130:<br>• Mode: PCM mode 0<br>• Port: I2S is connected to I2Sx connection point<br>• CLK and WA active in dynamic mode<br>• Sample rate: 8 kHz<br>• Master/Slave mode: Master |

Objective Specification

| AT command | Description | Factory-programmed value | Comment |
|---|---|---|---|
| | | On SARA-G340 / SARA-G350:<br>1,1,0 | On SARA-G340 / SARA-G350 series:<br>• Mode: normal mode 1<br>• Port: I2S is connected to I2Sx connection point<br>• CLK and WA active in dynamic mode |
| | | On LEON-G series:<br>4,2,1 | On LEON-G series:<br>• Mode: normal mode 4<br>• Port: I2S is connected to I2Sy connection point<br>• CLK and WA active in continuous mode |
| +UIMSCONF | IMS configuration setting | "IMS",0,"IPV4V6","true","false","false","true","","","","","","false","","","","",2000,16000,17000,64000,1500,5060,600000,600000,30,1800,"false","false","LIST","","","3gpp","gsm7","AUTO","AUTO","PS_PREF","IMS_PREF","true","true","false","lteonly","false","false" | • "KEY_IMS_PDP_APN": IMS Access Point Name: "IMS".<br>• "KEY_IMS_PDP_CID": PDP context identifier: 0.<br>• "KEY_IMS_PDP_TYPE": IMS PDP type: "IPV4V6".<br>• "KEY_AUTH_TYPE_AKA": AKAv1 MD5 Digest Authentication enabled<br>• "KEY_AUTH_TYPE_AKAV2": AKAv2 MD5 Digest Authentication disabled<br>• "KEY_AUTH_TYPE_MD5": MD5 Digest Authentication disabled<br>• "KEY_SEC_AGREE": Security Agreement and IPsec enabled<br>• "KEY_CONFIG_XDM_URL": XDM/XCAP Server Root URL empty<br>• "KEY_PASSWORD": password for IMS MD5 Digest Authentication and XCAP Authentication empty<br>• "KEY_HOME_NETWORK_DOMAIN": Home Domain/Realm empty string.<br>• "KEY_PRIVATE_IDENTITY": private User ID for IMS Registration and XDM Authentication (IMPI) empty<br>• "KEY_PUBLIC_IDENTITY": public User ID empty<br>• "KEY_CONFIG_SOFT_SIM": Software SIM feature disabled<br>• "KEY_CONFIG_SOFT_SIM_K": Software SIM secret K empty<br>• "KEY_CONFIG_SOFT_SIM_OP": Software SIM secret OP empty string<br>• "KEY_PCSCF_SERVER_ADDRESS": P-CSCF IP Address/Domain empty<br>• "KEY_DNS_SERVER": DNS IP address empty<br>• "KEY_SIP_TIMER_T1": Timer_T1 set to 2000 if the <MNO> parameter of the *+UMNOCONF* command is set to 0 (regulatory MNO), 3000 if the <MNO> parameter is set to 3 (Verizon).<br>• "KEY_SIP_TIMER_T2": the Timer_T2 set to 16000.<br>• "KEY_SIP_TIMER_T4": the Timer_T4 set to 17000.<br>• "KEY_SIP_TIMER_TF": the Timer_TF set to 64000.<br>• "KEY_MTU_SIZE": the Maximum Transmission Unit (MTU) is 1500.<br>• "KEY_IMS_CLIENT_PORT": port 5060 used by the UE's SIP application |

Objective Specification

| AT command | Description | Factory-programmed value | Comment |
|---|---|---|---|
| | | | • "KEY_REG_EXPIRES": IMS registration expiration time set to 600000.<br>• "KEY_MAX_REG_EXPIRES": maximum IMS registration expiration time set to 60 0000.<br>• "KEY_RETRY_BASE_TIME": Retry Base Time set to 30.<br>• "KEY_RETRY_MAX_TIME": Retry Max Time set to 1800.<br>• "KEY_REG_BARRED_USER_ID": Use Barred User ID in Registration and De-Registration feature disabled<br>• "KEY_EXPLICIT_UNSUB_REG_EVENT": unsubscription of the Registration Event Package during deregistration disabled<br>• "KEY_PCSCF_BACKOFF_PREFERENCE": Backoff on P-CSCF change due to server failure set to "LIST".<br>• "KEY_SMSC_NUMBER": SMSC phone number empty<br>• "KEY_SMSC_URI": SMSC URI empty<br>• "KEY_MO_SMS_FORMAT": SMS format set to "3gpp".<br>• "KEY_MO_SMS_ENCODING": SMS encoding to be used for Mobile Originated SMS set to "gsm7".<br>• "KEY_QOS_PREFERENCE": QoS precondition during SIP call set-up set to "AUTO".<br>• "KEY_PDP_BEARER_MODE": QoS Allocation Mode set to "AUTO".<br>• "KEY_DOMAIN_PREFERENCE": Domain Preference for the IMS Service Continuity feature set to "PS_PREF".<br>• "KEY_SMS_PREFERENCE": preferred service used for MO SMS: "IMS_PREF".<br>• "KEY_IMS_SUPPORT": IMS support and registration enabled<br>• "KEY_IMS_MWI_SUPPORT": MWI Event Package Support for IMS enabled<br>• "KEY_IMS_SIGCOMP_SUPPORT": Signal Compression Support for IMS Signaling feature disabled<br>• "KEY_IMS_RAT": IMS will try to register on LTE RAT only<br>• "KEY_IMS_SMS_SEND_OK_WRITE_UICC": SMSes correctly sent not stored<br>• "KEY_IMS_SMS_SEND_NOK_WRITE_UICC": SMSes not sent due to network errors not stored. |
| +UIPCHGN | IP change notification | 0 | IP change notification disabled |
| +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 | Local aiding, AssistNow online, AssistNow offline, AssistNow autonomous enabled<br>Power saving disabled<br>Minimum number of satellites for navigation: 3<br>Minimum satellite signal level for navigation: 7<br>Disabled initial Fix must be 3D flag |

Objective Specification

| AT command | Description | Factory-programmed value | Comment |
|---|---|---|---|
| | | | Static Hold Mode: 0<br>SBAS disabled<br>Jamming indicator disabled<br>Antenna settings unknown<br>Broadband jamming detection threshold: 0 dB<br>Continuous wave jamming detection threshold: 0 dB |
| +ULTECAT | LTE category configuration | 0,4 | • Factory-programmed LTE category configuration applied<br>• LTE category: 4 |
| +UMCLK | Master clock control | 0 | CODEC_CLK mode setting (<mclk_mode>): clock out pin from LISA module (input for audio codec) is set as three state with pull down resistor. |
| | | 0 | Setting of dynamic of the application mode (<enabling_mode>): <mclk_mode> setting is applied to CODEC_CLK pin only when audio path is active. After audio path is disabled (i.e. a call is hang up) CODEC_CLK is disabled too |
| +UMNOCONF | MNO configuration | • TOBY-L201 / MPCI-L201 2,7<br>• TOBY-L280 / MPCI-L280 4,1 | • TOBY-L201 / MPCI-L201 AT&T configuration, automatic power cycle<br>• TOBY-L280 / MPCI-L280 Telstra configuration, automatic power cycle |
| +UMNOPLMN | PLMN list extensions | 2,"310.030,310.150,310.170,310.280,310.380,310.410,310.560" | For AT&T: "310.030,310.150,310.170,310.280,310.380,310.410,310.560". |
| | | 3,"310.590,310.890,311.480" | For Verizon: "310.590,310.890,311.480". |
| | | 4,"505.11,505.71,505.72,505.01,530.04" | For Telstra: "505.11,505.71,505.72,505.01,530.04" |
| +UNFM | Network friendly mode activation | 0, 0 | • Network friendly mode deactivated<br>• +UUNFM URC disabled |
| +UNFMCONF=0 | Network friendly mode configuration, back-off timer configuration parameter set | 60, 2, 7680 | • Back-off timer base: 60 s<br>• Multiplier factor of the geometrical sequence: 60<br>• Back-off timer's maximum duration: 7680 s |
| +UNFMCONF=1 | Network friendly mode configuration, basic parameter set | 10, 1, 10, 1, 10, 1 | • Maximum number of CS registration attempts per defined time interval: 10<br>• Time interval in hours associated to CS registration attempts: 1 h<br>• Maximum number of PS registration attempts per defined time interval: 10<br>• Time interval in hours associated to CS registration attempts: 1 h<br>• Maximum number of PDP context activation attempts per defined time interval: 10<br>• Time interval in hours associated to CS registration attempts: 1 h |
| +UNVMMCC | MCC update table | | Empty table |
| +UNVMPLMN | PLMN info list | | Empty table |
| +UPSD | Packet switched data | | Empty profile |
| +URAT | Selection of Radio Access Technology | 1,2 | • Radio Access technology: GSM/UMTS Dual mode<br>• RAT UMTS |
| | | On TOBY-L2 / MPCI-L2: 4,3 | • Radio Access technology: GSM / UMTS / LTE (tri mode) |

Objective Specification

| AT command | Description | Factory-programmed value | Comment |
|---|---|---|---|
| | | | • RAT LTE |
| +URING | RING line handling | 0 | Feature disabled (RING line is only asserted on incoming call and incoming SMS) |
| +URPM | RPM activation | 0 | Radio Policy Manager deactivated |
| +URNG | Ringing tone selection | 0 | Melody 0 |
| +URXDIV | RX diversity | 1 | 3G Rx Diversity disabled |
| | DARP phase | 3 | DARP Phase 2 always on |
| +USIMSTAT | (U)SIM initialization status reporting | 0 | URC +UUSIMSTAT disabled |
| +USOAO | Socket Always On | 0,0 | Feature disable |
| | | 1,0 | PSD profile: 0 |
| | | 2,0 | Client Mode |
| | | 3," " | Empty |
| | | 4,2000 | Default port: 2000 |
| | | 5,6 | TCP socket |
| | | 20+i," " | Empty |
| +USPM | Audio path mode setting | On TOBY-L2 series: | On TOBY-L2 series: |
| | | 1,1,0,0,2 | • Speech audio output path: Downlink path 1 via I2S<br>• Speech audio input path: Uplink path 1 via I2S<br>• Alert sound on main downlink path (Downlink path 1 via I2S)<br>• Headset indication: not considered<br>• VMIC is always switched Off |
| | | On LISA-U2 / SARA-U2 series: | On LISA-U2 / SARA-U2 series: |
| | | 1,1,0,0,2 | • Speech audio output path: Downlink path 1 via I2S<br>• Speech audio input path: Uplink path 1 via I2S<br>• Alert sound on main downlink path (Downlink path 1 via I2S)<br>• Headset indication: not considered<br>• VMIC is always switched Off |
| | | On LISA-U1 series: | On LISA-U1 series: |
| | | 1,1,0,0,2 | • Speech audio output path: Headset microphone<br>• Speech audio input path: Mono headset earpiece<br>• Alert sound on main downlink path (Mono headset earpiece)<br>• Headset indication: not considered<br>• VMIC is always switched Off |
| | | On SARA-G340 / SARA-G350 series: 0,0,0,0,0 | On SARA-G340 / SARA-G350 series:<br>• Speech audio output path: Handset microphone<br>• Speech audio input path: Normal earpiece<br>• Alert sound on main downlink path (Mono headset earpiece)<br>• Headset indication: not considered<br>• VMIC is switched On /Off |
| | | On LEON-G series: 0,0,1,1,0 | On LEON-G series:<br>• Speech audio output path: Handset microphone<br>• Speech audio input path: Normal earpiece<br>• Alert sound on Loudspeaker<br>• Headset indication: considered |

Objective Specification

| AT command | Description | Factory-programmed value | Comment |
|---|---|---|---|
| | | | • VMIC is switched On /Off |
| +UUSBCONF | USB profiles configuration | On TOBY-L2 series:<br>3,"RNDIS" | • High throughput<br>• USB network function: "RNDIS" |
| | | On SARA-U / LISA-U series:<br>0 | • 7 CDC-ACM |
| +USIO | Serial interfaces configuration | 1 | • AT command on UART, diagnostic log on AUX UART, I2S can be used for DAI |
| +UWAPCFG | Wireless access point physical layer configuration | "UBXWifi",2,"ubx-wifi",1,0,3 | • ESSID: "UBXWifi"<br>• Authentication type: WPA2<br>• Security passphrase: "ubx-wifi"<br>• Country code: US<br>• Wireless channel number: auto<br>• IEEE standard: 802.11b/g/n<br>TOBY-L210 / TOBY-L280<br>The factory-programmed country code is 0 (EU). |
| +UWAPIPCFG | Wireless access point network layer configuration | 192.168.2.1,255.255.255.0,<br>192.168.2.100,192.168.2.200 | • Access point IP address: 192.168.2.1<br>• Access point netmask: 255.255.255.0<br>• Start IP address of the DHCP range: 192.168.2.100<br>• Stop IP address of the DHCP range: 192.168.2.200 |
| +UWCFG | Wi-Fi module power mode | 0, 0, 0 | • Wi-Fi module is turned off<br>• Connection manager disabled<br>• Conflict reporting URC disabled |
| +UWREGBLOCK | Wi-Fi regulatory domains block configuration | 60 | • Timer duration when the module enters in not registered state: 60 minutes |
| +UWSTACFG | Wireless station physical layer configuration | 0 | • Disabled |
| +UWSTAIPCFG | Wireless station network layer configuration | 1,1 | • Connectivity within an external access point enabled<br>• Internal DHCP client to associate to the external access point enabled |
| +UWWEBUI | Web user interface configuration | 0 | • Web user interface disabled |
| +UWWEBUIFTP | Web user interface customization through FTP service | 0 | • Access to the Web user interface through FTP service is not allowed |

## B.3 Saving AT commands configuration

The following procedure can be used to store the AT commands configuration for the AT commands listed in *Appendix B.1* and *Appendix B.2*.

- Write the run-time configuration of the AT commands listed in *Appendix B.1* to the RAM profile mirror by means of the *AT&W* command (e.g. AT&W0)
- Confirm that the 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)
- Since the permanently saving of NVM content is achieved by a low priority process, the time depends on all the other activities as network procedures, call management, and so on. To be sure to save suddenly the run-time configuration of the commands listed in *Appendix B.2*, it is advisable to use *+CPWROFF* or *+CFUN=15* or *+CFUN=16*. If the *+CPWROFF* has been issued the module, perform a reboot of the device

## B.4 Estimated command response time

After having sent a command to a u-blox cellular module, the time to obtain a resulting result code depends on the SIM and the network. It is possible to have an immediate response if the command does not interact with either the network or the SIM.

Objective Specification

The following table reports the maximum time to get the result code for the AT commands. The commands are grouped by categories.

| Category | Estimated maximum time to get response | Commands |
|---|---|---|
| Power off | < 40 s | +CPWROFF |
| Call control and supplementary services | < 20 s | A, H, +CAEMLPP, +CHLD, +CHUP, +CNAP, +COLP, +COLR, +CSVM |
| | Up to 7 min | +VTS |
| Network commands | Up to 3 min (<1 s for prompt ">" when present) | D, D>, DL, +CCFC, +CCWA, +CFUN, +CGATT, +CGDATA, +CLCK, +CLIP, +CLIR, +COPS, +CPMS, +CMGL, +CMGR, +CMGS, +CMSS, +CPWD, +CTFR, +CUSD, +UCGOPS, +UCMGL, +UCMGP, +UCMGR, +UCMGS, +UCSDA, +UPSDA |
| | Up to 1 s | +UDOPN |
| | < 5 s | +UCELLINFO |
| | < 40 s | +UEONS |
| Phonebook commands | < 35 s | +CPBF, +CPBR, +CPBS, +CPBW |
| Delete all the SMSes | < 55 s | +CMGD |
| Send an SMS | < 150 s | +CMGS, +CMSS |
| New message acknowledgement to MT | < 150 s | +CNMA |
| SIM management | < 10 s | +CACM, +CAMM, +CAOC, +CMGW, +CNUM, +CPIN, +CPOL, +CPUC, +CR, +CRES, +CRSM, +CSCA, +CSCB, +CSMP, +UCMGW |
| SIM toolkit | < 20 s | +SATD, +SATE, +SATR, +STKENV, +STKTR, +UCATENV, +UCATTR, +URCATE, +URCATR |
| PDP context activation | < 150 s | +CGACT, +UPSDA |
| PDP context deactivation | < 40 s | +CGACT, +UPSDA |
| ECM data connection | Up to 3 min | +UCEDATA |
| Restore configuration | < 5 s | +UFACTORY |
| GPIO commands | < 10 s | +UGPIOC, +UGPIOR, +UGPIOW |
| Internet suite (TCP/IP, DNS, FTP, HTTP, SMTP) | < 10 s (except URC) | +USMTPC, +USMTPM, +USOCL, +USODL, +USOLI, +USORD, +USORF, +USOST, +USOWR |
| | < 20 s | +USOCO |
| | < 70 s (except URC) | +UDNSRN |
| GNSS commands | < 10 s (except +UGPS for which timeout is according to the performed operation) | +UGAOS, +UGGGA, +UGGLL, +UGGSA, +UGGSV, +UGPS, +UGRMC, +UGTMR, +UGUBX, +UGVTG, +UGZDA, +ULOC |
| Wi-Fi | < 15 s | +UWSCAN |
| | < 20 s | +UWAPCFG, +UWCFG, +UWSTACFG |
| Audio recording | Up to 10 s | +URECFILE |

## B.5 Multiple AT command interfaces

u-blox cellular modules support multiple AT command interfaces, that means a certain number of virtual or physical channels that work as described in *Definitions*.

Each interface maintains an own run-time AT commands configuration (AT command profile); this means that the AT command profile is different among the interfaces and therefore the AT commands configuration for the commands belonging to the profile can be different among the interfaces.

At the module start-up, since there is only a set of the 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). Subsequently, each interface can change its run-time AT profile (stored in RAM). The commands *AT&W*, *AT&V* manage this run-time AT commands configuration for the interface where they are issued.

The USB interface implements multiple AT command interfaces. Unlike what happens for the other physical interfaces (e.g. UART, SPI), the AT command interfaces that run on the USB interface only exists as long as the USB interface connects the module with the DTE. As a result, if the USB connection between the module and the DTE is interrupted (e.g. by USB cable removal), all the AT command interfaces running on it are destroyed. This has two main consequences:

Objective Specification

- Any data connection (both circuit switched and packet switched) established over an AT command interface associated to the USB interface is released.
- As already explained in *Appendix B.1*, whenever the USB connection between the module and the DTE is re-established, the AT command interfaces running on it are created, and for each of these interfaces the AT command profile is reloaded from NVM and applied.

The reload of the AT command profile from the NVM also results in the re-application of the *+UPSV* setting, which is a shared "AT interface configuration". This must be kept in mind, since the change could have impacts on the communication over the UART interface.

As mentioned in *Definitions*, 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 relate to AT commands that configure the DCE-DTE interface.

*Table 67* provides the major differences.

| AT command | UART / AUX UART (where available) | Multiplexer | USB (where available) | SPI (where available) |
|---|---|---|---|---|
| AT&K | Effective | When it returns OK (the configuration is allowed), it is effective | When it returns OK (the configuration is allowed), it is not effective (only change the value in the AT command profile) | When it returns OK (the configuration is allowed), it is not effective (only change the value in the AT command profile) |
| AT\Q | Effective | When it returns OK (the configuration is allowed), it is effective | When it returns OK (the configuration is allowed), it is not effective (only change the value in the AT command profile) | When it returns OK (the configuration is allowed), it is not effective (only change the value in the AT command profile) |
| AT+ICF | Effective | Returns OK, but it is not effective (only change the value in the AT command profile) | Returns OK, but it is not effective (only change the value in the AT command profile) | Returns OK, but it is not effective (only change the value in the AT command profile) |
| AT+IFC | Effective | When it returns OK (the configuration is allowed), it is effective | When it returns OK (the configuration is allowed), it is not effective (only change the value in the AT command profile) | When it returns OK (the configuration is allowed), it is not effective (only change the value in the AT command profile) |
| AT+IPR | Effective | Returns OK, but it is not effective (only change the value in the AT command profile) | Returns OK, but it is not effective (only change the value in the AT command profile) | Returns OK, but it is not effective (only change the value in the AT command profile) |
| 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 67: Interface comparison**

Objective Specification

# C Appendix: UDP Direct Link workflow

## C.1 Data from the IP network to the external port

When a UDP data packet is received from the network, its payload is forwarded through the external port as soon as possible (according to the HW flow control, if any).

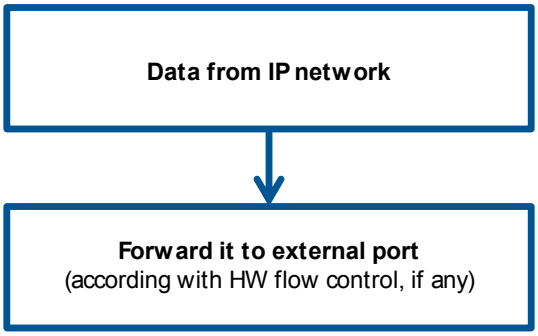



**Figure 23: Workflow of data from the IP network to the external port**

## C.2 Data from the external port to the IP network

When some data comes from the external port, there are 2 parameters involved:

1. The UDP DL packet size (factory-programmed: 1024 bytes; valid range 100-1472)
2. The UDP DL sending timer delay (factory-programmed: 1000 ms; valid range 100-120000)

Both parameters are specific for each socket and could be modified by the user. These values are not saved into the NVM and if not specified, the factory-programmed values are used.

There are 3 different cases that may occur while receiving data from the external port in UDP DL mode:

1. The received data from the external port is equal to the UDP DL packet size: the received data is immediately sent to the network
2. The received data from the external port is more than the UDP DL packet size: the amount of data till UDP DL packet size is immediately sent to the network, the remaining data is saved into an intermediate buffer.
3. The received data from the external port is less than UDP DL packet size: the received data is saved into an intermediate buffer and sent to the network when the UDP DL sending timer expires. The timer is reset (it restarts the countdown) every time new data is received from the external port, this means that the data will be sent to the network after N ms (default 1000 ms) since the last received byte.

The data sent from the serial port is not echoed to the sender.

The configuration of UDP DL packet size and UDP DL sending timer are NOT saved in NVM.

The following diagram shows how the events of external data input and sending timer expire are handled.

Objective Specification

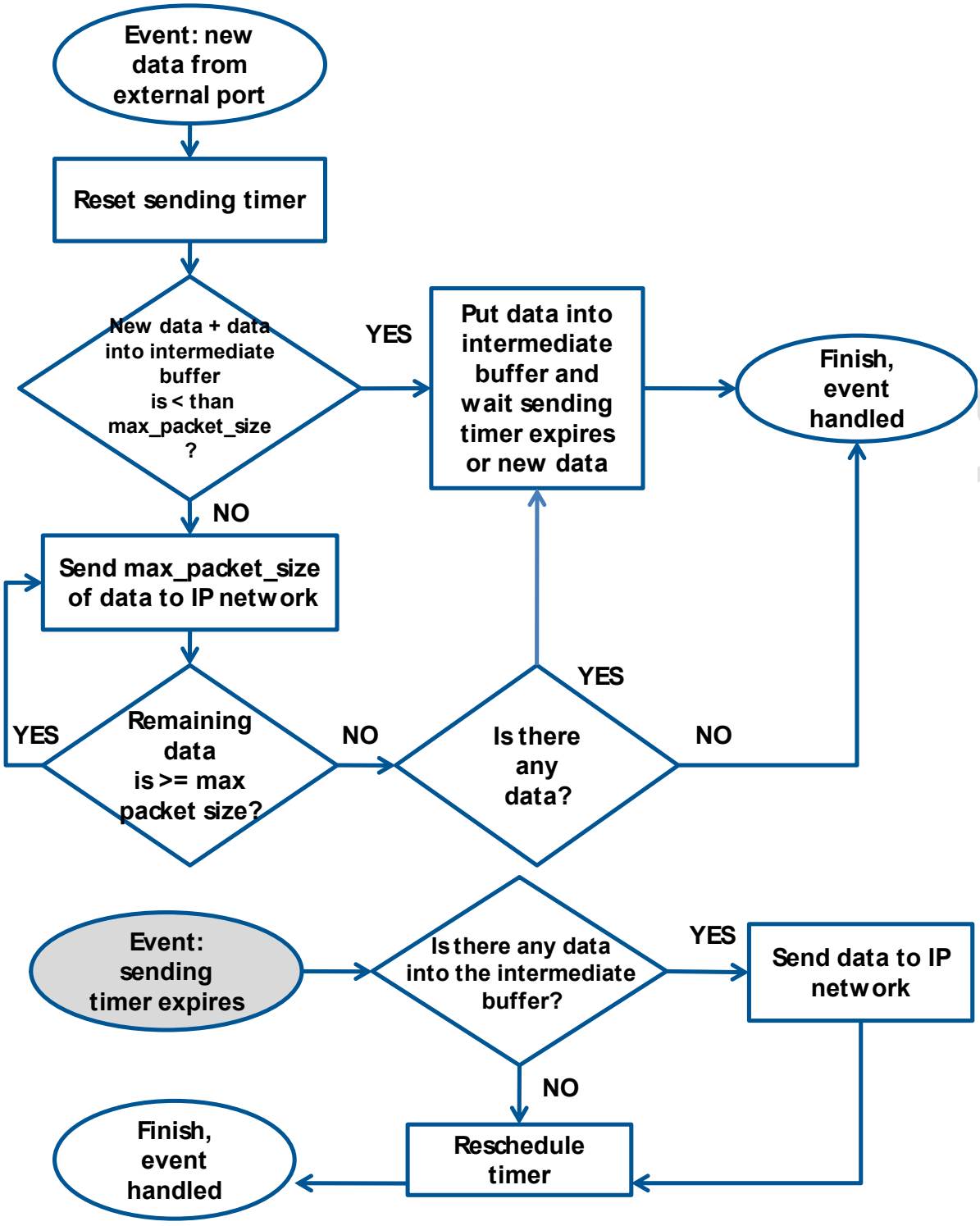



**Figure 24: Workflow of data from the external port to the IP network**

# D Appendix: Glossary

| | |
|---|---|
| 2G | 2nd Generation |
| 3G | 3rd Generation |
| 3GPP | 3rd Generation Partnership Project |
| ADC | Analog to Digital Converter |
| AIeC | Automatically Initiated eCall |
| ADN | Abbreviated Dialing Numbers |
| AMR | Adaptive Multi Rate |
| AP | Access Point |
| 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 |
| DARP | Downlink Advanced Receiver Performance |
| DCD | Data Carrier Detect |
| DCE | Data Communication Equipment |
| DCM | Data Connection Management |
| DHCP | Dynamic Host Configuration Protocol |
| 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 |
| EARFCN | E-UTRAN Absolute Radio Frequency Channel Number |
| eCall | Emergency Call |
| EEP | EEPROM Emulation Parameters |
| EF | Elementary File |
| $EF_{PLMNwAcT}$ | Elementary File "User controlled PLMN Selector with Access Technology" |
| eIM | eCall In-band Modem |
| EONS | Enhanced Operator Name from SIM-files $EF_{OPL}$ and $EF_{PNN}$ |
| EPD | Escape Prompt Delay |
| ETSI | European Telecommunications Standards Institute |
| E-UTRAN | Evolved UTRAN |
| FDN | Fixed Dialling Number |
| FOAT | Firmware Over AT |
| FOTA | Firmware Over The Air |
| FS | File System |

Objective Specification

| | |
|---|---|
| FTP | File Transfer Protocol |
| FW | Firmware |
| FWINSTALL | Firmware Install |
| GAS | Grouping information Alpha String |
| 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 |
| $I^2C$ | Inter-Integrated Circuit |
| $I^2S$ | Inter IC Sound or Integrated Interchip 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 |
| InBM | In-Band Modem (generic) |
| IP | Internet Protocol |
| IRA | International Reference Alphabet |
| IRC | Intermediate Result Code |
| ISDN | Integrated Services Digital Network |
| ISP | Internet Service Provider |
| IVS | In-Vehicle System (eCall related) |
| L3 | Layer 3 |
| LCP | Link Control Protocol |
| LF | Line Feed |
| LNS | Linux Network Subsystem |
| M2M | Machine-To-Machine |
| MCC | Mobile Country Code |
| ME | Mobile Equipment |
| MIeC | Manually Initiated eCall |
| MMI | Man Machine Interface |
| MN | Mobile Network Software Subsystem |
| MNC | Mobile Network Code |
| MNO | Mobile Network Operator |
| MO | Mobile Originated |
| MS | Mobile Station |
| MSD | Minimum Set of Data (eCall related) |
| MSIN | Mobile Subscriber Identification Number |
| MSISDN | Mobile Systems International Subscriber Identity Number |
| MSPR | Multi-Slot Power Reduction |
| MT | Mobile Terminated |
| MWI | Message Waiting Indication |
| NITZ | Network Identity and Time Zone |
| NVM | Non-Volatile Memory |
| OLCM | On Line Commands Mode |
| PAD | Packet Assembler/Disassembler |
| P-CID | Physical Cell Id |
| PCN | Personal Communication Network |
| PDP | Packet Data Protocol |
| PDU | Protocol Data Unit |
| PIN | Personal Identification Number |
| PLMN | Public Land Mobile Network |

Objective Specification

| | |
|---|---|
| PPP | Point-to-Point Protocol |
| PSAP | Public Safety Answering Point (eCall related) |
| PSD | Packet-Switched Data |
| PUK | Personal Unblocking Key |
| QoS | Quality of Service |
| RAM | Random Access Memory |
| RDI | Restricted Digital Information |
| RFU | Reserved for Future Use |
| RNDIS | Remote Network Driver Interface Specification |
| RI | Ring Indicator |
| RTC | Real Time Clock |
| RTP | Real-time Transport Protocol |
| RTS | Request To Send |
| Rx | Receiver |
| SAP | SIM Access Profile |
| SC | Service Centre |
| SI | SIM Application Part Software Subsystem |
| SIP | Session Initiation Protocol |
| SIM | Subscriber Identity Module |
| SMS | Short Message Service |
| SMSC | Short Message Service Center |
| SMTP | Simple Mail Transfer Protocol |
| SoR | Steering of Roaming |
| SDIO | Secure Digital Input Output |
| STA | station |
| SSID | Service Set Identifier |
| TA | Terminal Adaptor |
| TCP | Transfer Control Protocol |
| TE | Terminal Equipment |
| TFT | Traffic Flow Template |
| TP | Transfer layer Protocol |
| Tx | Transmitter |
| TZ | Time Zone |
| UCS2 | Universal Character Set |
| UDI | Unrestricted Digital Information |
| UDP | User Datagram Protocol |
| UI | Unnumbered Information |
| UICC | Universal Integrated Circuit Card |
| UIH | Unnumbered Information with header Check |
| URC | Unsolicited Result Code |
| USIM | UMTS Subscriber Identity Module |
| UTRAN | Universal Terrestrial Radio Access Network |
| UUS1 | User-to-User Signalling Supplementary Service 1 |
| WLAN | Wireless Local Area Network |

Objective Specification

# Related documents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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 - Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Man-Machine Interface (MMI) of the User Equipment (UE)
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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
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23. ISO 639 (1988) Code for the representation of names of languages
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25. LEON-G1 series System Integration Manual, Docu No UBX-13004888
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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)


Objective Specification

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
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49. LISA-U series System Integration Manual, Docu No UBX-13001118
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53. 3GPP TS 25.306 - UE Radio Access capabilities
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69. Maxim MAX9860 16-Bit Mono Audio Voice Codec datasheet, 19-4349; Rev 1; 9/09. Available from the Maxim website (*http://datasheets.maxim-ic.com/en/ds/MAX9860.pdf*)
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71. ETSI TS 122 101 V8.7.0 (2008-01) Service aspects; Service principles (3GPP TS 22.101 version 8.7.0 Release 8)
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Objective Specification

**77.** LISA-U Audio Application Note, Docu No UBX-13001835
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**82.** ETSI TS 127 007 V10.3.0 (2011-04) AT command set for User Equipment (UE) (3GPP TS 27.007 version 10.3.0 Release 10)
**83.** 3GPP TS 51.010-2 Mobile Station (MS) conformance specification; Part 2: Protocol Implementation Conformance Statement (PICS) proforma specification
**84.** 3GPP TS 34.121-2 User Equipment (UE) conformance specification; Radio transmission and reception (FDD); Part 2: Implementation Conformance Statement (ICS)
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**89.** 3GPP TS 23.221 Architectural requirements
**90.** 3GPP TS 23.203 Policy and charging control architecture
**91.** 3GPP TS 31.101 UICC-terminal interface; Physical and logical characteristics
**92.** ETSI TS 102 221 V8.2.0 (2009-06) Smart Cards; UICC-Terminal interface; Physical and logical characteristics (Release 8)
**93.** RFC 4291 - IP Version 6 Addressing Architecture (*http://tools.ietf.org/html/rfc4291*)
**94.** 3GPP TS 25.305 User Equipment (UE) positioning in Universal Terrestrial Radio Access Network (UTRAN); Stage 2
**95.** 3GPP TS 23.032: Universal Geographical Area Description (GAD)
**96.** TOBY-L2 series Networking Modes Application Note, Docu No UBX-14000479
**97.** 3GPP TS 25.331 Radio Resource Control (RRC); Protocol specification
**98.** 3GPP TS 36.101 Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception
**99.** Wi-Fi / Cellular Integration Application Note, Docu No UBX-14003264
**100.** 3GPP TS 24.173 IMS Multimedia telephony communication service and supplementary services; Stage 3
**101.** 3GPP TS 24.341 Support of SMS over IP networks; Stage 3
**102.** 3GPP TS 24.229 IP multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3
**103.** 3GPP TS 36.306 Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio access capabilities
**104.** 3GPP TS 36.133 Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management
**105.** 3GPP TS 25.133 Requirements for support of radio resource management (FDD)
**106.** 3GPP TS 22.071 Location Services (LCS); Service description
**107.** IEC 61162 Digital interfaces for navigational equipment within a ship
**108.** 3GPP TS 36.331 Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification (Release 10)
**109.** 3GPP TS 24.167 3GPP IMS Management Object (MO); Stage 3
**110.** ITU-T E.212 - Series E: Overall network operation, telephone service, service operation and human factors
**111.** RFC 793 - Transmission Control Protocol (TCP) Protocol Specification (*https://www.rfc-editor.org/rfc/rfc793.txt*)
**112.** 3GPP TS 26.201 Speech codec speech processing functions; Adaptive Multi-Rate - Wideband (AMR-WB) speech codec; Frame structure
**113.** 3GPP TS 24.216 Communication Continuity Management Object (MO)


Objective Specification

**114.** 3GPP TS 36.521-2 - Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment conformance specification; Radio transmission and reception; Part 2: Implementation Conformance Statement (ICS)

**115.** 3GPP TS 36.523-2 - Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Packet Core (EPC); User Equipment conformance specification; Part 2: Implementation Conformance Statement (ICS)

**116.** 3GPP TS 23.003 Numbering, addressing and identification

**117.** TOBY-L2 series Audio Application Note, Docu No UBX-15015834

**118.** 3GPP TS 31.111 Universal Subscriber Identity Module (USIM) Application Toolkit (USAT)

**119.** RFC 3969 - The Internet Assigned Number Authority (IANA) Uniform Resource Identifier (URI) Parameter Registry for the Session Initiation Protocol (SIP)

**120.** RFC 3261 - SIP: Session Initiation Protocol

**121.** RFC 5341 - The Internet Assigned Number Authority (IANA) tel Uniform Resource Identifier (URI) Parameter Registry

**122.** RFC 3966 - The tel URI for Telephone Numbers

**123.** RFC 2141 - URN Syntax

**124.** RFC 3406 - Uniform Resource Names (URN) Namespace Definition Mechanisms

**125.** RFC 5031 - A Uniform Resource Name (URN) for Emergency and Other Well-Known Services

**126.** 3GPP TS 22.084 MultiParty (MPTY) supplementary service; Stage 1

**127.** 3GPP TS 24.607 Originating Identification Presentation (OIP) and Originating Identification Restriction (OIR) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification

**128.** 3GPP TS 24.608 Terminating Identification Presentation (TIP) and Terminating Identification Restriction (TIR) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification

**129.** 3GPP TS 36.213 Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures

**130.** 3GPP TS 36.212 Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding

**131.** RFC 4715 - The Integrated Services Digital Network (ISDN) Subaddress Encoding Type for tel URI

**132.** End User Test Application Note, Docu No UBX-13001922

**133.** OMA Device Management V1.2.1 (*http://technical.openmobilealliance.org/Technical/technical-information/release-program/current-releases/dm-v1-2-1*)


For regular updates to u-blox documentation and to receive product change notifications, register on our homepage.

Objective Specification

# Revision history

| Revision | Date | Name | Status / Comments |
|---|---|---|---|
| - | 30-Apr-2011 | tgri | Initial release |
| P1 | 06-May-2011 | lpah | Changed the title, removed "2G and 3.75G" |
| 1 | 11-May-2011 | lpah | New commands for LEON-06x supported |
| 2 | 26-May-2011 | lpah | Improvement for GPS and GPIO AT commands |
| 3 | 07-Jul-2011 | lpah | Changed status to Preliminary; Assistnow online and offline description in +ULOCGNSS corrected |
| A | 14-Oct-2011 | lpah | Applicable to LISA-U1x0-01S and LISA-U200-00S<br>New commands for STK raw mode and +PACSP |
| A1 | 05-Dec-2011 | mtom / lpah | Changed status to Advance Information<br>Improved the +UVTS command syntax and the primary and secondary PDP contexts description<br>+CGDCONT setting stored in non volatile memory<br>New settings for the FW update over AT commands<br>Added number of allowed SIM locks |
| A2 | 03-Feb-2012 | mtom / lpah | Changed status to Preliminary |
| B | 18-May-2012 | mtom / lpah | Changed status to Objective Specification status<br>Extended audio AT commands for LISA-U200-01 and LISA-U230-01<br>New commands: +UCMGP, +UMCLK, +URXDIV, +UMWI I2C and SAP<br>Extended applicability to LEON-G100-07 |
| B1 | 31-Jul-2012 | mtom | Changed status to Preliminary; added +UEXTDCONF command description and one shot automatic baud rate detection description |
| B2 | 10-Oct-2012 | lpah | Changed status to Advance Information; applicable to LISA-U260 and LISA-U270 |
| B3 | 13-Dec-2012 | lpah | Changed status to Preliminary; applicable to LEON-G100-08S and LEON-G100-71S |
| C | 26-Mar-2013 | lpah | Changed status to Advance Information; applicable to SARA-G350-00S and SARA-G350-71S<br>New AT commands: *+UDYNDNS*, +UAEC, +UAGC, *+UIPCHGN*, +USER, *+USOAO*, *+UTPB* |
| C1 | 17-Apr-2013 | lpah | Changed status to Preliminary |
| C2 | 06-Jun-2013 | lpah | Changed status to Objective Specification; applicability extended to SARA-G300-01S, SARA-G310-01S and LISA-U2x0-02S |
| C3 | 04-Jul-2013 | lpah | Changed status to Advance Information<br>(Last revision with old doc number, WLS-SW-11000) |
| D | 30-Jul-2013 | lpah | Changed status to Preliminary |
| D1 | 13-Sep-2013 | lpah | Added LEON-G100-71S FW version for Initial Production<br>SIM detection not supported by SARA-G300 / SARA-G31310 modules<br>Removed +UAEC, +UAGC, +USER AT commands |
| R19 | 29-Nov-2013 | lpah | Extended the document applicability to new products<br>New commands: *+UFWINSTALL*<br>Updated +UCELLLOCK applicability<br>Improved description on *+UHFP* for SARA-G350 and the eCall command description<br>Added note on *+COPS* command description for LISA-U1 / LISA-U2 series |
| R20 | 23-Jan-2014 | lpah | Document applicable to LEON only for LEON-G100-06S-02, LEON-G100-07S-01 and LEON-G100-08S-01<br>New commands: *+CECALL*, *+CECALL*<br>Modified commands: *+CSQ*, *+COPS* and *+CGED* |
| R21 | 10-Apr-2014 | lpah | Document applicable to SARA-U260 / SARA-U270 / SARA-G340 products<br>New layout for the command description<br>Reviewed the contents of the sections. Introduced these new sections: SIM management, Audio interface<br>Split the +UDCONF command description for each supported functionality |

Objective specification

| Revision | Date | Name | Status / Comments |
|---|---|---|---|
| | | | New commands: +CECALL, +UDCONF=66, +UGSRV<br><br>Modified commands: +UGPRF, +UDCONF=30, +USPM, +USMTP, +UHSDUPA, +UHTTPC, +UDMTFD, +UGAOF, +UGAOP, +UGAOS, +UGGGA, +UGGLL, +UGGSA, +UGGSV, +UGPS, +UGRMC, +UGTMR, +UGUBX, +UGVTG, +UGZDA, +ULOC, +ULOCCELL, +ULOCGNSS, +CGED, +CRLP, +UDCONF=40, +UDCONF=20<br><br>Updated estimated response time information for these commands: +CAOC, +CGANS, +CGCLASS, +CGCMOD, +CMGL, +CMGR, +CMGW, +CPMS, +CR, +CSCA, +CSCB, +CSMP, +CSVM, +SATD, +SATE, +SATR, +STKPRO, +UCMGL, +UCMGR, +UCMGP, +UCMGS, +UCMGW, +UDNSRN, +UDYNDNS, +UFRW, +UFTPER, +UGAOP, +UGPRF, +UIPCHGN, +ULOCCELL, +ULOCGNSS, +UPSDA, +USMTP, +USMTPER, +USOAO, +USOCO, +USOCR, +USOCTL, +USOER, +USOGO, +USOSO, +VTS, D*, D>, DL, Z, +UCELLINFO, +UEONS |
| R22 | 23-Jun-2014 | lpah | Modified commands: +UCELLLOCK, GPRS definition, +USPM, GPIO Introduction, +UDWNFILE, +UFTPC, +UFTP, +UHTTPC, +UHTTP, +CPBS, +USOGO, +USOSO, +CSVM, +CGPERMSTATE, +UFWUPD, +UI2S, +CGDCONT, +UI2CO, +UPSDA, +UEXTDCONF, +UMCLK, +USOAO, +USOAO, +UGIND, +UGIND, +UGPS, +UGAOF, +UGAOF, +UGAOP, +UGAOP, +UGAOS, +UGAOS, Multiple AT command interfaces<br><br>Extended the command description: +CMUX, +UFTP, HTTP errors, +UPSD, +UDCONF=8, +D, +UPING, +UFTPC, +UCELLINFO, +USOST, +UDCONF=40, +UGPRF, I, +UGSRV, Multiple AT command interfaces, +CGDCONT, +UDCONF=30, +ICF, +IPR, +UTPB, +UPSV, +UGPIOC, +ULSTFILE, +CBST, +UUFTPCD, +UBANDSEL, +UHSDUPA, +STKTR, +CIND AT commands<br><br>Review the command applicability for these commands: +UDCONF=2, +UDCONF=3, +UDCONF=20, +UDCONF=40, +UDCONF=30, +UDCONF=81, +UGPS, +UGIND, +UGPRF, +UGAOP, +UGAOF, +UGSRV, +UGAOS, +UGUBX, +UGTMR, +UGZDA, +UGGGA, +UGGLL, +UGGSV, +UGRMC, +UGVTG, +UGGSA, +ULOC, +ULOCGNSS, +ULOCCELL, +COPS, +USOAO, +UDBF, +UHFP, +UMGC, +USGC, +USTN, +UUBF, +UI2S, +UPAR, +UPLAYFILE, +USAR, +USPM, +USTOPFILE, +UTGN, +UGPIOC, +UDCONF=30 |
| R23 | 21-Jul-2014 | lpah | Modified commands: CME error result codes, Multiple AT command interfaces, Audio, +UDCONF=30, +UPAR, +UTGN, H, +CHUP, +UDCONF=32, +UDCONF=31, +UDCONF=90, FTP, +CSCS, +CGCLASS, +CGREG, +UCGCLASS, +UPSD, +UGAOF, +UGAOP, +UGGSV, +UGIND, +UGPRF, +UGPS, +UGSRV, +UGTMR, +ULOCCELL, +ULOCGNSS, +CPOL, +UCD, +UCELLLOCK, +UDCONF=20, +UDCONF=61, +UDCONF=81, +WS46, PING, +UDCONF=4, +UPING, +STKPRO, +CSIM, +UDCONF=50, +CNMA, +UCMGP, +UANTR, +UDCONF=0, +UDCONF=40, +UDCONF=66, +UFWUPD, +CALM, +UDCONF=1, +UDCONF=2, +UDCONF=3, +UDCONF=5, +UDCONF=6, +UDCONF=7, +UDCONF=8, +USODL, Z<br><br>Extended the command description: GPIO, +URDBLOCK, +CRC, +CRLP, +FCLASS, PPP, +UDCONF=0, +UPSD, +CGTFT, GPRS, SMS, +STKTR, SMS error result codes, +UTEST, +CGED, +CGDSCONT, +CGQMIN, +CGQREQ AT commands<br><br>Updated estimated response time information for this command: +UDOPN<br><br>Review the command applicability for this command: +UDCONF=90 |
| R24 | 18-Sep-2014 | lpah | Extended the document applicability to TOBY-L2 / MPCI-L2 products starting from UBX-14000245-R03<br><br>New commands: +CCHC, +CCHO, +CGLA, +CRLA, +CGPIAF, +CUAD, +CESQ, +UCSDETACH, +CPNER, +UCATPROF, +UCATPROI, +UCATPRON, +UCATTR, +UCATCNF, +UCATENV, +UCATCC, +URCATI, +URCATN, +URCATR, +URCATF, +URCATCC, +UCGATT, +CEMODE, +CEREG, +CGDEL, +CGTFTRDP, +UAUTHREQ, +UTGSINK, +CGEQOS, +CGEQOSRDP, +CGSCONTRDP, +CEUS, +CGCONTRDP, +UCGDFLT, +UDCONF=9, +UCGED, +UDCONF=60, +UUSBCONF, +UIPADDR, +UIPCONF, +UIPROUTE, +UIPTABLES, +UBMCONF, +UDPDP<br><br>Modified commands: +CFUN, +CALA, +CCLK, +COPS, +WS46, +CPWD, +CPBW, +CSCB, +CPMS, +CNMA, +FCLASS, +UCSP, +CUSD, +CGACT, D*, +UPSD, +CGTFT, +CGTFTRDP, +UTEST, +UI2S, +UEXTDCONF, +UHTTPC, +UFTPC<br><br>Review the command applicability for these commands: +UCELLLOCK, +CGED, +UDATACHANNEL, +CGANS, +CGAUTO |
| R25 | 17-Nov-2014 | lpah | New command: +UDCONF=67 |

Objective Specification

| Revision | Date | Name | Status / Comments |
|---|---|---|---|
| | | | Modified commands: *D*, *DL*, *D>*, *+CFUN*, *+CALA*, *+CIND*, *+CMER*, *+CPOL*, *+URAT*, *+UCGOPS*, *+CSQ*, *+CREG*, *+COPS*, *+CESQ*, *+UHOMEZR*, *+UCELLLOCK*, *+CPLS*, *+UCGED*, *+CLCK*, *+CPBS*, *SMS introduction*, *+CPMS*, *+CMGR*, *+CMGW*, *+CMGS*, *+CMGL*, *+CSMP*, *+UCMGR*, *+CUSD*, *&C*, *&D*, *V*, *&V*, *+CGLA*, *+CRLA*, *+CCHO*, *+CUAD*, *+CCHC*, *+STKCNF*, *+CGDCONT*, *<APN>*, *+CEMODE*, *+UCGATT*, *D**, *+UCGDFLT*, *+CGREG*, *+UREG*, *+UTEST*, *+UFWUPD*, *+UUSBCONF*, *+UPSV*, *GPIO Introduction* |
| R26 | 23-Jan-2015 | lpah | Extended the document applicability to TOBY-L200-50S / TOBY-L200-50S products version<br>New command: *+UWAPIPCFG*, *+UWAPCFG*, *+UWCFG*, *+UWTEST*, *+UWAPSTALIST*, *+UWSTAIPCFG*, *+UWSTACFG*, *+UWFWRESET*, *+UWAPMACADDR*, *+UWMP*, *+UWSCAN*, *+UWWEBUI*<br>Modified commands: *+CSQ*, *+UTEST*, *+CMUX*, *&K*, *+ICF*, *+IFC*, *\Q*, *+UPSV*, *+IPR*, *+UUSBCONF*, *O*, *S2*, *S12*, *&C*, *&D*, *+UDNSRN* |
| R27 | 27-Feb-2015 | lpah | Extended the document applicability to SARA-U270-00X and SARA-U280-00S product versions<br>Modified commands: *+CMUX*, *+CGSN*, *+CSNS*, *+UBANDSEL*, *+CGED*, *+URAT*, *+UHSDUPA*, *+CREG*, *+UCELLLOCK*, *+UCSDETACH*, *+COPS*, *+UDCONF=20*, *+UCGOPS*, *+CLCK*, *+CNMI*, *+CLCC*, *O*, *S2*, *S12*, *&C*, *&D*, *+IPR*, *+ICF*, *+IFC*, *&K*, *\Q*, *<PDP_Type>*, *+UPSD*, *+UPSDA*, *+UPSND*, *+UCGDFLT*, *+UAUTHREQ*, *+CRSM*, *+STKTR*, *+STKPRO*, *+STKCNF*, *+UFWINSTALL*, *+UFWUPD*, *+UPSV*, *+UTEST*, *+URXDIV*, *+UDYNDNS*, *+UDWNFILE*, *+ULSTFILE*, *+URDFILE*, *+URDBLOCK*, *+UDELFILE*, *+UI2S*, *+UWAPCFG*, *+UWCFG*, *+UWTEST*, *+UWSTAIPCFG*, *+UWAPMACADDR*, *+UWWEBUI*<br>Review the command applicability for these commands: *+CMUX*, *+UCALLSTAT*, *+UCSD*, *+UCSDA*, *+UCSND*, *+UPSV*, *&K*, *&S*, *\Q*, *+SATF*, *+SATI*, *+SATN*, *+UDELFILE*, *+UDWNFILE*, *+ULSTFILE*, *+URDBLOCK*, *+URDFILE* |
| R28 | 08-Jun-2015 | lpah | Extended the document applicability to TOBY-L201-01S and TOBY-L280-00S product versions<br>New commands: *+CASIMS*, *+CIREG*, *+UIMSCONF*, *+UIMSRCONF*, *+UMNOCONF*, *+UMNOPLMN*, *+ULTECAT*, *+UANT*<br>Modified commands: *+CALA*, *+CTZR*, *+CREG*, *+COPS*, *+UBANDSEL*, *+UCGED*, *+CMGR*, *+IPR*, *+CSIM*, *+STKPRO*, *+STKTR*, *+STKCNF*, *+STKENV*, *+SATE*, *+UCATTR*, *+UCATPROI*, *<PDP_addr>*, *+CGREG*, *+UAUTHREQ*, *+UPSDA*, *+UDELFILE*, *+UDWNFILE*, *+ULSTFILE*, *+URDBLOCK*, *+URDFILE*, *+USOST*, *HTTP introduction*, *+UFTP*, *+UFTPC*, *+UHTTP*, *+UHTTPC*, *+UHTTPER*, *+UGPS*, *+UGSRV*, *+ULOCGNSS*, *+UDCONF=31*, *Wi-Fi introduction* |
| R29 | 19-Jun-2015 | lpah | Extended the document applicability to LISA-U200-03S, LISA-U201-03S, SARA-U260-03S, SARA-U270-03S, SARA-U280-03S product versions<br>New commands: *+UEMC*, *+UEMN*, *+UDCONF=82*, *+CAEMLPP*, *+CPPS*, *+CAAP*, *+USIMSTAT*, *+UBIP*, *+UNFM*, *+UNFMCONF*, *+URPM*, *+UNVMPLMN*, *+UNVMMCC*, *+UFACTORY*, *+UCEDATA*, *+UCTS*, *+USOSEC*, *+UDCONF=10*, *+USECMNG*, *+USECPRF*, *+UHTTPAC*, *+ULOCIND*, *+ULOCAID*, *+UDCONF=70*, *+CMOLRE*, *+CMOLR*, *+ULCSEVT*, *+CMTLR*, *+CMTLRA*<br>Modified commands: *+CGSN*, *+CSGT*, *+COPS*, *+UCELLINFO*, *+CGED*, *+URAT*, *+CSQ*, *+CLCK* *+CPBW*, *+UCMGP*, *+CNMI*, *+CGSMS*, *+CCWA*, *+CUSD*, *+UDCONF=50*, *D**, *+UNVMPLMN*, *+UCEDATA*, *+UUSBCONF*, *GPIO Introduction*, *+UGPIOC*, *File System Introduction*, *+UEXTDCONF*, *+UPLAYFILE*, *+USOWR*, *+UFTPC*, *+ULOC*, *+UECALLSTAT*, *+UECALLVOICE*, *+UECALLDATA*, *+UDCONF=67* |
| R30 | 22-Jul-2015 | lpah | Objective Specification status<br>Extended the document applicability to TOBY-L200-02S, TOBY-L210-02S, MPCI-L200-02S, MPCI-L210-02S product versions<br>New commands: *+UVGC*, *+UAPT*, *+UWWEBUIFTP*<br>Modified commands: *+CMUX*, *H*, *+CSNS*, *+CIND*, *+COPS*, *+UBANDSEL*, *+UDCONF=81*, *+CGED*, *+UMNOCONF*, *+UCELLLOCK*, *+UIMSCONF*, *+CPMS*, *+CMGF*, *+CNMI*, *+ICF*, *+IPR*, *+UCATENV*, *+UCATTR*, *+URCATE*, *+URCATR*, *+STKPRO*, *<APN>*, *+UCGDFLT*, *+URING*, *+UDATACHANNEL*, *+USOSEC*, *GPIO Introduction*, *+UGPIOC*, *+URDFILE*, *+UPAR*, *+UGSRV*, *+ULOCIND*, *+ULOCGNSS*, *LCS*, *+ULCSEVT*, *+CMOLRE*, *+CMOLR*, *+CMTLR*, *+CMTLRA*, *+UDCONF=70*, *+UIPROUTE*, |

Objective Specification

| Revision | Date | Name | Status / Comments |
|---|---|---|---|
| | | | *Web User Interface (WebUI)*, *Audio interface introduction*, *+UAPT*, *+USTN*, *+UVGC*, *+UI2S*, *+UMCLK*, *+USPM*, *+UTGN* |
| R31 | 14-Aug-2015 | lpah | Early Production Information status<br>Extended the document applicability to LISA-U200-83S, LISA-U270-68S, SARA-U270-53S product versions<br>Extended the document applicability to TOBY-L210-60S and MPCI-L210-60S product versions<br>Modified commands: *+CMUX*, *+CGSN*, *+CFUN*, *+CIND*, *+CSNS*, *+COPS*, *+CREG*, *+CGED*, *+CPOL*, *+UCELLINFO*, *+UDCONF=20*, *+UFDAC*, *+UMNOCONF*, *+USIMLCK*, *+CPBW*, *+FCLASS*, *\Q*, *&K*, *+ICF*, *+IFC*, *+UDCONF=50*, *<cid>*, *<PDP_addr>*, *<type_of_service_(tos)_(ipv4)_and_mask-traffic_class_(ipv6)_and_mask>*, *<flow_label (ipv6)>*, *<PDP_Type>*, *+CEUS*, *+UCGDFLT*, *D**, *+UCGCLASS*, *+UCLASS*, *+UPSD*, *+USTS*, *+UPSV*, *+UTEST*, *+UUSBCONF*, *+UFACTORY*, *File tags*, *File System limits*, *GPIO Introduction*, *+UGPIOC*, *+UPAR*, *+USAR*, *+UTGN*, *+UDCONF=30*, *Audio parameters tuning introduction*, *IPv4/IPv6 addressing*, *+USOSO*, *+USOCO*, *+USOCTL*, *+USOLI*, *+UFTP*, *+USORF*, *+USOST*, *+UHTTP*, *+UHTTPC*, *+ULOC*, *+ULOCIND*, *+UGUBX*, *+CMOLR*, *+ULCSEVT*, *Wi-Fi Introduction*, *+UWAPCFG*<br>Review the command applicability for these commands: *+UNVMMCC*, *+USPM*, *+UIPCHGN*, *+UDCONF=4* |
| R32 | 14-Sep-2015 | lpah | Advance Information status<br>New commands: *+UFGI*, *KTDEVSTAT*, *KTCFUN*, *KTUBXCONF*, *KTUCALLREJ*, **KTF*OPENING*, *KTUUMTSENV*, *+USIMATR*<br>Modified commands: *AT Commands Settings*, *+CGSN*, *+GSN*, *+CALA*, *+CALM*, *+UPROGRESS*, *+COPS*, *+URAT*, *+UCELLLOCK*, *+CEMODE*, *+UFWUPD*, *+UANT*, *+UTEST*, *+UDCONF=40*, *+UFACTORY*, *+UDCONF=30*, *+UVGC*, *IPv4/IPv6 addressing*, *+USOWR*, *+USOST*, *+UDCONF=7*, *+USOAO*, *+UFTP*<br>Review the command applicability for these commands: *+CSVM*, *+CCWE*, *+UPROGRESS*, *L*, *M*, *P*, *T*, *+UCELLLOCK*, *+CGED*, *+ULTECAT*, *+UMNOCONF*, *+UMNOPLMN*, *+CASIMS*, *+UIMSCONF*, *+UIMSRCONF*, *+CIREG*, *+UANT*, *+UI2CC*, *+UI2CO*, *+UI2CR*, *+UI2CW*, *+UI2CREGR* |
| R33 | 23-Sep-2015 | lpah | New commands: *+UWREGBLOCK*<br>Modified commands: *+UPROGRESS*, *+UCELLLOCK*, *+FCLASS*, *+UCATPROI*, *+UCATPRON*, *+UCATTR*, *+CGDATA*, *+UANT*, *File Tags Introduction*, *+UDCONF=30*, *+UFTPC*, *+UDCONF=31*, *+UWWEBUI*, *+UWAPCFG*<br>Review the command applicability for these commands: *+VTS*, *+UVTS*, *D**, *+UDATACHANNEL*, *+UDCONF=40*, *+UDMTFD*, |
| R34 | 12-Oct-2015 | lpah | Extended the document applicability to TOBY-L280-02S, MPCI-L280-02S<br>Modified commands: *Information text responses and result codes*, *Operational restrictions*, *+CMUX*, *+CIND*, *+CEER*, *+UCEER*, *D*, *+CSQ*, *+CESQ*, *+COPS*, *+UHSDUPA*, *+UMNOCONF*, *+UMNOPLMN*, *+URAT*, *+UBANDSEL*, *+CPLS*, *+CLCK*, *+CHLD*, *+ICF*, *+CSIM*, *+CRSM*, *+UUICC*, *+CCHO*, *+UCATPRON*, *+UDMTF*, *Introduction and common parameters definition*, *<cid>*, *<PDP_Type>*, *+UCGDFLT*, *+UAUTHREQ*, *+CGDSCONT*, *+CGDATA*, *+CGACT*, *D**, *+UDCONF=9*, *+UFWINSTALL*, *+UFWUPD*, *+UDCONF=40*, *+UUSBCONF*, *+UI2S*, *+UPAR*, *+UPLAYFILE*, *+UTGN*, *TCP/IP UDP/IP Introduction*, *+USOLI*, *+USORF*, *+USODL*, *+USOCTL*, *+UHTTP*, *+UHTTPC*, *+UI2CO*, *+UIPROUTE*, *+UIPADDR*, *+UWCFG*,<br>Review the command applicability for these commands: *+UAUTHREQ*, *D**, |
| R35 | 30-Nov-2015 | lpah | Early Production Information status<br>New commands: *+URECFILE*<br>Modified commands: *AT command settings*, *+CMUX*, *+CPAS*, *+CIND*, *+CTZU*, *+CSTA*, *S0*, *+COPS*, *+UCD*, *+UMNOCONF*, *+CGED*, *+UCGED*, *+UMNOPLMN*, *SMS Introduction*, *+CPMS*, *&D*, *+CCFC*, *&K*, *+ICF*, *+IFC*, *\Q*, *+IPR*, *O*, *+CGSMS*, *+CGCLASS*, *D**, *+CGPIAF*, *+CGDATA*, *+UPSD*, *+UDCONF=40*, *+UDCONF=66*, *+UPSV*, *+UNFMCONF*, *GPIO Introduction*, *+UGPIOC*, *+UMCLK*, *+UPLAYFILE*, *+UHFP*, *+USODL*, *+UFTP*, *+UGPRF*, *+ULOC*, *+UGSRV*, *+UDMTFD*, *+UDCONF=31*, *+USAPIND*, *+USAPMODE*, *+UIPADDR*, *Web User Interface (WebUI)*, *+UWCFG*, *+UWAPCFG*, *+UWREGBLOCK*<br>Review the command applicability for these commands: *+CASIMS*, *+UIMSCONF*, *+UIMSRCONF*, *+CIREG*, *+UDCONF=31* |

Objective Specification

| Revision | Date | Name | Status / Comments |
|---|---|---|---|
| R36 | 15-Dec-2015 | lpah | Extended the document applicability to SARA-G340-02S, SARA-G350-02S, SARA-G350-02X, SARA-G350-02A, LISA-U201-83S, MPCI-L201-01S<br><br>Modified commands: *+CSCS*, *+CFUN*, *+CIND*, *+CSQ*, *+COPS*, *+URAT*, *+UBANDSEL*, *+CGED*, *+UCD*, *+UMNOCONF*, *+CPOL*, *+WS46*, *+UIMSCONF*, *+CLCK*, *+CPWD*, *+CPBS*, *+CPBW*, *+CPBR*, *+CPBF*, *+CGSMS*, *+CNMI*, *+CAOC*, *+CCFC*, *+CCUG*, *+CCWA*, *+CHLD*, *+CLIP*, *+CLIR*, *+CNAP*, *+COLP*, *+COLR*, *+CSSN*, *+CTFR*, *+CUSD*, *+CUUS1*, *&K*, *&S*, *\Q*, *+IFC*, *<PDP_Type>*, *+CGDCONT*, *D**, *+UPSD*, *+CGEREP*, *+UFWUPD*, *+UPSV*, *+UFACTORY*, *GPIO Introduction*, *File System Introduction*, *+UDWNFILE*, *+UI2S*, *+USPM*, *+UVGC*, *+UFTPC*, *+ULOCAID*, *Web User Interface (WebUI)*<br><br>Review the command applicability for these commands: *+CGED*, *+CAEMLPP*, *+CPPS*, *+CAAP*, *\Q*, *&K*, *&S* |
| R37 | 29-Jan-2016 | lpah | Document status updated to Early Production Information<br><br>Modified commands: *Command line*, *+CMUX*, *+CEER*, *S0*, *+UCELLLOCK*, *+UCGED*, *+CPBS*, *+CPBR*, *+CPBF*, *+CPBW*, *SMS Introduction*, *+CNMI*, *+CMGW*, *&D*, *&K*, *+IFC*, *\Q*, *+IPR*, *O*, *+UTPB*, *+UPSD*, *+UPSDA*, *+CGACT*, *+CGDATA*, *D**, *+UPSV*, *+UPLAYFILE*, *+UHFP*, *+USODL*, *+USECPRF*, *+UFTPC*, *+UPING*, *+UI2CR*, *+UI2CREGR*, *+UI2CC*, *+UIPADDR*, *+UWAPCFG*, *+UWREGBLOCK*, *Internal TCP/UDP/IP stack class error codes* |
| R38 | 16-Feb-2016 | lpah | Document status reverted to Advance Information. Extended the document applicability to TOBY-L210-62S<br><br>New commands: *+CVMOD*, *+CNEM*, *+CSSAC*<br><br>Modified commands: *&H*, *+VTS*, *S0*, *+COPS*, *+URAT*, *+UHSDUPA*, *+UBANDSEL*, *+WS46*, *+UMNOCONF*, *+UIMSCONF*, *+UIMSRCONF*, *&V*, *<APN>*, *PPP*, *D**, *+CGACT*, *+UCGCLASS*, *+UCLASS*, *+CEMODE*, *+UCGDFLT*, *+URXDIV*, *+UFACTORY*, *+UDCONF=40*, *+UDCONF=60*, *+UDCONF=30*, *+UDMTFD*, *+UDCONF=70*<br><br>Review the command applicability for this command: *+VTD* |
| R39 | 31-Mar-2016 | lpah | Extended the document applicability to SARA-U260-00S-01, SARA-U270-00S-01 and TOBY-L220-02S. Removed the document applicability to SARA-U260-00S-00<br><br>Modified commands: *Summary table*, *+CSCS*, *+CMOD*, *+UVTS*, *+COPS*, *+CGED*, *+ULTECAT*, *+UMNOCONF*, *+CLCK*, *+CPBW*, *&V*, *<PDP_Type>*, *<IM_CN_Signalling_Flag_Ind>*, *PPP LCP handshake behaviour*, *D**, *+CGDCONT*, *+CGDSCONT*, *+CGCONTRDP*, *+CGSCONTRDP*, *+UCGDFLT*, *+UCGCLASS*, *+CGEREP*, *+CGCMOD*, *+UFWINSTALL*, *+UFWUPD*, *+UDCONF=66*, *KTUUMTSENV*, *+UAPT*, *+UVGC*, *+UTGN*, *+UPAR*, *+USECPRF*, *+UHTTPC*, *+UIPADDR*, *+UDPDP*, *Wi-Fi introduction*, *+UWSTAIPCFG*, *+UWAPCFG*, *+UWAPIPCFG*, *+UWAPMACADDR*, *+UWAPSTALIST*, *+UWCFG*, *+UWFWRESET*, *+UWMP*, *+UWREGBLOCK*, *+UWSCAN*, *+UWSTACFG*, *+UWTEST*, *+UWWEBUI*, *+UWWEBUIFTP*<br><br>Review the command applicability for this command: *+UDMTF*<br><br>Updated estimated response time information for these commands: *+UWCFG*, *+UWAPCFG*, *+UWSTACFG* |
| R40 | 26-Apr-2016 | lpah | Extended the document applicability to TOBY-L210-60S-01, MPCI-L210-60S-01<br><br>New commands: *+CISRVCC*, *+COPS*, *+UMNOCONF*, *+CMCCS*, *+CLCCS*, *+CAVIMS*, *+CDU*<br><br>Modified commands: *+CPOL*, *+CASIMS*, *+USIMSTAT*, *+UDCONF=50*, *+CGEREP*, *+UGAOP*, *+UGUBX* |
| R41 | 18-May-2016 | lpah | Document reverted to Objective Specification status<br><br>Extended the document applicability to SARA-G300-00S-01, SARA-G310-00S-01, LISA-U201-03A, LISA-U270-63S<br><br>New commands: *+UBIPAPN*, *+UDCONF=11*, *+UOMADM*, *+UOMADMALERT*, *+UOMADMREP*<br><br>Modified commands: *+URAT*, *+CGED*, *+UCGED*, *+CLCK*, *+CRLP*, *+UCATPROF*, *<PDP_addr>*, *+CGDCONT*, *+UCTS*, *Audio interface introduction*, *+UMGC*, *+USGC*, *+USECMNG*, *+USECPRF*, *+UFTPC*, *+UDMTFD*, *eCall Introduction*, *+UECALLVOICE*, *+UECALLDATA*, *+CECALL*, *Networking introduction*, *+UDPDP*, *Mobile termination error result codes +CME ERROR*, *Internal TCP/UDP/IP stack class error codes* |

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