LEXI-R10 series

LTE Cat 1bis modules

AT commands manual

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

UBXDOC-686885345-1786 - R04
C1-Public

www.u-blox.com

Document information		
Title	**LEXI-R10 series**	
Subtitle	LTE Cat 1bis modules	
Document type	AT commands manual	
Document number	UBXDOC-686885345-1786	
Revision and date	R04	29-May-2024
Disclosure restriction	C1-Public	

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Preface

Applicable products

This document applies to the following products:

Name	Type number	Modem version	Application version	PCN reference
LEXI-R10401D	LEXI-R10401D-00B-00	01.01	A00.01	UBXDOC-686885345-2033
LEXI-R10801D	LEXI-R10801D-00B-00	01.03	A00.02	UBXDOC-686885345-2054

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	TOBY-L2 MPCI-L2					
	LISA-U110 LISA-U120 LISA-U130 LISA-U2					
	LEON-G1 SARA-G3					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	full	No	No	No	-	-

For satellite products:

command_name						
Modules	SARA-S5					
	LARA-L6					
	SARA-R5 LARA-R6					
Attributes	**Technology**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	Satellite	No	No	No	-	-

It is composed of two sections:

- **Modules**: lists all the modules that support the command. The modules are grouped in rows by cellular standard (i.e. L for LTE high data rate (Cat 3 and above), R for LTE low data rate (Cat 1 and below), U for UMTS/HSPA, G for GSM/GPRS, N for NB-IoT (LTE Cat NB1 / LTE Cat NB2)). 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)
- **Technology**: This attribute is only used when a product is a cellular/satellite module
  - **Cellular**: the command is supported in Cellular RAT among all the products listed in the "Modules" section
  - **Satellite**: the command is supported in Satellite RAT among all the products listed in the "Modules" section
  - **Cel/Sat**: the command is supported in Cellular and/or Satellite RATs among all the products listed in the "Modules" section supporting the respective RATs
- **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 1.4
  - **NVM**: the command setting is saved in the non-volatile memory as specified in Chapter 1.4
  - **<command_name>**: the parameter values set with the command are volatile, but the whole profile can be stored in NVM with <command_name> AT command.
  - **OP**: the command setting can be overwritten by the Mobile Network Operator (MNO) profile set with the +UMNOPROF or +UMNOCONF AT commands (if supported)
  - **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
- **Response time**: estimated maximum time to get the final result code for the AT command execution. It is the time needed to provide the response in the worst case, e.g. when all the steps that have to be run to carry out the operation take the longest time to be performed; it is based on a theoretical estimation, derived by the the 3GPP specifications in case of AT commands related to cellular modem features (e.g. registration, de-registration, PDP context activation). For additional details on the response time of cellular network related AT command, see Maximum vs typical response time of cellular network related AT commands.
  More precisely, the response time considers the time from the complete acquisition of the command line to the issuing of the command result code. This kind of response time 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 (e.g. the synchronous/asynchronous transfer type, the selected baud rate, etc.), by power saving and flow control, which introduce a variable latency in the command acquisition by the DCE.

  For example, the maximum expected response time shall be extended if the communication with the module is carried out on a MUX virtual port, because in this case the command line and the result code are transferred via a specific protocol running on the physical port, that might introduce additional communication delay due to framing and re-transmissions.

  Similarly, the maximum expected response time of AT commands accessing the SIM shall be extended if the module is using a remote SIM card via SAP instead of the local SIM card.

  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).

  The response time shall be extended if the issued AT command triggers a service that cannot be served immediately due to concurrent access to the same service or resource via AT commands issued on a different communication port or from internal applications; typical examples are registration commands

and SIM access, that can be also autonomously triggered by the module (e.g. auto-COPS) and can therefore postpone the execution of the AT commands issued by the user.

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

The attributes listed in the summary table apply by default to all u-blox modules supporting the specific AT command. If a u-blox module or module series does not comply to the default behavior, the exception is highlighted in Chapter 1.4 for the saving of settings, in Chapter 1.3.4 for the abortability, and in a product specific note in the AT command description for the PIN check.

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 u-blox cellular module hardware or software topics.

- For some guidelines when developing applications for LTE Cat 1 technologies, see the LARA-R6 series application development guide [9].
- For some guidelines when developing applications for LTE Cat M1 technologies, see the SARA-R41 application development guide [31] or the LEXI-R4 / SARA-R42 application development guide [32] or the SARA-R5 series application development guide [27].
- For some guidelines when developing applications for NB-IoT technologies, see the SARA-N3 series application development guide [47] or the NB-IoT application development guide [44].
- For more examples of typical scenarios when developing application for LTE Cat 4, LTE Cat 1, UMTS/HSPA and GSM/GPRS technologies, see the AT commands examples application note [49].

See Related documentation for 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 email
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
- Clear description of your question or the problem
- A short description of the application
- Your complete contact details

Contents

1 AT command settings 12
1.1 Definitions 12
1.2 Operational mode of the AT interface 12
1.3 Command description 13
1.4 Storing of AT commands setting 16
1.5 +UDCONF AT command 16

2 General operation 18
2.1 Start up and initialization 18
2.2 AT commands types 18

3 IPC - Inter Processor Communication 21
3.1 Multiplexing mode +CMUX 21

4 General 23
4.1 Manufacturer identification +CGMI 23
4.2 Manufacturer identification +GMI 23
4.3 Model identification +CGMM 24
4.4 Model identification +GMM 24
4.5 Firmware version identification +CGMR 24
4.6 Request product serial number identification +CGSN 25
4.7 Identification information I 26
4.8 TE character set configuration +CSCS 27
4.9 International mobile subscriber identification +CIMI 28
4.10 Card identification +CCID 28

5 Mobile equipment control and status 30
5.1 Module switch off +CPWROFF 30
5.2 Set module functionality +CFUN 30
5.3 Clock +CCLK 32
5.4 Set greeting text +CSGT 32
5.5 Automatic time zone update +CTZU 33
5.6 Time zone reporting +CTZR 34
5.7 Network Time Synchronization +USNTP 35
5.8 Report mobile termination error +CMEE 36
5.9 Extended error report +CEER 37

6 Call control 38
6.1 Hook control H 38

7 Network service 39
7.1 Network parameters definition 39
7.2 Subscriber number +CNUM 41
7.3 Signal quality +CSQ 41
7.4 Extended signal quality +CESQ 43
7.5 Signal quality change event reporting control +UCESQS 44
7.6 Operator selection +COPS 45
7.7 User PLMN reselection +UUSERSCAN 47
7.8 MAC QoS inactivity timer +UMACQOSTMR 47
7.9 Connection Release +UCONNREL 48
7.10 Preferred PLMN list selection +CPLS 48
7.11 Network registration status +CREG 49
7.12 Preferred operator list +CPOL 52
7.13 Channel and network environment description +UCGED 53
7.14 Frequency/Cell Lock +UFREQLOCK 58

7.15 Forbidden PLMN list delete +UFPLMNDEL ... 60
7.16 Cell Bar +UCELLBAR ... 60
7.17 Signalling connection status +CSCON ... 61
7.18 Radio Policy Manager (RPM) configuration +URPMCONF ... 62
7.19 Radio Policy Manager (RPM) parameters configuration +URPMPARAM ... 64
7.20 Radio Policy Manager (RPM) version +URPMVERSION ... 65
7.21 eDRX setting +CEDRXS ... 65
7.22 eDRX read dynamic parameters +CEDRXRDP ... 67
7.23 Set MNO profile +UMNOPROF ... 68
7.24 Band configuration +UBANDCONF ... 70
7.25 NAS timers configuration +UNASTCFG ... 70
7.26 Protocol stack configuration +UPSCONFIG ... 72
7.27 Discontinuous reception settings +UDRX ... 77
7.28 Network band scan status +USCANSTAT ... 78
7.29 EMM and RRC Events Counters +UPSSTAT ... 80
7.30 Network error code reporting +CNEC ... 81

8 Device lock ... 83
8.1 Enter PIN +CPIN ... 83
8.2 Facility lock +CLCK ... 84
8.3 Change password +CPWD ... 85
8.4 Remaining PIN retries +CPINR ... 86

9 Short Messages Service ... 88
9.1 Introduction ... 88
9.2 Select message service +CSMS ... 88
9.3 Preferred message storage +CPMS ... 89
9.4 Preferred message format +CMGF ... 91
9.5 Show text mode parameters +CSDH ... 91
9.6 New message indication +CNMI ... 92
9.7 New message acknowledgement to MT +CNMA ... 95
9.8 Send message +CMGS ... 96
9.9 Send SMS command +CMGC ... 97
9.10 Write message to memory +CMGW ... 99
9.11 Send message from storage +CMSS ... 100
9.12 Delete message +CMGD ... 101
9.13 Read message +CMGR ... 102
9.14 List message +CMGL ... 104
9.15 Read concatenated message +UCMGR ... 107
9.16 Send concatenated message +UCMGS ... 110
9.17 Inline send message +USMSSEND ... 111
9.18 Set text mode parameters +CSMP ... 112
9.19 Service center address +CSCA ... 113
9.20 Select cell broadcast message types +CSCB ... 113
9.21 More messages to send +CMMS ... 114

10 V24 control and V25ter ... 116
10.1 Introduction ... 116
10.2 Circuit 109 behavior &C ... 116
10.3 Circuit 108/2 and escape sequence behavior &D ... 116
10.4 Flow control &K ... 118
10.5 DTE-DCE character framing +ICF ... 118
10.6 DTE-DCE local flow control +IFC ... 119
10.7 UART data rate configuration +IPR ... 120
10.8 Return to on-line data state O ... 121
10.9 Command echo E ... 122
10.10 Result code suppression Q ... 122
10.11 DCE response format V ... 123
10.12 Set to factory defined configuration &F ... 123
10.13 Store current configuration &W ... 124
10.14 Display current configuration &V ... 124

11 SIM management 126
11.1 Generic SIM access +CSIM 126
11.2 Restricted SIM access +CRSM 126
11.3 SIM hot insertion configuration +UDCONF=50 128
11.4 Open logical channel +CCHO 129
11.5 Close logical channel +CCHC 130
11.6 Generic UICC logical channel access +CGLA 130
11.7 SIM states reporting +USIMSTAT 131

12 SIM toolkit 133
12.1 Introduction 133
12.2 Terminal profile +STKPROF 133
12.3 Bearer Independent Protocol status indication +UBIP 134

13 Packet switched data services 136
13.1 PDP contexts and parameter definition 136
13.2 PPP LCP handshake behavior 138
13.3 PDP context definition +CGDCONT 138
13.4 Default CID and preferred protocol type configuration +UDCONF=19 141
13.5 PS attach or detach +CGATT 142
13.6 PDP context activate or deactivate +CGACT 143
13.7 Enter PPP state/GPRS dial-up D* 144
13.8 Show PDP address +CGPADDR 145
13.9 Packet switched event reporting +CGEREP 145
13.10 Manual deactivation of a PDP context H 148
13.11 PDP context modify +CGCMOD 148
13.12 Define secondary PDP context +CGDSCONT 149
13.13 UE modes of operation for EPS +CEMODE 150
13.14 EPS network registration status +CEREG 151
13.15 Define EPS quality of service +CGEQOS 153
13.16 EPS quality of service read dynamic parameters +CGEQOSRDP 155
13.17 PDP context read dynamic parameters +CGCONTRDP 156
13.18 Traffic flow template +CGTFT 158
13.19 Uplink user data plane configuration +UDCONF=9 161
13.20 APN rate control +CGAPNRC 161
13.21 Define PDP context authentication parameters +CGAUTH 162

14 System features 164
14.1 Firmware installation +UFWINSTALL 164
14.2 Antenna detection +UANTR 164
14.3 Antenna dynamic tuner +UATUN 165
14.4 Wi-Fi network scan +UWIFISCAN 167
14.5 RING line handling +URING 169
14.6 USB profiles configuration +UUSBCONF 170
14.7 USB sleep configuration +UUSBSLPCONF 172
14.8 UART baud rate and flow control NVM management +UUARTCONF 173
14.9 Multiplexer protocol deep-sleep mode configuration +UDCONF=201 174
14.10 Serial interfaces configuration selection +USIO 175
14.11 Internal temperature monitor +UTEMP 177
14.12 Restore factory configuration +UFACTORY 178
14.13 NVM RAM mode management +UNVMCFG 179
14.14 NVM/NVM Backup configuration management commit+UNVMW 180
14.15 NVM configuration management reset +UNVMR 181
14.16 NVM configuration management factory restore +UNVMF 182
14.17 Firmware update Over AT (FOAT) +NFWUPD 182
14.18 URC reporting behavior configuration +UURCCFG 183
14.19 Enable/disable URCs reporting +UURCSTAT 184

15 Power management 186
15.1 Power saving control (Power SaVing) +UPSV 186

15.2 Power Saving Mode Setting +CPSMS ... 187
15.3 Deep-sleep mode indication +UPSMR ... 189
15.4 Deep-sleep URCs configuration +USLPURC ... 190
15.5 Sleep-mode voting+USLPVOTE ... 191
16 GPIO ... 193
16.1 Introduction ... 193
16.2 GPIO select configuration command +UGPIOC ... 198
16.3 GPIO read command +UGPIOR ... 201
16.4 GPIO set command +UGPIOW ... 202
17 End user test ... 203
17.1 Toggle test mode +UTEST=0, +UTEST=1 ... 203
17.2 Digital pins testing +UTEST=10 ... 204
18 File System ... 207
18.1 File tags ... 207
18.2 List files information +ULSTFILE ... 209
18.3 Open file +FOPEN ... 210
18.4 Read file +FREAD ... 211
18.5 Write file +FWRITE ... 212
18.6 Write file +FWRITEHEX ... 213
18.7 Close file +FCLOSE ... 214
18.8 Set position indicator +FSEEK ... 214
18.9 Get position indicator +FPOSITION ... 215
18.10 Truncate file +FTUCAT ... 215
18.11 Erase file +FERASE ... 216
18.12 Delete file +FDELETE ... 216
18.13 File system limits ... 217
19 DNS ... 218
19.1 Resolve name / IP number through DNS +UDNSRN ... 218
19.2 Override DNS configuration +UDNSCFG ... 220
20 Internet protocol transport layer ... 222
20.1 Introduction ... 222
20.2 IPv4/IPv6 addressing ... 223
20.3 Sockets Always On feature ... 223
20.4 Create Socket +USOCR ... 224
20.5 SSL/TLS/DTLS mode configuration on TCP/UDP socket +USOSEC ... 225
20.6 Set socket option +USOSO ... 226
20.7 Get Socket Option +USOGO ... 228
20.8 Close Socket +USOCL ... 229
20.9 Get Socket Error +USOER ... 230
20.10 Connect Socket +USOCO ... 231
20.11 Write socket data +USOWR ... 232
20.12 SendTo command (UDP only) +USOST ... 234
20.13 Read Socket Data +USORD ... 235
20.14 Receive From command (UDP only) +USORF ... 237
20.15 Set Listening Socket +USOLI ... 238
20.16 HEX mode configuration +UDCONF=1 ... 239
20.17 Set socket in Direct Link mode +USODL ... 240
20.18 Internal TCP/IP stack handling configuration+UDCONF=101 ... 242
20.19 Socket control +USOCTL ... 243
20.20 Iperf application+UIPERF ... 244
21 Device and data security ... 246
21.1 Introduction ... 246
21.2 Device security ... 246
21.3 Data security provided by secure connections (SSL/TLS/DTLS) ... 247
22 HTTP ... 268

22.1 Common parameters definition ... 268
22.2 HTTP control +UHTTP ... 268
22.3 HTTP advanced control+UHTTPAC ... 272
22.4 HTTP command +UHTTPC ... 273
22.5 HTTP protocol error +UHTTPER ... 276
22.6 Save/Restore HTTP profile from NVM +UHTTPNV ... 277
23 Ping ... 278
23.1 Ping command +UPING ... 278
24 Positioning ... 281
24.1 Positioning server configuration +UGSRV ... 281
24.2 CellLocate® and hybrid positioning ... 283
25 Networking ... 288
25.1 System networking modes ... 288
25.2 Get the USB IP configuration +UIPADDR ... 289
25.3 Set network adapter parameters +UNETCFG ... 291
25.4 Configure and control the data path for the network adapter +UNETDEVCTL ... 292
26 MQTT ... 295
26.1 Introduction ... 295
26.2 MQTT profile configuration +UMQTT ... 295
26.3 Save/Restore MQTT profile from NVM +UMQTTNV ... 300
26.4 MQTT command +UMQTTC ... 300
26.5 MQTT error +UMQTTER ... 305
A Appendix: Error result codes ... 306
A.1 Mobile termination error result codes +CME ERROR ... 306
A.2 Message service error result codes +CMS ERROR ... 314
A.3 +CEER error result codes ... 319
A.4 Firmware install final result codes ... 321
A.5 LEXI-R10 FOAT error result codes ... 321
A.6 Internal TCP/UDP/IP stack class error codes ... 322
A.7 Internet suite error classes ... 323
A.8 Ping error result codes ... 327
A.9 SNTP error result codes ... 327
B Appendix: AT Commands List ... 328
B.1 Parameters stored in profiles ... 347
B.2 Parameters stored in non volatile memory ... 348
B.3 Saving AT commands configuration ... 351
B.4 Estimated maximum command response time ... 351
B.5 Multiple AT command interfaces ... 352
C Mobile Network Operator profiles ... 354
C.1 LEXI-R10 Introduction ... 354
C.2 LEXI-R10401D Americas MNO and conformance profiles table ... 355
C.3 LEXI-R10801D Americas MNO and conformance profiles table ... 356
D Appendix: glossary ... 357
Related documentation ... 361
Revision history ... 367
Contact ... 367

1 AT command settings

u-blox cellular modules provide at least one physical serial interface that is compliant to V.24 [210]. When the module is powered on, it enters the command mode. For more details on command mode, see 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.

LEXI-R10
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 behavior among the interfaces in reference to the AT command interface. It also describes the limitations (if any) in the concurrent use of more than one AT command interface.

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

LEXI-R10
Where supported, two UART AT interfaces can be used at the same time (it is not the default behavior). See +USIO command description for details on how to set such behavior.
According to the terminology used in the data sheet, UART is the main asynchronous serial interface, while AUX UART is the auxiliary asynchronous interface. For more details on supported serial interfaces and their characteristics, see the corresponding module data sheet.
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).

1.2 Operational mode of the AT interface

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 (PPP or DUN 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.

- **Direct link mode**: intermediate state where the DCE transfers data transparently over a connected TCP/UDP socket (e.g. by means of +USODL), after reporting the "CONNECT" string.
- **SMS mode**: AT commands for writing or sending SMSs lead the AT interface into an intermediate state indicated by the ">" (greater-than sign) where SMS text/PDU can be entered (DCD signal shall be in ON state during this operation). <Ctrl-Z> indicates that the SMS editing is completed, while <ESC> indicates aborting of the edited SMS.
- **Raw mode**: special AT commands lead the AT interface into intermediate state where raw data is being exchanged (e.g. during file transfer).
- **AT commands over an IP connection**: the DCE is accepting a TCP connection on a specific TCP port. The DTE can connect via TCP protocol to the port and can send commands over this TCP connection. The DCE may send responses back to the DTE via the same TCP connection. The communication over IP connection is denoted by a set of two ports:
  - AT command port;
  - binary data port. The binary data port is used for the exchange of binary data between the DCE and DTE.

  For more details, on the configuration of the TCP ports see +UIFCONF.

☞ LEXI-R10
The AT commands over IP connection is not supported.

☞ LEXI-R10
To establish a PSD connection see the +CGDCONT and +CGACT AT commands.

1.2.1 Switch from data mode to online command mode

When a data connection is established it is possible to switch from data mode to online command mode (OLCM) in the following ways:

- with the escape sequence "+++", which can be configured with the S2 AT command, if supported
- 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 OLCM, or to command mode (the data connection is released). For more details, see the &D AT command description

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

When using the multiplexer and PPP combined, toggling the DTR line (of the physical serial interface where the multiplexer protocol is started) from ON to OFF state does not terminate the PPP session and return the device to the command mode. In this configuration, it is recommended that the host terminates the PPP session, which can be done by sending LCP_TERM REQ or deasserting the DTR virtual line (sending of specific MUX MSC command).

1.3 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).

For default value it is intended the value automatically set if the parameter is omitted and at the module power-on (if the command setting is not stored in NVM/profile). For factory-programmed value it is intended the value set at the module power-on when the setting is not modified respect with the manufacturer setting; it is valid for the commands that store the setting in NVM/profile.

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.

1.3.1 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

1.3.2 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

  Parameter types:
  - Number: positive and negative counting numbers, as well as zero {..., -2, -1, 0, 1, 2,...}.
  - String: sequence of characters enclosed within quotation marks (" ").
- <S3_character>: command line termination character; the factory-programmed termination character is <CR>

☞ 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).

☞ LEXI-R10
The command line is not case sensitive.

☞ 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).

The serial interface driver generally does not allow a new command until the previous one has been terminated by "OK" final result code 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.

1.3.2.1 Concatenation of AT commands

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: ATI;+CGATT?;+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.

☞ LEXI-R10
Not all the commands can be entered with other commands on the same command line: +CMGW, +CMGS, and all AT commands that bring the AT interface into data mode (e.g. +USOWR) must be used by themselves.

1.3.3 Notes

LEXI-R10

- The maximum length of the command line is 8192 characters.

1.3.4 Information text responses and result codes

The AT command response comprises an optional information text string and a final result code that can assume the format as follows:

- **Verbose format:**
  Information text response(s): <S3_character><S4_character><text><S3_character><S4_character>
  Final result code: <S3_character><S4_character><verbose code><S3_character><S4_character>
- **Numerical format:**
  Information text response(s): <text><S3_character><S4_character>
  Final result code: <numerical_code><S3_character>

where

- <S3_character> is the command line termination character
- <S4_character> is the linefeed character

☞ LEXI-R10
The V AT command configures the result code in numeric or verbose format.

Table 1 lists the allowed result codes.

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 +CMEE AT 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).
DELAYED	9	Final	Delayed
NOT SUPPORT	10	Final	Operation not supported
INVALID COMMAND LINE	11	Final	Invalid command line
CR	12	Final	Carriage return
SIM DROP	13	Final	SIM not inserted
Command aborted	3000	Final	Command execution aborted issuing a character to the DCE
DISCONNECT	14	Final	Data connection disconnected
ABORTED	18	Final	Aborted terminal

Table 1: Allowed result codes

The following result codes are not supported:

- LEXI-R10 - CONNECT<data rate>, NO DIALTONE, BUSY, NO ANSWER, RING, DELAYED, Command aborted, ABORTED, NOT SUPPORT, INVALID COMMAND LINE, CR, and SIM DROP.

As already stated in the Preface section (see the "Can be aborted" attribute), some AT commands can be aborted after having issued them.

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 the +CGDCONT 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 +CMEE AT command configures the error result code format as follows:

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

where <err> represents the verbose or numeric error result code depending on the +CMEE AT command setting.

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)

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 implement a different error management and provide different error result codes: The corresponding sections provide more details for retrieving the error result codes for these operations.

1.4 Storing of AT commands setting

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 (where supported).

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

☞ LEXI-R10
The module does not store the AT commands setting in the personal profiles. Instead, for each AT interface there is a different configuration (AT channel configuration). These per channel configurations are volatile, unless storage into NVM is forced via AT&W.
However, for the sake of documentation uniformity, the term "(personal) profile" is used in the manual, and Appendix
B.1 lists the complete settings stored in the profiles for each AT interface and the corresponding commands.
More details about loading, storing and updating these settings can be found in the command descriptions for: AT&F, AT&W, and AT&V.

1.5 +UDCONF AT command

The UDCONF AT commands constitute a group of u-blox proprietary AT commands that allow to configure some features beloging to i.e network services, internet suite, etc. They are indicated by the "+UDCONF=" string followed by an <op_code> (i.e. +UDCONF=20). The allowed <op_code> values depend on the module series.

The generic set command syntax is:

```
AT+UDCONF=<op_code>,<param1>,<param2>,....
```

while the generic read command syntax is

```
AT+UDCONF=<op_code>
```

The test command syntax is defined as follows:

```
+UDCONF: <op_code1>,(supported <op_code1_param1>),(supported <op_code1_param2>),..
+UDCONF: <op_code2>,(supported <op_code2_param1>),(supported <op_code2_param2>),..
+UDCONF: <op_code3>,(supported <op_code3_param1>),(supported <op_code3_param2>),..
OK
```

The test command syntax for <op_code>=110 (NVM RAM mode management) differs respect with the other <op_code> values:

```
+UDCONF: 110,"audio","+CLVL,+CRSL,+UMGC,+USGC,+UMSEL,+UMAFE,+USAFE,+UI2S,+USPM"
```

The string after the <at_group> parameter (i.e. "audio") lists the commands that are impacted by the corresponding "command class". The allowed values for the <at_group> parameter (i.e. AT+UDCONF=110, "audio") are provided by means of the corresponding read command.

2 General operation

2.1 Start up and initialization

The characteristics of the boot of the cellular device vary from module to module and are described in the corresponding system integration manual. During the boot phase the module might not respond to the AT interface until all necessary SW modules have been installed (e.g. USB drivers). Monitoring of the greeting text, where supported, can help in detecting the successful end of the boot phase.

A complete start up including cellular network operation can only take place with a SIM card.

☞ LEXI-R10
If the SIM card has enabled the PIN check, some commands answer with "+CME ERROR: SIM PIN required" and most cellular functionalities are not started. After entering the required PIN via the +CPIN command, or if booting with a SIM with disabled PIN check, SIM initialization is carried out and a lot of SIM files are read: it is possible that some commands (e.g. phonebook AT commands) are affected by this preliminary phase, resulting in a temporary error response.

2.1.1 Auto-registration

If the +COPS <mode> parameter in the profiles or in NVM is left to its factory-programmed value 0 or is set to 1, then after SIM initialization, all u-blox modules will automatically perform PLMN selection and registration for circuit switched/non EPS services as well as packet switched/EPS services. Auto-registration (also sometimes called "auto-COPS", not to be confused with automatic <mode>=0) will also be triggered at SIM insertion, for modules supporting SIM hot insertion, or at SIM driver recovery, occurring when the communication with the SIM card is re-established by the module after an unrecoverable error, caused e.g. by mechanical vibrations or electrical interference.

☞ LEXI-R10
During the auto-registration any further network request (by means of AT+COPS=0 or AT+COPS=1) is processed immediately.

The user can retrieve the result of the auto-registration by polling the registration status commands (e.g. +CREG/+CGREG/+CEREG/+CIREG) or enabling their unsolicited notifications. If auto-COPS is running, at boot time or at SIM insertion, network service commands issued by the user might have a longer response time than expected; this is particularly visible when the module is switched on in a jammed condition, or with a roaming SIM card that shall perform several registration attempts before gaining access to a VPLMN. If the automatic registration fails and the cause cannot be retrieved via +CEER, it is suggested to disable auto-COPS starting the module in +COPS: 2 or in airplane mode +CFUN: 4 and trigger registration with AT commands.

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.

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.

2.2.5 Unsolicited Result Code (URC)

An unsolicited result code is a string message (provided by the DCE) that is not triggered as an 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 or can be enabled by another command. Generally the AT commands activate the URC on the present (virtual) AT interface on which they are enabled. If the AT commands settings are stored in the **personal profile**, the related URCs are enabled on all AT interface identifiers once set with AT&W (where supported). If the AT commands settings are stored to the **NVM**, at the module boot the related URCs are enabled on all the AT interfaces.

☞ There are cases where both the AT command setting and the AT interface identifier is stored to NVM, therefore the URC will be enabled only on a specific AT interface. These cases are documented in the related AT commands descriptions.

☞ For more details on the storing of AT command setting, see Storing of AT commands setting.

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 if 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); if 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:

Class	AT command to configure the class
Reception of a new SMS related URCs	+CNMI AT command

For the above classes, it is possible to select the presentation strategy when the AT interface is busy, according to the 3GPP TS 27.007 [75]; buffering or discarding are the two possible choices (URCs are lost in the latter case). This is done by means of the corresponding AT command (see the AT commands listed in the table above). 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, then 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

☞ LEXI-R10
URCs presentation deferring and URCs caching can be configured with +UURCCFG AT command.

☞ To ensure the DCE can transmit the buffered URCs, 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. Otherwise, the collision of the URCs with the subsequent AT command is possible.

☞ If multiple AT interfaces are available, it is best to use one of the AT interfaces to manage all the user-enabled URCs, while using the other ones to send AT commands and receive their responses.
The URCs related to external causes (e.g., RING) are issued on all interfaces.

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.

3 IPC - Inter Processor Communication

3.1 Multiplexing mode +CMUX

+CMUX						
Modules	All products					
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 [104]. 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 set command during the multiplexing is not allowed.

The multiplexer configuration is as follows:

Modules	Control channel	AT commands / data connection	GNSS tunneling	SIM Access Profile (SAP)
LEXI-R10	Channel 0	Channel 1 - 3		

Table 2: Multiplexer configuration

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

3.1.3 Defined values

Parameter	Type	Description
<mode>	Number	Multiplexer transparency mechanism: • 0: basic option
<subset>	Number	The way in which the multiplexer control channel is set up: • 0 (default value): UIH frames used only
<port_speed>	Number	Value is ignored.
<N1>	Number	Maximum frame size. The range is 1-1509 and the default value is 31.
<T1>	Number	Value is ignored.
<N2>	Number	Value is ignored.

Parameter	Type	Description
<T2>	Number	Value is ignored.
<T3>	Number	Value is ignored.
<k>	Number	Value is ignored.

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>.

LEXI-R10

- GNSS tunneling is not supported.
- For the configuration of the module power saving during a multiplexer protocol session, see the +UDCONF=201 AT command description.

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 product name.

4.3.2 Syntax

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

4.3.3 Defined values

Parameter	Type	Description
<model>	String	Name of the product

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 product name.

4.4.2 Syntax

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

4.4.3 Defined values

Parameter	Type	Description
<model>	String	Name of product

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

4.6 Request product serial number identification +CGSN

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

4.6.1 Description

Returns the International Mobile station Equipment Identity (IMEI) number and related information to identify the MT that the TE is connected to.

4.6.2 Syntax

Type	Syntax	Response	Example
Generic syntax			
Set	AT+CGSN[=<snt>]	[+CGSN:]<param_val>	AT+CGSN=0
		OK	357520070120767
			OK
Serial number request			
Set	AT+CGSN[=0]	<sn>	AT+CGSN
		OK	357520070120767
			OK
IMEI request			
Set	AT+CGSN=1	+CGSN: <imei>	AT+CGSN=1
		OK	+CGSN: "357520070120767"
			OK
IMEISV request			
Set	AT+CGSN=2	+CGSN: <imeisv>	AT+CGSN=2
		OK	+CGSN: "3575200701207601"
			OK
SVN request			
Set	AT+CGSN=3	+CGSN: <svn>	AT+CGSN=3
		OK	+CGSN: "01"
			OK
Full IMEI and SVN request			
Set	AT+CGSN=255	<imei_full>	AT+CGSN=255
		OK	35752007012076701
			OK

Type	Syntax	Response	Example
Test	AT+CGSN=?	+CGSN: (list of supported <snt>s) OK	+CGSN: (0-3,255) OK

4.6.3 Defined values

Parameter	Type	Description
<snt>	Number	It indicates the requested serial number type. Depending on <snt> value, the <param_val> parameter in the information text response provides different information: • 0 (default value): MT serial number, typically the International Mobile station Equipment Identity (IMEI) • 1: International Mobile station Equipment Identity (IMEI) • 2: International Mobile station Equipment Identity and Software Version Number (IMEISV) • 3: Software Version Number (SVN) • 255: IMEI (not including the spare digit), the check digit and the SVN
<sn>	Number	MT serial number, typically the International Mobile station Equipment Identity (IMEI)
<imei>	String	International Mobile station Equipment Identity (IMEI). IMEI is composed of Type Allocation Code (TAC) (8 digits), Serial Number (SNR) (6 digits) and the Check Digit (CD) (1 digit).
<imeisv>	String	International Mobile station Equipment Identity and Software Version Number (IMEISV). The 16 digits of IMEISV are composed of Type Allocation Code (TAC) (8 digits), Serial Number (SNR) (6 digits) and the software version (SVN) (2 digits).
<svn>	String	Software Version Number (SVN) which is a part of IMEISV.
<imei_full	Number	International Mobile station Equipment Identity (IMEI), Check Digit and Software Version Number.
<param_val>	Number/ String	Type and supported content depend on related <snt> (details are given above)

4.7 Identification information I

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

4.7.1 Description

Returns some module information as the module type number and some details about the firmware 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.

4.7.2 Syntax

Type	Syntax	Response	Example
Action	**Type number request** ATI[0]	<type_number> OK	ATI0 LEXI-R10401D-00B-00 OK
	Model name ATI7	<model_name> OK	ATI7 LEXI-R10401D OK
	Modem and application version request ATI9	<modem_version>,<applications_version> OK	ATI9 01.00.A00.02 OK

4.7.3 Defined values

Parameter	Type	Description
<type_number>	String	Product type number
<model_name>	Number	Model name. For more details on the allowed values, see Notes.
<modem_version>	String	Module modem version
<applications_version>	String	Module application version. Where not applicable the module provides "Undefined"

4.7.4 Notes

LEXI-R10

- Table 3 reports the model name of each type number.

Product type number	Model name
LEXI-R10401D-00B-00	LEXI-R10401D
LEXI-R10801D-00B-00	LEXI-R10801D

Table 3: Model name (ATI7 response)

4.8 TE character set configuration +CSCS

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

4.8.1 Description

Selects the TE character set.

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

LEXI-R10
The command setting is stored in the NVM following the procedure described in the Saving AT commands configuration section.

4.8.2 Syntax

Type	Syntax	Response	Example
Set	AT+CSCS=<chset>	OK	AT+CSCS="IRA" OK
Read	AT+CSCS?	+CSCS: <chset> OK	+CSCS: "IRA" OK
Test	AT+CSCS=?	+CSCS: (list of supported <chset>'s) OK	+CSCS: ("IRA","GSM","PCCP437", "8859-1","UCS2","HEX", "PCCP936") OK

4.8.3 Defined values

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

Parameter	Type	Description
		• "UCS2": 16-bit universal multiple-octet coded character set (USO/IEC10646); UCS2 character strings are converted to hexadecimal numbers from 0000 to FFFF; e.g. "004100620063" equals three 16-bit characters with decimal values 65, 98 and 99 • "HEX": character strings consist only of hexadecimal numbers from 00 to FF; e.g. "032FE6" equals three 8-bit characters with decimal values 3, 47 and 230; no conversions to the original MT character set shall be done • "PCCP936": Chinese character set • "UTF-8": octet (8-bit) lossless encoding of UCS characters (see RFC 3629 [205]); UTF-8 encodes each UCS character as a variable number of octets, where the number of octets depends on the integer value assigned to the UCS character. The input format shall be a stream of octets. It shall not be converted to hexadecimal numbers as in "HEX" or "UCS2". This character set requires an 8-bit TA - TE interface. Allowed values: • LEXI-R10 - "IRA" (factory-programmed value), "GSM", "UCS2"

4.9 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

4.9.1 Description

Request the IMSI (International Mobile Subscriber Identity).

4.9.2 Syntax

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

4.9.3 Defined values

Parameter	Type	Description
<IMSI>	Number	International Mobile Subscriber Identity

4.10 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

4.10.1 Description

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

4.10.2 Syntax

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

Type	Syntax	Response	Example
Test	AT+CCID=?	OK	

4.10.3 Defined values

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

4.10.4 Notes

- The command requires the SIM to correctly work.

5 Mobile equipment control and status

5.1 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

5.1.1 Description

Switches off the MT. During shutdown 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 AT+CPWROFF command.

5.1.2 Syntax

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

5.1.3 Notes

LEXI-R10

- The +UCPWROFF URC is not supported.

5.2 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	Appendix B.4	+CME Error

5.2.1 Description

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

5.2.2 Syntax

Type	Syntax	Response	Example
Set	AT+CFUN=<fun>[,<rst>]	OK	AT+CFUN=1 OK
Read	AT+CFUN?	+CFUN: <power_mode> OK	+CFUN: 1 OK
Test	AT+CFUN=?	+CFUN: (list of supported <fun>'s),(list of supported <rst>'s) OK	+CFUN: (0,1,4,15,16,19),(0-1) OK
URC		+UUFASTSHUTDOWN: <value>	+UUFASTSHUTDOWN: 0

5.2.3 Defined values

Parameter	Type	Description
<fun>	Number	Selected functionality: • 0: sets the MT to minimum functionality (disable both transmit and receive RF circuits by deactivating both CS and PS services) • 1 (factory-programmed value): sets the MT to full functionality, e.g. from airplane mode or minimum functionality. Full functionality mode is persistent between power cycles triggered by AT+CFUN=15, AT+CFUN=16 or AT+CPWROFF (where supported). • 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 AT+CFUN=15, AT+CFUN=16 or AT+CPWROFF (where supported). • 10: fast power-off, the command triggers a fast shutdown, without sending a detach request to the network, with storage of current settings in module's non-volatile memory. The "OK" final result code indicates the command request was successful, while the +UUFASTSHUTDOWN URC provides the status of the power-off process. • 11: safe memory and power-off, the command puts the memory in safe state avoiding further write and erase operations and shuts down the system without performing any controlled shutdown procedure • 15: MT silent reset (with detach from network and saving of NVM parameters), without reset of the SIM card • 16: MT silent reset (with detach from network and saving of NVM parameters), with reset of the SIM card • 19: sets the MT to minimum functionality by deactivating CS and PS services and the SIM card. Re-enable the SIM card by means of <fun>=0, 1, 4. Allowed values: • LEXI-R10 - 0, 1, 4, 10, 11, 15, 16, 19
<rst>	Number	Reset mode: • 0 (default value): do not reset the MT before setting it to the selected <fun> • 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> (if persistent at reboot).
<power_mode>	Number	Power mode: • 0: MT is switched on with minimum functionality • 1: MT is switched on • 4: MT is in "airplane mode" • 5: MT is in "test mode" • 19: MT is in minimum functionality with SIM deactivated Allowed values: • LEXI-R10 - 0, 1, 4, 19
<value>	Number	Allowed values: • 0: fast power-off ongoing • 1: fast power-off completed

5.2.4 Notes

LEXI-R10

- <fun>=15 resets the SIM card, same as <fun>=16.
- Only the +UUFASTSHUTDOWN: 1 URC is provided after the trigger of <gpio_mode>=24 GPIO functionality and <fun>=10 command.

5.3 Clock +CCLK

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

5.3.1 Description

Sets and reads the real-time clock of the MT.

5.3.2 Syntax

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

5.3.3 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. • LEXI-R10 - The factory-programmed value is "00/01/01,00:00:00+00". Values prior to the factory-programmed value are not allowed.

5.3.4 Notes

- If the parameter value is out of range, then the "+CME ERROR: operation not supported" or "+CME ERROR: 4" will be provided (depending on the +CMEE AT command setting).
- "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 AT 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.

LEXI-R10

- Time setting is not permanently stored in NVM.

5.4 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

5.4.1 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.

5.4.2 Syntax

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

5.4.3 Defined values

Parameter	Type	Description
<text>	String	Greeting text. The factory-programmed value is: • LEXI-R10 - "+UUSTATUS: READY"
<mode>	Number	Allowed values: • 0: turn off the greeting text • 1: turn on the greeting text Factory-programmed value: • LEXI-R10 - 1
<ltext>	Number	Maximum length of the <text> parameter.

5.4.4 Notes

LEXI-R10

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

5.5 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

5.5.1 Description

Configures the automatic time zone update via NITZ.

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

5.5.2 Syntax

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

5.5.3 Defined values

Parameter	Type	Description
<on_off>	Number	Automatic time zone update: • 0: automatic time zone via NITZ disabled • 1: automatic time zone update via NITZ enabled; if the network supports the service, update the local time to the module (not only time zone) • 2: automatic time zone update via NITZ enabled; if the network supports the service, update the GMT time to the module (not only time zone) Allowed values: • LEXI-R10 - 0, 1 (factory-programmed value)

5.6 Time zone reporting +CTZR

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

5.6.1 Description

Configures the time zone change event reporting. If the reporting is enabled, according to the <mode> parameter the MT returns:

- the **+CTZV** URC whenever the time zone changes and additionally the **+CTZDST** URC if the daylight saving time information is available
- the **+CTZE** URC
- the **+CTZEU** URC whenever the universal time reporting is available

5.6.2 Syntax

Type	Syntax	Response	Example
Set	AT+CTZR=<mode>	OK	AT+CTZR=1 OK
Read	AT+CTZR?	+CTZR: <mode> OK	+CTZR: 0 OK
Test	AT+CTZR=?	+CTZR: (list of supported <mode>s) OK	+CTZR: (0-1) 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		+CTZEU: <tz>,<dst>[,<utime>]	+CTZEU: +04,1
URC		+CTZDST: <dst>	+CTZDST: 1

5.6.3 Defined values

Parameter	Type	Description
<mode>	Number	Enables the time zone reporting URCs: • 0: disable the time zone change event reporting • 1: enable the time zone reporting by +CTZV and +CTZDST URCs • 2: enable the time zone reporting by +CTZE URC • 3: enable the time zone reporting and universal time reporting by +CTZEU URC according to 3GPP TS 27.007 Release 13 Allowed values: • LEXI-R10 - 0 (default value), 1, 2, 3. The +CTZDST URC is not supported.
<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.

Parameter	Type	Description
<dst>	Number	Indicates the daylight saving time. The allowed values are: • 0: no adjustments • 1: +1 hour adjustment • 2: +2 hours adjustment
<utime>	String	Universal time in format "yyyy/MM/dd,hh:mm:ss". The characters indicate year, month, day, hour, minutes, seconds.

5.6.4 Notes

- The +CTZU AT command (automatic time zone setting) does not affect the time zone reporting.
- 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.
- For the +CTZE URC, the local time <time> needs to be derived by the MT.

LEXI-R10

- The command setting is stored in the personal profile.
- The format of the <time> and <utime> parameter is "yy/MM/dd,hh:mm:ss".

5.7 Network Time Synchronization +USNTP

+USNTP						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	Full	No	No	No	<45 s	+CME Error +USNTP Error

5.7.1 Description

Synchronizes the local RTC time with the Coordinated Universal Time (UTC) via the NTP server.

The local RTC time synchronization via the NTP server will be retained until the module reboot.

Local time is returned via +UUSNTP URC when +CTZU is enabled, otherwise UTC time is returned.

The default EPS bearer with the default CID (<cid>=1) will be used for time synchronization. To activate and use another PDP context for this purpose, use +CGACT and +UDCONF=19 respectively.

5.7.2 Syntax

Type	Syntax	Response	Example
Set	AT+USNTP=<host_name>[,<port>[,<autosync>[,<cid>]]]	OK	AT+USNTP="cn.pool.ntp.org" OK
Test	AT+USNTP=?	+USNTP: "host_name",(list of supported <port>s),(list of supported <autosync>s),(list of supported <cid>s) OK	+USNTP: "host_name",(1-65535),(0,1),(1-15) OK
URC		+UUSNTP: <time>	+UUSNTP: "2020/08/01,08:53:48"
URC		+UUSNTPER: <error_code>	+UUSNTPER: 5

5.7.3 Defined values

Parameter	Type	Description
<host_name>	String	IP address or domain name of the NTP server. For IP address format reference, see the IP addressing.
<port>	Number	NTP server port, the range goes from 1-65535, default port is 123.

Parameter	Type	Description
<autosync>	Number	Local RTC time synchronization: • 0 (default value): disable the synchronization of local RTC from NTP server • 1: enable the synchronization of local RTC from NTP server
<cid>	Number	See <cid>. For more details on the default value of the parameter, see description.
<time>	String	Time in format "yyyy/MM/dd,hh:mm:ss". The characters indicate year, month, day, hour, minutes, seconds.
<error_code>	Number	The error occurred while processing the +USNTP command. For the list of the allowed error result codes, see SNTP error codes.

5.8 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

5.8.1 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.

☞ LEXI-R10
The command setting is stored in the personal profile following the procedure described in the Saving AT commands configuration section.

5.8.2 Syntax

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

5.8.3 Defined values

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

5.8.4 Notes

- The following convention is valid:

Numeric error code	Verbose error code	Description
3	"operation not allowed"	The MT is in a state which does not allow performing the entered command.
4	"operation not supported"	The error result code is related to a parameter not covered by the GSM/ETSI or u-blox specification

LEXI-R10

- The <n> factory-programmed value is 1.

5.9 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

5.9.1 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 / EPS bearer establishment or unsuccessful PDP context activation,
- The last GPRS / EPS bearer detach or PDP context deactivation.

LEXI-R10
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 to 3GPP TS 24.008 [84].

5.9.2 Syntax

Type	Syntax	Response	Example
Action	AT+CEER	+CEER: <type>[,<cause>,<error_description>,<mcc>,<mnc>] OK	+CEER: "EMM cause ESM failure", 27,"Missing or unknown APN",001,01 OK
Test	AT+CEER=?	OK	

5.9.3 Defined values

Parameter	Type	Description
<type>	String	• "EMM cause": <cause>, <error_description>, <mcc> and <mnc> parameters are provided • "ESM cause": <cause> and <error_description> parameters are provided • "EMM cause ESM failure": <cause>, <error_description>, <mcc> and <mnc> parameters are provided • "No report available": no more parameters are provided
<cause>	Number	Code number of the received error (internal or network originated); more details in Appendix A.3.1
<error_description>	String	Code description of the received error; more details in Appendix A.3.1
<mcc>	Number	Mobile Country Code (range 0 - 999)
<mnc>	Number	Mobile Network Code (range 0 - 999)

5.9.4 Notes

LEXI-R10

- The GPRS attach/detach and call setup/modification/release are not supported.
- The <mcc> and <mnc> optional parameters are only displayed after a failed attach attempt, they are no longer displayed after a successful attach.

6 Call control

6.1 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	+CME Error

6.1.1 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.

6.1.2 Syntax

Type	Syntax	Response	Example
Action	ATH	OK	

7 Network service

7.1 Network parameters definition

Parameter	Type	Description	Commands
<MCC>	Number	Mobile Country Code. The range is 0-999 (3 digits).	+COPS, +UCGED
<MNC>	Number	Mobile Network Code. The range is 0-999 (1 to 3 digits).	+COPS, +UCGED
<LAC>	Number	Location Area Code, The range is 0x0-0xFFFF (2 octets)	+COPS
<CI>	Number	Cell identity.	+COPS
<RxLev>	Number	Received Signal Strength Indicator (RSSI) index as defined in 3GPP TS 45.008 [90]: • 0: less than -110 dBm • 1..62: from -110 to less than -48 dBm with 1 dBm steps • 63: -48 dBm or greater	+COPS, +UCGED
<RAC>	Number	Routing Area Code, range 0x0-0xFF (1 octet); see the 3GPP TS 44.018 [161]	+COPS
<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 [101]. The special value -1 means not valid.	+UCGED
<scrambling_code>	Number	Primary scrambling code (PSC).	+COPS, +UCGED
<dl_frequency>	Number	Downlink frequency. The range is 0-16383.	+COPS
<ul_frequency>	Number	Uplink frequency. The range is 0-16383.	+COPS
<arfcn>	Number	Absolute Radio Frequency Channel Number (ARFCN).	+COPS, +UCGED
<rscp_lev>	Number	Received Signal Code Power expressed in dBm levels: • 0: less than -115 dBm • 1..90: from -115 dBm to less than -25 dBm with 1 dBm steps • 91: -25 dBm	+COPS
<ecn0_lev>	Number	Energy per Chip/Noise ratio expressed in dB levels: • 0: less than -24 dB • 1..48: from -24 dB to less than 0 dB with 0.5 dB steps • 49: 0 dB	+COPS, +UCGED
<EARFCN>	Number	E-UTRAN Absolute radio frequency channel number as defined in the 3GPP TS 36.101 [127]. As per 3GPP TS 36.101 [127] the allowed values depend on the module supported bands. See the corresponding module data sheet for the complete list of the bands supported by each module.	+UCGED
<PhysCellID>	Number	Physical cell ID. The range is 0-503.	+COPS
<TAC>	Number	Tracking area code.	+COPS, +UCGED
<LcellId>	Number	E-UTRAN CI (cell identifier) in hexadecimal format; the range is 0x0-0xFFFFFFF (28 bits), 0000000 if not known or not detectable.	+UCGED
<dl_EARFCN>	Number	Downlink E-UTRAN absolute radio frequency channel number in decimal format.	+COPS
<ul_EARFCN>	Number	Uplink E-UTRAN absolute radio frequency channel number in decimal format.	+COPS
<RSRP>	Number	Reference Signal Received Power (RSRP) as defined in 3GPP TS 36.133 [132]: • 0: less than -140 dBm	+COPS, +UCGED

Parameter	Type	Description	Commands
		• 1..96: from -140 dBm to less than -44 dBm with 1 dBm steps • 97: -44 dBm or greater	
<RSRQ>	Number	• LEXI-R10 - Reference Signal Received Quality (RSRQ) as defined in 3GPP TS 36.133 [132]: o 0: less than -19.5 dB o 1..33: from -19.5 dB to less than -3 dB with 0 .5 dB steps o 34: -3 dB or greater	+COPS, +UCGED
<RSRP_value>	Number	Current Reference Signal Received Power (RSRP) expressed in dBm, the range goes from -140.00 dBm to -44.00 dBm.	+UCGED
<RSRQ_value>	Number	Current Reference Signal Received Quality (RSRQ) expressed in dB, the range goes from -20.00 dB to -3.00 dB.	+UCGED
<BSIC>	Number	Base Station Identify Code (BSIC) in hexadecimal format, the range is 0x0-0x3F (6 bits).	+COPS, +UCGED
<Lband>	Number	E-UTRAN band (see 3GPP TS 36.101 Table 5.5-1 [127]). Allowed values:	+UCGED
<Requested_eDRX_cycle>	String	Requested eDRX cycle value to be allocated to the UE. Half byte in a 4 bit format: the eDRX cycle value refers to bit 4 to 1 of octet 3 of the extended DRX parameters information element. For the coding and the value range, see the extended DRX parameters information element in 3GPP TS 24.008 table 10.5.5.32/3GPP TS 24.008 [84]. • LEXI-R10 - The factory-programmed value is 3 ("0 011").	+CEDRXS, +CEDRXRDP
<Assigned_eDRX_cycle>	String	Assigned eDRX cycle value. Half byte in a 4 bit format: the eDRX cycle value refers to bit 4 to 1 of octet 3 of the extended DRX parameters information element. For the coding and the value range, see the extended DRX parameters information element in 3GPP TS 24.008 table 10 .5.5.32/3GPP TS 24.008 [84].	+CEDRXS, +CEDRXRDP
<Requested_paging_time_ window>	String	Requested paging time window value to be allocated to the UE. Half byte in a 4 bit format: the paging time window (PTW) refers to bit 8 to 5 of octet 3 of the extended DRX parameters information element. For the coding and the value range, see the extended DRX parameters information element in 3GPP TS 24.008 table 10 .5.5.32/3GPP TS 24.008 [84]. • LEXI-R10 - The factory-programmed value is 1 ("0 001").	+CEDRXS
<Assigned_paging_time_ window>	String	Assigned paging time window value. Half byte in a 4 bit format: the paging time window (PTW) refers to bit 8 to 5 of octet 3 of the extended DRX parameters information element. For the coding and the value range, see the extended DRX parameters information element in 3GPP TS 24.008 table 10.5.5.32/3GPP TS 24.008 [84].	+CEDRXS, +CEDRXRDP
<LTE_rrc>	Number	LTE radio resource control (RRC) state: • 0: null • 1: IDLE • 2: ATTEMPT TO CONNECT • 3: CONNECTED • 4: LEAVING CONNECTED STATE • 5: ATTEMPT LEAVING E-UTRA • 6: ATTEMPT ENTERING E-UTRA • 7: CELL SEARCH • 255: not known or not detectable	+UCGED

7.2 Subscriber number +CNUM

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

7.2.1 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.

7.2.2 Syntax

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

7.2.3 Defined values

Parameter	Type	Description
<alphax>	String	Associated with <numberx>
<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)

7.3 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

7.3.1 Description

Returns the radio signal strength <signal_power> and <qual> from the MT.

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.

7.3.2 Syntax

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

Type	Syntax	Response	Example
		OK	OK

7.3.3 Defined values

Parameter	Type	Description
<signal_power>	Number	The allowed range is 0-31 and 99. Remapped indication of the following parameters: • the Received Signal Strength Indication (RSSI) in GSM and LTE RATs. For more details on the RSSI values mapping in LTE RAT, see Notes. • the Received Signal Code Power (RSCP) in UMTS RAT. When the RF power level of the received signal is the highest possible, the value 31 is reported. When it is not known, not detectable or currently not available, 99 is returned.
<qual>	Number	The allowed range is 0-7 and 99. The information provided depends on the selected RAT: • In 2G RAT CS dedicated and GPRS packet transfer mode indicates the Bit Error Rate (BER) as specified in 3GPP TS 45.008 [155] • In 2G RAT EGPRS packet transfer mode indicates the Mean Bit Error Probability (BEP) of a radio block. 3GPP TS 45.008 [155] specifies the range 0-31 for the Mean BEP which is mapped to the range 0-7 of <qual> • In UMTS RAT indicates the Energy per Chip/Noise (ECN0) ratio in dB levels of the current cell. 3GPP TS 25.133 [133] specifies the range 0-49 for EcN0 which is mapped to the range 0-7 of <qual> • In LTE RAT indicates the Reference Signal Received Quality (RSRQ). TS 36.133 [132] specifies the range 0-34 for RSRQ which is mapped to the range 0-7 of <qual> See Table 4 for the complete parameter mapping.

7.3.4 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			

Table 4: <qual> parameter mapping for each supported RAT

LEXI-R10

- Table 5 maps <signal_power> values reported from UE and the RSSI. RSSI includes the signal transmitted by the network plus noise.

<signal_power>	RSSI
0	RSSI of the network <= -113 dBm
1	-111 dBm
2...30	-109 dBm <= RSSI of the network <= -53 dBm
31	-51 dBm <= RSSI of the network
99	Not known or not detectable

Table 5: Mapping between <signal_power> reported from UE and the RSSI

LEXI-R10

- Only LTE RAT is supported.

- The command can be used with no need of SIM insertion, because the module always tries to camp on a suitable cell at boot.
- When the module enters the out of service condition (e.g. in +COPS:2 with SIM inserted and PIN verified, or in out of coverage), all the parameters are reset to "not known or not detectable" values.

7.4 Extended signal quality +CESQ

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

7.4.1 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.

7.4.2 Syntax

Type	Syntax	Response	Example
Action	AT+CESQ	+CESQ: <rxlev>,<ber>,<rscp>,<ecn0>,<rsrq>,<rsrp> OK	+CESQ: 99,99,255,255,20,80 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) OK	+CESQ: (0-63,99),(0-7,99),(0-96,255),(0-49,255),(0-34,255),(0-97,255) OK

7.4.3 Defined values

Parameter	Type	Description
<rxlev>	Number	Received Signal Strength Indication (RSSI).
<ber>	Number	Bit Error Rate (BER): • 0..7: as RXQUAL values in the table in 3GPP TS 45.008 [155], subclause 8.2.4 • 99: not known or not detectable
<rscp>	Number	Received Signal Code Power (RSCP): • 0: less than -120 dBm • 1..95: from -120 dBm to -26 dBm with 1 dBm steps • 96: -25 dBm or greater • 255: not known or not detectable
<ecn0>	Number	Ratio of received energy per PN chip to the total received power spectral density (see 3GPP TS 25.133 [133] subclause): • 0: less than -24 dB • 1..48: from -24 dB to -0.5 dBm with 0.5 dB steps (i.e. 1: -24 dB <= Ec/Io < -23.5 dB) • 49: 0 dB or greater • 255: not known or not detectable

Parameter	Type	Description
<rsrq>	Number	Reference Signal Received Quality (RSRQ): • 0: less than -19.5 dB • 1..33: from -19.5 dB to -3.5 dB with 0.5 dB steps • 34: -3 dB or greater • 255: not known or not detectable
<rsrp>	Number	Reference Signal Received Power (RSRP): • 0: less than -140 dBm • 1..96: from -140 dBm to -45 dBm with 1 dBm steps • 97: -44 dBm or greater • 255: not known or not detectable

7.4.4 Notes

LEXI-R10

- The command can be used with no need of the SIM insertion, because the module always tries to camp on a suitable cell at the module boot.
- When the module enters the out of service condition (e.g. in +COPS:2 with SIM inserted and PIN verified, or in out of coverage), all the parameters are reset to "not known or not detectable" value.

7.5 Signal quality change event reporting control +UCESQS

+UCESQS						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	Full	No	Profile	No	< 5 s	+CME Error

7.5.1 Description

Controls the extended signal change quality event reporting.

7.5.2 Syntax

Type	Syntax	Response	Example
Set	AT+UCESQS=<rpt>[,<var>]	OK	AT+UCESQS=2,7 OK
Read	AT+UCESQS?	+UCESQS: <rpt>,<var> OK	+UCESQS: 2,7 OK
Test	AT+UCESQS=?	+UCESQS: (list of supported <rpt>'s),(list of supported <var>'s) OK	+UCESQS: (0-2),(1-7) OK
URC		+CESQ: <rxlev>,<ber>,<rscp>,<ecno>,<rsrq>,<rsrp>	+CESQ: 99,99,255,255,1,7
URC		+UCESQ: RSRP,<rsrp>,RSRQ,<rsrq>,SNR,<snr>	+UCESQ: RSRP,-96,RSRQ,-11,SNR,12

7.5.3 Defined values

Parameter	Type	Description
<rpt>	Number	Signal quality change event reporting mode: • 0 (factory-programmed value): disable event reporting • 1: report signal quality change via the +CESQ URC • 2: report signal quality change via the +UCESQ URC
<var>	Number	Specifies the threshold for the signal quality change event reporting. If the variation in the RSRQ, RSRQ and SNR is greater than or equal to the specified threshold, the +CESQ or +UCESQ URC is reported, depending upon the <rpt> parameter. Higher

Parameter	Type	Description
		the threshold, lesser the URC reporting. The range is 0-7. The default value is 1, the factory-programmed value is 0.
<rxlev>	Number	Received Signal Strength Indication (RSSI). Allowed value: • 99: not known or not detectable
<ber>	Number	Bit Error Rate (BER). Allowed value: • 99: not known or not detectable
<rscp>	Number	Received Signal Code Power (RSCP). Allowed value: • 255: not known or not detectable
<ecno>	Number	Ratio of received energy per PN chip to the total received power spectral density. Allowed value: • 255: not known or not detectable
<snr>	Number	Signal to noise ratio, reported in dB. The range goes from -20 dB to 40 dB
<rsrp>	Number	Reference Signal Received Quality (RSRQ). • The range goes from -156 dBm to -44 dBm for +UCESQ reporting • Allowed values for +CESQ URC reporting: o 0: less than -140 dBm o 1..96: from -140 dBm to -45 dBm with 1 dBm steps o 97: -44 dBm or greater o 255: not known or not detectable
<rsrq>	Number	Reference Signal Received Quality (RSRQ). • The range goes from -34 dB to 2.5 dB for +UCESQ reporting • Allowed values for +CESQ URC reporting: o 0: less than -19.5 dB o 1..33: from -19.5 dB to -3.5 dB with 0.5 dB steps o 34: -3 dB or greater o 255: not known or not detectable

7.6 Operator selection +COPS

+COPS						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	partial	No	Profile	Yes	Appendix B.4	+CME Error

7.6.1 Description

The set command forces an attempt to select and register with the LTE network operator, which can be chosen in the list of network operators returned by the test command, which triggers a PLMN scan on all supported bands. Through the <mode> parameter the network selection can be automatically performed by the module or manually forced on a specified network operator.

By default, u-blox cellular modules support auto-registration, therefore AT+COPS=0 or AT+COPS=1 commands are not required at switch on: for more details, see Auto-registration.

The command is accessible also without an inserted SIM. The PIN insertion is required only for AT+COPS=2 command: if the PIN is not inserted, AT+COPS=2 returns the "+CME ERROR: SIM Failure" error result code. The <mode> parameter value is correctly returned by the read command only after the SIM initialization.

The set command handling depends on the <mode> parameter value (for more details on the <mode> parameter allowed values, see Defined values):

- **<mode>=0** and **<mode>=1**: the AT command setting can be stored in the NVM.
- **<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. The current setting is stored in the NVM.
- **<mode>=2**: this setting cannot be stored in the NVM. In addition, when in <mode>=2, a AT+CFUN=0/AT+CFUN=1 cycle restores the <mode> setting stored in the NVM.

The response time for the set and read command is immediate. The user shall not rely 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 the following AT commands shall be used:

- EPS network registration status +CEREG
- Network registration status +CREG

Only numeric <format> is supported. Alphanumeric format can be selected but, given that +COPN is not supported, no PLMN name string will be returned by the test AT command; the read AT command returns the PLMN name in alphanumeric format only if it has been received via NITZ (Network Identity and Time Zone) Information during the registration.

User reselection (see 3GPP TS 23.122 [112]) can be triggered in +COPS: 0 with +UUSERSCAN AT command.

The AT+COPS=1,<format>,<oper> command forces the MT to select and register with the network even if the operator currently belongs to the list of the Forbidden Public Land Mobile Networks (FPLMNs).

PLMN manual mode exception (see 3GPP TS 23.122 [112] subclause 4.4.3.1) is supported: this feature allows manual selection of the HPLMN or an EHPLMNs when the selected PLMN is not available.

The test command cannot be aborted. In case the PLMN scan is interrupted e.g. by a deregistration procedure, the command will return the partial PLMN scan results.

The PLMN scan can be triggered in deregistered state (+COPS: 2) as well as in minimum functionality states (+CFUN: 0/+CFUN: 4/+CFUN: 19).

The PLMN scan can be triggered during a RRC connection, which is temporarily released by the module and re-established at the end of the the network search in case of pending data.

The user should not enter colliding requests (e.g. AT+COPS=0 and AT+COPS=2) on different communication ports, because this might cause interoperability issues if overlapping registration and deregistration requests are not handled by the network, and could result in an unpredictable registration state. Similarly, when notified of a mobile terminated detach event (e.g. via +CGEV URC), it is recommended to wait a few seconds before entering AT+COPS=2 in order to let the pending registration procedure (automatically triggered by the module in most cases) successfully end.

7.6.2 Syntax

Type	Syntax	Response	Example
Set	AT+COPS=<mode>[,<format>[,<oper>[,<AcT>]]]	OK	AT+COPS=0,0 OK
Read	AT+COPS?	+COPS: <mode>[,<format>,<oper>,<AcT>] OK	+COPS: 0,0,"vodafone IT",7 OK
Test	AT+COPS=?	+COPS: [(<stat>,"","", numeric <oper>,<AcT>)],[(<stat>,"","", numeric <oper>,<AcT>)[,...]],(list of supported <mode>s),(list of supported <format>s) OK	+COPS: (2,"","","22210",7),(1,"","","29340",7),,(0-4),(0-2) OK

7.6.3 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 numeric format: • 0 (factory-programmed value): automatic (<oper> field is ignored) • 1: manual • 2: deregister from network • 3: set only <format> • 4: manual/automatic

Parameter	Type	Description
<format>	Number	• 0: long alphanumeric <oper> • 1: short format alphanumeric <oper> • 2 (factory-programmed value): numeric <oper>
<oper>	String	The <oper> string returned by the +COPS read command response consists in the network alphanumeric name from NITZ information, where available. Given in format <format>, this field may be up to 16 characters long when <format> is set to long alphanumeric, and up to 8 characters when <format> is set to short alphanumeric. The used alphabet is not affected by +CSCS AT command. The factory-programmed value is an empty string.
<stat>	Number	• 0: unknown • 1: available • 2: current • 3: forbidden
<AcT>	Number	Indicates the radio access technology: • 7: LTE

7.7 User PLMN reselection +UUSERSCAN

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

7.7.1 Description

Executes the user PLMN reselection process, by triggering a search for higher priority PLMNs. If no higher priority PLMN is found, the module remains in the state it was before the search (see the 3GPP TS 23.122 [112] subclause 4.4.3.2).

If a PLMN scan is already in progress, the command will return an error result code.

This command is effective only if the PLMN selection mode is set to automatic mode, i.e. in +COPS: 0, the SIM is present and PIN is inserted (if enabled).

7.7.2 Syntax

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

7.8 MAC QoS inactivity timer +UMACQOSTMR

+UMACQOSTMR						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	partial	No	NVM / OP	No	<10 s	+CME Error

7.8.1 Description

Sets the MAC QoS inactivity timer for LTE RAT. This timer is a cellular platform proprietary guard timer that is restarted for any received or transmitted packet. If the timer expires, the RRC connection is locally released and re-established to perform a Tracking Area Update indicating no pending data, after which the network will immediately release the RRC connection.

☞ The command setting is not stored in the NVM.

☞ This timer shall be disabled when the module is connected to a network simulator that keeps the RRC connection active on purpose, e.g. during conformance and regulatory testing.

7.8.2 Syntax

Type	Syntax	Response	Example
Set	AT+UMACQOSTMR=<lte_tmr>	OK	AT+UMACQOSTMR=2 OK
Read	AT+UMACQOSTMR?	+UMACQOSTMR: <mode>,<lte_tmr> OK	+UMACQOSTMR: 1,2 OK
Test	AT+UMACQOSTMR=?	+UMACQOSTMR: (list of supported <lte_tmr>s values) OK	+UMACQOSTMR: "+UMACQOSTMR": (0-50) OK

7.8.3 Defined values

Parameter	Type	Description
<mode>	Number	Indicates if the inactivity timer is enabled (0) or disabled (1).
<lte_tmr>	Number	Represents the inactivity timer for LTE. The range goes from 0 to 50 s, and 0 (factory-programmed value) indicates that the timer is disabled.

7.9 Connection Release +UCONNREL

+UCONNREL						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	full	No	No	No	<5 s	+CME Error

7.9.1 Description

Causes the UE to immediately release the RRC connection locally and then re-establish it, allowing the network to subsequently release it cleanly by sending an RRC Connection Release message to the module.

7.9.2 Syntax

Type	Syntax	Response	Example
Set	AT+UCONNREL	OK	AT+UCONNREL OK

7.10 Preferred PLMN list selection +CPLS

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

7.10.1 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.

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.

7.10.2 Syntax

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

7.10.3 Defined values

Parameter	Type	Description
<list>	Number	• 0 (default and factory-programmed 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 [89]). • 1: operator controlled PLMN selector with Access Technology $EF_{OPLMNwAcT}$; this file can be read only (see the 3GPP TS 31.102 [89]). • 2: HPLMN selector with Access Technology $EF_{HPLMNwAcT}$; this file can be read only (see the 3GPP TS 31.102 [89]).

7.10.4 Notes

LEXI-R10

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

7.11 Network registration status +CREG

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

7.11.1 Description

Configures the network registration URC related to CS (circuit-switched) domain. 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.
- +CREG: <stat>,[<lac>],[<ci>],[<AcTStatus>][,<cause_type>,<reject_cause>] if <n>=3 and the MT registration status (<stat>) changes. The <cause_type> and the <reject_cause> parameters are returned only if the MT is not registered, but it is currently searching a new operator to register to (<stat>=2) or if the registration is denied (<stat>=3).

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 the <n> parameter. The location information elements <lac>, <ci> and <AcTStatus>, if available, are returned only when <n>=2 or <n>=3 and the MT is registered with the network. The <cause_type>, <reject_cause> parameters are returned only if <n>=3 and the MT is not registered, but it is currently searching a new operator to register to (<stat>=2) or if the registration is denied (<stat>=3).

☞ 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 the latter cases the reported <ci> might be not correct because the UE in DCH state cannot read broadcast system information before

the change of serving cell. In contrast, in GSM RAT no unsolicited location information is received during a CS connection.

☞ The DTE application should set a reasonable timer (10 s) when receiving the +CREG: 3 URC, since this might be due to the fact that the LTE registration was rejected (SIM not enabled for LTE RAT, wrong APN during the initial default bearer setup in the EPS attach procedure and other temporary reject causes).

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

7.11.2 Syntax

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

7.11.3 Defined values

Parameter	Type	Description
<n>	Number	Network registration URC configuration. Allowed values: • 0 (default value and factory-programmed value): network registration URC disabled • 1: network registration URC enabled • 2: network registration and location information URC enabled • 3: network registration and reject cause URC enabled Allowed values: • LEXI-R10 - 0, 1, 2, 3
<stat>	Number	Network registration status. Allowed values: • 0: not registered, the MT is not currently searching a new operator to register to • 1: registered, home network • 2: not registered, but the MT is currently searching a new operator to register to • 3: registration denied • 4: unknown (e.g. out of GERAN/UTRAN/E-UTRAN coverage) • 5: registered, roaming • 6: registered for "SMS only", home network (applicable only when <AcTStatus> indicates E-UTRAN) • 7: registered for "SMS only", roaming (applicable only when <AcTStatus> indicates E-UTRAN) • 8: attached for emergency bearer services only (see 3GPP TS 24.008 [84] and 3GPP TS 24.301 [119] that specify the condition when the MS is considered as attached for emergency bearer services) • 9: registered for "CSFB not preferred", home network (applicable only when <AcTStatus> indicates E-UTRAN) • 10: registered for "CSFB not preferred", roaming (applicable only when <AcTStatus> indicates E-UTRAN) Allowed values: • LEXI-R10 - 0, 1, 2, 3, 4, 5, 6, 7
<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.

Parameter	Type	Description
<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: • 0: GSM • 1: GSM COMPACT • 2: UTRAN • 3: GSM/GPRS with EDGE availability • 4: UTRAN with HSDPA availability • 5: UTRAN with HSUPA availability • 6: UTRAN with HSDPA and HSUPA availability • 7: E-UTRAN • 8: EC-GSM-IoT (A/Gb mode) • 9: E-UTRAN (NB-S1 mode) • 255: the current <AcTStatus> value is invalid Allowed values: • LEXI-R10 - 7
<cause_type>	Number	<reject_cause> type. Allowed values: • 0: indicates that <reject_cause> contains an EMM cause value, see 3GPP TS 24.30 1 [119] Annex A
<reject_cause>	Number	Cause of the failed registration. The value is of type as defined by <cause_type>

7.11.4 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 supported) if network coverage 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 /non EPS 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 supported) if network coverage is available
- 3: the registration failed for CS/non-EPS services after a Location Update Reject or an LTE Attach Request rejected, or accepted for EPS services only; 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
  - CS domain not available (LTE specific)

  It is still possible to make emergency calls (if supported) 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
  - No service
  - Service detached
  - 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 CS/non EPS 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 (or on one of the equivalent HPLMN's)
- 7: in LTE, the MT is registered only for the SMS circuit-switched service on a VPLMN, in national or international roaming
- 8: the MT is attached for emergency bearer services only.
- 9: in LTE, the MT is registered only for the SMS circuit-switched service on the HPLMN (or on one of the equivalent HPLMN's). CS fallback is not supported for voice services, therefore if the device is configured as "voice centric" (see +CEMODE) and does not support VoLTE, it will disable LTE and reselect 3G or 2G RAT if supported.
- 10: in LTE, the MT is registered only for the SMS circuit-switched service on a VPLMN, in national or international roaming. CS fallback is not supported for voice services, therefore if the device is configured as "voice centric" (see +CEMODE) and does not support VoLTE, it will disable LTE and reselect 3G or 2G RAT if supported.

LEXI-R10

- The PIN insertion is not mandatory before the command execution.
- If LTE registration is successful, network registration status "registered" is indicated regardless of the availability of non EPS services (SMS services).

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 set command can write an entry in the selected list or can delete it if the operator parameter is not provided.

☞ LEXI-R10
If <oper> is given but <index> is left out, the <oper> is put in the next free location. 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.

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

7.12.3 Defined values

Parameter	Type	Description
<index> / <indexn>	Number	Represents the order number of operator in the SIM preferred operator list. The parameter range depends on the number of entries in SIM card (i.e. its size), but can be further limited by the capabilities of the module.
<format>	Number	See also +COPS command description: • 0: long format alphanumeric <oper> • 1: short format alphanumeric <oper> • 2 (default value): numeric <oper> Allowed values: • LEXI-R10 - 2 (default value)
<oper> / <opern>	String	Format indicated by <format>
<GSM_AcT>	Number	GSM access technology. Allowed values: • 0: access technology not selected • 1: access technology selected
<GSM_Compact_AcT>	Number	GSM compact access technology. Allowed values: • 0: access technology not selected • 1: access technology selected
<UTRAN_AcT>	Number	UTRA access technology. Allowed values: • 0: access technology not selected • 1: access technology selected
<E-UTRAN_AcT>	Number	E-UTRAN access technology. Allowed values: • 0: access technology not selected • 1: access technology selected

7.13 Channel and network environment description +UCGED

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

7.13.1 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 the <rat> parameter value.

Table 6 lists the supported <mode> parameter values:

<mode>	0	2	3	4	5	6	8
LEXI-R10	*	*					*

Table 6: <mode> parameter applicability

7.13.2 Syntax

Type	Syntax	Response	Example
Set	AT+UCGED=<mode>[,<urc_reporting>]	OK	AT+UCGED=2 OK
Read	AT+UCGED?	**<mode>=0:** +UCGED: 0 OK	+UCGED: 0 OK
		<mode>=2, <rat>=4: +UCGED: 2 4,<svc>,<MCC>,<MNC> <EARFCN>,<Lband>,<ul_BW>,<dl_BW>,<TAC>,<LcellId>,<P-CID>,<mTmsi>,<mmeGrId>,<mmeCode>, <RSRP>,<RSRQ>,<Lsinr>,<LTE_rrc>,<RI>,<CQI>,<avg_rsrp>,<totalPuschPwr>,<avgPucchPwr>,<drx>, <l2w>,<volte_mode>[,<ul_BLER>,<dl_BLER>] [N1: <MCC>,<MNC>,<EARFCN>,<P-CID>,<RSRP>,<RSRQ> [N2: <MCC>,<MNC>,<EARFCN>,<P-CID>,<RSRP>,<RSRQ> [...]]] OK	+UCGED: 2 4,0,001,01 2525,5,25,50,2b67,69f6bc7,111,00000000,ffff,ff,67,19,4,1,255,255,255,255,255,0,255,0,0.21,0.21 N1: 001,01,2525,52,25,13 OK
		<mode>=8: +UCGED: 8,<urc_reporting> [[<timer_name>,<timer_value>] [<timer_name>,<timer_value>] [...]] OK	+UCGED: 8,0 T3346,3600 OK
Test	AT+UCGED=?	+UCGED: (list of supported <mode>s),(list of supported <urc_reporting>s) OK	+UCGED: (0,2,8),(0,1) OK
URC		**<mode>=8:** +UCGED: <timer_name>,<timer_state>[,<timer_value>]	+UCGED: T3346,0,3600

7.13.3 Defined values

Parameter	Type	Description
<mode>	Number	Allowed values: • 0: reporting disabled • 2: short form reporting enabled • 3: retrieve the short form text information report • 4: mobility management (MM) transition state reporting enabled • 5: RSRP and RSRQ reporting enabled • 6: short form reporting with mobility management (MM) transition state enabled • 8: active NAS backoff timers information reporting enabled See Table 6 for the list of allowed values by series modules.
<rat>	Number	Current Radio Access Technology: • 2: 2G • 3: 3G • 4: 4G • 5: unknown. The parameter is set to a 5 until a network information update is not successfully performed through the AT+UCGED=2 command or when the MT is set to minimum functionality (+CFUN: 0, +CFUN: 4, +CFUN: 19). • 6: LTE Cat M1 • 7: NB-IoT
<svc>	Number	Current radio service state: • 0: not known or not detectable • 1: radio off • 2: searching • 3: no service • 4: registered The radio service state is updated at each change from a valid network service state (2G, 3G or 4G) to another valid network service state (2G, 3G or 4G). To retrieve the network registration status information refer to +CREG, +CGREG and +CEREG AT commands. ☞ LEXI-R10 The parameter is not supported, is always reported as 0: "not known or not detectable".
<MCC>	Number	See <MCC>.
<MNC>	Number	See <MNC>.
<EARFCN>	Number	See <EARFCN>.
<Lband>	Number	See <Lband>.
<ul_BW>	Number	Number of Uplink Resource Blocks (see 3GPP TS 36.101 table 5.6-1 [127]), 255 if not known or not detectable.
<dl_BW>	Number	Number of Downlink Resource Blocks (see 3GPP TS 36.101 table 5.6-1 [127]), 255 if not known or not detectable.
<TAC>	Number	See <TAC>.
<LcellId>	Number	See <LcellId>.
<mTmsi>	Number	4 bytes MME Temporary Mobile Subscriber Identity in hexadecimal format; 00000000 if not known or not detectable. ☞ LEXI-R10 The parameter is not supported, is always reported as 00000000: "not known or not detectable".
<mmeGrId>	Number	2 bytes MME Group Identifier in hexadecimal format; FFFF if not known or not detectable. ☞ LEXI-R10 The parameter is not supported, is always reported as FFFF: "not known or not detectable".

Parameter	Type	Description
<RSRP>	Number	See <RSRP>.
<RSRQ>	Number	See <RSRQ>.
<mmeCode>	Number	Current EMM (EPS Mobility Management) state and substate: • 0x00: NULL • 0x01: REGISTERED INITIATED • 0x02: DEREGISTERED INITIATED • 0x03: TRACKING AREA UPDATE INITIATED • 0x04: SERVICE REQUEST INITIATED • 0x05: DEREGISTERED NORMAL SERVICE • 0x06: DEREGISTERED LIMITED SERVICE • 0x07: DEREGISTERED ATTEMPTING TO ATTACH • 0x08: DEREGISTERED PLMN SEARCH • 0x09: DEREGISTERED NO IMSI • 0x0A: DEREGISTERED ATTACH NEEDED • 0x0B: DEREGISTERED LIMITED SERVICE • 0x0C: DEREGISTERED ECALL INACTIVE • 0x0D: REGISTERED NORMAL SERVICE • 0x0E: REGISTERED ATTEMPTING TO UPDATE • 0x0F: REGISTERED LIMITED SERVICE • 0x10: REGISTERED PLMN SEARCH • 0x11: REGISTERED UPDATE NEEDED • 0x12: REGISTERED NO CELL AVAILABLE • 0x13: REGISTERED ATEMPTING TO UPDATE MM • 0x14: REGISTERED IMSI DETACH INITIATED • 0xFF: not known or detectable
<Lsinr>	Number	E-UTRAN Signal to Interference and Noise ratio in dB. • LEXI-R10 - The range goes from -20 to 40; 255 if not known or not detectable.
<LTE_rrc>	Number	See <LTE_rrc>.  LEXI-R10 The only allowed values are IDLE(1), CONNECTED(3) and CELL SEARCH(7).
<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 [146] section 7.2 and 3GPP TS 36.212 [147] section 5.2.2.6 for more details.  LEXI-R10 The parameter is not supported, is always reported as 255: "not known or not detectable".
<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 [146] section 7.2 for more details.  LEXI-R10 The parameter is not supported, is always reported as 255: "not known or not detectable".
<avg_rsrp>	Number	Average value of last 10th Reference Signal Received Power (RSRP).  LEXI-R10 The parameter is not supported, is always reported as 255: "not known or not detectable".
<totalPuschPwr>	Number	Mobile output power for PUSCH transmission averaged over 480 ms in dBm.  LEXI-R10

Parameter	Type	Description
		The parameter is not supported, is always reported as 255: "not known or not detectable".
<avgPuschPwr>	Number	Mobile output power for PUSCH transmission averaged over 480 ms in dBm.
<avgPucchPwr>	Number	Mobile output power for PUCCH transmission averaged over 480 ms in dBm. LEXI-R10 The parameter is not supported, is always reported as 255: "not known or not detectable".
<drx>	Number	Discontinuous Reception "drx-Inactivity-Timer" value in ms; 0 if not known or not detectable. LEXI-R10 The parameter is not supported, always reported as 0. Use the +UDRX AT command to read its value.
<l2w>	Number	SIB3 LTE to WCDMA reselection criteria: (threshServingLow)x2 +(q-RxLevMin)x2; 255 if not known or not detectable. LEXI-R10 The parameter is not supported, is always reported as 255: "not known or not detectable".
<volte_mode>	Number	Reserved for future use. LEXI-R10 The parameter is not supported, is always reported as 255: "not known or not detectable".
<meas_gap>	Number	Measurement gap configuration: • 0: disabled • 40: 40 ms measurement gap repetition period corresponding to the measurement gap pattern ID 0 (see table 8.1.2.1-1 of 3GPP TS 36.133 [132]) • 80: 80 ms measurement gap repetition period corresponding to the measurement gap pattern ID 1 (see table 8.1.2.1-1 of 3GPP TS 36.133 [132])
<rai_support>	Number	Indicates if the network supports the release assistance indication (RAI): • 0: RAI not supported • 1: RAI supported
<tti_bundling>	Number	TTi (Transmission Time interval) bundling status: • 0: off • 1: on
<NBMsinr>	Number	Logarithmic value of SINR values expressed in 1/5th of a dB. The range goes from 0 to 250 which translates to a range from -20 dB to 30 dB
<esm_cause>	Number	ESM cause value as defined in 3GPP TS 24.301 [119]
<emm_state>	Number	EMM state value as defined in 3GPP TS 24.301 [119]. Allowed values: • 0: EMM-NULL • 1: EMM-DEREGISTERED • 2: EMM-REGISTERED-INITIATED • 3: EMM-REGISTERED • 4: EMM-TRACKING-AREA-UPDATING-INITIATED • 5: EMM-SERVICE-REQUEST-INITIATED • 6: EMM-DEREGISTERED-INITIATED • 7: undefined (or invalid)
<tx_pwr>	Number	TX power value in 1/10 dBm if device is in traffic, 255 otherwise
<drx_cycle_len>	Number	Idle DRX cycle length in 10 ms radio-frame units
<tmsi>	String	TMSI in hexadecimal format, with most significant byte first
<P-CID>	Number	E-UTRAN cell Physical Cell ID; the range is 0-503, 65535 if not known or not detectable.
<ul_BLER>	Number	Uplink Block Error Ratio (BLER); the range is 0-100.
<dl_BLER>	Number	Downlink Block Error Ratio (BLER); the range is 0-100.

Parameter	Type	Description
<RSRP_value>	Number	See <RSRP_value>.
<RSRQ_value>	Number	See <RSRQ_value>.
<MMtransition>	Number	Mobility management transition state. Allowed values: • 0: no change • 1: handover to UMTS • 2: handover to GSM • 3: handover to LTE • 4: reselection to UMTS • 5: reselection to GSM • 6: reselection to LTE • 7: cell change order to UMTS • 8: cell change order to GSM • 9: cell change order to LTE • 10: RAT change • 255: unknown
<UL_IPcounter>	Number	Counter of the uplink IP packets; it reports the aggregated value from all active PDP contexts. The counter is reset only with module reset. The range goes from 0 to 4294967295.
<DL_IPcounter>	Number	Counter of the downlink IP packets; it reports the aggregated value from all active PDP contexts. The counter is reset only with module reset. The range goes from 0 to 4294967295.
<timer_name>	String	Active NAS backoff timer. • LEXI-R10 Allowed values: o T3346 o T3448 o T3412 o T3324
<timer_value>	Number	NAS backoff timer's remaining value in milliseconds. In case of PLMN back-off timers the value 0 indicates that the PLMN is permanently back-off forbidden. LEXI-R10 The timer value is reported in seconds.
<timer_state>	Number	Timer state: • 0: timer start • 1: timer stop • 2: timer expiry
<urc_reporting>	Number	Enable/disable URC reporting for timer start/stop/expiry. The default value is 0.

7.13.4 Notes

LEXI-R10

- The <urc_reporting> parameter can be configured only if <mode>=8.

7.14 Frequency/Cell Lock +UFREQLOCK

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

7.14.1 Description

Allows to manage the list of the preferred EARFCNs and to lock the module on a specific cell or frequency.

The preferred EARFCN setting is effective only when cell power levels are similar; otherwise, it is ignored. For instance, if a higher-ranked cell on a different EARFCN is available, the module will prioritize the selection of

that cell. The preferred EARFCN list is automatically updated by the module based on the LTE cells it has detected so far.

In cell lock mode, configuring the EARFCN and P-CID pair will result in the device locking onto the designated frequency and cell, regardless of power levels. During this state, handover and reselection features remain deactivated until the lock setting is disabled. If the specified EARFCN and P-CID are not available, the module enters an Out of Coverage state (OOC).

☞ The setting can be changed only in deregistered state.

7.14.2 Syntax

Type	Syntax	Response	Example
Generic syntax			
Set	AT+UFREQLOCK=<op_code>[,<param1>[,<param2>[,...]]]	OK	AT+UFREQLOCK=0 OK
Read	AT+UFREQLOCK?	[+UFREQLOCK: 1,<earfcn1>[,<earfcn2>[,...]]] [+UFREQLOCK: 2,<earfcn>[,<phyCellId>]] OK	AT+UFREQLOCK? +UFREQLOCK: 1,1650,3400 +UFREQLOCK: 2,3400 OK
Cancel cell lock			
Set	AT+UFREQLOCK=0	OK	AT+UFREQLOCK=0 OK
Set preferred EARFCN list			
Set	AT+UFREQLOCK=1,<earfcn_1>[,<earfcn_2>...]	OK	AT+UFREQLOCK=1,3738,3734 OK
Lock the module on a specified frequency or cell			
Set	AT+UFREQLOCK=2,<earfcn>[,<phyCellId>]	OK	AT+UFREQLOCK=2,3738,143 OK
Clear preferred EARFCN list			
Set	AT+UFREQLOCK=3	OK	AT+UFREQLOCK=3 OK
Test	AT+UFREQLOCK=?	+UFREQLOCK: (list of supported <op_code>s) OK	+UFREQLOCK: (0,1,2,3) OK

7.14.3 Defined values

Parameter	Type	Description
<op_code>	Number	Depending on <op_code> value <param1> and <param2> assume different meaning. Allowed values: • 0: cancel cell lock • 1: set preferred EARFCN list • 2: configure frequency or cell lock • 3: clear preferred EARFCN list
<EARFCN>	Number	See <EARFCN>.
<phyCellId>	Number	See <PhysCellID>.

7.15 Forbidden PLMN list delete +UFPLMNDEL

+UFPLMNDEL						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	full	No	No	No	<5 s	+CME Error

7.15.1 Description

Removes the FPLMN list from NVM or SIM or both depending on <mode> parameter. The FPLMN list in NVM has 16 entries, the FPLMN list in the SIM card has 4 entries.

7.15.2 Syntax

Type	Syntax	Response	Example
Set	AT+UFPLMNDEL=<mode>	OK	AT+UFPLMNDEL=0 OK
Test	AT+UFPLMNDEL=?	+UFPLMNDEL: (list of supported <mode>s) OK	+UFPLMNDEL: (0,1,2) OK

7.15.3 Defined values

Parameter	Type	Description
<mode>	Number	Allowed values: • 0: Remove FPLMN list from NVM and SIM card • 1: Remove FPLMN list from NVM • 2: Remove FPLMN list from SIM card

7.16 Cell Bar +UCELLBAR

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

7.16.1 Description

Configure the module to bar a specific cell for the defined duration by adding the cell to the cell barred list.

Once this duration elapses, the system automatically removes the cell from the barred list, restoring normal access.

7.16.2 Syntax

Type	Syntax	Response	Example
Set	AT+UCELLBAR=<earfcn>, <phyCellId>,<cellBarTime>	OK	AT+UCELLBAR=5095,2,20 OK
Read	AT+UCELLBAR?	[+UCELLBAR: <earfcn>,<phyCellId>, <cellBarTime>,<remainBarTime>] OK	+UCELLBAR: 5095,2,20,14 OK
Test	AT+UCELLBAR=?	+UCELLBAR: (list of the supported <earfcn>s),(list of the supported <phyCellId>s), (list of the supported <cellBarTime>s) OK	+UCELLBAR: (1-262143),(0-503),(0-65535) OK

7.16.3 Defined values

Parameter	Type	Description
<earfcn>	Number	See <EARFCN>, range 1 - 262143.
<phyCellId>	Number	See <PhysCellID>, range 0-503.
<cellBarTime>	Number	Time to bar the cell, range 0-65535 in seconds
<remainBarTime>	Number	Time remaining until the bar is lifted, range 0-65535 in seconds

7.17 Signalling connection status +CSCON

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

7.17.1 Description

Returns details of the current terminal's radio connection status (i.e. to the base-station). The set command configures the +CSCON URC. When enabled, the URC is sent from the MT at each change of the MT connection mode.

☞ The state is only updated when radio events, such as send and receive, take place. This means that the current state may be out of date. The terminal may think it is "Connected" yet cannot currently use a base station due to a change in the link quality.

☞ LEXI-R10
AT&W saves the AT command setting to the personal profile.

7.17.2 Syntax

Type	Syntax	Response	Example
Set	AT+CSCON=<n>	OK	AT+CSCON=1 OK
Read	AT+CSCON?	+CSCON: <n>[,<mode>[,<state>[,<access>[,<coreNetwork>]]]] OK	+CSCON: 1,1 OK
Test	AT+CSCON=?	+CSCON: (list of supported <n>s) OK	+CSCON: (0,1) OK
URC		+CSCON: <mode>[,<state>[,<access>]]	+CSCON: 0

7.17.3 Defined values

Parameter	Type	Description
<n>	Number	URC configuration: • 0: +CSCON URC disabled • 1: URC +CSCON: <mode> enabled • 2: URC +CSCON: <mode>[,<state>] enabled • 3: URC +CSCON: <mode>[,<state>[,<access>]] enabled Allowed values: • LEXI-R10 - 0 (factory-programmed value), 1
<mode>	Number	Indicates the signaling connection status: • 0: idle • 1: connected
<state>	Number	Allowed values: • 0: UTRAN URA_PCH • 1: UTRAN Cell_PCH

Parameter	Type	Description
		• 2: UTRAN Cell_FACH • 3: UTRAN Cell_DCH • 4: GERAN CS connected • 5: GERAN PS connected • 6: GERAN CS and PS connected • 7: E-UTRAN connected • 8: NG-RAN connected state • 9: NG-RAN inactive state Allowed values:
<access>	Number	Indicates the radio access technology: • 0: GERAN • 1: UTRAN TDD • 2: UTRAN FDD • 3: E-UTRAN TTD • 4: E-UTRAN FDD • 5: NR Allowed values:
<coreNetwork>	Number	Indicates the core network type the UE is connected to: • 0: EPC • 1: 5GCND Allowed values:

7.17.4 Notes

LEXI-R10

- The <state>, <access> and <coreNetwork> parameters are not supported.

7.18 Radio Policy Manager (RPM) configuration +URPMCONF

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

7.18.1 Description

Configures the Radio Policy Manager (RPM) related parameters.

The parameters are grouped in different sets:

- LEXI-R10 **PLMN SIM card based check configuration**: it sets PLMNs in MCC.MNC format, for which the RPM functionality will be active.
- **Current RPM configuration**: the parameters can only be read
- **Default RPM parameter setting stored in the module**: the parameters can only be read

7.18.2 Syntax

Type	Syntax	Response	Example
Generic syntax			
Set	AT+URPMCONF=<op_code>,.....	OK	
PLMN SIM card based check configuration			
• LEXI-R10			
Set	AT+URPMCONF=6,<PLMN>	OK	AT+URPMCONF=6,22288 OK
Set	AT+URPMCONF=7,<PLMN>	OK	AT+URPMCONF=7,22288 OK
• LEXI-R10			

Type	Syntax	Response	Example
Read	AT+URPMCONF?	+URPMCONF: 0,<PLMN>,<PLMN>,<PLMN>,<PLMN>,<PLMN>,<PLMN>,<PLMN>,<PLMN>,<PLMN>,<PLMN>,<PLMN>,<PLMN>,<PLMN>,<PLMN>,<PLMN>,<PLMN>,<PLMN>,<PLMN>,<PLMN>,<PLMN>,<PLMN>,<PLMN>,<PLMN>,<PLMN>,<PLMN>,<PLMN>,<PLMN>,<PLMN>,<PLMN>,<PLMN> OK	+URPMCONF: 0,"222.88","0.00", OK
Test	AT+URPMCONF=?	+URPMCONF: (list of the supported <op_code>s) OK	+URPMCONF: (0) OK

7.18.3 Defined values

Parameter	Type	Description
<op_code>	Number	Type of operation: • 0: PLMN SIM card based check configuration • 1: current RPM configuration • LEXI-R10 -6: Set <PLMN> value in <op_code>=0 list. • LEXI-R10 -7: Delete <PLMN> value in <op_code>=0 list.
<PLMN>	String	PLMN in MCC.MNC format. "FFF.FF" indicates empty PLMN; the range goes from 000.00 to 999.999. The factory-programmed value is empty. ☞ LEXI-R10 "0.00" indicates empty PLMN. The factory-programmed value is not empty.
<RPM_active>	Number	Indicates the action to perform: • 0: RPM feature is currently not active • 1: RPM feature is currently active
<SIM_RPM_setting>	Number	Indicates whether the inserted SIM card contains RPM parameter setting: • 0: the inserted SIM card does not contain the RPM parameter setting • 1: the inserted SIM card contains the RPM parameter setting
<N1>,<T1>,<F1>,<F2>,<F3>,<F4>,<LR1>,<LR2>,<LR3>	Number	See the Radio Policy Manager Requirements [174].
<RPM_enabled_flag_m>,<N1_m>,<T1_m>,<F1_m>,<F2_m>,<F3_m>,<F4_m>	Number	Default RPM parameter setting stored in the module. See the Radio Policy Manager Requirements [174].

7.18.4 Notes

LEXI-R10

- <op_code>=0, 1, are not supported

7.19 Radio Policy Manager (RPM) parameters configuration +URPMPARAM

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

7.19.1 Description

Activates or deactivates the Radio Policy Manager (RPM) feature and configures its related parameters.

Generally a UE aggressively retries the registration procedure until it is successful and behaves similarly if the PDP context activation procedure fails. This behavior may cause signaling overload and consequently a 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 GSMA Connection Efficiency [174].

The set command overwrites the RPM parameters in the NVM. The read command displays all the current RPM parameters, counters and the leak rates.

☞ Module reboot is required to apply the new configuration

7.19.2 Syntax

Type	Syntax	Response	Example
Set	AT+URPMPARAM=<rpmflag>[,<N1>[,<T1>[,<T1_ext[,<F1>[,<F2>[,<F3>[,<F4>]]]]]]]	OK	AT+URPMPARAM=1,1,11 OK
Read	AT+URPMPARAM?	+URPMPARAM: <rpmflag>,<N1>,<T1>,<T1_ext,<F1>,<F2>,<F3>,<F4>,<isOmParamsValid>, <CBR1>, <CR1>, <CPDP1>, <CPDP2>, <CPDP3>, <CPDP4>, <LR1>, <LR2>, <LR3> OK	AT+URPMPARAM? +URPMPARAM: 0,1,10,30,60,30,60,30,1,10,0,0,0,0,0,0,0,0 OK

7.19.3 Defined values

Parameter	Type	Description
<rpmflag>	Boolean	Indicates whether RPM functionality is to be enabled or disabled at power up: • 0: RPM feature is currently not active • 1: RPM feature is currently active
<N1>,<T1>,<T1_ext,<F1>,<F2>,<F3>,<F4>	Number	RPM parameters, see the Radio Policy Manager Requirements topic 8.3.2[174].
<isOmParamsValid>	Boolean	Indicates if the RPM parameters are present on the SIM card to enable the operation management (OM) functionality: • 0: operation management functionality is currently not active • 1: operation management functionality is currently active
<CBR1>, <CR1>, <CPDP1>, <CPDP2>, <CPDP3>, <CPDP4>	Number	Operation management counters, see the Radio Policy Manager Requirements topic 8.3.4[174].
<LR1>, <LR2>, <LR3>	Number	Operation management leak rates, see the Radio Policy Manager Requirements topic 8.3.3[174].

7.20 Radio Policy Manager (RPM) version +URPMVERSION

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

7.20.1 Description

Reads the Radio Policy Manager (RPM) version. The read command displays the current RPM version.

7.20.2 Syntax

Type	Syntax	Response	Example
Read	AT+URPMVERSION?	+URPMVERSION: <rpmversion> OK	AT+URPMVERSION? +URPMVERSION: 2 OK

7.20.3 Defined values

Parameter	Type	Description
<rpmversion>	Number	Indicates the current RPM version

7.21 eDRX setting +CEDRXS

+CEDRXS						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	partial	Yes	NVM / OP	No	-	+CME Error

7.21.1 Description

Configures the UEs extended discontinuous reception (eDRX) parameters. The command controls whether the UE wants to apply the eDRX or not, as well as the requested eDRX cycle and paging time window values for each specified type of radio access technology.

The set command also enables the +CEDRXP URC, issued on any change in the eDRX parameters provided by the network.

The set command with <mode>=3 will disable the use of eDRX and reset all parameters to factory-programmed values. Do not set <Requested_eDRX_cycle> and <Requested_paging_time_window> parameters in this form of command.

The read command returns the requested eDRX cycle and paging time window values. See the +CEDRXP URC and the +CEDRXRDP AT command to see if eDRX is used by the current selected cell and to retrieve the network assigned values, if any.

LEXI-R10
The set command can be applied also runtime; if the module is registered in 4G RAT and the parameters are changed with respect to the previously required values, a TAU is performed.

LEXI-R10
If the set command is issued and any of the optional parameters is omitted, the module applies the last set values.

7.21.2 Syntax

Type	Syntax	Response	Example
Set	AT+CEDRXS=<mode>,<AcT_type>[,<Requested_eDRX_cycle>[,<Requested_paging_time_window>]]	OK	AT+CEDRXS=1,4,"0101","0101" OK
Read	AT+CEDRXS?	+CEDRXS: [<AcT_type>, <Requested_eDRX_cycle>, <Requested_paging_time_window> [...] [+CEDRXS: <AcT_type>, <Requested_eDRX_cycle>, <Requested_paging_time_window>]] OK	+CEDRXS: 4,"0101","0001" OK
Test	AT+CEDRXS=?	+CEDRXS: (list of supported <mode>s),(list of supported <AcT_type>s),(list of supported <Requested_eDRX_cycle>s),(list of supported <Requested_paging_time_window>s) OK	+CEDRXS: (0-3),(3,4,5),("0000"-"1111"),("0000"-"1111") OK
URC		+CEDRXP: <AcT_type>[, <Requested_eDRX_cycle>[, <Assigned_eDRX_cycle>[, <Assigned_paging_time_window>]]]	+CEDRXP: 4,"1010","1001","1101"

7.21.3 Defined values

Parameter	Type	Description
<mode>	Number	Indication to disable or enable the use of eDRX in the UE. Allowed values: • 0 (default and factory-programmed value): use of eDRX disabled • 1: use of eDRX enabled • 2: enable the use of eDRX and enable the +CEDRXP URC • 3: disable the use of eDRX and reset all other parameters for eDRX to factory-programmed values Allowed values: • LEXI-R10 - 0, 1, 2, 3
<AcT_type>	Number	Indicates the type of access technology: • 0: use of eDRX disabled • 2: GPRS/eGPRS • 4: E-UTRAN (WB-S1 mode) • 5: E-UTRAN (NB-S1 mode) Allowed values: • LEXI-R10 - 0, 4
<Requested_eDRX_cycle>	String	See <Requested_eDRX_cycle>.
<Assigned_eDRX_cycle>	String	See <Assigned_eDRX_cycle>.
<Requested_paging_time_window>	String	See <Requested_paging_time_window>.
<Assigned_paging_time_window>	String	See <Assigned_paging_time_window>.

7.21.4 Notes

LEXI-R10

- The PIN insertion is not mandatory before the command execution.
- <Requested_eDRX_cycle>="0000" and <Requested_eDRX_cycle>="0001" are not supported.
- The +CEDRXP URC enabling by AT+CEDRXS=2,<AcT_type> command is not stored in NVM. AT&W saves <mode>=2 setting to the profile.
- <Requested_eDRX_cycle> and <Requested_paging_time_window> values can only be changed when <mode>=1 or <mode>=2.

7.22 eDRX read dynamic parameters +CEDRXRDP

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

7.22.1 Description

If the eDRX is used by the current selected cell the command provides the requested eDRX cycle value (<Requested_eDRX_cycle>), the assigned eDRX cycle value (<Assigned_eDRX_cycle>) and the assigned paging time window value (<Assigned_paging_time_window>). Otherwise, if the eDRX is not used, the +CEDRXRDP: 0 information text response is returned.

7.22.2 Syntax

Type	Syntax	Response	Example
Action	AT+CEDRXRDP	+CEDRXRDP: <AcT_type>[, <Requested_eDRX_cycle>, <Assigned_eDRX_cycle_value>, <Assigned_paging_time_window>] OK	+CEDRXRDP: 5,"0010","1110","0101" OK
Test	AT+CEDRXRDP=?	OK	

7.22.3 Defined values

Parameter	Type	Description
<AcT_type>	Number	Indicates the type of radio access technology: • 0: use of eDRX disabled • 2: GSM (A/Gb mode) • 4: E-UTRAN (WB-S1 mode) • 5: E-UTRAN (NB-S1 mode) Allowed values: • LEXI-R10 - 0, 4
<Requested_eDRX_cycle>	String	See <Requested_eDRX_cycle>.
<Assigned_eDRX_cycle>	String	See <Assigned_eDRX_cycle>.
<Assigned_paging_time_window>	String	See <Assigned_paging_time_window>.

7.23 Set MNO profile +UMNOPROF

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

7.23.1 Description

Automatically configures the module to be compliant to the requirements of various Mobile Network Operators.

Follow this procedure to properly set up the configuration:

- Deregister the module from the network (issue AT+CFUN=0 or AT+COPS=2 command)
- Issue AT+UMNOPROF=<MNO>
- To apply the new configuration reboot the module
  - LEXI-R10 - by the AT+CFUN=16 AT command

After setting a new MNO profile, the module reconfigures the MNO specific settings, e.g. the PDP context settings (e.g. APN of the initial EPS bearer).

Follow this procedure to restore the profile factory-programmed configuration:

- LEXI-R10 - Set the <MNO> parameter to the currently selected profile and reboot the module (AT+CFUN=16) to make the change effective

LEXI-R10
In Verizon profile (<MNO>=3), the LwM2M client is by default enabled. In all other <MNO> profiles, the LwM2M client is by default disabled.

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 [117], 3GPP TS 34.121-2 [118], 3GPP TS 36.521-2 [139] and 3GPP TS 36.523-2 [140], 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.

The customer is allowed to set only the <MNO> profile of a certified MNO for each product variant. See the corresponding module data sheet for the list of certified MNOs for each product.

7.23.2 Syntax

Type	Syntax	Response	Example
Set	AT+UMNOPROF=<MNO>[,<reset>,<urc_notification_enabled>]	OK	AT+UMNOPROF=1,0,1 OK
Read	AT+UMNOPROF?	+UMNOPROF: <MNO>[,[<MNO_detected>],<reset>,<urc_notification_enabled>] OK	+UMNOPROF: 3 OK
URC		+UMNOPROF: <MNO>,<MNO_detected>	+UMNOPROF: 1,2

7.23.3 Defined values

Parameter	Type	Description
<MNO>	Number	Mobile Network Operator (MNO) profile: • 0: undefined / regulatory. For more details, see Notes. • 1: SIM ICCID/IMSI select • 2: AT&T

Parameter	Type	Description
		• 3: Verizon • 4: Telstra • 5: T-Mobile US • 6: China Telecom • 8: Sprint • 13: Telefonica • 19: Vodafone • 20: NTT DoCoMo • 21: Telus • 28: SoftBank • 31: Deutsche Telekom • 32: US Cellular • 33: VIVO • 38: LG U+ • 39: SKT • 41: KDDI • 43: Rogers • 44: Claro Brasil • 45: TIM Brasil • 46: Orange France • 47: Bell • 48: KT • 90: global • 100: standard Europe • 101: standard Europe No-ePCO. The factory-programmed configuration of this profile is the same of the standard Europe profile (<MNO>=100), but the ePCO is disabled. • 102: standard JP (global) • 198: AT&T 2-4-12. The factory-programmed configuration of this profile is the same of the AT&T profile (<MNO>=2), but the LTE band 5 is disabled. • 199: Generic voice capable AT&T • 201: GCF-PTCRB. This profile is meant only for conformance testing. • 206: FirstNet • 207: VZW-Private • 208: Verizon Global Allowed values depend on the module series: • LEXI-R10401D - 2, 3, 90 (factory programmed value), 206 • LEXI-R10801D - 90 (factory-programmed value)
<MNO_detected>	Number	If <MNO>=1 (SIM ICCID/IMSI select) and the SIM is inserted, it specifies the <MNO> value that matches the SIM Issuer Identifier Number (IIN) or the <MNO> retrieved by the IMSI and that is actually applied.
<reset>	Number	Configure the automatic reset. Allowed values: • 0: the automatic reset is disabled; the user shall reboot the module by itself • 1: the automatic reset is enabled It must be issued only if <MNO>=1.
<urc_notification_enabled>	Number	Configure the URC notification. Allowed values: • 0: URC is not issued if the <MNO_detected> value changes • 1: URC is issued any time the <MNO_detected> value changes It must be issued only if <MNO>=1.

7.23.4 Notes

- The standard Europe profile should be used as the basis for all other MNOs in Europe outside of Vodafone and Deutsche Telekom. However, there may be changes that need to be applied to the module for proper operation with any given European MNO such as attach type, RAT preference, band selection, etc. Please consult with the preferred network provider.

LEXI-R10

- The <reset>, <urc_notification_enabled> parameters are not supported.

7.24 Band configuration +UBANDCONF

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

7.24.1 Description

Allows to configure the LTE preferred bands within the list of the supported bands: the sequence in which the bands are specified corresponds to their relative priority in the PLMN search procedure.

The band configuration can be changed runtime, also in registered state: in this case the module automatically peforms LTE detach and LTE attach with updated capabilities.

If a not supported band is selected, the module returns an error result code.

☞ 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 [117], 3GPP TS 34.121-2 [118], 3GPP TS 36.521-2 [139] and 3GPP TS 36.523-2 [140], 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.

7.24.2 Syntax

Type	Syntax	Response	Example
Set	AT+UBANDCONF=<band_1>[,<band_2>[,...]]	OK	AT+UBANDCONF=4,71,13,66,2,5 OK
Read	AT+UBANDCONF?	+UBANDCONF: <band_1>[,<band_2>[,...]] OK	+UBANDCONF: 4,71,13,66,2,5 OK
Test	AT+UBANDCONF=?	+UBANDCONF: (list of supported <bands>s) OK	+UBANDCONF: (2,4,5,12,13,66,71) OK

7.24.3 Defined values

Parameter	Type	Description
<band_x>	Integer	Band in decimal number. Allowed values are: • LEXI-R10401D - 2, 4, 5, 12, 13, 66, 71 • LEXI-R10801D - 1, 3, 5, 7, 8, 20, 28

7.25 NAS timers configuration +UNASTCFG

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

7.25.1 Description

Configures the time period and number of attempts for the following NAS timers.

- High Priority PLMN timer (HPPLMN): enables or disables the periodic search for higher priority PLMNs.

- T3482 timer: allows the MT to control the retransmission of PDN connectivity requests.
- T3492 timer: allows the MT to control the retransmission of PDN disconnect requests.

The set command overwrites the timer values and its maximum number of attempts by configuring <timer_value> and <try_count> parameters, leaving these parameters empty will reconfigure the timers to their factory-programmed values.

The read command will return empty values, if the user has not previously set the values for <timer_value> and <try_count>.

7.25.2 Syntax

Type	Syntax	Response	Example
Set	AT+UNASTCFG=<timer_id>[,<timer_value>[,<try_count>]]	OK	AT+UNASTCFG=0,360,1 OK AT+UNASTCFG=0 OK
Read	AT+UNASTCFG?	+UNASTCFG: 0[,<timer_value>,<try_count>] +UNASTCFG: 1[,<timer_value>,<try_count>] +UNASTCFG: 2[,<timer_value>,<try_count>] OK	+UNASTCFG: 0, 360, 1 +UNASTCFG: 1, 5, 3 +UNASTCFG: 2 OK
Test	AT+UNASTCFG=?	+UNASTCFG: (list of supported <timer_id>s),((list of supported <timer_value>s),(list of supported <try_count>s)) OK	+UNASTCFG: 0,(1-1048575),(0-255) +UNASTCFG: 1,(1-32),(1-5) +UNASTCFG: 2,(1-32),(1-5) OK

7.25.3 Defined values

Parameter	Type	Description
<timer_id>	Number	Allowed values: • 0: High priority PLMN search timer • 1: ESM PDN connectivity request timer • 2: ESM PDN disconnect request timer
<timer_value>	Number	Specifies the periodic repeat interval in seconds used to overwrite the timer value. • For <timer_id>=0 the range goes from 1 to 1048575. The default value is 60 minutes if no value is specified in the SIM EF_{HPPLMN} (see the 3GPP TS 23.122 [112] subclause 4.4.3.3). • For <timer_id>=1 the range goes from 1 to 32. The default value is 8 seconds (see the 3GPP TS 24.301 [119] subclause 10.3). • For <timer_id>=2 the range goes from 1 to 32. The default value is 6 seconds (see the 3GPP TS 24.301 [119] subclause 10.3).
<try_count>	Number	Specifies the maximum repeat times of the timer. • For <timer_id>=0 the range goes from 0 to 255. By default configuration no value is specified, either higher priority PLMN search attempts is in the range of 6 minutes to 8 hours in 6 minutes steps or no periodic attempts shall be made (see the 3GPP TS 23.122 [112] subclause 4.4.3.3). • For <timer_id>=1 the range goes from 1 to 5. The default value is 5 (see the 3GPP TS 24.301 [119] subclause 6.5.1.5). • For <timer_id>=2 the range goes from 1 to 5. The default value is 5 (see the 3GPP TS 24.301 [119] subclause 6.5.2.5)

7.25.4 Notes

- For <timer_id>= 0, if <timer_value> is present then <try_count> must also be present.

7.26 Protocol stack configuration +UPSCONFIG

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

7.26.1 Description

Allows reading and modifying parameter settings of the protocol stack and UE's extended configuration.

The AT command parameters are automatically stored in NVM, and take in effect after the module reboot.

7.26.2 Syntax

Type	Syntax	Response	Example
Set	AT+UPSCONFIG=<param>, <value>	OK	AT+UPSCONFIG="Rohc",0 OK
Read	AT+UPSCONFIG?	+UPSCONFIG: <param1>, <value1> +UPSCONFIG: <param2>, <value2> [...] OK	+UPSCONFIG: "PsSoftReset",1 +UPSCONFIG: "Rohc",1 +UPSCONFIG: "Ipv6RsForTestSim",0 +UPSCONFIG: "Ipv6RsDelay",5 +UPSCONFIG: "PlmnSearchPowerLevel",1 +UPSCONFIG: "Epco",0 +UPSCONFIG: "T3324MaxValueS",16777215 +UPSCONFIG: "BarValueS",20 +UPSCONFIG: "DataInactTimer",60 +UPSCONFIG: "RelaxMonitorDeltaP",0 +UPSCONFIG: "UeCategory",2 +UPSCONFIG: "RelVersion",14 +UPSCONFIG: "EnableEAB",0 +UPSCONFIG: "AttachEpsCid",1 +UPSCONFIG: "TcpTptOpt",1 +UPSCONFIG: "AttachWithIMSICtrl",1 +UPSCONFIG: "PowerAttachWoEia",1 +UPSCONFIG: "EnableDataCounter",0 +UPSCONFIG: "UpdateLociCtrl",0 +UPSCONFIG: "RoamService",2 +UPSCONFIG: "SavePlmnSelMode",1 +UPSCONFIG: "EmergencyCamp",0 +UPSCONFIG: "EnableAcl",0 +UPSCONFIG: "PdpReact",0 +UPSCONFIG: "EnableABCheck",1 +UPSCONFIG: "WeakCellOpt",1

Type	Syntax	Response	Example
			+UPSCONFIG: "QRxLevMin",0 +UPSCONFIG: "ReselToWeakNcellOpt",0 +UPSCONFIG: "UpdateFreqCtrl",0 +UPSCONFIG: "QualityFirst",0 +UPSCONFIG: "StaticConfig",0 +UPSCONFIG: "DisableCDRX",0 +UPSCONFIG: "IgnoreEmmCause",0 +UPSCONFIG: "UserDrxCycle",0 +UPSCONFIG: "setClatState",0 +UPSCONFIG: "UeSpecificDrxCycle",0 OK
Test	AT+UPSCONFIG=?	+UPSCONFIG: (list of supported <param>s) OK	("PsSoftReset","Rohc","Ipv6RsForTestSim", "Ipv6RsDelay","PlmnSearchPowerLevel", "Epco","T3324MaxValueS","BarValueS", "DataInactTimer","RelaxMonitorDeltaP", "UeCategory","RelVersion","EnableEAB", "AttachEpsCid","TcpTptOpt", "AttachWithIMSICtrl","PowerAttachWoEia", "EnableDataCounter","UpdateLociCtrl", "RoamService","SavePlmnSelMode", "EmergencyCamp","EnableAcl","PdpReact", "EnableABCheck","WeakCellOpt","QRxLevMin", "ReselToWeakNcellOpt", "UpdateFreqCtrl", "QualityFirst","StaticConfig","DisableCDRX", "setClatState","IgnoreEmmCause", "UserDrxCycle","UeSpecificDrxCycle") OK

7.26.3 Defined values

Parameter	Type	Description
<PsSoftReset>	Number	Protocol stack soft reset configuration: • 0 (default value): disabled • 1: enabled
<Rohc>	Number	Robust header compression (RoHC) configuration: • 0: disabled • 1 (default value): enabled Only profile 2 is supported (RoHC UDP).
<Ipv6RsForTestSim>	Number	Enables or disables the IPv6 NDS - Neighbor Discovery Protocol (RS - Router Solicitation) procedure which gets IPv6 prefix address when using test SIM. Allowed values: • 0: disabled • 1 (default value): enabled IPv6 NDP (RS) procedure is triggered by default if the inserted SIM card is not for testing.
<Ipv6RsDelay>	Number	Sets a delay in seconds before the device initiates the IPv6 Neighbor Discovery Protocol (Router Solicitation) procedure to acquire an IPv6 prefix address. The range goes from 0 to 65535 and the default value is 15. IPv6 NDP (RS) procedure is triggered by default if the inserted SIM card is not for testing.
<PlmnSearchPowerLevel>	Number	Configures the time interval between PLMN search requests when the User Equipment (UE) goes Out of Service. Allowed values: • 0 (default value if the SIM is a test SIM): OOS PLMN search interval: 5 seconds, 10 seconds, 20 seconds

Parameter	Type	Description
		• 1 (default value if the SIM is not a test SIM): OOS PLMN search interval: 15 seconds, 30 seconds, 1 minute • 2: OOS PLMN search interval: 5 minutes, 10 minutes, 15 minutes • 3: OOS PLMN search interval: 30 seconds, then stop PLMN search, and let AT +COPS=0 start PLMN search • 4: does not perform PLMN search when OOS, lets the user decide next action (whether to perform PLMN search or not)
<Epco>	Number	Allows the selection between Protocol Configuration Option (PCO) and Extended Protocol Configuration Option (EPCO). Allowed values: • 0 (default value): PCO • 1: EPCO
<T3324MaxValueS>	Number	Configures "PSM without network coordination" feature by specifying a user-defined T3424 timer duration. If the feature is configured, the UE enters Power Saving Mode (PSM) <T3324MaxValueS> seconds after each RRC connection release (see +CSCON: 0 URC). The range of <T3324MaxValueS> parameter goes from 0 to 16777215 (default value); setting a <T3324MaxValueS> value equal or higher than 65535 s disables the feature. Feature enabling is independent of +CPSMS settings: in case PSM has been requested and the <Assigned_Active_Time> value is shorter than <T3324MaxValueS> (see +CEREG AT command), the UE will be already in PSM at <T3324MaxValueS> timer expiry. PSM without network coordination can be used only if no mobile-terminated communication is expected after <T3324MaxValueS> timer expiry.
<BarValueS>	Number	Configures the User Equipment (UE) barring period in seconds due to SIB14. Once the timer expires, the UE is permitted to attempt access to the network again. The range goes from 1 to 600 and the default value is 120.
<DataInactTimer>	Number	Sets the value of the "data inactivity timer" in seconds. If this timer is not configured by the network (in MAC-MainConfig), the specified setting value will be used. The data inactivity timer operates at the physical layer (PHY), and upon expiration, PHY signals the RRC to release the connection and transition to an idle state. The range goes from 15 to 255 and the special value 0 disables the feature; the default value is 60. The parameter can only be configured when the device is in deregistered state or in airplane mode.
<RelaxMonitorDeltaP>	Number	Sets the value of "SearchDeltaP" in db for the Relaxed Monitoring feature. If this value is not configured by the network (in SIB3), the specified setting value will be used. The range goes from 0 to 15 and the default value is 0. The parameter can only be configured when the device is in deregistered state or in airplane mode.
<UeCategory>	Number	Configures the value of the User Equipment (UE) category. Allowed values: • 1: LTE Cat 1 • 2 (default value): LTE Cat 1bis The parameter can only be configured when the device is in deregistered state or in airplane mode.
<RelVersion>	Number	Configures the UE release version. The allowed values are 13 and 14 while the default value is 14. The parameter can only be configured when the device is in deregistered state or in airplane mode.
<EnableEAB>	Number	Enables or disables extended access barring: • 0: disabled • 1 (default value): enabled The parameter can only be configured when the device is in either a powered off state or in airplane mode.
<AttachEpsCid>	Number	Set the default EPS bearer context CID value. The range goes from 1 (default value) to 15.
<TcpTptOpt>	Number	Configures the enabling or disabling of TCP throughput optimization, specifically influencing the TCP throughput for RNDIS/PPP TCP connections. The default setting ensures maximum throughput. Allowed values: • 0: disabled • 1 (default value): enabled
<AttachWithIMSICtrl>	Number	Controls attach with IMSI when the inserted SIM card is not for testing. Allowed values: • 0 (default value): not control ATTACH with IMSI • 1: ATTACH with IMSI when power on • 2: ATTACH always with IMSI

Parameter	Type	Description
		The setting is not effective when using a test SIM card, i.e. the IMSI or GUTI is used in the ATTACH according to 3GPP guidelines.
<PowerAttachWoEia>	Number	Enables or disables power on ATTACH without integrity protected when the inserted SIM card is not for testing. Allowed values: • 0: disabled • 1 (default value): enabled The setting is not effective when using a test SIM card, i.e. the integrity protection is enabled according to 3GPP guidelines.
<EnableDataCounter>	Number	Enables or disables the PS data counter feature: • 0 (default value): disabled • 1: enabled
<UpdateLociCtrl>	Number	Set the mode of updating EFEPSLOCI and EFLOCI to SIM. Allowed values: • 0 (default value): update EFEPSLOCI and EFLOCI to SIM if the parameters are changed (EPS update status, TAI, GUTI for EFEPSLOCI; TMSI, LAI for EFLOCI) • 1: delay updating EFEPSLOCI and EFLOCI to SIM until do deregistration AT+CFUN=0. In this mode the EFs may not be updated to SIM if the SIM card is removed or the UE is powered off without sending AT+CFUN=0.
<RoamService>	Number	Enables or disables the roaming service. AT+UPSCONFIG=RoamService [,<roam_mode>[,<effect>]] <roam_mode> • Allowed values: o 1: disable roaming service o 2 (default value), 255: enable roaming service <effect> • Allowed values: o 0: take effect after the UE reboots o 1 (default value): take effect immediately
<SavePlmnSelMode>	Number	Enables or disables saving the PLMN select mode that is set through AT+COPS=0 to NVM. Allowed values: • 0: the PLMN select mode is not saved to NVM. It is reset to automatic PLMN selection after the reboot • 1 (default value): the PLMN select mode is saved to NVM and is not changed after the reboot
<EmergencyCamp>	Number	Enables or disables the emergency camp feature, permitting power-on without a SIM card and initiating emergency camping on any available cell when allowed. Allowed values: • 0 (default value): disabled • 1: enabled
<EnableAcl>	Number	Enables or disables UE ACL(APN control list): • 0 (default value): disabled • 1: enabled
<PdpReact>	Number	Enables or disables the UE React: • 0 (default value): disabled • 1: enabled
<EnableABCheck>	Number	Enables or disables the check on Access Barring (broadcast in SIB2 or SIB14): • 0: disabled • 1 (default value): enabled
<WeakCellOpt>	Number	Enables or disables UE enhanced cell search when detecting a weak signal cell: • 0: disabled • 1 (default value): enabled The parameter can only be configured when the device is in deregistered state or in airplane mode.
<QRxLevMin>	Number	Controls the configuration of the q-RxlevMin * 2 value in dBm, which is used for S criteria checking in RRC. The range goes from -156 to -44 while the special value 0 (default value) means the feature disabled. The parameter can only be configured when the device is in either a powered off state or in airplane mode.
<ReselToWeakNcellOpt>	Number	Controls the delta value. When enabled, it prevents the User Equipment (UE) from reselecting a neighbor cell where the Reference Signal Received Power (RSRP)

Parameter	Type	Description
		is lower than the serving cell by at least the configured delta value in dBm. The range goes from 0 (default value) to 100, where 0 means the feature disabled. The parameter can only be configured when the device is in deregistered state or in airplane mode.
<UpdateFreqCtrl>	Number	Sets the mode of updating FREQ list to NVM. Allowed values: • 0 (default value): update NVM if FREQ list is changed • 1: update NVM on deregistration by AT+CFUN=0 command
<QualityFirst>	Number	Filter neighboring cells based on their signal quality as reported in the Measurement Indication (MeasInd) message. Allowed values: • 0 (default value): disabled • 1: PHY will report a strongest neighbour cell's SNR of each frequency in IDLE MeasInd • 2: PHY will report all neighbour cell's SNR in IDLE MeasInd, it will increase power consumption The parameter can only be configured when the device is in either a powered off state or in airplane mode
<StaticConfig>	Number	Enables/disables static configuration when UE is in IDLE state: • 0 (default value): disabled • 1: enabled The parameter can only be configured when the device is in either a powered off state or in airplane mode.
<DisableCDRX>	Number	Enables or disables the UE support CDRX capability: • 0 (default value): disabled • 1: enabled The parameter can only be configured when the device is in either a powered off state or in airplane mode.
<IgnoreEmmCause>	Number	Controls whether to ignore the EMM cause in ATTACH/TAU ACCEPT or only allow success n ATTACH/TAU ACCEPT if the EMM cause is present. • 0: disabled • 1 (default value): enabled
<setClatState>	Number	Enables or disables the CLAT service for 464XLAT: • 0 (default value): disabled • 1: enabled
<UserDrxCycle>	Number	Configures the idle mode DRX cycle used by the UE in a network un-coordinated way. Monitoring fewer paging occasions than the network-configured ones can be used to lower power consumption when no MT data is expected or when in static conditions, if the network implements a paging retransimission strategy. Allowed values: • 0 (default value): feature disabled (the UE will use the network-configured <drx_cycle_len>, see +UDRX). • (1-7): the UE will monitor paging with <drx_cycle_len> * factor periodicity. If the calculated periodicity is lower than 320 ms or higher than 5120 ms, DRX cycle is set to 320 ms or 5120 ms respectively. List of factors follows: o 1: factor=1/8 o 2: factor=1/4 o 3: factor=1/2 o 4: factor=2 o 5: factor=4 o 6: factor=8 o 7: factor=16 • (8-12): the UE will monitor paging with the specified <UserDrxCycle> periodicity if larger than the network configured <drx_cycle_len>. If this is not the case the UE will use the network-configured <drx_cycle_len>. List of values follows: o 8: 320 ms o 9: 640 ms o 10: 1280 ms o 11: 2560 ms o 12: 5120 ms

Parameter	Type	Description
		The parameter can only be configured when the device is either in a powered off state or in airplane mode.
<UeSpecificDrxCycle>	Number	Allows to select an idle mode DRX cycle longer than the network default one in a network coordinated way to reduce average power consumption. Allowed values: • 0 (default value): feature disabled (the UE will use the network-configured <drx_cycle_len>, see +UDRX). • (8-11): if the specified value is larger than the network configured <drx_cycle_len> value, during the registration procedure the UE notifies the network that it will monitor paging with the specified <UeSpecificDrxCycle> period. If this is not the case the UE will use the network-configured <drx_cycle_len>. List of supported values follows: o 8: 320 ms o 9: 640 ms o 10: 1280 ms o 11: 2560 ms Runtime parameter changes are supported, and trigger a Tracking Area Update to notify the network.

7.27 Discontinuous reception settings +UDRX

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

7.27.1 Description

Reads idle (DRX) and connected mode (C-DRX) discontinuous reception network settings.

In connected mode C-DRX is optionally configured by the network (refer to 3GPP 3GPP TS 36.321 [163]). If C-DRX is not configured, all the parameters other than <mode>=2 are displayed with 0 values. When C-DRX is configured with long C-DRX cycles only, <shortDrxCycle> and <shortCycleTimer> parameters are displayed with 0 values.

7.27.2 Syntax

Type	Syntax	Response	Example
Generic syntax			
Read	AT+UDRX?	+UDRX: <mode>[,<param1>[,<drxRetransmissionTimer>,<drxStartOffset>,<shortDrxCycle>,<shortCycleTimer>,<longdrxCycle>,<onDurationTimer>]] OK	+UDRX: 1,320 OK
Module in idle mode			
Read	AT+UDRX?	+UDRX: 1,<drx_cycle_len> OK	+UDRX: 1,320 OK
Module in connected mode			
Read	AT+UDRX?	+UDRX: 2,<drxInactivityTimer>,<drxRetransmissionTimer>,<drxStartOffset>,<shortDrxCycle>,<shortCycleTimer>,<longdrxCycle>,<onDurationTimer> OK	+UDRX: 2,17,4,4,9,1,9,7 OK
Module not registered			
Read	AT+UDRX?	+UDRX: 3	+UDRX: 3

Type	Syntax	Response	Example
		OK	OK

7.27.3 Defined values

Parameter	Type	Description
<mode>	Number	Current mode. Allowed values: • 1: idle • 2: connected • 3: invalid
<drx_cycle_len>	Number	Network configured idle mode DRX cycle length in ms. Allowed values are 320, 640, 1280 and 2560 (see 3GPP TS 36.331 [135]).
<drxInactivityTimer>	Number	When C-DRX is configured, it specifies the number of consecutive PDCCH subframe(s) before C-DRX activation, after the subframe in which a PDCCH indicates a transmission. The range is 0-21: value 0 means psf1, which corresponds to 1 PDCCH sub-frame (see 3GPP TS 36.331 [135]).
<drxRetransmissionTimer>	Number	When C-DRX is configured, it specifies the maximum number of consecutive PDCCH subframe(s) the UE must remain active waiting for a possible retransmission. The range is 0-7 (see 3GPP TS 36.331 [135]).
<drxStartOffset>	Number	When C-DRX is configured, it specifies the subframe where the long DRX Cycle starts (see 3GPP TS 36.331 [135]).
<shortDrxCycle>	Number	When C-DRX is configured with both short and long cycles, it specifies the short DRX cycle length given by the <onDurationTimer> followed by a possible period of inactivity. The range is 0-15 (see 3GPP TS 36.331 [135]).
<shortCycleTimer>	Number	When C-DRX is configured with both short and long cycles, it specifies the multiple of <shortDrxCycle> to be completed after the <drxInactivityTimer> has expired, before starting with long C-DRX cycles. The range is 1-16 when C-DRX is configured with both short and long cycles (see 3GPP TS 36.331 [135]), otherwise it assumes a 0 value.
<longDrxCycle>	Number	When C-DRX is configured, it specifies the long DRX cycles length. In each cycle there is one RX active window given by the <onDurationTimer>. The range is 0-15: value 0 corresponds to sf10 (10 ms) and value 15 to sf2560 (2560 ms) (see 3GPP TS 36.331 [135]).
<onDurationTimer>	Number	Specifies the RX active window length. The range is 0-15: value 0 means psf1, which corresponds to 1 PDCCH sub-frame (see 3GPP TS 36.331 [135]).
<param1>	Number	Supported content depends on the related <mode> (details are given above).

7.28 Network band scan status +USCANSTAT

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

7.28.1 Description

Enables/disables the current band scan status, type and device radio technology reporting; to enable the URC reporting, set the <reporting> parameter to 1. After enabling the URC reporting, the +USCANSTAT URC is issued to return the current band scan status and band scan type along with its radio technology information: thereafter, if either the parameter <scan_state> or <scan_type> changes, a +USCANSTAT URC will be issued.

7.28.2 Syntax

Type	Syntax	Response	Example
Set	AT+USCANSTAT=<reporting>	OK	AT+USCANSTAT=1 OK
Read	AT+USCANSTAT?	+USCANSTAT: <reporting>,<scan_state>,<scan_type>,<scanned_	+USCANSTAT: 1,7,1,1 OK

Type	Syntax	Response	Example
		act>[,<scanned_act>[,<scanned_act>[,<oosTimeStep>]]] OK	
Test	AT+USCANSTAT=?	+USCANSTAT: (list of supported <reporting>s) OK	+USCANSTAT: (0-1) OK
URC		+USCANSTAT: <scan_state>,<scan_type>,<scanned_act>[,<scanned_act>[,<scanned_act>]]	+USCANSTAT: 1,1,7

7.28.3 Defined values

Parameter	Type	Description
<reporting>	Number	Configure the +USCANSTAT URC. Allowed values: • 0 (default value): disables the URC • 1: enables the URC
<scan_state>	Number	Current RRC band scan state: • LEXI-R10 o 0: scan stopped (no PLMN search is ongoing) o 1: scan ongoing (PLMN search is ongoing) o 2: plmn selected (already selected a PLMN) o 3: oos (UE is in OOS and has started a PLMN search timer)
<scan_type>	Number	Current RRC band scan type: • LEXI-R10 o 0: no scan o 1: scan for PLMN search (see +COPS test command) o 2: scan for backgorund PLMN search o 3: scan for high priority PLMN search o 4: scan for network cell search (see +UCFSCAN AT command) o 5: scan for PCI list search o 6: scan for PLMN selection triggered by user (see AT+COPS=1 command) o 7: scan for PLMN selection Allowed values: o LEXI-R10 : 7
<scanned_act>	Number	Current access technology type: • 0: GSM / GPRS / eGPRS • 2: UMTS • 3: LTE • 7: LTE Cat M1 • 8: NB-IoT • 9: GPRS / eGPRS Allowed values: • LEXI-R10 : 3
<oosTimeStep>	Number	Remaining time (in seconds) of out of service PLMN search timer. ☞ LEXI-R10 The <oosTimeStep> is only present when <scan_state>=3.

7.28.4 Notes

LEXI-R10

- The set command is not supported.
- The test command returns only "OK" final result code.

7.29 EMM and RRC Events Counters +UPSSTAT

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

7.29.1 Description

Enables/Disables and configures the reporting of protocol stack EMM and RRC counters and events.

The information text response of the read command reports the protocol stack information with a syntax determined by the <mode> parameter value.

7.29.2 Syntax

Type	Syntax	Response	Example
Set	AT+UPSSTAT=<mode>	OK	AT+UPSSTAT=1 OK
Read	AT+UPSSTAT?	**<mode>=0:** +UPSSTAT: 0 OK	+UPSSTAT: 0 OK
		<mode>=1: +UPSSTAT: <mode> RRC, ConEstSucc:<rrcConnEstSucc>, ConEstFail:<rrcConnEstFail> EMM, AttachSucc:<AttachSucc>, AttachFail:<AttachFail>, TAUSucc:<TAUSucc>, TAUFail:<TAUFail>, SRSucc:<SRSucc>, SRFail:<SRFail>, AuthFail:<AuthFail>, DetachNum:<DetachNum> PLMN, OOS:<OOScount> OK	+UPSSTAT: 1 RRC, ConEstSucc:0, ConEstFail:0 EMM, AttachSucc:0, AttachFail:0, TAUSucc:0, TAUFail:0, SRSucc:0, SRFail:0, AuthFail:0, DetachNum:0 PLMN, OOS:0 OK
		<mode>=2: +UPSSTAT: <mode>, <rrcConnEstSucc>, <rrcConnEstFail>,<AttachSucc>, <AttachFail>,<TAUSucc>, <TAUFail>,<SRSucc>,<SRFail>, <AuthFail>,<DetachNum>, <OOScount> OK	+UPSSTAT: 2,0,0,0,0,0,0,0,0,0,0 OK
Test	AT+UPSSTAT=?	+UPSSTAT: (list of supported <mode>s) OK	+UPSSTAT: (0,1,2,3) OK

7.29.3 Defined values

Parameter	Type	Description
<mode>	Number	Allowed values: • 0: reporting disabled

Parameter	Type	Description
		• 2: reporting enabled • 2: short form reporting enabled • 3: reset of reported counters. Configured <mode> does not change.
<rrcConnEstSucc>	Number	Total amount of RRC connection successful procedures. The range goes from 0 to 65535.
<rrcConnEstFail>	Number	Total amount of RRC connection failed procedures. The range goes from 0 to 65535.
<AttachSucc>	Number	Total amount of Attach successful procedures. The range goes from 0 to 65535.
<AttachFail>	Number	Total amount of Attach failed procedures. The range goes from 0 to 65535.
<TAUSucc>	Number	Total amount of Tracking Area update successful procedures. The range goes from 0 to 65535.
<TAUFail>	Number	Total amount of Tracking Area update failed procedures. The range goes from 0 to 65535.
<SRSucc>	Number	Total amount of Service Request successful procedures. The range goes from 0 to 65535.
<SRFail>	Number	Total amount of Service Request update failed procedures. The range goes from 0 to 65535.
<AuthFail>	Number	Total amount of Authentication rejected procedures. The range goes from 0 to 65535.
<DetachNum>	Number	Total amount of MT-Detach and MO-Detach procedures. The range goes from 0 to 65535.
<OOScount>	Number	Total amount of PLMN Out-of-Service events. The range goes from 0 to 65535.

7.30 Network error code reporting +CNEC

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

7.30.1 Description

Enables or disables URCs reporting of error result codes sent by the network. Depending on the radio access technology, the command can enable CS mobility management, GPRS mobility management, GPRS session management, EPS mobility management and EPS session management error code reporting. The same network error causes can be obtained by polling +CEER command.

7.30.2 Syntax

Type	Syntax	Response	Example
Set	AT+CNEC=<n>	OK	AT+CNEC=0 OK
Read	AT+CNEC?	+CNEC: <n> OK	+CNEC: 0 OK
Test	AT+CNEC=?	+CNEC: (list of supported <n>s) OK	+CNEC: (0,8,16,24) OK
URC		+CNEC_EMM: <error_code>[,<cid>]	+CNEC_EMM: 2
URC		+CNEC_ESM: <error_code>[,<cid>]	+CNEC_ESM: 27

7.30.3 Defined values

Parameter	Type	Description
<n>	Number	Indicates a bitmask expressed in decimal format used to enable error code URCs for the following categories: • 0: reporting disabled • 8: reporting enabled for EMM error codes (<+CNEC_EMM>) • 16: reporting enabled for ESM error codes (<+CNEC_ESM>).

Parameter	Type	Description
		More categories can be enabled at the same time by summing up the category value, e.g., <n>=24 enables both EMM and ESM reporting.
<error_code>	Number	Code of the received error. More details on the error causes and their meaning can be found in Appendix A.3.
<cid>	Number	See <cid>.

8 Device lock

8.1 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

8.1.1 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.

8.1.2 Syntax

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

8.1.3 Defined values

Parameter	Type	Description
<pin>, <newpin>	String	4-to-8 characters long string of decimal digits. If only PIN is required, <newpin> is not to be entered. 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 • SIM PIN: MT is waiting SIM PIN to be given • SIM PUK: MT is waiting SIM PUK to be given • SIM PIN2: MT is waiting SIM PIN2 to be given • SIM PUK2: MT is waiting SIM PUK2 to be given • PH-NET PIN: MT is waiting network personalization password to be given • PH-NETSUB PIN: MT is waiting network subset personalization password to be given • PH-SP PIN: MT is waiting service provider personalization password to be given • PH-CORP PIN: MT is waiting corporate personalization password to be given • PH-SIM PIN: MT is waiting phone to SIM/UICC card password to be given

8.1.4 Notes

- The command needs the SIM module to work correctly
- If PIN is not inserted the following situation can occur:

Command	Response
AT+CMEE=2	OK
AT+COPS=0	+CME ERROR: SIM PIN required
AT+CMEE=0	OK
AT+COPS=0	ERROR

- To change the PIN the user must use the AT+CPWD="SC",<old_pin>,<new_pin> command (see +CPWD AT command for details). Example:

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

8.2 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

8.2.1 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 information text response for "not active" case (<status>=0) is returned only if the service is not active for any <class>. Instead when querying the status of a network service (<mode>=2) asking for a specific <class>, the DUT sends a generic request. 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.

8.2.2 Syntax

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

8.2.3 Defined values

Parameter	Type	Description
<fac>	String	Facility values. Allowed values (for the applicability to the module see Table 7): • "SC": SIM (PIN enabled/disabled) • "PN": Network Personalisation (see the 3GPP TS 22.022 [92]) • "PU": network sUbset Personalisation (see the 3GPP TS 22.022 [92]) • "PP": service Provider Personalisation (see the 3GPP TS 22.022 [92]) • "PC": Corporate Personalisation (see the 3GPP TS 22.022 [92]) • "PS": SIM/USIM Personalisation (see the 3GPP TS 22.022 [92]) • "FD": SIM fixed dialling phonebook feature • "AO": BAR (Bar All Outgoing Calls) • "OI": BOIC (Bar Outgoing International Calls) • "OX": BOIC-exHC(Bar Outgoing International Calls except to Home Country) • "AI": BAIC (Bar All Incoming Calls)

Parameter	Type	Description
		• "IR": BIC-Roam (Bar Incoming Calls when Roaming outside the home country) • "AB": All Barring services (applicable only for <mode>=0) • "AG": All outGoing barring services (applicable only for <mode>=0) • "AC": All inComing barring services (applicable only for <mode>=0) • "CS": CNTRL (lock CoNTRoL surface (e.g. phone keyboard)) (see the 3GPP TS 27.007 [75]) • "PF": Lock Phone to the very First inserted SIM/UICC card (see the 3GPP TS 27.007 [75]) • "NT": Barr incoming calls from numbers Not stored to TA memory (see the 3GPP TS 27.007 [75]) • "NM": Barr incoming calls from numbers Not stored to MT memory (see 3GPP TS 27.007 [75]) • "NS": Barr incoming calls from numbers Not stored to SIM/UICC memory (see the 3GPP TS 27.007 [75]) • "NA": Barr incoming calls from numbers Not stored in any memory (see the 3GPP TS 27.007 [75])
<mode>	Number	• 0: unlock • 1: lock • 2: query status
<status>	Number	• 0: not active • 1: active
<passwd>	String	Shall be the same as password specified for the facility from the MT user interface or with the +CPWD command
<class>	Number	Sum of numbers each representing a class of information. The default value is 7 (voice + data + fax): • 1: voice • 2: data • 4: FAX • 8: short message service • 16: data circuit sync • 32: data circuit async • 64: dedicated packet access • 128: dedicated PAD access

8.2.4 Notes

Module series	SC	PN	PU	PP	PC	PS	FD	AO	OI	OX	AI	IR	AB	AG	AC	CS	PF	NT	NM	NS	NA
LEXI-R10	x																				

Table 7: Lock applicability (<fac> allowed values)

LEXI-R10

- The PIN insertion is not mandatory before the command execution.

8.3 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

8.3.1 Description

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

8.3.2 Syntax

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

8.3.3 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)

8.3.4 Notes

- An error result code will be provided when attempting to change the PIN code if either the PIN is blocked or the PIN check is disabled through AT+CLCK command.

LEXI-R10

- Only <fac>="SC" is supported.
- The "+CME ERROR: SIM Failure" error result code is returned when attempting to change the PIN code if the PIN check is disabled through AT+CLCK command.

8.4 Remaining PIN retries +CPINR

+CPINR						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	full	No	No	No	< 10 s	+CME Error

8.4.1 Description

Reads the number of remaining retries for SIM PIN, SIM PIN2, SIM PUK, SIM PUK2.

8.4.2 Syntax

Type	Syntax	Response	Example
Action	AT+CPINR	+CPINR: <code>,<retries>,<default_ retries> [...] +CPINR: <code>,<retries>,<default_ retries> OK	AT+CPINR +CPINR: "SIM PIN",3,3 +CPINR: "SIM PUK",10,10 +CPINR: "SIM PIN2",3,3 +CPINR: "SIM PUK2",10,10 OK
Set	AT+CPINR=<code>	+CPINR: <code>,<retries>,<default_ retries> OK	AT+CPINR="SIM PIN" +CPINR: "SIM PIN",3,3 OK
Test	AT+CPINR=?	OK	

8.4.3 Defined values

Parameter	Type	Description
<code>	String	Type of PIN. Allowed values: • "SIM PIN" • "SIM PUK" • "SIM PIN2" • "SIM PUK2"
<retries>	String	Number of remaining retries per PIN.
<default_retries>	Number	Number of default/initial retries per PIN.

9 Short Messages Service

9.1 Introduction

For a complete overview of SMS, see 3GPP TS 23.040 [80] and 3GPP TS 27.005 [86].

In case of errors all the SMS related AT commands return an error result code as defined in Appendix A.2.

9.1.1 Class 0 SMS

The storing of a class 0 SMS depends on the module series:

- LEXI-R10 - not stored.

9.1.2 <index> parameter range

The <index> parameter range depends on the memory storage type:

ME (ME message), **SM** ((U)SIM message) **MT** (ME + SM):

BM (Broadcast Message):

- LEXI-R10 - Broadcast Message storage is not supported.

SR (Status Report):

- LEXI-R10 - Status Report storage is not supported.

9.1.3 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"

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.

9.2 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

9.2.1 Description

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

LEXI-R10
The command setting is stored in the profile following the procedure in the Saving AT commands configuration section.

9.2.2 Syntax

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

9.2.3 Defined values

Parameter	Type	Description
<service>	Number	Allowed values: • 0: see 3GPP TS 23.040 [80] and 3GPP TS 23.041 [81]; syntax of AT commands is compatible with 3GPP TS 27.005 [86] phase 2; phase 2+ features may be supported if no new command syntax is required • 1: see 3GPP TS 23.040 [80] and 3GPP TS 23.041 [81]; syntax of AT commands is compatible with 3GPP TS 27.005 [86] phase 2+
<mt>	Number	Mobile terminated messages: • 0: not supported • 1: supported
<mo>	Number	Mobile originated messages: • 0: not supported • 1: supported
<bm>	Number	Broadcast messages: • 0: not supported • 1: supported

9.2.4 Notes

LEXI-R10

- To activate correctly the manual acknowledge (see +CNMA AT command), set <service> to 1 before changing the settings of the +CNMI AT command to route the messages directly to TE.
- Set <service> to 1 to acknowledge an incoming message (either SMS or Status Report) with +CNMA AT 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.

LEXI-R10

- PIN is not required.

9.3 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	< 10 s	+CMS Error

9.3.1 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.

9.3.2 Syntax

Type	Syntax	Response	Example
Set	AT+CPMS=<mem1>[,<mem2>[,<mem3>]]	AT+CPMS: <used1>,<total1>,<used2>,<total2>,<used3>,<total3> OK	AT+CPMS="BM","SM","SM" +CPMS: 0,5,0,50,0,50 OK
Read	AT+CPMS?	+CPMS: <mem1>,<used1>,<total1>,<mem2>,<used2>,<total2>,<mem3>,<used3>,<total3> OK	+CPMS: "MT",4,350,"MT",4,350,"MT",4,350 OK
Test	AT+CPMS=?	+CPMS: (list of supported <mem1>s),(list of supported <mem2>s),(list of supported <mem3>s) OK	+CPMS: ("MT","ME","SM","BM","SR"),("MT","ME","SM"),("MT","ME","SM") OK

9.3.3 Defined values

Parameter	Type	Description
<mem1>	String	Memory used to read and delete messages. The supported values may vary: • "ME": ME message storage • "SM": (U)SIM message storage • "MT": "ME"+"SM", "ME" preferred • "BM": Broadcast Message storage • "SR": Status Report storage The default value is the currently set value. The factory-programmed value depends on the module series: see Notes for more details.
<mem2>	String	Memory used to write and send SMS. The supported values may vary: • "ME": ME message storage • "SM": (U)SIM message storage • "MT": "ME"+"SM", "ME" preferred The default value is the currently set value. The factory-programmed value depends on the module series: see Notes for more details.
<mem3>	String	Memory preferred to store the received SMS. The supported values may vary: • "ME": ME message storage • "SM": (U)SIM message storage • "MT": "ME"+"SM", "ME" preferred The default value is the currently set value. The factory-programmed value depends on the module series: see Notes for more details.
<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>

9.3.4 Notes

- LEXI-R10 - the factory-programmed value is "ME", "ME" and "ME".

LEXI-R10

- "SR", "BM" and "MT" message storages are not supported.
- The PIN verification is not required when the preferred memory storage is "ME".

9.4 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

9.4.1 Description

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

9.4.2 Syntax

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

9.4.3 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: • 0: PDU mode • 1: text mode The factory-programmed value is: • LEXI-R10 - 1

9.4.4 Notes

LEXI-R10

- PIN is not required.
- The <mode> parameter is mandatory.

9.5 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

9.5.1 Description

Controls whether detailed SMS header information is shown in text mode (see the AT+CMGF=1 command).

This affects the responses of the +CMGR, +CMGL, +CSMP, +CSCA AT commands and the +CMT, +CMTI, +CDS, +CDSI, +CBM, +CBMI (see +CNMI) URCs.

9.5.2 Syntax

Type	Syntax	Response	Example
Set	AT+CSDH=[<show>]	OK	AT+CSDH=1 OK

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

9.5.3 Defined values

Parameter	Type	Description
<show>	Number	Allowed values: • 0 (default): do not show detailed SMS header information • 1: show detailed SMS header information

9.5.4 Notes

LEXI-R10

- The <show> parameter is mandatory in the set command.

LEXI-R10

- PIN is not required.
- The parameters setting is stored in the personal profile following the procedure described in Saving AT commands configuration section.

9.6 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

9.6.1 Description

Selects the procedure to indicate the reception of a new SMS if 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 [79].

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).

☞ LEXI-R10
The command setting is stored in the NVM following the procedure described in the Saving AT commands configuration section.

9.6.2 Syntax

Type	Syntax	Response	Example
Set	AT+CNMI=[<mode>[,<mt>[,<bm>[,<ds>[,<bfr>]]]]]	OK	AT+CNMI=1,1 OK
Read	AT+CNMI?	+CNMI: <mode>,<mt>,<bm>,<ds>,<bfr> OK	+CNMI: 0,0,0,0,0 OK
Test	AT+CNMI=?	+CNMI: (list of supported <mode>s),(list of supported <mt>s),(list of supported <bm>s),(list of supported <ds>s),(list of supported <bfr>s) OK	+CNMI: (0-2),(0-3),(0-3),(0-2),(0-1) OK
URC		+CMTI: <mem>,<index>	+CMTI: "SM",5

Type	Syntax	Response	Example
URC		**Text mode (+CMGF=1):** +CMT: <oa>,[<alpha>], <scts>[,<tooa>,<fo>,<pid>, <dcs>,<sca>,<tosca>, <length>]<CR><LF><data>	+CMT: "+393475234652",,"14/11/21,11:58:23+01" Hello world
		PDU mode (+CMGF=0): +CMT: ,<length><CR><LF><pdu>	
URC		**Text mode (+CMGF=1):** +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 Hello!
		PDU mode (+CMGF=0): +UCMT: <pdu_ length><CR><LF><pdu>	
URC		+CBMI: <mem>,<index>	+CBMI: "BM",48
URC		**Text mode (+CMGF=1):** +CBM: <sn>,<mid>,<dcs>,<page>, <pages><CR><LF><data>	+CBM: 271,1025,1,1,1 The quick brown fox jumps over the lazy dog 0123456789
		PDU mode (+CMGF=0): +CBM: <length><CR><LF><pdu>	
URC		+CDSI: <mem>,<index>	+CDSI: "MT",2
URC		**Text mode (+CMGF=1):** +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): +CDS: <length><CR><LF><pdu>	

9.6.3 Defined values

Parameter	Type	Description
<mode>	Number	Controls the processing of URCs specified within this command: • 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) • 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 • 2: buffer URCs in the MT when the serial link is busy (e.g. data-transfer); otherwise forward them directly to the DTE • 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): • 0 (default and factory-programmed value): No SMS-DELIVER indications are routed to the TE • 1: if SMS-DELIVER is stored in the MT, indication of the memory location is routed to the DTE using the +CMTI URC • 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

Parameter	Type	Description
		message waiting indication group (storage message) result in indication as defined in <mt>=1 • 3: Class 3 SMS-DELIVERs are routed directly to DTE using URCs defined in <mt>=2. Messages of other data coding schemes result in indication as defined in <mt>=1
<bm>	Number	Specifies the rules for managing the received Cell Broadcast messages (CBM): • 0 (default and factory-programmed value): no CBM indications to the DTE • 1: if the CBM is stored in the MT, an indication of the used memory location is routed to DTE using the +CBMI URC • 2: new CBMs are routed directly to the DTE using the +CBM URC • 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: • 0 (default and factory-programmed value): no SMS-STATUS-REPORTs are routed to the DTE • 1: SMS-STATUS-REPORTs are routed to the DTE using the +CDS URC • 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: • 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). • 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: • in text mode: number of characters • in PDU mode: PDU's length in octets without the Service Center's address. In example: 039121430100038166F6000004E374F80D: 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 [80] TP-User-Data in text mode responses; format: • if <dcs> indicates that 3GPP TS 23.038 [79] GSM 7 bit default alphabet is used: o if TE character set other than "HEX" (see the +CSCS command in 3GPP TS 27.007 [75]): ME/TA converts GSM alphabet into current TE character set according to rules of Annex A o if TE character set is "HEX": ME/TA converts each 7-bit character of GSM 7 bit default alphabet into two IRA character long hexadecimal number (e.g. character Æ (GSM 7 bit default alphabet 28) is presented as 1C (IRA 49 and 67)) • 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 (e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65)) In the case of CBS: 3GPP TS 23.041 [81] CBM Content of Message in text mode responses; format: • if <dcs> indicates that 3GPP TS 23.038 [79] GSM 7 bit default alphabet is used: o if TE character set other than "HEX" (see the +CSCS in 3GPP TS 27.007 [75]): ME/TA converts GSM alphabet into current TE character set according to rules of Annex A o if TE character set is "HEX": ME/TA converts each 7-bit character of the GSM 7 bit default alphabet into two IRA character long hexadecimal number

Parameter	Type	Description
		• 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 [81]
<pages>	Number	CBM Page Parameter bits 0-3 in integer format as described in 3GPP TS 23.041 [81]
<fo>	Number	First octet of the SMS TPDU (see 3GPP TS 23.040 [80])
<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: • 0: normal • 1: interactive • 2: urgent • 3: emergency
<privacy>	Number	3GPP2 privacy: • 0: not restricted • 1: restrictive • 2: confidential • 3: secret
<callback_number>	String	Callback number
<encoding>	Number	Text encoding: • 0: octet, unspecified • 2: ASCII7 • 3: IA5 • 4: UCS2 • 8: ISO 8859-1 • 9: GSM7
<num_sms>	Number	Total number of SMS
<part>	Number	Fragment part number
<reference>	Number	3GPP2 reference ID

9.6.4 Notes

LEXI-R10

- PIN is not required.
- <mt> parameter's factory-programmed value is 2.
- <bm>=1 is not supported.
- <ds>=2 is not supported.

9.7 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	Appendix B.4	+CMS Error

9.7.1 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 [85] 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 +CMS ERROR: <err> error result code 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.

9.7.2 Syntax

Type	Syntax	Response	Example
Set	**Text mode (+CMGF=1):** AT+CNMA	OK	AT+CNMA OK
	PDU mode (+CMGF=0): AT+CNMA[=<n>[,<length> [PDU is given<Ctrl-Z>/<ESC>]]]	OK	AT+CNMA=1,5 >0007000000 <Ctrl-Z> OK
Test	AT+CNMA=?	**Text mode (+CMGF=1):** OK	OK
		PDU mode (+CMGF=0): +CNMA: (list of supported <n>s) OK	+CNMA: (0-2) OK

9.7.3 Defined values

Parameter	Type	Description
<n>	Number	Allowed values: • 0: the command operates similarly as defined for the text mode • 1: sends RP-ACK (or buffered result code received correctly) • 2: sends RP-ERROR (if PDU is not given, ME/TA shall send SMS-DELIVER-REPORT with 3GPP TS 23.040 [80] TP-FCS value set to 'FF' (unspecified error cause))
<length>	Number	PDU's length in octets without the Service Center's address

9.8 Send message +CMGS

+CMGS						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	full	Yes	No	No	Appendix B.4	+CMS Error

9.8.1 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. Optionally (when enabled by +CSMS AT command and the network supports) <ackpdu> is returned. Values can be used to identify message upon unsolicited delivery status report result code. <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.

9.8.2 Syntax

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

9.8.3 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: • in text mode: number of characters • in PDU mode: PDU's length in octets without the Service Center's address. In example 039121430100038166F6000004E374F80D: is a PDU with Service Center's number +1234, that generates the address 03912143 (4 octets). Thus in this case <length>=13.
<PDU>	String	Protocol Data Unit: each 8-bit octet of the PDU must be written as two IRA character long hexadecimal numbers, e.g. octet with integer value 42 must be written as two characters 2A (IRA 50 and 65)
<ackpdu>	String	See the 3GPP TS 23.040 [80] RP-User-Data element of RP-ACK PDU; the format is same as for <PDU> in case of SMS

9.8.4 Notes

LEXI-R10

- The <toda> parameter is ignored.
- If the set command cannot be executed within 60 s from the entrance into SMS mode (e.g. because <Ctrl-Z> or <ESC> are not issued), an error result code is returned.

9.9 Send SMS command +CMGC

+CMGC						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	full	Yes	No	No	Appendix B.4	+CMS Error

9.9.1 Description

Sends a command message from a DTE to the network (SMS-SUBMIT). The message reference value <mr> is returned to the DTE for a successful message delivery. Optionally (when enabled by +CSMS AT command and network supports) the <ackpdu> parameter is returned. Values can be used to identify message upon unsolicited delivery status report result code. <Ctrl-Z> indicates that the SMS shall be sent, while <ESC> indicates aborting of the edited SMS.

☞ The entered PDU is preceded by a ">" (Greater-Than sign) character, and this indicates that the interface is in "PDU enter" mode. The DCD signal shall be in ON state while the PDU is entered.

☞ The +CMT URC is issued on the reception of the SMS messages.

9.9.2 Syntax

Type	Syntax	Response	Example
Set	**Text mode (+CMGF=1):** AT+CMGC=<fo>,<ct>[,<pid>[,<mn>[,<da>[,<toda>]]]]<CR> > text is entered<Ctrl-Z/ESC>	+CMGC: <mr>[,<scts>] OK	AT+CMGC=17,0<CR> > This is the text<Ctrl-Z> +CMGC: 20 OK
	PDU mode (+CMGF=0): AT+CMGC=<length><CR> > <PDU> is given<Ctrl-Z/ESC>	+CMGC: <mr>[,<ackpdu>] OK	AT+CMGC=13<CR> > 0391214301000381 66F6000004E374F80D<Ctrl-Z> +CMGC: 2 OK
Test	AT+CMGC=?	OK	
URC		+CMT: [<alpha>], <length><CR><LF><pdu>	

9.9.3 Defined values

Parameter	Type	Description
<mr>	Number	Message reference
<length>	Number	PDU's length in octets without the Service Center's address. In example 039121430 100038166F6000004E374F80D: is a PDU with Service Center's number +1234, that generates the address 03912143 (4 octets). Thus in this case <length>=13.
<PDU>	String	Protocol Data Unit: each 8-bit octet of the PDU must be written as two IRA character long hexadecimal numbers, e.g. octet with integer value 42 must be written as two characters 2A (IRA 50 and 65).
<ackpdu>	String	See the 3GPP TS 23.040 [80] RP-User-Data element of RP-ACK PDU; format is same as for <PDU> in case of SMS.
<alpha>	String	Alphanumeric representation of destination or originating address. See the 3GPP TS 27.005 [86].
<fo>	Number	First octet of the SMS TPDU (see 3GPP TS 23.040 [80])
<ct>	Number	TP-Command-Type (default value: 0)
<pid>	Number	TP-Protocol-Identifier (default value: 0); see the 3GPP TS 23.040 [80]
<mn>	Number	See the 3GPP TS 23.040 [80] TP-Message-Number in integer format
<da>	String	Destination address
<toda>	Number	Type of address of <da> - octet

9.9.4 Notes

LEXI-R10

- If the command cannot be executed within 60 s from the entrance into SMS mode (e.g. because <Ctrl-Z> or <ESC> are not issued), an error result code is returned.

9.10 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

9.10.1 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.

☞ LEXI-R10
It is possible to write SMSes in "ME" also without the PIN insertion (no access to SIM is required when <mem2>= "ME").

9.10.2 Syntax

Type	Syntax	Response	Example
Set	**Text mode (+CMGF=1):** AT+CMGW[=<oa/da>[,<tooa/toda>[,<stat>]]]<CR> text is entered<Ctrl-Z/ESC>	+CMGW: <index> OK	AT+CMGW="091137880"<CR> > This is the text<Ctrl-Z> +CMGW: 303 OK
	PDU mode (+CMGF=0): AT+CMGW=<length>[,<stat>]<CR> PDU is given<Ctrl-Z/ESC>	+CMGW: <index> OK	AT+CMGW=13<CR> > 0391214301000381 66F600000 4E374F80D<Ctrl-Z> +CMGW: 303 OK
Test	AT+CMGW=?	OK	

9.10.3 Defined values

Parameter	Type	Description
<da>	String	TP-Destination-Address Address-Value field (see the 3GPP TS 23.040 [80]); 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 [80]); 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 [85]); see the <toda> parameter for the default value
<toda>	Number	TP-Destination-Address Type-of-Address octet (see the 3GPP TS 24.011 [85]); 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: • 0: in PDU mode or "REC UNREAD" in text mode: received unread SMS messages • 1: in PDU mode or "REC READ" in text mode: received read SMS messages • 2: in PDU mode or "STO UNSENT" in text mode: stored unsent SMS messages • 3: in PDU mode or "STO SENT" in text mode: stored sent SMS messages
<text>	String	SMS string
<index>	Number	Storage position

Parameter	Type	Description
<length>	Number	The parameter meaning depends on the message format: • In text mode: number of characters • In PDU mode: PDU's length in octets without the Service Center's address. In example: 039121430100038166F6000004E374F80D 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)

9.10.4 Notes

LEXI-R10

- The <toda>/<tooa> parameter is ignored.
- If the set command cannot be executed within 60 s from the entrance into SMS mode (e.g. because <Ctrl-Z> or <ESC> are not issued), an error result code is returned.

9.11 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	Appendix B.4	+CMS Error

9.11.1 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.

9.11.2 Syntax

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

9.11.3 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
<scts>	String	3GPP TS 23.040 TP-Service-Centre-Time-Stamp [80] in time-string format (see <dt>).
<ackpdu>	String	See the 3GPP TS 23.040 [80] RP-User-Data element of RP-ACK PDU; format is same as for <PDU> in case of SMS.

9.11.4 Notes

LEXI-R10

- The <toda> parameter is ignored.

9.12 Delete message +CMGD

+CMGD						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	partial	Yes	No	No	Appendix B.4	+CMS Error

9.12.1 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>.

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.

LEXI-R10
When deleting a message from an empty location, the module returns the "OK" final result code.

LEXI-R10
It is possible to read SMSes in "ME" also without the PIN insertion (no access to SIM is required when <mem1>= "ME").

9.12.2 Syntax

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

9.12.3 Defined values

Parameter	Type	Description
<index>	Number	Storage position
<flag>	Number	Deletion flag. If present, and different from 0, the <index> parameter is ignored: • 0 (default value): delete the message specified in <index> • 1: delete all the read messages from the preferred message storage, leaving unread messages and stored mobile originated messages (whether sent or not) untouched • 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 • 3: delete all the read messages from the preferred message storage, sent and unsent mobile originated messages leaving unread messages untouched • 4: delete all the messages from the preferred message storage including unread messages

9.12.4 Notes

LEXI-R10

- The test command returns list of occupied memory indexes e.g. (0,1,4,5). If there is no occupied memory index, an empty list is returned.

9.13 Read message +CMGR

+CMGR						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	full	Yes	No	No	<10 s	+CMS Error

9.13.1 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 AT+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 +CNMI AT command notes).

☞ 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.

☞ LEXI-R10
It is possible to read SMSes in "ME" also without the PIN insertion (no access to SIM is required when <mem1>= "ME").

9.13.2 Syntax

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

Type	Syntax	Response	Example
		OK	0791934329002000040 C9193230982661400008070 328045218018D4F29CFE0 6B5CBF379F87C4EBF41E4340 82E7FDBC3 OK
Test	AT+CMGR=?	OK	

9.13.3 Defined values

Parameter	Type	Description
<index>	Number	Storage position
<stat>	Number	• 0: in PDU mode or "REC UNREAD" in text mode: received unread SMS • 1: in PDU mode or "REC READ" in text mode: received read SMS • 2: in PDU mode or "STO UNSENT" in text mode: stored unsent SMS • 3: in PDU mode or "STO SENT" in text mode: stored sent SMS
<oa>	String	Originator address
<alpha>	String	Alphanumeric representation of <da> or <oa> corresponding to the entry found in the phonebook 3GPP TS 24.008 [84]. 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 [80])
<pid>	Number	TP-Protocol-Identifier (default 0); see the 3GPP TS 23.040 [80]
<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 [84]); default 145 when string includes '+', otherwise default 129
<length>	Number	Two meanings: • in text mode: number of characters • in PDU mode: PDU's length in octets without the Service Center's address. In example 039121430100038166F6000004E374F80D: 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 [80] TP-User-Data in text mode responses; format: • if <dcs> indicates that 3GPP TS 23.038 [79] GSM 7 bit default alphabet is used: 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 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 Æ (GSM 7 bit default alphabet 28) is presented as 1C (IRA 49 and 67)) • 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 (e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65)) In the case of CBS: 3GPP TS 23.041 [81] CBM Content of Message in text mode responses; format: • if <dcs> indicates that 3GPP TS 23.038 [79] GSM 7 bit default alphabet is used: 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 o if TE character set is "HEX": ME/TA converts each 7-bit character of the GSM 7 bit default alphabet into two IRA character long hexadecimal number • if <dcs> indicates that 8-bit or UCS2 data coding scheme is used: ME/TA converts each 8-bit octet into two IRA character long hexadecimal number

Parameter	Type	Description
<da>	String	Destination address
<toda>	Number	Type of address of <da> - octet
<vp>	Number	Format depending of the <fo> setting: • Relative format: validity period starting from when the SMS is received by the SMSC, in range 0-255 (default value 167); for more details see the 3GPP TS 23.040 [80] • 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 [80]); 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 [80] 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 [81] CBM Page Parameter bits 4-7 in integer format
<pages>	Number	3GPP TS 23.041 [81] 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)

<vp> | Validity period value

<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

9.14 List message +CMGL

+CMGL						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	full	Yes	No	No	< 10 s	+CMS Error

9.14.1 Description

Returns SMS messages with status value <stat> from message storage <mem1> to the DTE. If status of the received message is "received unread", status in the storage changes to "received read".

☞ LEXI-R10
It is possible to read SMSes in "ME" also without the PIN insertion (no access to SIM is required when <mem1>= "ME").

9.14.2 Syntax

Type	Syntax	Response	Example
Set	**Text mode (+CMGF=1):** AT+CMGL[=<stat>]	**Command successful and SMS-DELIVERs:** +CMGL: <index>,<stat>,<oa>, [<alpha>],[<scts>][,<tooa>, <length>]	AT+CMGL +CMGL: 303,"REC READ","+39340 1234999",,"08/08/06,10:01:38+08"

Type	Syntax	Response	Example
		<data> [+CMGL: <index>,<stat>,<oa>, [<alpha>],[<scts>][,<tooa>, <length>]<data>[...]] OK	You have a missed called. Free information provided by your operator. OK
		Command successful and SMS-SUBMITs: +CMGL: <index>,<stat>,<da>, [<alpha>],[<toda>, <length>] <data> [+CMGL: <index>,<stat>, <da>,[<alpha>],[<toda>, <length>]<data>[...]] OK	
		Command successful and SMS-STATUS-REPORTs: +CMGL: <index>,<stat>,<fo>,<mr>, [<ra>],[<tora>],<scts>,<dt>,<st> [+CMGL: <index>,<stat>,<fo>,<mr>, [<ra>],[<tora>],<scts>,<dt>,<st> [...]] OK	
		Command successful and SMS-COMMANDs: +CMGL: <index>,<stat>,<fo>,<ct> [+CMGL: <index>,<stat>,<fo>, <ct>[...]] OK	
		Command successful and CBM storage: +CMGL: <index>,<stat>,<sn>, <mid>,<page>,<pages><data> [+CMGL: <index>,<stat>,<sn>, <mid>,<page>,<pages>,<data>[...]] OK	
	PDU mode (+CMGF=0): AT+CMGL[=<stat>]	**Command successful:** +CMGL: <index>,<stat>,[<alpha>], <length> <pdu> [+CMGL: <index>,<stat>,[<alpha>], <length>] <pdu> [...]	AT+CMGL=1 +CMGL: 305,1,,57 079193432900 1185440ED0D637396C7EBBCB0 000909092708024802A050 003000303DEA0584CE60 205D974791994769BDF3A90 DB759687E9F534FD0DA2C9603419 OK
Test	AT+CMGL=?	+CMGL: (list of supported <stat>s) OK	+CMGL: ("REC UNREAD","REC READ","STO UNSENT","STO SENT", "ALL") OK

9.14.3 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: • 0: in PDU mode or "REC UNREAD" in text mode: received unread SMS messages • 1: in PDU mode or "REC READ" in text mode: received read SMS messages • 2: in PDU mode or "STO UNSENT" in text mode: stored unsent SMS messages • 3: in PDU mode or "STO SENT" in text mode: stored sent SMS messages • 4: in PDU mode or "ALL" in text mode: all SMS messages
<index>	Number	Storage position
<oa>	String	Originator address
<alpha>	String	Alphanumeric representation of <da> or <oa> corresponding to the entry found in the phonebook 3GPP TS 24.008 [84]. The parameter is not managed.
<scts>	String	Service center time stamp in time-string format; see the <dt> parameter
<tooa>	Number	Type of address of <oa> - octet
<length>	Number	Two meanings: • in text mode: number of characters • in PDU mode: PDU's length in octets without the Service Center's address. In example 0391214301000381 66F6000004E374F80D: 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 [80]; format: • if DCS indicates that 3GPP TS 23.038 [79] GSM 7 bit default alphabet is used: o if TE character set other than "HEX" (see the +CSCS AT command description): ME/TA converts GSM alphabet into current TE character set according to rules of Annex A o if TE character set is "HEX": ME/TA converts each 7-bit character of GSM 7 bit default alphabet into two IRA character long hexadecimal number (e.g. character Æ (GSM 7 bit default alphabet 28) is presented as 1C (IRA 49 and 67)) • 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 (e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65)) In the case of CBS: 3GPP TS 23.041 [81] CBM Content of Message in text mode responses; format: • if DCS indicates that 3GPP TS 23.038 [79] GSM 7 bit default alphabet is used: o if TE character set other than "HEX" (see the +CSCS AT command description): ME/TA converts GSM alphabet into current TE character set according to rules of Annex A o if TE character set is "HEX": ME/TA converts each 7-bit character of the GSM 7 bit default alphabet into two IRA character long hexadecimal number if DCS indicates that 8-bit or UCS2 data coding scheme is used: ME/TA converts each 8-bit octet into two IRA character long hexadecimal number
<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 [80])
<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 [81] CBM Page Parameter bits 4-7 in integer format

Parameter	Type	Description
<pages>	Number	3GPP TS 23.041 [81] 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

9.14.4 Notes

LEXI-R10

- When parameter <stat> is omitted, the default value will be 0 (if PDU mode is active) or "REC UNREAD" (if text mode is active).
- The <stat> parameter is blank in **SMS-STATUS-report** displaying case.

9.15 Read concatenated message +UCMGR

+UCMGR						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	full	Yes	No	No	<10 s	+CMS Error

9.15.1 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:

- SMS-DELIVER: the parameters <tooa>, <fo>, <pid>, <dcs>, <sca>, <tosca>, <length> shall be displayed only if +CSDH: 1.
- SMS-SUBMIT: the parameters <toda>, <fo>, <pid>, <dcs>, <vp>, <sca>, <tosca>, <length> shall be displayed only if +CSDH: 1.
- SMS-COMMAND: <pid>, <mn>, <da>, <toda>, <length>, <cdata> shall be displayed only if +CSDH: 1.

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 +CNMI AT command notes).

If the received message status is "received unread", the 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.

LEXI-R10
It is possible to read SMSes in "ME" also without the PIN insertion (no access to SIM is required when <mem1>= "ME").

9.15.2 Syntax

Type	Syntax	Response	Example
Set	AT+UCMGR=<index>	**SMS-DELIVER** +UCMGR: <stat>,<oa>,[<alpha>], <scts>[,<tooa>, <fo>,<pid>,<dcs>, <sca>,<tosca>,<length>][,<seq>, <max>,<iei>,<ref>] <data> OK **SMS-SUBMIT**	AT+UCMGR=1 +UCMGR: "REC READ", "+393488535999",,"07/04/05,18:02:28+08",145,4,0,0,"+393492000466",145,153,1,2,0,127

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Type	Syntax	Response	Example
		+UCMGR: <stat>,<da>,[<alpha>] [<toda>,<fo>,<pid>,<dcs>,[<vp>], <sca>,<tosca>,<length>][,<seq>, <max>,<iei>,<ref>] <data> OK **SMS-STATUS-report** +UCMGR:<stat>,<fo>,<mr>,[<ra>], [<tora>]<scts><dt>,<st> OK **SMS-COMMAND** +UCMGR: <stat>,<fo>,<ct>[,<pid>, [<mn>],[<da>],[<toda>],<length> [<cdata>]] OK **CBM storage** +UCMGR: <stat>,<sn>,<mid>, <dcs>,<page>,<pages> <data> OK	or disclosure to third parties without express permis OK
Test	AT+UCMGR=?	OK	

9.15.3 Defined values

Parameter	Type	Description
<index>	Number	Storage position
<stat>	String	Indicates the status of message in memory: • "REC UNREAD": received unread SMS • "REC READ": received read SMS • "STO UNSENT": stored unsent SMS • "STO SENT": stored sent SMS
<oa>	String	Originator address
<alpha>	String	Alphanumeric representation of <da> or <oa> corresponding to the entry found in the phonebook 3GPP TS 24.008 [84]. 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 [80])
<pid>	Number	TP-Protocol-Identifier (default 0); see 3GPP TS 23.040 [80]
<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 3GPP TS 24.008 [84]); default 145 when string includes '+', otherwise default 129
<length>	Number	Number of characters
<seq>	Number	Sequence number of the current short message (1-255)
<max>	Number	Maximum number of short messages in the concatenated short message (1-255)
<iei>	Number	Information Element Identifier, the possible values are the following: • 0: Concatenated short messages, 8-bit reference number • 8: Concatenated short messages, 16-bit reference number
<ref>	Number	Concatenated short message reference number: • 0-255: concatenated short messages, 8-bit reference number case • 0-65535: concatenated short messages, 16-bit reference number case
<data>	String	In the case of SMS: 3GPP TS 23.040 [80] TP-User-Data in text mode responses; format:

Parameter	Type	Description
		• if <dcs> indicates that 3GPP TS 23.038 [79] GSM 7 bit default alphabet is used: o if TE character set other than "HEX" (see the +CSCS AT command description): ME/TA converts GSM alphabet into current TE character set according to rules of 3GPP TS 27.005 [86] Annex A o if TE character set is "HEX": ME/TA converts each 7-bit character of GSM 7 bit default alphabet into two IRA character long hexadecimal number (e.g. character Æ (GSM 7 bit default alphabet 28) is presented as 1C (IRA 49 and 67)) • 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 (e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65)) In the case of CBS: 3GPP TS 23.041 [81] CBM Content of Message in text mode responses; format: • if <dcs> indicates that 3GPP TS 23.038 [79] GSM 7 bit default alphabet is used: o if TE character set other than "HEX" (see the +CSCS AT command description): ME/TA converts GSM alphabet into current TE character set according to rules of 3GPP TS 27.005 [86] Annex A o if TE character set is "HEX": ME/TA converts each 7-bit character of the GSM 7 bit default alphabet into two IRA character long hexadecimal number if <dcs> indicates that 8-bit or UCS2 data coding scheme is used: ME/TA converts each 8-bit octet into two IRA character long hexadecimal number
<da>	String	Destination address
<toda>	Number	Type of address of <da> - octet
<vp>	Number	Format depending of the <fo> setting: • Relative format: validity period starting from when the SMS is received by the SMSC, in range 0-255 (default value 167); for more details see 3GPP TS 23.040 [80] <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") (refer to 3GPP TS 23.040 [80]); 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 [80] 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 [81] CBM page parameter bits 4-7 in integer format
<pages>	Number	3GPP TS 23.041 [81] CBM page parameter bits 0-3 in integer format

9.16 Send concatenated message +UCMGS

+UCMGS						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	full	Yes	No	No	Appendix B.4	+CMS Error

9.16.1 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.

9.16.2 Syntax

Type	Syntax	Response	Example
Set	AT+UCMGS=<da>,[<toda>],<seq>,<max>,<iei>,<ref><CR> text is entered<Ctrl-Z/ESC>	+UCMGS: <mr> OK	AT+UCMGS="0171112233",,1,2,0,127<CR> > 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> +UCMGS:2 OK AT+UCMGS="0171112233",,2,2,0,127<CR> > sion is strictly prohibited.<Ctrl-Z> +UCMGS:3 OK
Test	AT+UCMGS=?	OK	

9.16.3 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: • 0: concatenated short messages, 8-bit reference number • 8: concatenated short messages, 16-bit reference number
<ref>	Number	Concatenated short message reference number: • 0-255: concatenated short messages, 8-bit reference number case • 0-65535: concatenated short messages, 16-bit reference number case
<text>	String	SMS string
<mr>	Number	Message reference

9.16.4 Notes

LEXI-R10

- Only <iei>=0 is supported.
- The <toda> parameter is ignored.
- If the command cannot be executed within 60 s from the entrance into SMS mode (e.g. because <Ctrl-Z> or <ESC> are not issued), an error result code is returned.

9.17 Inline send message +USMSSEND

+USMSSEND						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	Full	Yes	No	No	60 s	+CMS Error

9.17.1 Description

Sends a message from a DTE to the network without using the character <Ctrl-Z>. The message reference value <mr> is returned in case of successful message delivery. Both text and PDU modes are supported, but only the mode currently configured on the AT terminal by +CMGF will be accepted.

9.17.2 Syntax

Type	Syntax	Response	Example
Set	**Text mode (+CMGF:1):** AT+USMSSEND=<mode>,<da>,[<toda>],<text>	+CMGS: <mr> OK	AT+USMSSEND=1,"0171112233",,"This is the text" +CMGS: 2 OK
	PDU mode (+CMGF:0): AT+USMSSEND=<mode>,PDU is given	+CMGS: <mr> OK	AT+USMSSEND=0,"039121430100038166F6000004E374F80D" +CMGS: 2 OK
Test	AT+USMSSEND=?	+USMSSEND: (1),("da"),(128,129,145,161,177,193),(160) OK	

9.17.3 Defined values

Parameter	Type	Description
<mode>	Number	Indicates the format of messages • 0: PDU mode • 1: text mode
<da>	String	Destination address
<toda>	Number	Type of address of <da> - octet, the default value is 0 ("unknown").
<text>	String	SMS string, the maximum length is 160 characters.
<mr>	Number	Message reference
<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). The maximum PDU length is 180 octets without the Service Center's address.

9.18 Set text mode parameters +CSMP

+CSMP						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	full	Yes	+CSAS	No	< 10 s	+CMS Error

9.18.1 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 [79] and the 3GPP TS 23.040 [80].

LEXI-R10
The command setting is stored in the NVM following the procedure described in the Saving AT commands configuration section.

9.18.2 Syntax

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

9.18.3 Defined values

Parameter	Type	Description
<fo>	Number	First octet of the SMS TPDU (see 3GPP TS 23.040 [80]). The factory-programmed value is 17.
<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 factory-programmed value is 167); for more details see the 3GPP TS 23.040 [80]

<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 [80]); the time zone is expressed in steps of 15 minutes. The range goes from -48 to +56

<pid>	Number	TP-Protocol-Identifier (factory-programmed value: 0); see the 3GPP TS 23.040 [80]
<dcs>	Number	Data Coding Scheme. The factory-programmed value is 0.

9.18.4 Notes

LEXI-R10

- Read command first reads parameter settings from NVM and then from the SIM. If parameter settings exist in the SIM, they take precedence.
- Write command first writes parameter settings to NVM and then to the SIM.

9.19 Service center address +CSCA

+CSCA						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	full	Yes	+CSAS	No	< 10 s	+CMS Error

9.19.1 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.

LEXI-R10
The command setting is stored in the NVM following the procedure described in the Saving AT commands configuration section.

9.19.2 Syntax

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

9.19.3 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 [84]); the default value is 145 when string includes '+', otherwise the default is 129.

9.19.4 Notes

LEXI-R10

- The <tosca> parameter is an octet in integer format.

9.20 Select cell broadcast message types +CSCB

+CSCB						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	partial	Yes	+CSAS	No	< 10 s	+CMS Error

9.20.1 Description

Selects which types of CBM's are to be received by the MT.

9.20.2 Syntax

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

9.20.3 Defined values

Parameter	Type	Description
<mode>	Number	Allowed values: • 0 (default value and factory-programmed value): message types specified in <mids> and <dcss> accepted • 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 [81], 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 [79], chapter 5.

9.20.4 Notes

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

LEXI-R10

- The <mode> parameter is mandatory in the set command.

LEXI-R10

- PIN is not required.
- The maximum number of <mids> and <dcss> is 5.
- The <mids> and <dcss> are not saved in NVM or SIM and only kept for limited time for duplicate check, hence these will be lost on reboot. For Japanese operators the values are kept for 1 hour. For the rest of operators the values are kept for 24 hours.

9.21 More messages to send +CMMS

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

9.21.1 Description

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

9.21.2 Syntax

Type	Syntax	Response	Example
Set	AT+CMMS=[<mode>]	OK	AT+CMMS=2 OK
Read	AT+CMMS?	+CMMS: <mode> OK	+CMMS: 2 OK

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

9.21.3 Defined values

Parameter	Type	Description
<mode>	Number	Allowed values: • 0 (default value): disabled • 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 • 2: keep permanently enabled. The link is closed after each send sequence, but <mode> is not switched back to 0

9.21.4 Notes

LEXI-R10

- The <mode> parameter is mandatory in the set command.

LEXI-R10

- PIN is not required.

10 V24 control and V25ter

10.1 Introduction

These commands, unless specifically stated, do not implement set syntax using "=", read ("?"), or test ("=?"). If such commands are used, the "+CME ERROR: unknown" or "+CME ERROR: 100" error result code is provided (depending on the +CMEE AT command setting).

10.2 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

10.2.1 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.

10.2.2 Syntax

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

10.2.3 Defined values

Parameter	Type	Description
<value>	Number	Indicates the behavior of circuit 109 • 0: DCE always presents ON condition on circuit 109 • 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

10.2.4 Notes

- See the corresponding module system integration manual for the DCD behavior during the initialization phase of the module.

10.3 Circuit 108/2 and escape sequence 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

10.3.1 Description

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

It also controls how the escape sequence may change the on-line data state.

10.3.2 Syntax

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

10.3.3 Defined values

Parameter	Type	Description
<value>	Number	Allowed values: • 0: the DCE ignores circuit 108/2 • 1: upon an ON-to-OFF transition of circuit 108/2, the DCE enters online command state and issues the final result code • 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 The default and factory-programmed value is: • LEXI-R10 - 2

10.3.4 +++ behavior

- A special meaning of the &D value is provided for the +++ sequence during a PS data transfer with PPP L2 protocol (this is outside the ITU-T V.25ter recommendation [207] scope). Upon +++ sequence the PS data transfer is escaped and the system returns in the on-line command state.
- The ATO command is used to resume the PS data transfer session.
- If the module has a DUN/PPP activated and is in OLCM, the ATH command deactivates the PPP and the associated PDP context (if possible).

☞ For more details, see the ITU-T recommendation V250 [206], ITU-T V.25ter recommendation [207] and ITU-T V.32 recommendation [208].

☞ See the corresponding module system integration manual for the DTR behavior during the initialization phase of the module.

10.3.5 DTR, +++ behavior

PS data mode (PPP L2 protocol case)		
Event	**DTE sends +++**	**DTR ON-to-OFF transition**
&D0	DCE enters online command mode	No action
&D1	DCE enters online command mode	DCE enters online command mode
&D2	DCE enters online command mode	Context deactivation

Table 8: PS data mode

Direct Link 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	DCE enters command mode
&D2	DCE enters command mode	DCE enters command mode

Table 9: Direct Link mode

10.3.6 Notes

- The escape sequence for the PS data mode with a L2 protocol different from the PPP is not ~+++, and it could be not supported. For more information, see the S2 notes if supported.

LEXI-R10

- S2 command is not supported and the escape sequence is fixed to "+++"
- On the AUX UART interface, the DTR line is always considered to ON state (even if the AUX UART interface does not support the DTR line).
- Setting a 5-wire UART configuration (for mode details, see the +USIO AT command), on the UART interface the DTR line is always considered to ON state (even if the UART interface does not support the DTR line).

10.4 Flow control &K

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

10.4.1 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

10.4.2 Syntax

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

10.4.3 Defined values

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

10.4.4 Notes

- The command handling is the same for <value> parameter 4, 5 or 6.

LEXI-R10

- The command setting is not stored in the personal profile but in NVM, individually for each AT interface.

10.5 DTE-DCE character framing +ICF

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

10.5.1 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 +ICF read command (and displayed in the current personal profile configuration where supported) but it has no meaning
- The command setting is ignored when the AT command interface runs on the USB or on the SPI interface

10.5.2 Syntax

Type	Syntax	Response	Example
Set	AT+ICF=[<format>[,<parity>]]	OK	AT+ICF=3,1

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

10.5.3 Defined values

Parameter	Type	Description
<format>	Number	• 0: auto detect • 1: 8 data 2 stop • 2: 8 data 1 parity 1 stop • 3: 8 data 1 stop • 4: 7 data 2 stops • 5: 7 bit, 1 parity, 1 stop • 6: 7 bit, 1 stop Allowed values: • LEXI-R10 - 1, 2, 3 (default and factory-programmed value), 4, 5, 6
<parity>	Number	• 0: odd • 1: even Allowed values: • LEXI-R10 - 0 (default and factory-programmed value), 1

10.5.4 Notes

LEXI-R10

- The command setting is not stored in the personal profile but in NVM, individually for each AT interface.
- Running the command on a CDC-ACM or MUX Virtual Channel interface will produce a successful result and the settings will be saved, however they will have no effect.
- The command setting is not displayed in the AT&V information text response.

10.6 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

10.6.1 Description

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

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.

10.6.2 Syntax

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

10.6.3 Defined values

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

10.6.4 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).

LEXI-R10

- The command setting is not stored in the personal profile but in NVM, individually for each AT interface.
- The command is accepted and stored to NVM, but has no effect if issued on CDC-ACM and MUX virtual interfaces.
- The SW flow control is not supported (<DCE_by_DTE> and <DTE_by_DCE> cannot be set to 1).

10.7 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

10.7.1 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.

10.7.2 Syntax

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

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

10.7.3 Defined values

Parameter	Type	Description
<rate>	Number	Allowed baud rates expressed in b/s (0, if present, means autobauding): • LEXI-R10 - 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 (default and factory-programmed value), 230400, 460800, 921600, 3000000

10.7.4 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.

LEXI-R10

- The command setting is not stored in the personal profile but in NVM, individually for each AT interface.
- Running the command on a CDC-ACM or MUX Virtual Channel interface will produce a successful result and the settings will be saved, however they will have no effect.
- The command setting is not displayed in the AT&V information text response.

10.8 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

10.8.1 Description

Causes the DCE to return to online data state and issue a CONNECT intermediate result code on DTE.

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.

10.8.2 Syntax

Type	Syntax	Response	Example
Action	ATO	<response>	ATO CONNECT

10.8.3 Defined values

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

10.8.4 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).

10.9 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

10.9.1 Description

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

10.9.2 Syntax

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

10.9.3 Defined values

Parameter	Type	Description
<value>	Number	• 0: echo off • 1 (default and the factory-programmed value): echo on

10.10 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

10.10.1 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.

10.10.2 Syntax

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

10.10.3 Defined values

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

10.11 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

10.11.1 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. See Information text responses and result codes for description of the result code formats.

10.11.2 Syntax

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

10.11.3 Defined values

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

10.12 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

10.12.1 Description

Resets the current profile to factory-programmed setting. 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, S4 AT commands) loaded from the factory-programmed profile. The other DCE settings are applied after the response has been sent.

LEXI-R10
For more details on the settings stored in the profiles, see the Parameters stored in profiles.

10.12.2 Syntax

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

10.12.3 Defined values

Parameter	Type	Description
<value>	Number	Only 0 allowed

10.13 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

10.13.1 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.

10.13.2 Syntax

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

10.13.3 Defined values

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

10.13.4 Notes

LEXI-R10

- Only <value>= 0 (default profile 0) is supported.
- Each AT interface has its own AT configuration in RAM mirror and NVM; NVM is updated (if changed) when the command is issued. Command performes the storage for every AT interface, regardless of the AT interface where it is issued.

10.14 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

10.14.1 Description

Reports a summary of the current configuration and of the stored user profiles.

10.14.2 Syntax

Type	Syntax	Response	Example
Action	AT&V	List of commands stored in the active profile with the related values OK	E: 0 Q: 0 +CREG: 0 +CEREG: 0 +CEDRXS: 0 +CSCON: 0 +CMGF: 1

Type	Syntax	Response	Example
			+CTZR: 0
			+CTZU: 1
			+CMEE: 2
			+UCESQS: 0
			+CGEREP: 0
			+UPSMR: 0
			+USIMSTAT: 0
			+UBIP: 0
			+UPDPADDR URC: 0
			+UPCFUN URC: 0
			+CSMS: 0
			+CSDH: 0
			+USLPURC: "SLEEP1":0,"SLEEP2":0 ,"HIBNATE":0
			&C: 0
			&D: 2
			+USMSFULL URC: 0
			+CNEC: 0
			+UCESQS: 0
			&F: 0
			&W: 0
			&K: 3
			OK

10.14.3 Notes

LEXI-R10

- Only the active profile is displayed, without tags. The AT command does not show the stored profile.
- AT&K setting is shown even if it is not part of the profile data that can be stored via AT&W.

11 SIM management

11.1 Generic SIM access +CSIM

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

11.1.1 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.

☞ LEXI-R10
It is recommended to disable the power saving with AT+UPSV=0 before sending a sequence of commands to the SIM card. The power saving can be re-enabled at the end.

11.1.2 Syntax

Type	Syntax	Response	Example
Set	AT+CSIM=<length>,<command>	+CSIM: <length>,<response> OK	AT+CSIM=14,"A0A40000027F20" +CSIM: 4,"6E00" OK
Test	AT+CSIM=?	OK	OK

11.1.3 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 [88] and ETSI TS 102 221 [167]
<response>	String	Response to the command passed on by the SIM to the MT (3GPP TS 51.011 [88] and ETSI TS 102 221 [167])

11.2 Restricted SIM access +CRSM

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

11.2.1 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 expected response time shall be increased when using a remote SIM card via SAP and in case of simultaneous access to the SIM by another AT interface or by internal clients (e.g. BIP, IMS).

☞ The command needs the SIM module to work correctly.

☞ LEXI-R10
It is recommended to disable the power saving with AT+UPSV=0 before sending a sequence of commands to the SIM card. The power saving can be re-enabled at the end.

11.2.2 Syntax

Type	Syntax	Response	Example
Set	AT+CRSM=<command>[,<fileid>[,<P1>,<P2>,<P3>[,<data> [,<pathid>]]]]	+CRSM: <sw1>,<sw2>[,<response>] OK	AT+CRSM=176,28471,0,0,3 +CRSM: 144,0,"989301770020594178F2" OK
Test	AT+CRSM=?	OK	OK

11.2.3 Defined values

Parameter	Type	Description
<command>	Number	Allowed commands: • 176: read binary • 178: read record • 192: get response • 203: retrieve data • 214: update binary • 219: set data • 220: update record • 242: status Allowed values: • LEXI-R10 - 176, 178, 192, 214, 220, 242
<fileid>	Number	Identifies an elementary datafile on SIM. Mandatory for each command except STATUS (e.g. 28423: meaning IMSI file (6F07)). For a complete description of Elementary Files (EF), see 3GPP TS 31.102 [89].
<P1>, <P2>, <P3>	Number	Defines the request. These parameters are mandatory for each command, except GET RESPONSE and STATUS. The values are described in 3GPP TS 51.011 [88] and ETSI TS 102 221 [167].
<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 [167] (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 [167].
<sw1>, <sw2>	Number	Contains SIM information about the execution of the actual command and can be (more details in 3GPP TS 51.011 [88] and ETSI TS 102 221 [167]). Status words examples for 2G SIM cards: • 0x90 0x00: normal ending of the command • 0x9F 0xXX: length XX of the response data • 0x92 0x0X: command successful but after using an internal retry routine X times • 0x92 0x40: memory problem • 0x94 0x00: no EF selected • 0x94 0x02: out of range (invalid address) • 0x94 0x04: file ID not found; pattern not found • 0x94 0x08: file is inconsistent with the command • 0x98 0x02: no CHV initialized • 0x98 0x04: access condition not fullfiled / unsucc. CHV verify / authent.failed • 0x98 0x08: in contradiction with CHV status • 0x98 0x10: in contradiction with invalidation status

Parameter	Type	Description
		• 0x98 0x40: unsucc. CHV-verif. or UNBLOCK CHV-verif. / CHV blocked / UNBL.blocked • 0x67 0xXX: incorrect parameter P3 • 0x6A 0x81: function not supported • 0x6A 0x82: file not found • 0x6B 0xXX: incorrect parameter P1 or P2 • 0x6D 0xXX: unknown instruction code given in the command • 0x6E 0xXX: wrong instruction class given in the command • 0x6F 0xXX: technical problem with no diagnostic given Status words examples for 3G SIM cards: • 0x90 0x00: normal ending of the command • 0x91 0xXX: length XX of the response data • 0x63 0xCX: command successful but after using an internal retry routine X times • 0x62 0x00: no information given, state of non volatile memory unchanged • 0x64 0x00: no information given, state of non-volatile memory unchanged • 0x65 0x00: no information given, state of non-volatile memory changed • 0x65 0x81: memory problem • 0x67 0x00: wrong length • 0x69 0x85: conditions of use not satisfied • 0x69 0x86: command not allowed (no EF selected) • 0x69 0x82: security status not satisfied • 0x62 0x81: part of returned data may be corrupted • 0x6A 0x81: function not supported • 0x6A 0x82: file not found • 0x6A 0x83: record not found • 0x6B 0x00: wrong parameter(s) P1, P2 • 0x6D 0x00: instruction code not supported or invalid • 0x6E 0x00: instruction code not supported or invalid • 0x6F 0x00: technical problem, no precise diagnosis
<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 3GPP TS 51.011 [88] and the ETSI TS 102 221 [167]). 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.

11.3 SIM hot insertion configuration +UDCONF=50

+UDCONF=50						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	full	No	NVM	No	-	+CME Error

11.3.1 Description

Configures the SIM hot insertion feature. The feature enables the SIM interface upon detection of external SIM card physical insertion / removal and behaves accordingly, triggering registration to / deregistration from the cellular network.

☞ The command setting is saved in NVM and will be effective at the next power on.

11.3.2 Syntax

Type	Syntax	Response	Example
Set	AT+UDCONF=50,<sim_hot_insertion>	OK	AT+UDCONF=50,1 OK
Read	AT+UDCONF=50	+UDCONF: 50,<sim_hot_insertion> OK	AT+UDCONF=50 +UDCONF: 50,1 OK

11.3.3 Defined values

Parameter	Type	Description
<sim_hot_insertion>	Number	SIM hot insertion setting. Allowed values: • 0 (factory-programmed value): SIM hot insertion disabled • 1: SIM hot insertion enabled

11.3.4 Notes

LEXI-R10

- For the correct behavior of the SIM hot insertion feature, the "SIM card detection" feature (configurable by means of the +UGPIOC AT command) must be enabled too.

11.4 Open logical channel +CCHO

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

11.4.1 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.

When the maximum number of logical channels have been opened (normally 3, 2 when the IMS client is active), the command provides an error result code.

LEXI-R10
The <sessionid> is to be used when sending commands with +CGLA AT command.

11.4.2 Syntax

Type	Syntax	Response	Example
Set	AT+CCHO=<dfname>	+CCHO: <sessionid> OK	AT+CCHO="A000000087100 4FF49FF0589" +CCHO: 11791 OK
Test	AT+CCHO=?	OK	

11.4.3 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.

11.5 Close logical channel +CCHC

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

11.5.1 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.

11.5.2 Syntax

Type	Syntax	Response	Example
Set	AT+CCHC=<sessionid>	+CCHC OK	AT+CCHC=11791 +CCHC OK
Test	AT+CCHC=?	OK	

11.5.3 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.

11.6 Generic UICC logical channel access +CGLA

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

11.6.1 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.

11.6.2 Syntax

Type	Syntax	Response	Example
Set	AT+CGLA=<sessionid>,<length>,<command>	+CGLA: <length>,<response> OK	
Test	AT+CGLA=?	OK	

11.6.3 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 [123] (hexadecimal character format; see +CSCS AT command)
<response>	String	Response to the command passed on by the UICC to the MT in the format as described in 3GPP TS 31.101 [123] (hexadecimal character format; see +CSCS AT command)

11.7 SIM states reporting +USIMSTAT

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

11.7.1 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).

11.7.2 Syntax

Type	Syntax	Response	Example
Set	AT+USIMSTAT=<mode>	OK	AT+USIMSTAT=3 OK
Read	AT+USIMSTAT?	+USIMSTAT: <mode> OK	+USIMSTAT: 3 OK
Test	AT+USIMSTAT=?	+USIMSTAT: (list of supported <mode>s) OK	+USIMSTAT: (0-7) OK
URC		+UUSIMSTAT: <state>	+UUSIMSTAT: 8

11.7.3 Defined values

Parameter	Type	Description
<mode>	Number	Bitmask representing which indications the +UUSIMSTAT URC is allowed to report. See Table 10 for the meaning of each bit. The factory-programmed value is 0.
<state>	Number	Indicates the SIM card initialization status, the phonebook initialization status and the REFRESH proactive command execution result: • 0: SIM card not present • 1: PIN needed • 2: PIN blocked • 3: PUK blocked • 4: (U)SIM not operational • 5: (U)SIM in restricted use (FDN or BDN active) • 6: (U)SIM operational (registration may be initiated) • 7: SIM phonebook ready to be used (when the SIM application is active)

Parameter	Type	Description
		• 8: USIM phonebook ready to be used (when the USIM application is active) • 9: (U)SIM toolkit REFRESH proactive command successfully concluded • 10: (U)SIM toolkit REFRESH proactive command unsuccessfully concluded • 11: PPP connection active, (U)SIM toolkit REFRESH proactive command delayed till PPP deactivation • 12: voice call active, (U)SIM toolkit REFRESH proactive command delayed till call release • 13: CSD call active, (U)SIM toolkit REFRESH proactive command delayed till call release • 14: eSIM operational (registration may be initiated) Allowed values: • LEXI-R10 - 0, 1, 2, 3, 4, 6, 14

11.7.4 Notes

- <state>=9 and 10 will not be reported when dedicated (+CFUN: 6) or raw (+CFUN: 9) mode is active.
- Table 10 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 and state 14 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 13 may be reported)

Table 10: <mode> bitmask meaning

LEXI-R10

- The command setting can be stored in the profiles. Refer to Appendix B.1 for additional details.

12 SIM toolkit

12.1 Introduction

SIM Application Toolkit (STK) is the 3GPP standard feature that allows the Subscriber Identity Module (SIM) to handle the DCE, by issuing commands such as sending SMS to the network, or triggering a SIM refresh, or asking for local information (e.g. Location, IMEI), and monitor its access to the cellular network, by configuring notifications for relevant events (envelopes).

The processing of SIM Application toolkit commands can be seamlessly performed by the DCE, or can be done by the host application by activating the SIM toolkit AT interface either in dedicated or in raw mode, where supported. In dedicated mode, the DTE is notified of STK commands and events after decoding; in raw mode the DTE is notified with the raw data as received from the SIM. Only one mode can be enabled and function at a time.

Most commands in this section (with the exception of +UBIP, +UCATPROF, +STKPROF, +CUSATW and +CUSATR AT commands, where supported) 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 the +CMEE is set to 2) is usually returned.

For more details on the SIM Application toolkit command description and parameters, see 3GPP TS 51.014 [103] and ETSI TS 102.223 [166].

☞ 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 SIM card can establish data sessions with a SIM OTA server using the the module's cellular connectivity by means of the Bearer Independent Protocol (BIP) feature.

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 supported and activated and the Open Channel command requires the user intervention (see ETSI TS 102 223 [166]).

12.2 Terminal profile +STKPROF

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

12.2.1 Description

Allows reading and changing the terminal profile (list of SIM Application Toolkit facilities supported by the terminal, see ETSI TS 102 223 [166]) data stored in NVM and used only at the SIM initialization. The SIM card may use this information to filter the proactive commands sent to the module. This command does not actually remove/add any functionality from/to the module.

12.2.2 Syntax

Type	Syntax	Response	Example
Set	AT+STKPROF=<length>,<data>	OK	AT+STKPROF=2,"1F7F" OK

Type	Syntax	Response	Example
Read	AT+STKPROF?	+STKPROF: <length>,<data> OK	+STKPROF:17,"FFFFFFFF7F0300DF7F000000000010A0003" OK
Test	AT+STKPROF=?	OK	

12.2.3 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

12.2.4 Notes

LEXI-R10

- The set command is allowed also if the SIM card is not inserted or the PIN is not inserted.

12.3 Bearer Independent Protocol status indication +UBIP

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

12.3.1 Description

Configures the Bearer Independent Protocol status indication, i.e. the +UUBIP URC presentation.

☞ The channel status event provides information about the link status and its drop, therefore it is advisable to enable it where available.

☞ LEXI-R10
The command setting is stored in the personal profile.

12.3.2 Syntax

Type	Syntax	Response	Example
Set	AT+UBIP=<mode>	OK	AT+UBIP=1 OK
Read	AT+UBIP?	+UBIP: <mode> OK	+UBIP: 0 OK
Test	AT+UBIP=?	+UBIP: (list of supported <mode>'s) OK	+UBIP: (0,1) OK
URC		+UUBIP: <ev_cmd>,<val>	+UUBIP: 10,261

12.3.3 Defined values

Parameter	Type	Description
<mode>	Number	Indicates whether the +UUBIP URC is enabled or not: • 0 (factory-programmed value): BIP status indication disabled • 1: BIP status indication enabled • 2: OPEN CHANNEL, CLOSE CHANNEL and CHANNEL STATUS EVENT status indications enabled Allowed values: • LEXI-R10 - 0, 1
<ev_cmd>	Number	Indicates the event download's tag or proactive command's tag. Allowed values:

Parameter	Type	Description
		• 10: Channel status event • 64: Open channel proactive command • 65: Close channel proactive command • 66: Receive data proactive command • 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 [166])

12.3.4 Notes

LEXI-R10

- <ev_cmd>=10 and 66 are not supported.

13 Packet switched data services

13.1 PDP contexts and parameter definition

13.1.1 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 [82].

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.

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). 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. 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.

LEXI-R10
At most 1 PDP context can be used with dial-up.

13.1.2 Multiple PDP contexts

LEXI-R10
The section does not apply to this module series.

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 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 an internal PDP context is supported. This IP instance supports up to 7 sockets;
- The sum of active external and internal PDP contexts cannot exceed the maximum number of active PDP contexts indicated in the <cid> parameter description;

- Using external PDP contexts via dial-up, it is usually possible to have at most 3 PPP instances simultaneously active.

13.1.3 Parameter definition

13.1.3.1 <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 Gateway GPRS Support Node (GGSN) or the external packet data network to be connected to.

The APN can be omitted: this is the so-called "blank APN" setting, which may be required by some mobile network operators; in this case the APN string is not included in the message sent to the network, which will provide the module with the assigned APN in the message response. When "blank APN" is used by the module, some mobile network operators do not provide a valid APN and assign an "anchor" or "default" APN, which does not allow bi-directional traffic with the packet data network: in these cases the network specific APN shall be known in advance and defined before establishing the PDP context/PDN connection.

The maximum length of the parameter is:

- LEXI-R10 - 99 characters (the maximum length of coded APN is 100 octets, see 3GPP TS 23.003 [141], subclause 9.1)

13.1.3.2 <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(s) on the product version:[1]

Product	Max number of definable PDP contexts	Max number of active PDP contexts
LEXI-R10	15	3

13.1.3.3 <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.

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"

LEXI-R10
In AT+CGDCONT set command, the parameter is ignored.

13.1.3.4 <PDP_type>

The Packet Data Protocol (PDP) type is a string parameter which specifies the type of packet data protocol:

- "IP": Internet Protocol (IETF STD 5)
- "Non-IP": Non IP
- "IPV4V6": virtual <PDP_type> introduced to handle dual IP stack UE capability (see the 3GPP TS 24.301 [119])
- "IPV6": Internet Protocol, version 6 (see RFC 2460 [176])

LEXI-R10

[1] The maximum number of active PDP contexts may be limited by the MNO

<PDP_type>="Non-IP" is not supported.

13.2 PPP LCP handshake behavior

When a data call is initiated by means of D* AT 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 behavior of module series differ between them.

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.

13.3 PDP context definition +CGDCONT

+CGDCONT						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	partial	Yes	NVM / OP	No	-	+CME Error

13.3.1 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.

Usage of static i.e. user defined IP address is possible in UTRAN and GERAN but not in EUTRAN; to prevent inconsistent addressing methods across various RATs, static IP addressing is not recommended for LTE modules: 3GPP TS 23.060 [82] Rel.8 and later releases specify that a UE with EUTRAN/UTRAN/GERAN capabilities shall not include a static PDP address in PDP context activation requests.

The information text response to the read command provides the configuration of all the PDP context / EPS bearers that have already been defined. The test command returns a different row for each <PDP_type> value supported by the module.

LEXI-R10
For initial default EPS bearer, when defining context authentication parameters username/password with +CGAUTH AT command, the <secure_PCO> flag must be set.

13.3.2 Syntax

Type	Syntax	Response	Example
Set	AT+CGDCONT=[<cid>[,<PDP_type>[,<APN>[,<PDP_addr>[,<d_comp>[,<h_comp>[,<IPv4AddrAlloc>[,<request_type>[,<P-CSCF_discovery>[,<IM_CN_Signalling_Flag_Ind>[,<NSLPI>[,<secure_PCO>[,<IPv4_MTU_discovery>[,<Local_Addr_Ind>[,<Non_IP_MTU_discovery>]]]]]]]]]]]]]]]	OK	**IPv4 example** AT+CGDCONT=1,"IP","APN_name","1.2.3.4",0,0 OK **IPv4v6 example** 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 OK **IPv6 example** AT+CGDCONT=1,"IPV6","APN","0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0",0,0 OK

Type	Syntax	Response	Example
Read	AT+CGDCONT?	+CGDCONT: <cid>,<PDP_type>,<APN>,<PDP_addr>,<d_comp>,<h_comp>[,<IPv4AddrAlloc>,<request_type>,<P-CSCF_discovery>,<IM_CN_Signalling_Flag_Ind>[,<NSLPI>[,<secure_PCO>[,<IPv4_MTU_discovery>[,<Local_Addr_Ind>[,<Non_IP_MTU_discovery>]]]]]] [+CGDCONT: <cid>,<PDP_type>,<APN>,<PDP_addr>,<d_comp>,<h_comp>[,<IPv4AddrAlloc>,<request_type>,<P-CSCF_discovery>,<IM_CN_Signalling_Flag_Ind>[,<NSLPI>[,<secure_PCO>[,<IPv4_MTU_discovery>[,<Local_Addr_Ind>[,<Non_IP_MTU_discovery>]]]]]]] OK	+CGDCONT: 1,"IP","web.omnitel.it","91.80.140.199",0,0,0,2,0,0,0,0,0,0 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>s),(list of supported <request_type>s),(list of supported <P-CSCF_discovery>s),(list of supported <IM_CN_Signalling_Flag_Ind>s),(list of supported <NSLPI>s),(list of supported <secure_PCO>s),(list of supported <IPv4_MTU_discovery>s),(list of supported <Local_Addr_Ind>s),(list of supported <Non_IP_MTU_discovery>s) [+CGDCONT: (list of supported <cid>s),<PDP_type>,,,(list of supported <d_comp>s),(list of supported <h_comp>s),(list of supported <IPv4AllocAddr>s),(list of supported <request_type>s),(list of supported <P-CSCF_discovery>s),(list of supported <IM_CN_Signalling_Flag_Ind>s),(list of supported <NSLPI>s),(list of supported <secure_PCO>s),(list of supported <IPv4_MTU_discovery>s),(list of supported <Local_Addr_Ind>s),(list of supported <Non_IP_MTU_discovery>s)] OK	+CGDCONT: (0-11),"IP",,,(0-2),(0-4),(0,1),(0,3),(0,1),(0,1),(0,1),(0,1),(0,1),(0,1),(0,1),(0,1) +CGDCONT: (0-11),"IPV6",,,(0-2),(0-4),(0,1),(0,3),(0,1),(0,1),(0,1),(0,1),(0,1),(0,1),(0,1),(0,1) +CGDCONT: (0-11),"IPV4V6",,,(0-2),(0-4),(0,1),(0,3),(0,1),(0,1),(0,1),(0,1),(0,1),(0,1),(0,1),(0,1) +CGDCONT: (0-11),"Non-IP",,,(0-2),(0-4),(0,1),(0,3),(0,1),(0,1),(0,1),(0,1),(0,1),(0,1),(0,1),(0,1) OK

13.3.3 Defined values

Parameter	Type	Description
<cid>	Number	See <cid>. The default value is 1.
<PDP_type>	String	See <PDP_type>. The default value is "IP".

Parameter	Type	Description
<APN>	String	See <APN>. The default value is "" (blank APN).
<PDP_addr>	Number	See <PDP_addr>. The default value is "0.0.0.0"
<d_comp>	Number	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 • 3: V.44
<h_comp>	Number	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 ☞ <h_comp>: the available head-compressions are dependent on configuration of the stack (configured via features in the stack)
<IPv4AddrAlloc>	Number	Controls how the MT/TA requests to get the IPv4 address information: • 0 (default value): IPv4 Address Allocation through NAS Signalling • 1: IPv4 Address Allocated through DHCP
<emergency_ indication>	Number	Indicates whether the PDP context is for emergency bearer services or not: • 0 (default value): PDP context is not for emergency bearer services • 1: PDP context is for emergency bearer services
<request_type>	Number	Indicates the type of PDP context activation request for the PDP context: • 0: PDP context is for new PDP context establishment or for handover from a non-3GPP access network (how the MT decides whether the PDP context is for new PDP context establishment or for handover is implementation specific) • 1: PDP context is for emergency bearer services • 2 (default value): PDP context is for new PDP context establishment • 3: PDP context is for handover from a non-3GPP access network
<P-CSCF_discovery>	Number	Influences how the MT/TA requests to get the P-CSCF address, see 3GPP TS 24.229 [130] annex B and annex L: • 0 (default value): preference of P-CSCF address discovery not influenced by +CGDCONT • 1: preference of P-CSCF address discovery through NAS Signalling • 2: preference of P-CSCF address discovery through DHCP
<IM_CN_Signalling_ Flag_Ind>	Number	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
<NSLPI>	Number	Indicates the NAS signalling priority requested for the corresponding PDP context: • 0 (default value): indicates that the PDP context has to be activated with the value for the low priority indicator configured in the MT. • 1: indicates that the PDP context has to be activated with the value for the low priority indicator set to "MS is not configured for NAS signalling low priority". The MT utilises the NSLPI information provided as specified in 3GPP TS 24.301 [119] and 3GPP TS 24.008 [84].
<secure_PCO>	Number	Specifies if security protected transmission of PCO is requested or not (applicable for EPS only): • 0 (default value): Security protected transmission of PCO is not requested. • 1: Security protected transmission of PCO is requested.
<IPv4_MTU_ discovery>	Number	Influences how the MT/TA requests to get the IPv4 MTU size: • 0 (default value): Preference of IPv4 MTU size discovery not influenced by +CGDCONT. • 1: Preference of IPv4 MTU size discovery through NAS signalling.
<Local_Addr_Ind>	Number	Indicates to the network whether or not the MS supports local IP address in TFTs: • 0 (default value): indicates that the MS does not support local IP address in TFTs. • 1: indicates that the MS supports local IP address in TFTs.
<Non_IP_MTU_ discovery>	Number	Influences how the MT/TA requests to get the Non-IP MTU size (for more details, see 3GPP TS 24.008 [84]):

Parameter	Type	Description
		• 0 (default value): preference of Non-IP MTU size discovery not influenced by +CGDCONT. • 1: preference of Non-IP MTU size discovery through NAS signalling.

13.3.4 Notes

Additional examples:

Command	Response	Description
		Configure the error result code format by means of the +CMEE AT command
AT+CGDCONT=?	+CGDCONT: (1-3),"IP",,,(0),(0-1) 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","tim.ibox.it"	OK	Define allowed PDP contexts
AT+CGDCONT=253,"IP","internet"	+CME ERROR: operation not allowed	Define out of range PDP contexts
AT+CGDCONT?	+CGDCONT: 2,"IP","internet","0.0.0.0",0,0 +CGDCONT: 1,"IP","STATREAL","0.0.0.0",0,0 +CGDCONT: 3,"IP","tim.ibox.it","0.0.0.0",0,0 OK	Read command

LEXI-R10

- The PIN insertion is not mandatory before the command execution.
- <request_type> allowed values are 0, 1 and 2.
- The <IM_CN_Signalling_Flag_Ind> allowed value is 0.
- The <PDP_addr>, <d_comp>, <h_comp>, <Local_Addr_Ind> and <Non_IP_MTU_discovery> parameters in AT+CGDCONT set command are ignored.
- The <IPv4AddrAlloc> parameter in AT+CGDCONT set command is ignored when <PDP_type> is "IPV6".
- Undefining an active PDP context is not allowed. If a PDP context is defined with the same settings several times, the same number of AT+CGDCONT=<cid> AT commands shall be issued to undefine it.

13.4 Default CID and preferred protocol type configuration +UDCONF=19

+UDCONF=19						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	full	Yes	NVM	No	-	+CME Error

13.4.1 Description

Specifies the default internal PDP context ID and the preferred IP type. If not explicitly specified otherwise, these parameters are used by internal applications that require IP connectivity, e.g., MQTT and HTTP.

☞ Reboot the module (e.g. by means of the AT+CFUN=15/AT+CFUN=16 command) to make the change effective.

☞ The read command reports the current effective setting.

13.4.2 Syntax

Type	Syntax	Response	Example
Set	AT+UDCONF=19,<cid>,<preferred_protocol_type>	OK	AT+UDCONF=19,1,0 OK
Read	AT+UDCONF=19	+UDCONF: 19,<cid>,<preferred_protocol_type> OK	AT+UDCONF=19 +UDCONF: 19,2,1 OK

13.4.3 Defined values

Parameter	Type	Description
<cid>	Number	Internal PDP context identifier used by default by AT commands. For the parameter allowed range, see <cid>. The factory-programmed value is 1.
<preferred_protocol_type>	Number	Preferred protocol type to be specified when the <cid> protocol type is IPv4v6. Allowed values: • 0 (factory-programmed value): IPv4 • 1: IPv6

13.5 PS 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	Appendix B.4	+CME Error

13.5.1 Description

Register (attach) the MT to, or deregister (detach) the MT from the packet switched (PS) services. 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 PS registration state changes to detached.

☞ The user should not enter colliding requests (e.g. AT+CGATT=1 and AT+CGATT=0) on different communication ports, because this might cause interoperability issues if overlapping attach and detach requests are not handled by the network, and could result in an unpredictable registration state. Similarly, when notified of a mobile terminated detach event (e.g. via +CGEV URC), it is recommended to wait a few seconds before entering AT+CGATT=0 in order to let the pending attach procedure (automatically triggered by the module in most cases) successfully end.

☞ The deregistration action is carried out even if the command is aborted.

13.5.2 Syntax

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

13.5.3 Defined values

Parameter	Type	Description
<state>	Number	Indicates the state of GPRS attachment: • 0: detached • 1 (default value): attached

13.6 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	Appendix B.4	+CME Error

13.6.1 Description

Activates or deactivates the specified PDP context. After the command, the MT remains in AT command mode. If any context is already in the requested state, the state for the context remains unchanged. If the required action cannot succeed, an error 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 then attempts to activate the specified context.

The maximum expected response time is different whenever the activation or the deactivation of a PDP context is performed: for more details, see Estimated command response time.

13.6.2 Syntax

Type	Syntax	Response	Example
Set	AT+CGACT=[<status>[,<cid>[,...]]]	OK	AT+CGACT=1,1 OK
Read	AT+CGACT?	[+CGACT: <cid>,<status> [+CGACT: <cid>,<status> [...]]] OK	+CGACT: 1,1 OK
Test	AT+CGACT=?	+CGACT: (list of supported <status>s) OK	+CGACT: (0-1) OK

13.6.3 Defined values

Parameter	Type	Description
<status>	Number	Indicates the state of PDP context activation: • 0: deactivated • 1: activated
<cid>	Number	See <cid>.

13.6.4 Notes

LEXI-R10

- If AT+CGACT=1,<cid> is issued multiple times on the same active <cid>, before being able to deactivate it the same number of AT+CGACT=0,<cid> AT commands shall be issued and the error result code "+CME ERROR: CID active counter value greater than ZERO" will be returned.

13.7 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	Appendix B.4	+CME Error

13.7.1 Description

The V.24 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:

- Sending the escape sequence "+++" or "~+++" (see &D where supported).
- Via a DTR transition from ON to OFF (see &D where supported).
- Sending an LCP Terminate Request.

13.7.2 Syntax

Type	Syntax	Response	Example
Set	ATD[<dialing_type_char>]*<dialing_number>[*[<address>][*[<L2P>][*[<cid>]]]]#	CONNECT (data transfer starts)	ATD*99***1# CONNECT

13.7.3 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	Layer 2 protocol to be used between the DTE and MT; allowed values: • "PPP" (default value) • "M-HEX" • "M-RAW_IP" • "M-OPT-PPP" The application on the remote side must support the selected protocol as well.
<cid>	Number	See <cid>

13.7.4 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***#.

13.8 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

13.8.1 Description

Returns a list of PDP addresses for the specified context identifiers. Only defined PDP contexts are displayed.

If the <cid> parameter is omitted, the addresses for all defined contexts are returned.

13.8.2 Syntax

Type	Syntax	Response	Example
Set	AT+CGPADDR=[<cid>[,<cid> [,...]]]	+CGPADDR: <cid>,<PDP_addr>	AT+CGPADDR=1
		[+CGPADDR: <cid>,<PDP_addr>	+CGPADDR: 1,"1.2.3.4"
		[...]]	OK
		OK	
Test	AT+CGPADDR=?	+CGPADDR: [(list of defined <cid>s)]	+CGPADDR: 1,3
		OK	OK

13.8.3 Defined values

Parameter	Type	Description
<cid>	Number	See <cid>
<PDP_addr>	Number	See <PDP_addr>

13.9 Packet switched event reporting +CGEREP

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

13.9.1 Description

Configures sending of URCs from MT to the DTE, if certain events occur in the packet switched MT or the network. By the <mode> parameter, it is possible to control the processing of the URCs codes specified within this command. The <bfr> parameter controls the effect on buffered codes when the <mode> parameter is set to 1 (discard URCs when V.24 link is reserved) or 2 (buffer URCs in the MT when link reserved and flush them to the DTE when the link becomes available).

13.9.2 Syntax

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

Type	Syntax	Response	Example
URC		+CGEV: ME PDN ACT <cid>[,<reason>[,<cid_other>]]	+CGEV: NW CLASS "CC"
		+CGEV: ME ACT <p_cid>,<cid>,<event_type>	
		+CGEV: ME PDN DEACT <cid>	
		+CGEV: PDN DEACT <cid>	
		+CGEV: ME DEACT <PDP_type>,<PDP_addr>,[<cid>]	
		+CGEV: ME DEACT,<p_cid>,<cid>,0	
		+CGEV: ME DEACT <p_cid>,<cid>,<event_type>	
		+CGEV: ME MODIFY <cid>,<change_reason>,<event_type>	
		+CGEV: ME DETACH	
		+CGEV: ME CLASS <class>	
		+CGEV: NW PDN ACT <cid>[,<reason>]	
		+CGEV: NW ACT <p_cid>,<cid>,<event_type>	
		+CGEV: NW PDN DEACT <cid>	
		+CGEV: NW DEACT <p_cid>,<cid>,0	
		+CGEV: NW DEACT <p_cid>,<cid>,<event_type>	
		+CGEV: NW DEACT <PDP_type>,<PDP_addr>,[<cid>]	
		+CGEV: NW MODIFY <cid>,<change_reason>,<event_type>	
		+CGEV: NW DETACH	
		+CGEV: NW CLASS <class>	
		+CGEV: VZW_SUBS_ACTION_NORMAL (0) - No restriction to data traffic	
		+CGEV: REJECT <PDP_type>,<PDP_addr>	
		+CGEV: NW REACT <PDP_type>,<cid>	
		+CGEV: NW ACT <PDP_type>,<cid>	

13.9.3 Defined values

Parameter	Type	Description
<mode>	Number	Controls the processing of URCs specified within this command. Allowed values: • 0 (default value): buffer URCs in the MT; if the buffer is full the oldest ones will be discarded • 1: discard URCs when V.24 link is reserved (online); otherwise forward them directly to the DTE • 2: buffer URCs in the MT when link reserved (online) and flush them to the DTE when the link becomes available; otherwise forward them directly to the DTE
<bfr>	Number	Controls the effect on buffered codes when <mode> 1 or 2 is entered. Allowed values: • 0 (default value): MT buffer of URCs defined within this command is cleared when <mode> 1 or 2 is entered • 1: MT buffer of URCs defined within this command is flushed to the DTE when <mode> 1 or 2 is entered (OK is given before flushing the codes)

Parameter	Type	Description
<cid>	Number	See <cid>
<reason>	Number	Indicates whether the reason why the context activation request for PDP type IPv4v6 was not granted: • 0: IPv4 only allowed • 1: IPv6 only allowed • 2: single address bearers only allowed • 3: single address bearers only allowed and MT initiated context activation for a second address type bearer was not successful
<cid_other>	Number	Indicates whether the context identifier allocated by MT for an MT initiated context of a second address type
<p_cid>	Number	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.
<event_type>	Number	Indicates whether the event is informational or whether the TE has to acknowledge it: • 0: informational event • 1: information request: acknowledgement required
<change_reason>	Number	Indicates what kind of change occurred: • 1: TFT only changed • 2: QoS only changed • 3: both TFT and QoS changed
<PDP_type>	Number	See <PDP_type>
<PDP_addr>	Number	See <PDP_addr>
<class>	String	GPRS mobile class. Allowed values: • "A": class A mode of operation (A/Gb mode), or CS/PS mode of operation (Iu mode) (highest mode of operation) • "B": class B (circuit-switched and packet-switched data alternatively supported) • "CG": class C (one service only) in GPRS mode • "CC": class C (one service only) in circuit-switched (GSM) mode

13.9.4 Notes

LEXI-R10

- <mode>= 2 is not supported.
- <bfr>= 1 is not supported.

13.9.5 Explanation of URCs

URC	Remarks
+CGEV: ME PDN ACT <cid>[,<reason>[,<cid_other>]]	The MT has activated a primary context.
+CGEV: ME ACT <p_cid>,<cid>,<event_type>	The network has responded to a MT initiated secondary context activation.
+CGEV: ME PDN DEACT <cid>	The MT has forced a primary context deactivation.
+CGEV: PDN DEACT <cid>	A primary context deactivation has been forced either by the MT or by the network.
+CGEV: ME DEACT <PDP_type>,<PDP_addr>,[<cid>]	The MT has forced a context deactivation.
+CGEV: ME DEACT,<p_cid>,<cid>,0	The UE has forced a secondary context deactivation.
+CGEV: ME DEACT <p_cid>,<cid>,<event_type>	The MT has forced a secondary context deactivation.
+CGEV: ME MODIFY <cid>,<change_reason>,<event_type>	The MT has forced a context modification.
+CGEV: ME DETACH	The mobile station has forced a GPRS detach
+CGEV: ME CLASS <class>	The mobile station has forced a change of MT class; the highest available class is reported.
+CGEV: NW PDN ACT <cid>[,<reason>]	The network has activated a primary context.

URC	Remarks
+CGEV: NW ACT <p_cid>,<cid>,<event_type>	The network has forced a secondary context activation.
+CGEV: NW PDN DEACT <cid>	The network has forced a primary context deactivation.
+CGEV: NW DEACT <p_cid>,<cid>,0	The network has forced a secondary context deactivation.
+CGEV: NW DEACT <p_cid>,<cid>,<event_type>	The network has forced a secondary context deactivation.
+CGEV: NW DEACT <PDP_type>,<PDP_addr>,[<cid>]	The network has forced a context deactivation.
+CGEV: NW MODIFY <cid>,<change_reason>,<event_type>	The network has forced a context modification.
+CGEV: NW DETACH	The network 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: VZW_SUBS_ACTION_NORMAL (0) - No restriction to data traffic	No restriction to data traffic. The URC is provided only on Verizon network.
+CGEV: REJECT <PDP_type>,<PDP_addr>	The context activation is rejected.
+CGEV: NW REACT <PDP_type>,<cid>	The network has forced a context re-activation.
+CGEV: NW ACT <PDP_type>,<cid>	The network has forced a context activation.

13.10 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	+CME Error

13.10.1 Description

Deactivates an active PDP context with PPP L2 protocol in online command mode. The MT responds with a final result code. For a detailed description, see the H command description. For additional information about OLCM, see the AT command settings .

☞ In GPRS online command mode, entered by typing the escape sequence "+++" or "~+++" (see &D), the ATH command is needed to terminate the connection. Alternatively, in data transfer mode, DTE originated DTR toggling or PPP disconnection may be used.

13.10.2 Syntax

Type	Syntax	Response	Example
Action	ATH	OK	

13.11 PDP context modify +CGCMOD

+CGCMOD						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	partial	Yes	No	No	Appendix B.4	+CME Error

13.11.1 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.

13.11.2 Syntax

Type	Syntax	Response	Example
Set	AT+CGCMOD=[<cid>[,<cid>[,,...]]]	OK	AT+CGCMOD=1

Type	Syntax	Response	Example
			OK
Test	AT+CGCMOD=?	+CGCMOD: (list of <cid>s with active contexts) OK	

13.11.3 Defined values

Parameter	Type	Description
<cid>	Number	See <cid>.

13.11.4 Notes

LEXI-R10

- The PIN insertion is not mandatory before the command execution.

13.12 Define secondary PDP context +CGDSCONT

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

13.12.1 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.

13.12.2 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 OK
Read	AT+CGDSCONT?	+CGDSCONT: <cid>,<p_cid>,<d_comp>,<h_comp>[,<IM_CN_Signalling_Flag_Ind>] [+CGDSCONT: <cid>,<p_cid>,<d_comp>,<h_comp>[,<IM_CN_Signalling_Flag_Ind>] [...]] OK	+CGDSCONT: 2,1,0,0,0 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>)] OK	+CGDSCONT: (1-8),(4,8),(0-2),(0-2),(0-1) OK

13.12.3 Defined values

Parameter	Type	Description
<cid>	Number	See <cid>
<p_cid>	Number	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.
<d_comp>	Number	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
<h_comp>	Number	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 ☞ <h_comp> the available head-compressions is depending on configuration of the stack (configured via features in the stack)
<IM_CN_Signalling_Flag_Ind>	Number	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

13.12.4 Notes

LEXI-R10

- The PIN insertion is not mandatory before the command execution.
- The set command is accepted when the <p_cid> is defined and activated via the +CGDCONT and +CGACT AT commands respectively.
- The read command returns a response when the parameters are configured successfully via the set command, otherwise an error result code is returned.

13.13 UE modes of operation for EPS +CEMODE

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

13.13.1 Description

Sets the MT to operate according to the specified mode of operation for EPS, see 3GPP TS 24.301 [119]. 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 [117], 3GPP TS 34.121-2 [118], 3GPP TS 36.521-2 [139] and 3GPP TS 36.523-2 [140], 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.

13.13.2 Syntax

Type	Syntax	Response	Example
Set	AT+CEMODE=[<mode>]	OK	AT+CEMODE=1 OK
Read	AT+CEMODE?	+CEMODE: <mode> OK	+CEMODE: 1 OK
Test	AT+CEMODE=?	+CEMODE: (list of supported <mode>'s) OK	+CEMODE: (0-3) OK

13.13.3 Defined values

Parameter	Type	Description
<mode>	Number	Mode configuration: • 0: PS mode 2 of operation. The UE registers only to EPS services, and the UE's usage setting is "data centric" • 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" • 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" • 3: PS mode 1 of operation. The UE registers only to EPS services, and the UE's usage setting is "voice centric"

13.13.4 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 [119].

13.14 EPS network registration status +CEREG

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

13.14.1 Description

Configures the network registration URC related to EPS domain. 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

- +CEREG: <stat>[,[<tac>],[<ci>],[<AcT>][,,[,[<Assigned_Active_Time>,[<Assigned_Periodic_TAU>]]]]] when <n>=4 if there is a change of the network cell in E-UTRAN
- +CEREG: <stat>[,[<tac>],[<ci>],[<AcT>][,[<cause_type>],[<reject_cause>][,[<Assigned_Active_Time>,[<Assigned_Periodic_TAU>]]]]] when <n>=5 and the value of <stat> changes

The parameters <AcT>, <tac>, <rac_or_mme>, <ci>, <cause_type>, <reject_cause>, <Assigned_Active_Time> and <Assigned_Periodic_TAU> are provided only if available.

The read command returns always at least the mode configuration (<n>), the EPS registration status (<stat>). The location parameters <tac>, <rac_or_mme>, <ci> and <AcT>, if available, are returned only when <n>=2, <n>=3, <n>=4 or <n>=5 and the MT is registered with the network. The parameters <cause_type>, <reject_cause>, if available, are returned when <n>=3 or <n>=5. The PSM related parameter <Assigned_Active_Time> is returned only when <n>=4 or <n>=5, the MT is registered with the network and PSM is granted by the network. The <Assigned_Periodic_TAU> parameter is returned only if when <n>=4 or <n>=5, the MT is registered with the network and an extended periodic TAU value (T3412_ext) is assigned.

13.14.2 Syntax

Type	Syntax	Response	Example
Set	AT+CEREG=[<n>]	OK	AT+CEREG=1 OK
Read	AT+CEREG?	+CEREG: <n>,<stat>[,[<tac>],[<ci>],[<AcT>[,[<cause_type>],[<reject_cause>][,[<Assigned_Active_Time>,[<Assigned_Periodic_TAU>]]]]]] OK	+CEREG: 2,1,"3a9b","0000c33d",7 OK
Test	AT+CEREG=?	+CEREG: (list of supported <n>s) OK	+CEREG: (0-4) OK
URC		+CEREG: <stat>[,[<tac>],[<ci>],[<AcT>][,[<cause_type>],[<reject_cause>][,[<Assigned_Active_Time>,[<Assigned_Periodic_TAU>]]]]]	+CEREG: 1,"3a9b","0000c33d",7

13.14.3 Defined values

Parameter	Type	Description
<n>	Number	Mode configuration: • 0: network registration URC disabled • 1: network registration URC +CEREG: <stat> enabled • 2: network registration and location information URC +CEREG: <stat>[,[<tac>],[<ci>],[<AcT>]] enabled • 3: network registration, location information and EMM cause value information URC +CEREG: <stat>[,[<tac>],[<ci>],[<AcT>][,<cause_type>,<reject_cause>]] enabled • 4: PSM, network registration and location information information URC +CEREG: <stat>[,[<tac>],[<ci>],[<AcT>][,,[,[<Assigned_Active_Time>[,<Assigned_Periodic_TAU>]]]]] enabled • 5: PSM, network registration, location information and EMM cause value information URC +CEREG: <stat>[,[<tac>],[<ci>],[<AcT>][,[<cause_type>],[<reject_cause>][,[<Assigned_Active_Time>,[<Assigned_Periodic_TAU>]]]]] enabled Allowed values: • LEXI-R10 - 0 (default value), 1, 2, 3, 4, 5
<stat>	Number	EPS registration status: • 0: not registered • 1: registered, home network • 2: not registered, but the MT is currently trying to attach or searching an operator to register to

Parameter	Type	Description
		• 3: registration denied • 4: unknown (e.g. out of E-UTRAN coverage) • 5: registered, roaming • 8: attached for emergency bearer services only (see 3GPP TS 24.008 [84] and 3GPP TS 24.301 [119] that specify the condition when the MS is considered as attached for emergency bearer services) Allowed values: • LEXI-R10 - 0, 1, 2, 3, 4, 5
<tac>	String	Two bytes tracking area code in hexadecimal format
<ci>	String	Four bytes E-UTRAN cell-id in hexadecimal format
<AcT>	Number	Access technology of the serving cell: • 0: GSM • 3: GSM/GPRS with EDGE availability • 7: E-UTRAN (see 3GPP TS 44.060 [120] that specifies the System Information messages which give the information about whether the serving cell supports EGPRS) • 8: E-UTRAN EC-GSM-IoT (A/Gb mode) • 9: E-UTRAN NB-IoT Allowed values: • LEXI-R10 - 7
<cause_type>	Number	<reject_cause> type: • 0: indicates that <reject_cause> contains an EMM cause value, see 3GPP TS 24.301 [119] Annex A • 1: indicates that <reject_cause> contains a manufacture-specific cause Allowed values: • LEXI-R10 - 0
<reject_cause>	Number	Cause of the failed registration. The value is of type as defined by <cause_type>
<Assigned_Active_Time>	String	One byte in an 8 bit format. Assigned Active Time value (T3324) allocated to the UE. The assigned Active Time value is coded as one byte (octet 3) of the GPRS Timer 2 information element coded as bit format (e.g. "00100100" equals 4 minutes). For the coding and the value range, see the GPRS Timer 2 IE in 3GPP TS 24.008 table 10.5.163/3GPP TS 24.008 [84]. See also 3GPP TS 23.682 [159], 3GPP TS 23.060 [82]) and 3GPP TS 23.401 [160].
<Assigned_Periodic_TAU>	String	One byte in an 8 bit format. Assigned extended periodic TAU value (T3412_ext) allocated to the UE. The assigned extended periodic TAU value is coded as one byte (octet 3) of the GPRS Timer 3 information element coded as bit format (e.g. "01000111" equals 70 hours). For the coding and the value range, see the GPRS Timer 3 IE in 3GPP TS 24.008 table 10.5.163a/3GPP TS 24.008 [84]. See also 3GPP TS 23.682 [159] and 3GPP TS 23.401 [160].
<rac_or_mme>	String	RAC (Routing Area Code) or MME Code (Mobile Management Entity) in hexadecimal format

13.14.4 Notes

LEXI-R10

- If <stat>=0 the MT is not registered and it does not search an operator to register to.

13.15 Define EPS quality of service +CGEQOS

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

13.15.1 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 [119] and 3GPP TS 23.203 [122]). 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.

13.15.2 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 OK
Read	AT+CGEQOS?	[+CGEQOS: <cid>,<QCI>,[<DL_GBR>,<UL_GBR>],[<DL_MBR>,<UL_MBR>]] [+CGEQOS: <cid>,<QCI>,[<DL_GBR>,<UL_GBR>],[<DL_MBR>,<UL_MBR>] [...]] OK	+CGEQOS: 1,1,2500,7000,2500,7000 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) OK	+CGEQOS: (1-8),(0-9),(0-5000),(0-21000),(0-5000),(0-21000) OK

13.15.3 Defined values

Parameter	Type	Description
<cid>	Number	See <cid>.
<QCI>	Number	Specifies a class of EPS QoS (see 3GPP TS 24.301 [119]): • 0: QCI is selected by network • 1-4: value range for guaranteed bit rate traffic flows • 5-9: value range for non-guaranteed bit rate traffic flows • 75: value for guaranteed bit rate traffic flows • 79: value for non-guaranteed bit rate traffic flows • 128-254: value range for Operator-specific QCIs Allowed values: • LEXI-R10 - 0, 1-4, 5-9, 75, 79
<DL_GBR>	Number	Indicates DL guaranteed bit rate (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 [119]).
<UL_GBR>	Number	Indicates UL guaranteed bit rate (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 [119]).
<DL_MBR>	Number	Indicates DL maximum bit rate (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 [119]).
<UL_MBR>	Number	Indicates UL maximum bit rate (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 [119]).

13.16 EPS quality of service read dynamic parameters +CGEQOSRDP

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

13.16.1 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.

13.16.2 Syntax

Type	Syntax	Response	Example
Set	AT+CGEQOSRDP=[<cid>]	[+CGEQOSRDP: <cid>,<QCI>,[<DL_GBR>,<UL_GBR>],[<DL_MBR>,<UL_MBR>],[<DL_AMBR>,<UL_AMBR>]] [+CGEQOSRDP: <cid>,<QCI>,[<DL_GBR>,<UL_GBR>],[<DL_MBR>,<UL_MBR>],[<DL_AMBR>,<UL_AMBR>] [...]] OK	AT+CGEQOSRDP=1 +CGEQOSRDP: 1,7,0,0,0,0,0,0 OK
Test	AT+CGEQOSRDP=?	+CGEQOSRDP: (list of <cid>s associated with active contexts) OK	+CGEQOSRDP: 1 OK

13.16.3 Defined values

Parameter	Type	Description
<cid>	Number	See <cid>.
<QCI>	Number	Specifies a class of EPS QoS (see 3GPP TS 24.301 [119]): • 0: QCI is selected by network • 1-4: value range for guaranteed bit rate traffic flows • 5-9: value range for non-guaranteed bit rate traffic flows • 65-66: value range for guaranteed bit rate traffic flows • 69-70: value range for non-guaranteed bit rate traffic flows • 75: value for guaranteed bit rate traffic flows • 79: value for non-guaranteed bit rate traffic flows • 128-254: value range for operator-specific QCIs
<DL_GBR>	Number	Indicates DL guaranteed bit rate (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 [119]).
<UL_GBR>	Number	Indicates UL guaranteed bit rate (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 [119]).
<DL_MBR>	Number	Indicates DL maximum bit rate (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 [119]).
<UL_MBR>	Number	Indicates UL maximum bit rate (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 [119]).
<DL_AMBR>	Number	Indicates DL APN aggregate maximum bit rate (MBR) (see 3GPP TS 24.301 [119]). The value is expressed in kb/s.

Parameter	Type	Description
<UL_AMBR>	Number	Indicates UL APN aggregate maximum bit rate (MBR) (see 3GPP TS 24.301 [119]). The value is expressed in kb/s.

13.17 PDP context read dynamic parameters +CGCONTRDP

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

13.17.1 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_Ind>, <LIPA_indication>, <IPv4_MTU> and <WLAN_offload> for an active non secondary PDP context with the context identifier <cid>.

If the MT indicates more than two IP addresses of P-CSCF servers or more than two IP addresses of DNS servers, multiple lines of information per <cid> will be returned.

A set command with an undefined <cid> provides an error result code.

☞ The command is not effective if the <PDP_type>="Non-IP".

13.17.2 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_Ind>[,<LIPA_indication>[,<IPv4_MTU>[,<WLAN_offload>[,<Local_Addr_Ind>[,<Non_IP_MTU>[,<Serving_PLMN_rate_control_value>]]]]]]]]]]]] [+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_Ind>[,<LIPA_indication>[,<IPv4_MTU>[,<WLAN_offload>[,<Local_Addr_Ind>[,<Non_IP_MTU>[,<Serving_PLMN_rate_control_value>]]]]]]]]]]]] [...]] OK	AT+CGCONTRDP=1 +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",,,,0,0,0,0 OK
Test	AT+CGCONTRDP=?	+CGCONTRDP: (list of active non secondary PDP contexts) OK	+CGCONTRDP: 1 OK

13.17.3 Defined values

Parameter	Type	Description
<cid>	Number	See <cid>.
<APN>	String	See <APN>.
<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: • "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
<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_Ind>	Number	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
<LIPA_indication>	Number	Indicates that the PDP context provides connectivity using a LIPA PDN connection. This parameter cannot be set by the TE: • 0: indication not received that the PDP context provides connectivity using a LIPA PDN connection • 1: indication received that the PDP context provides connectivity using a LIPA PDN connection
<IPv4_MTU>	Number	Provides the IPv4 MTU size in octets.
<WLAN_offload>	Number	Indicates whether the traffic can be offloaded using the specified PDN connection via a WLAN. This refers to bits 1 and 2 of the WLAN offload acceptability IE as specified in 3GPP TS 24.008 [84] subclause 10.5.6.20. Allowed values: • 0: offloading the traffic of the PDN connection via a WLAN when in S1 mode or when in Iu mode is not acceptable • 1: offloading the traffic of the PDN connection via a WLAN when in S1 mode is acceptable, but not acceptable in Iu mode • 2: offloading the traffic of the PDN connection via a WLAN when in Iu mode is acceptable, but not acceptable in S1 mode • 3: offloading the traffic of the PDN connection via a WLAN when in S1 mode or when in Iu mode is acceptable
<Local_Addr_Ind>	Number	Indicates whether the MS and the network support local IP address in TFTs (see 3GPP TS 24.301 [119] and 3GPP TS 24.008 [84] subclause 10.5.6.3). Allowed values: • 0: indicates that the MS or the network or both do not support local IP address in TFTs • 1: indicates that the MS and the network support local IP address in TFTs
<Non_IP_MTU>	Number	Non-IP MTU size in octets.
<Serving_PLMN_rate_control_value>	Number	Indicates the maximum number of uplink messages the UE is allowed to send in a 6 minutes interval. This refers to octet 3 to 4 of the Serving PLMN rate control IE as specified in 3GPP TS 24.301 [119].

13.18 Traffic flow template +CGTFT

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

13.18.1 Description

Allows the TE to specify a packet filter (PF) for a traffic flow template (TFT) that is used in the gateway GPRS support node (GGSN) for routing of down-link packets onto different QoS flows towards the TE (see the 3GPP TS 23.060 [82] and 3GPP TS 24.008 [84]). 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 that shall be issued previously.

The syntax AT+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 [82].

☞ 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.

☞ The command is not effective if the <PDP_type>="Non-IP".

13.18.2 Syntax

Type	Syntax	Response	Example
Set	AT+CGTFT=[<cid>,<packet_filter_identifier>,<evaluation_precedence_index>[,<remote_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>[,<local_address_and_subnet_mask>]]]]]]]]]	OK	AT+CGTFT=2,1,1,"10 9.115.183.216.255.255.0.0" OK
Read	AT+CGTFT?	+CGTFT: <cid>,<packet_filter_identifier>,<evaluation_precedence_index>,<remote_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>,<local_address_and_subnet_mask> [+CGTFT: <cid>,<packet_filter_identifier>,<evaluation_precedence_	+CGTFT: 2,1,1,"10 9.115.183.216.255.255.0.0",0,"0.0","0.0",00000000,"0.0",00000 OK

Type	Syntax	Response	Example
		index>,<remote_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>, <local_address_and_subnet_mask> [...]] OK	
Test	AT+CGTFT=?	+CGTFT: <PDP_type>,(list of supported <packet_filter_ identifier>s),(list of supported <evaluation_precedence_index>s), (list of supported <remote_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),(list of supported <local_address_and_subnet_ mask>s) [+CGTFT: <PDP_type>,(list of supported <packet_filter_ identifier>s),(list of supported <evaluation_precedence_index>s), (list of supported <source_address_ and_subnet_mask>s),(list of supported <protocol_number_ (ipv4)-next_header_(ipv6)>s),(list of supported <destination_port_ range>s),(list of supported <source_ port_range>s),(list of supported <ipsec_security_parameter_index_ (spi)>s),(list of supported <type_ of_service_(tos)_(ipv4)_and_ mask-traffic_class_(ipv6)_and_ mask>s),(list of supported <flow_ label (ipv6)>s),(list of supported <direction>s),(list of supported <local_address_and_subnet_ mask>s) [...]] OK	+CGTFT: IP,(1-16),(0-255),("0.0.0.0.0.0.0.0-255.255.255.255.255.255.255.255"),(0-255),("0.0-65535.65535"),("0.0-65535.65535"),(00000000-ffffffff),("0.0-255.255"),(0000-FFFFF),("0.0.0.0.0.0.0.0-255.255.255.255.255.255.255.255") OK

13.18.3 Defined values

Parameter	Type	Description
<cid>	Number	See <cid>
<PDP_type>	String	See <PDP_type>
<packet_filter_identifier>	Number	Packet filter:
<evaluation_precedence_index>	Number	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)
<remote_address_and_subnet_mask>	String	Specifies the remote 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
<protocol_number_(ipv4)-next_header_ (ipv6)>	Number	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
<destination_port_range>	String	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
<source_port_range>	String	Dot-separated numbers on the form "f.t" that specifies the source port range attribute of a valid packet filter: • Range: 0-65535
<ipsec_security_parameter_index_(spi)>	Number	IPSec SPI attribute of a valid packet filter which is a 32-bit field: • Range: 00000000-FFFFFFFF
<type_of_service_(tos)_(ipv4)_and_mask-traffic_class_(ipv6)_and_mask>	String	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. • Range: 0-255
<flow_label(ipv6)>	Number	Specifies the Flow Label attribute of a valid packet filter. It shall contain an IPv6 flow label, which is a 20-bit field. It only is valid for IPv6. • Range: 00000-FFFFF
<direction>	Number	Specifies the transmission direction in which the packet filter shall be applied: • 0: Pre Release 7 TFT Filter (see 3GPP TS 24.008 [84], table 10.5.162) • 1: uplink • 2: downlink • 3: bidirectional (used for uplink and downlink)
<local_address_and_subnet_mask>	String	Specifies the local 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

13.18.4 Notes

LEXI-R10

- The PIN insertion is not mandatory before the command execution.

13.19 Uplink user data plane configuration +UDCONF=9

+UDCONF=9						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	full	No	NVM	No	-	+CME Error

13.19.1 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 AT command is volatile.

13.19.2 Syntax

Type	Syntax	Response	Example
Set	AT+UDCONF=9,<UUDP_enable>[,<drop_rate>]	OK	AT+UDCONF=9,0,50 OK
Read	AT+UDCONF=9	+UDCONF: 9,<UUDP_enable>,<drop_rate> OK	AT+UDCONF=9 +UDCONF: 9,0,50 OK

13.19.3 Defined values

Parameter	Type	Description
<UUDP_enable>	Number	Configures the uplink user data plane feature: • 0: uplink user data plane disabled • 1 (factory-programmed value): uplink user data plane enabled
<drop_rate>	Number	Percentage of dropped packets. To be used in validation mode only. The allowed values are in range 1-100. The parameter can only be set when disabling the data plane (<UUDP_enable>=0), and, if not specified, the percentage of dropped packets is set to 100% by default.

13.19.4 Notes

LEXI-R10

- The <drop_rate> parameter is not supported.
- Only PPP packets and packets sent by the embedded IP stack can be dropped before being sent to the cellular modem.

13.20 APN rate control +CGAPNRC

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

13.20.1 Description

Returns the APN rate control parameters (see the 3GPP TS 24.008 [84]) associated to the corresponding <cid>.

If the <cid> parameter is omitted, the APN rate control parameters for all active contexts are returned.

☞ The test command returns the list of <cid>s associated with secondary and non secondary active PDP contexts.

13.20.2 Syntax

Type	Syntax	Response	Example
Set	AT+CGAPNRC[=<cid>]	[+CGAPNRC: <cid>[,<Additional_exception_reports>[,<Uplink_time_unit>[,<Maximum_uplink_rate>]]] [...] [+CGAPNRC: <cid>[,<Additional_exception_reports>[,<Uplink_time_unit>[,<Maximum_uplink_rate>]]]]] OK	AT+CGAPNRC=1 +CGAPNRC: 1,0,2,2 OK
Test	AT+CGAPNRC=?	+CGAPNRC: (list of <cid>s associated with active contexts) OK	+CGAPNRC: (1,2) OK

13.20.3 Defined values

Parameter	Type	Description
<cid>	Number	See <cid>
<Additional_exception_reports>	Number	Indicates whether or not additional exception reports are allowed to be sent when the maximum uplink rate is reached. This refers to bit 4 of octet 1 of the APN rate control parameters (see the 3GPP TS 24.008 [84] subclause 10.5.6.3.2): • 0: Additional exception reports are not allowed to be sent • 1: Additional exception reports are allowed to be sent
<Uplink_time_unit>	Number	Specifies the time unit to be used for the maximum uplink rate. This refers to bit 1 to 3 of octet 1 of the APN rate control parameters (see the 3GPP TS 24.008 [84] subclause 10.5.6.3.2): • 0: unrestricted • 1: minute • 2: hour • 3: day • 4: week
<Maximum_uplink_rate>	Number	Specifies the maximum number of messages the UE is restricted to send per uplink time unit. This refers to octet 2 to 4 of the APN rate control parameters (see the 3GPP TS 24.008 [84] subclause 10.5.6.3.2).

13.21 Define PDP context authentication parameters +CGAUTH

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

13.21.1 Description

Configures the authentication parameters for a PDP context, identified by the <cid> parameter.

The read command lists the settings for all the defined <cid>s.

13.21.2 Syntax

Type	Syntax	Response	Example
Set	AT+CGAUTH=<cid>[,<auth_prot>[,<userid>[,<password>]]]	OK	AT+CGAUTH=1,2,"1234","4321" OK

Type	Syntax	Response	Example
Read	AT+CGAUTH?	[+CGAUTH: <cid>[,<auth_prot>[,<userid>[,<password>]]] [..]] OK	+CGAUTH: 1,1,"1234","4321" OK
Test	AT+CGAUTH=?	+CGAUTH: (list of supported <cid>s),(list of supported <auth_prot>s),(list of supported <userid>s),(list of supported <password>s) OK	+CGAUTH: (0-10),(0,1,2),(0-60),(0-60) OK

13.21.3 Defined values

Parameter	Type	Description
<cid>	Number	See <cid>.
<auth_prot>	Number	Authentication protocol used for the PDP context: • 0 (default value): none; the <userid> and <password> parameter values are removed if defined previously • 1: PAP • 2: CHAP
<userid>	String	Username to access the IP network; the maximum length is 60 characters. The parameter will be provided by the network if it supports the PDP context authentication.
<password>	String	Password to access the IP network; the maximum length is 60 characters. The parameter will be provided by the network if it supports the PDP context authentication.

14 System features

14.1 Firmware installation +UFWINSTALL

+UFWINSTALL						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	full	No	No	No	-	FW Install Error

14.1.1 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. Do not remove the power supply or reset the module during the installation procedure even if it is fault tolerant! 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).

The command syntax differs depending on the module: see the corresponding subsection for the correct command handling.

Once the command has been sent correctly, the FW resets and at the next boot-up, the FW install will start.

☞ LEXI-R10
When the FW update is completed, a +UUFWINSTALL URC will notify the final result of the operation.

☞ 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).

14.1.2 Syntax

Type	Syntax	Response	Example
Set	AT+UFWINSTALL	OK	AT+UFWINSTALL OK
Test	AT+UFWINSTALL=?	OK	OK
URC		+UUFWINSTALL: <status_install>	

14.1.3 Defined values

Parameter	Type	Description
<status_install>	Number	Provides the update result code (see LEXI-R10 FOAT error result messages).

14.2 Antenna detection +UANTR

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

14.2.1 Description

Measures the DC component of load of the cellular antenna. The antenna load is expressed in kOhm.

14.2.2 Syntax

Type	Syntax	Response	Example
Set	AT+UANTR=[<antenna_id>]	+UANTR: <antenna_id>,<antenna_load> OK	AT+UANTR=0 +UANTR: 0,10 OK
Test	AT+UANTR=?	+UANTR: (list of supported <antenna_id>s) OK	+UANTR: (0) OK

14.2.3 Defined values

Parameter	Type	Description
<antenna_id>	Number	Antenna identifier: • 0 (default value): cellular antenna
<antenna_load>	Number	Measured value in kOhm of the antenna load with a resolution of 1 kOhm. The range goes from -1 to 53 (only integer values can be assumed), where: • -1: open circuit • 0: short circuit • 1: 1 kOhm (minimum limit of the measurement range) • ... • 53: 53 kOhm (maximum limit of the measurement range)

14.2.4 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.

14.3 Antenna dynamic tuner +UATUN

+UATUN						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	Full	No	NVM	No	< 5 s	+CME Error

14.3.1 Description

Configures two dedicated output pins (RFCTRL1 and RFCTRL2) to control in real time an external antenna tuning IC, changing their output value dynamically according to the current frequency band used by the cellular module. The default and factory-programmed configuration has all zero output values for all bands. The antenna dynamic tuner control setting is stored in the NVM, and its configuration is effective immediately after changing it. An example of the relation between the dedicated pins output and the frequency band in use is provided in the Notes.

14.3.2 Syntax

Type	Syntax	Response	Example
Antenna dynamic tuner control enabling			
Set	AT+UATUN=1,<atun_00_num_lte_bands>,<atun_01_num_bands>,<atun_10_num_bands>,<atun_11_num_bands>[,<atun_00_list_band_1>[,<atun_00_list_band_2>[,...]]][,	OK	AT+UATUN=1,5,2,1,0,1,3,7,28,254,5,20,8 OK

Type	Syntax	Response	Example
	<atun_01_list_band_1>[,<atun_01_list_band_2>[,...]]][,<atun_10_list_band_1>[,<atun_10_list_band_2>[,...]]][,<atun_11_list_band_1>[,<atun_11_list_band_2>[,...]]]		
Antenna dynamic tuner control disabling			
Set	AT+UATUN=0	OK	AT+UATUN=0 OK
Read	AT+UATUN?	+UATUN: <atun_enable>[,<atun_00_num_bands>,<atun_01_num_bands>,<atun_10_num_bands>,<atun_11_num_bands>[,<atun_00_list_band_1>[,<atun_00_list_band_2>[,...]]][,<atun_01_list_band_1>[,<atun_01_list_band_2>[,...]]][,<atun_10_list_band_1>[,<atun_10_list_band_2>[,...]]][,<atun_11_list_band_1>[,<atun_11_list_band_2>[,...]]]] OK	+UATUN: 1,5,2,1,0,1,3,7,28,254,5,20,8 OK
Test	AT+UATUN=?	+UATUN: (list of supported <atun_enable>),(list of supported <atun_XY_num_bands>),(list of supported <atun_XY_list_band_x>) OK	+UATUN: (0-1),(0-14),(1-85,254) OK

14.3.3 Defined values

Parameter	Type	Description
<atun_enable>	Number	Antenna dynamic tuner control status. Allowed values: • 0 (factory-programmed value): antenna dynamic tuner control disabled • 1: antenna dynamic tuner control enabled
<atun_XY_num_bands>	Number	Number of bands for which the dedicated pins output values are RFCTRL1=X (0 or 1) and RFCTRL2=Y (0 or 1). The allowed range is 0-14.
<atun_XY_list_band_x>	Number	Band value in decimal format; a list of <atun_XY_num_bands> band values shall be provided. The allowed range of the LTE bands is (1-85) and the value of the WiFi band 2.4 GHz is 254.

14.3.4 Notes

- The same band cannot be present in more than one list. At least one band shall be configured if the feature is enabled, otherwise an error result code will be returned.
- No control of the dedicated pins output is provided for the LTE bands, which are not in the list of the supported band configuration by means of the +UBANDCONF AT command. The WiFi band is always handled.
- The antenna tuner configuration does not persist after updating the FW version.

LEXI-R10401D

- Table 11 shows an example of parameters values when <atun_enable>=1.

RFCTRL1 - LEXI-R10 pin 45	RFCTRL2 - LEXI-R10 pin 44	atun_00_num_bands	atun_01_num_bands	atun_10_num_bands	atun_11_num_bands	atun_00_list_band_x	atun_01_list_band_x	atun_10_list_band_x	atun_11_list_band_x
0	0	7	-	-	-	2,4,12,13,14,66,254	-	-	-
0	1	-	1	-	-	-	5	-	-
1	0	-	-	0	-	-	-	-	-
1	1	-	-	-	1	-	-	-	71

Table 11: Example of antenna dynamic tuner configuration

LEXI-R10801D

- Table 12 shows an example of parameters values when <atun_enable>=1.

RFCTRL1 - LEXI-R10 pin 45	RFCTRL2 - LEXI-R10 pin 44	atun_00_num_bands	atun_01_num_bands	atun_10_num_bands	atun_11_num_bands	atun_00_list_band_x	atun_01_list_band_x	atun_10_list_band_x	atun_11_list_band_x
0	0	5	-	-	-	1,3,7,28,254	-	-	-
0	1	-	2	-	-	-	5,20	-	-
1	0	-	-	1	-	-	-	8	-
1	1	-	-	-	0	-	-	-	-

Table 12: Example of antenna dynamic tuner configuration

14.4 Wi-Fi network scan +UWIFISCAN

+UWIFISCAN						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	full	No	No	No	< 255 s	+CME Error

14.4.1 Description

Configures and scans the surroundings for wireless networks. The Wi-Fi scan response is provided through IRC based on the configuration set via the set command. The IRC returns one or more lines providing networks in the immediate surroundings.

The set command uses the default configurations and triggers the Wi-Fi scan. The read command returns the current configurations of the Wi-Fi scan parameters. The test command returns the list of supported Wi-Fi scan parameters.

☞ If <channelCount> is set to 1 and the following channel ID is set to 0, Wi-Fi scan procedure will scan all the available frequency channels.

14.4.2 Syntax

Type	Syntax	Response	Example
Set	AT+UWIFISCAN[=[<maxTimeout>],[<round>],[<maxBssidNum>],[<scanTimeOut>],[<wifiPriority>],[<channelRecLen>],[<channelCount>],[<channelId1>],...,[<channelId14>]]	+UWIFISCAN: <ssid>,<rssi>,<bssid>,<channel> [...] OK	AT+UWIFISCAN=12000,1,5,5,0,280,1,0 +UWIFISCAN: "test1",-49,"FC:EC:DA:3B:EB:FC",6 +UWIFISCAN: "test2",-81,"FC:EC:DA:3B:B5:91,1 +UWIFISCAN: "test3",-81,"78:45:58:34:E4:93",1 +UWIFISCAN: "test4",-84,"FC:EC:DA:3B:BA:3D",11 +UWIFISCAN: "test5",-95,"E4:38:7E:0D:27:E1",1 OK
Read	AT+UWIFISCAN?	+UWIFISCAN: <maxTimeout>,<round>,<maxBssidNum>,<scanTimeOut>,<wifiPriority>,<channelRecLen>,<channelCount>,<channelId1>[,...,[<channelId14>]] OK	+UWIFISCAN: 12000,1,5,5,0,280,2,1,2 OK
Test	AT+UWIFISCAN=?	+UWIFISCAN: (list of supported <maxTimeout>s),(list of supported <round>s),(list of supported <maxBssidNum>s),(list of supported <scanTimeOut>s),(list of supported <wifiPriority>s),(list of supported <channelRecLen>s),(list of supported <channelCount>s),(list of supported <channelId1>s),...,(list of supported <channelId14>s) OK	+UWIFISCAN: (4000-255000),(1-3),(4-40),(1-255),(0-1),(100-280),(1-14),(0-14),(1-14),(1-14),(1-14),(1-14),(1-14),(1-14),(1-14),(1-14),(1-14),(1-14),(1-14),(1-14),(1-14) OK

14.4.3 Defined values

Parameter	Type	Description
<maxTimeout>	Number	Wi-Fi scan timeout value expressed in milliseconds. The range goes from 4000 to 255000 ms. The default value is 12000 ms.
<round>	Number	Wi-Fi scan rounds. The range goes from 1 to 3. The default value is 1.
<maxBssidNum>	Number	Maximum required Wi-Fi SSID number. The range goes from 4 to 40. The default value is 5: • The Wi-Fi scan procedure will terminate and report the detected Wi-Fi results if the required Wi-Fi SSID is detected. • The Wi-Fi scan procedure will terminate and report the detected Wi-Fi results if the required Wi-Fi SSID is not found within the specified <maxTimeout>. • In case the <round> is set to 3 and <maxBssidNum> is set to 10; If the Wi-Fi scan detects five SSIDs in the first round, three SSIDs in the second round, and six SSIDs in the third round, it will remove any duplicate SSIDs, sort the remaining SSIDs in descending order, and report the ten Wi-Fi SSIDs result.
<scanTimeOut>	Number	Maximum search timout for each Wi-Fi scan <round>, expressed in seconds. The range goes from 1 to 255 s. The default value is 5 s.

Parameter	Type	Description
<wifiPriority>	Number	Priority of Wi-Fi scan over the radio connection: • 0 (default value): radio connection is preferred • 1: Wi-Fi scan is preferred
<channelRecLen>	Number	Maximum scan timeout for each Wi-Fi scan, expressed in milliseconds. The range goes from 100 to 280 ms. The default value is 280 ms.
<channelCount>	Number	Wi-Fi channel count. The range goes from 1 to 14. The default value is 1.
<channelId1>	Number	WI-Fi channel id-1. The range goes from 0 to 14, when <channelCount> is set to 1 otherwise the range goes from 1 to 14. The default value is 0.
<channelId2>, ..., <channelId14>	Number	WI-Fi channel id to scan for a specific channel. The range goes from 1 to 14. The default value is 1.
<ssid>	String	SSID name of external wireless network
<rssi>	String	Received signal strength indication, expressed in dBm.
<bssid>	String	MAC address of the external hotspot
<channel>	Number	Channel ID of the external wireless network

14.4.4 Notes

LEXI-R10

- The Wi-Fi scan can be executed with +CFUN: 0/+CFUN: 4 or without USIM inserted.
- The Wi-Fi scan procedure is only initiated when the radio connection is idle. If the <wifiPriority> is set to 0 and the radio is connected, the Wi-Fi scan will be delayed until the radio returns to the idle state. However, if the <wifiPriority> is set to 1, the Wi-Fi scan will be started immediately by releasing the radio connection.
- The <maxTimeout> must be greater than or equal to the product of <round> and <scantimeout> parameters.

14.5 RING line handling +URING

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

14.5.1 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 occurs and it remains asserted for 1 s unless another configured event happens (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.

14.5.2 Syntax

Type	Syntax	Response	Example
Set	AT+URING=<mode>	OK	AT+URING=1 OK
Read	AT+URING?	+URING: <mode> OK	+URING: 1 OK
Test	AT+URING=?	+URING: (list of the supported <mode>s) OK	+URING: (0-3) OK

14.5.3 Defined values

Parameter	Type	Description
<mode>	Number	Configures the RING line handling: • 0 (factory-programmed value): feature disabled (RING line is asserted only on incoming call and incoming SMS) • 1: RING line asserted for all the URCs • 2: RING line asserted for all the incoming data (PPP, sockets in Direct Link mode, FTP in Direct Link mode) • 3: RING line asserted for all URCs and all incoming data (PPP, sockets in Direct Link mode, FTP in Direct Link mode)

14.5.4 Notes

LEXI-R10

- The physical RING line is powered off when the module enters one of the deep-sleep modes (see +UPSV AT command description), hence its state cannot be considered. To use the ring indicator functionality during deep-sleep modes, the +UGPIOC AT command shall be used with <gpio_mode>=18 to map the functionality on a GPIO that is always powered on. The GPIOs that are always powered on can be found in the system integration manual [23].

14.6 USB profiles configuration +UUSBCONF

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

14.6.1 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.
- 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.

14.6.2 Syntax

Type	Syntax	Response	Example
Set	AT+UUSBCONF=[<id>[,<network>[,<audio>]]]	OK	AT+UUSBCONF=0,"AUTO",0 OK
Read	AT+UUSBCONF?	+UUSBCONF: <id>,<network>,<audio>,<pid> OK	+UUSBCONF: 0,"RNDIS",0,"0x1144" OK

Type	Syntax	Response	Example
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>)[,...]] OK	+UUSBCONF: (0 ("6 CDC-ACM"),(""),())),(2 ("NETWORK, 3 CDC-ACM"),("ECM"),()),(3 ("NETWORK, 1 CDC-ACM"),("RNDIS"),()) OK

14.6.3 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: • "AUTO": network autodetection • "ECM": CDC-ECM device class • "NCM": CDC-NCM device class • "MBIM": MBIM device class • "RNDIS": RNDIS device class • "RMNET": RMNET device class Allowed values:
<audio>	Number	Audio over USB function configuration: • 0: audio over USB disabled • 1: audio over USB enabled
<pid>	String	String in HEX format with 0x prefix, showing the identifier (PID) of the current profile. Assigned range for PID is 0x1102-0x1FFF.

14.6.4 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 an 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.
- Table 13 lists the USB product category associated to a <id>.

<id>	USB product category
0	Fairly back-compatible: It is a configuration similar to the one implemented in the u-blox LISA-U2 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: 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: 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. The presence of several USB functions limits the reachable data transfer throughput.
3	High throughput:

<id>	USB product category
	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.
4	High throughput with ethernet over USB: 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). The presence of several USB functions does not limit the reachable data transfer throughput.
12	Low/Medium throughput plus SAP: 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). SAP over USB is available on the first CDC-ACM, but it can be enabled or disabled. The presence of several USB functions limits the reachable data transfer throughput.
13	High throughput plus SAP: It is like the "High throughput", but only 1 CDC-ACM dedicated to SAP communication. ☞ AT commands can be issued only over the UART interface.
99	USB disabled: USB stack if fully disabled and there is no USB enumeration. ☞ AT commands can be issued only over the UART interface.

Table 13: USB product configuration

LEXI-R10

- The allowed USB configurations are listed as follows:

Command	PID	Available USB functions	Remark
AT+UUSBCONF=0	0x1301	1 DIAG + 2 CDC-ACM	Default and factory-programmed value
AT+UUSBCONF=4,"RNDIS"	0x1302	RNDIS + 1 DIAG + 2 CDC-ACM	
AT+UUSBCONF=4,"ECM"	0x1303	CDC-ECM + 1 DIAG + 2 CDC-ACM	
AT+UUSBCONF=99	-	None	USB stack fully disabled

Table 14: Supported USB functions

- Note: AT+UUSBCONF=99 can be issued only from UART interface.

14.7 USB sleep configuration +UUSBSLPCONF

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

14.7.1 Description

Configures the USB capability to allow module to enter deep-sleep modes. For further details about entering deep-sleep modes, see the system integration manual [23]:

- When <usb_allow_sleep>=0, the USB must be in suspended state to allow the module to enter deep-sleep mode and the deep-sleep mode is limited to Sleep-1, see the +UPSV AT command.
- When <usb_allow_sleep>=0, the USB remains enumerated during the module deep-sleep mode and it can be used by host to wake up module.

- When <usb_allow_sleep>=1, the module can enter deep-sleep regardless of USB state. USB is powered off during deep-sleep mode and the host detects a USB disconnect. USB is re-enumerated at every wake-up.
- When <usb_allow_sleep>=1, the module can reach the hibernate deep-sleep level, see the +UPSV AT command.

14.7.2 Syntax

Type	Syntax	Response	Example
Set	AT+UUSBSLPCONF=<usb_allow_sleep>	OK	AT+UUSBSLPCONF=1,5000 OK
Read	AT+UUSBSLPCONF?	+UUSBSLPCONF: <usb_allow_sleep>> OK	+UUSBSLPCONF: 1,5000 OK
Test	AT+UUSBSLPCONF=?	+UUSBSLPCONF: (list of supported <usb_allow_sleep>s) OK	+UUSBSLPCONF: (0-1) OK

14.7.3 Defined values

Parameter	Type	Description
<usb_allow_sleep>	Number	It is possible to enter deep-sleep mode when USB is in active state (not suspended nor disconnected state): • 0 (factory-programmed value): deep-sleep mode can be entered only if USB is in suspended state. • 1: deep-sleep mode can be entered regardless of USB state.

14.8 UART baud rate and flow control NVM management +UUARTCONF

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

14.8.1 Description

Stores the baud rate and flow control values to NVM (see the +IPR and &K AT commands) for the specified UART interface. The read command returns the NVM setting for all the available UART interfaces.

This command is intended to extend the possibility to have different stored values of +IPR and &K AT commands across the two UART interfaces.

☞ Setting in NVM for AUX UART interface is applied at boot regardless of the +USIO configuration, that is AUX UART mode (AT, binary).

☞ The settings are saved immediately in NVM; the new configuration will be effective at the subsequent module reboot.

14.8.2 Syntax

Type	Syntax	Response	Example
Set	AT+UUARTCONF=<uart_id>[,<rate>[,<fctrl>]]	OK	AT+UUARTCONF=1,115200,3 OK
Read	AT+UUARTCONF?	+UUARTCONF: <uart_id>,<rate>,<fctrl> [[..] OK	+UUARTCONF: 0,115200,3 +UUARTCONF: 1,115200,3 OK

Type	Syntax	Response	Example
		+UUARTCONF: <uart_id>,<rate>,<fctrl>] OK	
Test	AT+UUARTCONF=?	+UUARTCONF: (list of supported <uart_id>s),(list of fixed only supported <rate>s),(list of supported <fctrl>s) OK	+UUARTCONF: 1,(300,600,1200,2400,4800,9600,14400,19200,38400,57600,115200,230400,460800,921600,1000000,1200000,1500000,2000000,3000000),(0-3) OK

14.8.3 Defined values

Parameter	Type	Description
<uart_id>	Number	UART identification code: • 0: main UART identification code • 1: auxiliary UART identification code Allowed values: • LEXI-R10 - 0, 1
<rate>	Number	Allowed baud rates expressed in b/s: • LEXI-R10 - 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 (default and factory-programmed value), 230400, 460800, 921600, 3000000
<fctrl>	Number	DTE flow control mode (see the &K AT command): • 0: disable DTE flow control • 3 (default and factory-programmed value): enable the RTS/CTS DTE flow control

14.9 Multiplexer protocol deep-sleep mode configuration +UDCONF=201

+UDCONF=201						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	full	No	No	No	-	+CME Error

14.9.1 Description

Configures whether the module can enter a deep-sleep mode deeper than Sleep-1 during a multiplexer protocol session (started with +CMUX AT command).

☞ The command is effective only if power saving is enabled (see +UPSV AT command), and no other conditions block the entering into power saving.

☞ The command must be issued before starting a multiplexer session to be effective.

14.9.2 Syntax

Type	Syntax	Response	Example
Set	AT+UDCONF=201,<allow_sleep2>	OK	AT+UDCONF=201,0 OK
Read	AT+UDCONF=201	+UDCONF: 201,<allow_sleep2> OK	+UDCONF: 201,0 OK

14.9.3 Defined values

Parameter	Type	Description
<allow_sleep2>	Number	Allow Sleep-2 mode during a MUX session. Allowed values:

Parameter	Type	Description
		• 0 (default value): Sleep-2 or deeper mode is not allowed • 1: Sleep-2 or deeper mode is allowed

14.9.4 Notes

- In case <allow_sleep2> value is set to 1, the multiplexer session is lost when Sleep-2 (or Hibernate) mode is entered. Hence, the multiplexer session must be re-established by the host, at sleep exit.
- Each multiplexer DLC / virtual channel could impose more restricted conditions to module power saving entering, as it happens in case of UART interface (e.g. PPP dial-up over UART or over a multiplexer DLC limits the allowed deep-sleep mode to Sleep-1).
- The command configuration is not persistent and hence the command has to be re-issued in case of module reboot or if a deep-sleep level deeper than Sleep-1 is entered.
- In case the module is configured for entering PSM or eDRX deep-sleep mode with the lowest power consumption, and multiplexer protocol is used, use <allow_sleep2> value 1.

14.10 Serial interfaces configuration selection +USIO

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

14.10.1 Description

Selects the serial interfaces' configuration.

The configuration affects how an available (either physical or logical) serial interface is used, i.e. the meaning of the data flowing over it. Possible usages are:

- Modem interface (AT command)
- Trace interface (diagnostic log)
- Raw interface (e.g. GPS/GNSS tunneling or SAP)
- Digital audio interface
- None

A set of configurations, that considers all the available serial interfaces' and their associated usage, is called +USIO's configuration variant.

☞ The serial interfaces' configuration switch is not performed at 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.

☞ For the complete list of allowed USIO variants supported by each series modules, see Notes.

14.10.2 Syntax

Type	Syntax	Response	Example
Set	AT+USIO=<requested_variant>	OK	AT+USIO=1 OK
Read	AT+USIO?	+USIO: <requested_variant>, *<active_variant> OK	+USIO: 1, *1 OK
Test	AT+USIO=?	+USIO: Variant=<requested_variant>: [AT=<AT_interface>;] [GNSS=<GNSS_interface>;]	+USIO: Variant=0: AT="UART"; AT="AUX UART"; TRACE="EXT UART"

Type	Syntax	Response	Example
		[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>] [...]] OK	+USIO: Variant=1: AT="UART"; TRACE="AUX UART"; DIGITAL AUDIO="I2S" +USIO: Variant=2: AT="UART"; AT="AUX UART"; DIGITAL AUDIO="I2S" +USIO: Variant=3: AT="UART"; GNSS="AUX UART"; TRACE="EXT UART" +USIO: Variant=4: AT="UART"; GNSS="AUX UART"; DIGITAL AUDIO="I2S" OK

14.10.3 Defined values

Parameter	Type	Description
<requested_variant>	Number	Requested (stored in NVM for next boot) configuration variant (range 0-255). For the factory-programmed value, see the value in supported USIO variants table in Notes.
<active_variant>	Number	Active (currently used) configuration variant (range 0-255). For the factory-programmed value, see the value in supported USIO variants table in Notes.
<AT_interface>	String	Serial interface configured for AT commands
<GNSS_interface>	String	Serial interface configured for GNSS tunneling
<Trace_interface>	String	Serial interface configured for diagnostic log
<Digital_audio_interface>	String	Serial interface configured for digital audio

14.10.4 Notes

- Table 15 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: It is the full featured UART (9-wire), used as main interface to the host.
"AUX UART"	Auxiliary UART: It is the general purpose UART (3-wire or 5-wire), with limited v.24 features.
"EXT UART"	External UART: 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.
"USB"	USB CDC-ACM or Network over USB: USB CDC-ACM is a virtual UART, providing simulated v.24 features over a USB interface. Network over USB is a virtual network interface providing diagnostic logging.
"I2S"	I^2S interface: It can be used for the digital audio. See the Audio interface for the required configurations.
"SPI"	SPI interface: It is limited to diagnostic log.

<AT_interface>, <GNSS_interface>, <Trace_interface>, <Digital_audio_interface>	Serial interface description
"SDIO"	SDIO interface: It is limited to diagnostic log.

Table 15: Serial interfaces

LEXI-R10

- The allowed configurations are listed as follows:

<active_variant>	AT instance 1	AT instance 2	AT instance 3	AT instance 4	Diagnostic log
0 (factory-programmed value)	UART (9-wire)	USB2	USB3	Not available	USB1
1	UART (5-wire)	USB2	USB3	AUX UART (5-wire)	USB1
5	UART (5-wire)	USB2	USB3	Not available	AUX UART (3-wire) or USB1

Table 16: Supported USIO variants

- It is possible to route diagnostic log on AUX UART only when <active_variant> is 5 while it is always possible to have diagnostic log on USB port. In any case to enable diagnostic log on USB or AUX UART, it is necessary to use +TRACE AT command; for more details, see the +TRACE AT command.

14.11 Internal temperature monitor +UTEMP

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

14.11.1 Description

Returns the values of internal temperature sensors of the specified unit.

The command handling (sensors position and command syntax) depends on the module series:

- LEXI-R10 - The AT command returns the value measured by the temperature sensor on the **Die**.

14.11.2 Syntax

Type	Syntax	Response	Example
Set	AT+UTEMP=<unit>	OK	AT+UTEMP=0 OK
Read	AT+UTEMP?	+UTEMP: <die_temp>[,<unit>] OK	+UTEMP: 100,1 OK
Test	AT+UTEMP=?	+UTEMP: (list of supported <unit>) OK	+UTEMP: (0-1) OK

14.11.3 Defined values

Parameter	Type	Description
<unit>	Number	Select the measurement unit for value representation: • 0 (default value): values in tenth of Celsius degrees returned • 1: values in tenth of Fahrenheit degrees returned

Parameter	Type	Description
<die_temp>	Number	Fetched value of Die temperature of the selected measurement unit; the allowed range, expressed in tenth of degrees, depends on the measurement unit: • LEXI-R10 o Celsius degrees: [-400; 850] o Fahrenheit degrees: [-400; 1850]

14.12 Restore factory configuration +UFACTORY

+UFACTORY						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	full	No	NVM	No	5 s	+CME Error

14.12.1 Description

Force, at the next module boot, the restore of the factory configuration for FS and/or NVM.

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, then it is possible to issue the command with parameter 0,0.

14.12.2 Syntax

Type	Syntax	Response	Example
Set	AT+UFACTORY=<fs_op>,<nvm_op>	OK	AT+UFACTORY=0,1 OK
Read	AT+UFACTORY?	+UFACTORY: <fs_op>,<nvm_op> OK	+UFACTORY: 0,1 OK
Test	AT+UFACTORY=?	+UFACTORY: (list of supported <fs_op>s),(list of supported <nvm_op>s) OK	+UFACTORY: (0-2),(0-2) OK

14.12.3 Defined values

Parameter	Type	Description
<fs_op>	Number	FS factory restore type: • 0 (factory-programmed value): no factory restore • 1: see Notes • 2: all files stored in FS deleted
<nvm_op>	Number	NVM factory restore type: • 0 (factory-programmed value): no factory restore • 1: NVM flash sectors erased • 2: see Notes

14.12.4 Notes

LEXI-R10

- <fs_op>=1 deletes all user files and certificates previously downloaded through AT+FWRITE or AT +FWRITEHEX.
- <fs_op>=2 is not supported.
- <nvm_op>=1 deletes all MNO profiles and all settings, except UART and USB interface configuration.
- <nvm_op>=2 restores the UART and USB interface to the factory-programmed setting, limited to +USIO, +IPR, +IFC, +ICF, &K, /Q and +UUARTCONF.

- Restore, if armed, will be triggered at following power down (AT+CPWROFF) or reset (+CFUN AT command), not at the next reboot. Moreover +UFACTORY parameters are volatile, this means that if power is removed no action will be taken.

14.13 NVM RAM mode management +UNVMCFG

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

14.13.1 Description

Sets the NVM RAM mode for AT command settings stored in NVM. List the AT commands whose settings can be stored on NVM end/or in the NVM backup partition.

AT command settings are stored as UNVM items and are grouped in AT groups. Changing the NVM RAM mode for an AT group will change the behaviour for all AT command settings in that group. The NVM RAM mode is not supported for the UNVM items storable on the NVM backup.

Based on the configured NVM RAM mode the behaviour of UNVM items within an AT group is as follows:

- RAM mode:
  - Changing the AT command settings changes only the RAM mirror (NVM is intact).
  - +UNVMW commits the AT command settings from RAM mirror to NVM.
  - +UNVMR resets the AT command settings RAM mirror to the setting stored in NVM.
  - +UNVMF works the same in both modes - restores the NVM to factory with deleting the NVM.
- NVM mode:
  - Changing the AT command settings changes the NVM setting.
  - +UNVMW does nothing as setting is already in NVM.
  - +UNVMR does nothing as setting is coherent with NVM.
  - +UNVMF works the same in both modes - restores the NVM to factory with deleting the NVM.

RAM mode is useful for customer devices not requiring NVM capabilities on u-blox module (example: audio settings are configured at each boot by the application processor).

The AT groups are product-specific.

Reboot the module in order to apply the new NVM RAM mode.

If the NVM Backup is supported, the following AT commands can be issued to manage also the backup storage:

- +UNVMW commits the settings from NVM to the backup partition.
- +UNVMR commits the settings from backup partition to NVM and RAM
- +UNVMF restores the NVM and the backup partition to factory with deleting the NVM.

14.13.2 Syntax

Type	Syntax	Response	Example
Generic syntax			
Set	AT+UNVMCFG=<at_group>,<mode>	OK	AT+UNVMCFG="audio",1 OK
Read	AT+UNVMCFG=<at_group>	+UNVMCFG: <at_group>,<mode> OK	AT+UNVMCFG="audio" +UNVMCFG: "audio",1 OK
Restore factory	AT+UNVMCFG=	OK	AT+UNVMCFG= OK

Type	Syntax	Response	Example
Test	AT+UNVMCFG=?	+UNVMCFG:(list of supported <at_group>es),(list of commands in the at_group) OK	AT+UNVMCFG=? +UNVMCFG: ("audio"),"+CLVL,+USPM,+UI2S,+UMCLK" +UNVMCFG: ("generic"),"+UGPIO,+UDYNDNS,+UIPCHGN,+ULOG" +UNVMCFG: ("gnss"),"+UGPRF,+UGAOP,+UGAOF,+UGSRV" +UNVMCFG: ("nvmbckp"),"+USIO" OK

14.13.3 Defined values

Parameter	Type	Description
<at_group>	String	AT group: • "audio"; the group has factory-programmed value 0 for <mode> parameter. • "generic"; the group has factory-programmed value 0 for <mode> parameter. • "gnss"; the group has factory-programmed value 0 for <mode> parameter. Allowed groups: • LEXI-R10 - "generic", "gnss"
<mode>	Number	Mode. Allowed values: • 0: NVM mode • 1: RAM mode • 2: reserved

14.13.4 Notes

LEXI-R10

- <at_group>="nvmbckp" appears in the information text response to the test command. It does not support the RAM NVM mode.

14.14 NVM/NVM Backup configuration management commit+UNVMW

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

14.14.1 Description

Commits RAM configuration changes to NVM or commits NVM configuration changes to NVM backup. The operation done by this command depends on the selected AT group.

The commitment from RAM to NVM has no effect in the NVM operating mode. See +UDCONF=110 or +UNVMCFG for details about the configuration of the mode of operation. In particular for:

- LEXI-R10 - see +UNVMCFG

14.14.2 Syntax

Type	Syntax	Response	Example
Generic syntax			
Set	AT+UNVMW=<at_group>	OK	AT+UNVMW="audio" OK

Type	Syntax	Response	Example
Test	AT+UNVMW=?	+UNVMW: (list of supported <at_group>s) OK	+UNVMW: ("audio","generic","gnss","nvmbckp") OK

14.14.3 Defined values

Parameter	Type	Description
<at_group>	String	AT group: • "audio": audio configuration. The command commits RAM configuration changes to NVM. • "generic": generic configuration. The command commits RAM configuration changes to NVM. • "gnss": GNSS configuration. The command commits RAM configuration changes to NVM. • "nvmbckp": configuration storable in the NVM backup. The command commits NVM configuration changes to NVM backup. Allowed groups: • LEXI-R10 - "generic", "gnss", "nvmbckp"

14.15 NVM configuration management reset +UNVMR

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

14.15.1 Description

Resets RAM configuration from NVM and applies it or resets RAM and NVM configuration from NVM backup and applies it. The operation done by this command depends on the selected AT group.

The reset of RAM configuration from NVM has no effect in the NVM operating mode. See +UDCONF=110 or +UNVMCFG for details about the configuration of the mode of operation. In particular for:

- LEXI-R10 - see +UNVMCFG

14.15.2 Syntax

Type	Syntax	Response	Example
Generic syntax			
Set	AT+UNVMR=<at_group>	OK	AT+UNVMR="audio" OK
Test	AT+UNVMR=?	+UNVMR: (list of supported <at_group>s) OK	+UNVMR: ("audio","nvmbckp") OK

14.15.3 Defined values

Parameter	Type	Description
<at_group>	String	AT group: • "audio": audio configuration. The command resets RAM configuration from NVM. • "nvmbckp": configuration storable in the NVM backup. The command resets NVM and RAM configuration from NVM backup. Allowed groups: • LEXI-R10 - "nvmbckp"

14.16 NVM configuration management factory restore +UNVMF

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

14.16.1 Description

Restores the factory-programmed configuration.

☞ Reboot the module to apply the new configuration.

14.16.2 Syntax

Type	Syntax	Response	Example
Generic syntax			
Set	AT+UNVMF=<at_group>	OK	AT+UNVMF="audio" OK
Test	AT+UNVMF=?	+UNVMF: (list of supported <at_group>s) OK	+UNVMF: ("audio","generic","gnss","nvmbckp") OK

14.16.3 Defined values

Parameter	Type	Description
<at_group>	String	AT group: • "audio": audio configuration. The command restores the factory-programmed configuration in RAM and NVM. • "generic": generic configuration. The command restores the factory-programmed configuration in RAM and NVM • "gnss": GNSS configuration. The command restores the factory-programmed configuration in RAM and NVM. • "nvmbckp": configuration storable in the NVM backup. The command restores the factory-programmed configuration in RAM, NVM and NVM backup. Allowed groups: • LEXI-R10 - "generic", "gnss", "nvmbckp"

14.17 Firmware update Over AT (FOAT) +NFWUPD

+NFWUPD						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	full	No	No	No	-	FW install error +CME Error

14.17.1 Description

Triggers the firmware update over the AT command interface. The AT command allows the FW package download, validation and installation. The FW package is a binary (.bin) file provided by u-blox.

- Initialize the system to accept a new FW package (AT+NFWUPD=<cmd>=0).
- Download the FW package file by means of the package segment download command (AT+NFWUPD=1,<sn>,<len>,<data>,<crc>). If the file size exceeds 1024 bytes then the download command can be issued several times.

- Validate the FW package file by means of the AT+NFWUPD=<cmd>=2. The validation cannot be aborted, hence do not issue any other command during the package validation.
- If the validation succeeds, then issue the upgrade firmware command (AT+NFWUPD=<cmd>=5) to complete the FOAT process.

The FW update generally takes two minutes to complete the process. In case of failure during the FW update, the process will be rolled back and an error result code will be provided. At the end of upgrade process the module will be rebooted and the data stored in the NVM are set to the factory-programmed values of the new firmware version.

14.17.2 Syntax

Type	Syntax	Response	Example
Set	AT+NFWUPD=<cmd>[,<sn>,<len>,<data>,<crc>]	OK	AT+NFWUPD=1,0,8,ecdf224000000080,d1 OK
Test	AT+NFWUPD=?	+NFWUPD: (list of supported <cmd>s) OK	+NFWUPD: (1-5) OK

14.17.3 Defined values

Parameter	Type	Description
<cmd>	Number	Firmware package process command: • 0: initialize a new FW update session, erasing the update partition and resetting internal state. • 1: download a FW package segment. The <sn>,<len>,<data>,<crc> parameters are mandatory, <crc> is calculated by XOR8 each <data> byte • 2: package validation • 3: get the package name • 4: get the package version • 5: firmware upgrade • 6: download phase has to be intended as terminated Allowed values: • LEXI-R10 - 0, 1, 2, 3, 4, 5, 6
<sn>	Number	Sequence number for each package segment, starting with zero
<len>	Number	Data length expressed in bytes, should be multiple of 4 (for the last segment add NULL byte padding, if needed). The maximum length is 1024 bytes.
<data>	Number	Data to be transmitted, expressed in hexadecimal format
<crc>	Number	Simple XOR8 of the binary data, expressed as a hexadecimal byte value

14.18 URC reporting behavior configuration +UURCCFG

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

14.18.1 Description

Configures the caching and presentation deferring behavior for the URCs on a specific AT terminal.

14.18.2 Syntax

Type	Syntax	Response	Example
Set	AT+UURCCFG=<config_item>,<enable>	OK	AT+UURCCFG=0,1 OK

Type	Syntax	Response	Example
Read	AT+UURCCFG?	+UURCCFG: 0,<enable> +UURCCFG: 1,<enable> OK	+UURCCFG: 0,0 +UURCCFG: 1,1 OK
Test	AT+UURCCFG=?	+UURCCFG: (list of the supported <config_item> values),(list of the supported <enable> values) OK	+UURCCFG: (0-1),(0-1) OK

14.18.3 Defined values

Parameter	Type	Description
<config_item>	Number	URC reporting behavior: • 0: URC caching. When enabled, all URCs will be cached, up to a maximum of 16 on the terminal. When disabled, the last 16 cached URCs will be displayed. • 1: URCs presentation deferring. When enabled, all URCs will be buffered during the execution of other AT commands on the AT terminal. When disabled, URCs can be displayed in between other AT commands execution.
<enable>	Number	Allowed values: • 0: Disable (factory-programmed value of <config_item> = 0) • 1: Enable (factory-programmed value of <config_item> = 1)

14.18.4 Notes

LEXI-R10

- The <config_item> = 0 command setting is not saved in the NVM.

14.19 Enable/disable URCs reporting +UURCSTAT

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

14.19.1 Description

Allows to enable/disable simultaneously different URCs based on the given URC set.

14.19.2 Syntax

Type	Syntax	Response	Example
Set	AT+UURCSTAT=<urc_set>,<reporting>	OK	AT+UURCSTAT="all",1 OK
Read	AT+UURCSTAT?	+UURCSTAT: "CREG":<reporting>,"CEREG":<reporting>,"CEDRXP":<reporting>,"CSCON":<reporting>,"CTZEU":<reporting>,"UCESQ":<reporting>,"CGEV":<reporting>,"UPSMR":<reporting>,"UUSIMSTAT":<reporting>,"UUBIP":<reporting>,"UPDPADDR":<reporting>,"UPCFUN":<reporting>,"USMSFULL":<reporting>,"CNEC":<reporting>	+UURCSTAT: "CREG":1,"CEREG":1,"CEDRXP":1,"CSCON":1,"CTZEU":1,"UCESQ":1,"CGEV":1,"UPSMR":1,"UUSIMSTAT":1,"UUBIP":1,"UPDPADDR":1,"UPCFUN":1,"USMSFULL":1,"CNEC":1 OK

Type	Syntax	Response	Example
		OK	
Test	AT+UURCSTAT=?	+UURCSTAT:(list of supported <urc_set>s) OK	+UURCSTAT: "ALL":(0-1),"DEVICE_STATUS":(0-1),"NETWORK":(0-1),"BOOT_AND_WARN":(0-1),"CREG":(0-1),"CEREG":(0-1),"CEDRXP":(0-1),"CSCON":(0-1),"CTZEU":(0-1),"UCESQ":(0-1),"CGEV":(0-1),"UPSMR":(0-1),"UUSIMSTAT":(0-1),"UUBIP":(0-1),"UPDPADDR":(0-1),"UPCFUN":(0-1),"USMSFULL":(0-1),"CNEC":(0-1) OK

14.19.3 Defined values

Parameter	Type	Description
<urc_set>	String	Command options: • "ALL": all URCs reported by the read command (+CREG, +CEREG, +CEDRXP, +CSCON, +CTZEU, +UCESQ, +CGEV, +UUPSMR, +UUSIMSTAT, +UUBIP, +UPDPADDR, +USMSFULL, +CNEC) • "DEVICE_STATUS": device status URCs (+CREG, +CEREG, +CEDRXP, +CSCON, +CTZEU, +CGEV, +UUPSMR, +UUSIMSTAT, +UUBIP, +UPDPADDR, +USMSFULL, +CNEC) • "NETWORK": network related URCs (+CREG, +CEREG, +CEDRXP, +CSCON, +CGEV, +UUPSMR, +UPDPADDR, +CNEC) • "BOOT_AND_WARN": boot and warning related URCs (+UUSIMSTAT, +UPCFUN, +USMSFULL) • "CREG": see +CREG URC • "CEREG": see +CEREG URC • "CEDRXP": see +CEDRXP URC • "CSCON": see +CSCON URC • "CTZEU": see +CTZEU URC • "UCESQ": see +UCESQ URC • "CGEV": see +CGEV URC • "UPSMR": see +UPSMR AT command • "UUSIMSTAT": see +UUSIMSTAT URC • "UUBIP": see +UUBIP URC • "UPDPADDR": reports +UPDPADDR: <cid>[,<PDP_addr_1>[,<PDP_addr_2>]] URC. If enabled, the URC is issued each time a PDP context is activated, reporting the related <cid> and PDP addresses. This URC has not a dedicated command and can only be enabled/disabled through +UURCSTATUS command. • "UPCFUN": reports +UPCFUN: <fun> URC at boot. If enabled, the URC shows the module functionality status at boot (See +CFUN AT command read). This URC has not a dedicated command and can only be enabled/disabled through +UURCSTATUS command. • "USMSFULL": reports +USMSFULL: <mem> URC. If enabled, the URC is issued when the SMS used to store memory is full, reporting also which memory type is used. This URC has not a dedicated command and can only be enabled/disabled through +UURCSTATUS command. • "CNEC": see +CNEC URC
<reporting>	Number	Enable/disable URC reporting • 0: URC reporting disabled • 1: URC reporting enabled
<cid>	Number	See <cid>.
<PDP_addr_1>	String	IPV4 or IPV6 PDP address.
<PDP_addr_2>	String	Reports IPV6 PDP address when both IPV4 and IPV6 addresses are assigned.
<fun>	Number	See <fun> parameter.
<mem>	String	See memory types defined in +CPMS AT command.

15 Power management

15.1 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

15.1.1 Description

Sets the UART power saving configuration, but it has a global effect on the module power saving configuration. When the power saving is enabled, the module automatically enters the low power idle mode whenever possible, reducing the power consumption. Three different and incremental levels of power saving are supported, called deep-sleep modes (Sleep-1, Sleep-2, Hibernate). For further details, see the system integration manual [23].

- If the power saving is disabled (+UPSV: 0), the UART interface is always enabled and the module does not enter any deep-sleep mode.
- When power saving is enabled using <mode>=1, the UART interface is enabled and the module does not enter any deep-sleep mode before the <timeout> parameter. Receiving data on the UART interface or pressing PWR_ON input line keeps awake the module for another <timeout> since last character received or last PWR_ON press. To wake up the module it is necessary to press the PWR_ON input line.
- When power saving is enabled using <mode>=5, the UART interface is enabled and the module does not enter any deep-sleep mode as long as the properly configured GPIO is high.

15.1.2 Syntax

Type	Syntax	Response	Example
Generic syntax			
Set	AT+UPSV=[<mode>[,<timeout>[,<max_sleep_mode>]]]	OK	AT+UPSV=0 OK
Power saving disabling			
Set	AT+UPSV=0	OK	AT+UPSV=0 OK
Power saving controlled by the UART RX line			
Set	AT+UPSV=1[,<timeout>[,<max_sleep_mode>]]	OK	AT+UPSV=1,5000,4 OK
Power saving controlled by the GPIO input			
Set	AT+UPSV=5[,<timeout>[,<max_sleep_mode>]]	OK	AT+UPSV=5,5000,3 OK
Read	AT+UPSV?	+UPSV: <mode> OK	+UPSV: 0 OK
Test	AT+UPSV=?	+UPSV: (list of supported <mode>s), (range of allowed timeout values) OK	+UPSV: (0,1,5),(200-65535),(2-4) OK

15.1.3 Defined values

Parameter	Type	Description
<mode>	Number	Power saving configurations: • 0: (default and factory-programmed value): power saving disabled. • 1: power saving is automatically entered when conditions allow power saving but not before <timeout> parameter.

Parameter	Type	Description
		• 5: power saving is controlled by the GPIO pin configured with <GPIO_mode>=34.
<timeout>	Number	Sets inactivity timeout after which the module returns to power saving state. The allowed range is 200-65535 (expressed in ms). If the parameter is omitted, timeout value is set to 5000.
<max_sleep_mode>	Number	Maximum achievable deep-sleep mode. Allowed values: • 2: it corresponds to Sleep-1 mode • 3: it corresponds to Sleep-2 mode • 4: it corresponds to Hibernate mode For the default value, see Notes.

15.1.4 Notes

LEXI-R10

- The module does not enter any deep-sleep mode if the UART AT interface is in SMS mode or raw mode.
- The module is allowed to enter up to Sleep-1 mode if the UART AT interface is in direct link mode.
- The module is allowed to enter up to Sleep-1 mode if the UART or USB AT interface is in data mode (PPP dial-up).
- In <mode>=1, when the module is in any deep-sleep mode, the UART RX line cannot wake up the module.
- In <mode>=1, the PWR_ON input line must not be pressed for too much otherwise it triggers a power off sequence. For the PWR_ON input line timings, see the corresponding module data sheet [22].
- In <mode>=1 and in case of +USIO: 1, the last character received from the UART is the one determining the actual <timeout> time before entering the deep-sleep mode.
- To enable power saving using <mode>=5, GPIO3 must be already configured with <GPIO_mode>=34, see +UGPIOC AT command. If the GPIO is high, the UART interface is enabled and the module does not enter any deep-sleep mode; then, when the GPIO gets low, the module enters a deep-sleep mode as soon as possible and the UART interface is disabled.
- In <mode>=5, <timeout> parameter is not used, even if it is included in the set command.
- In case of +UUSBSLPCONF=0, only <max_sleep_mode>=2 is allowed. If it is omitted, the default value is set to <max_sleep_mode>=2.
- In case of +UUSBSLPCONF=1 or USB disabled by +UUSBCONF=99 all <max_sleep_mode> values are allowed. If the parameter is omitted, the default value is set to <max_sleep_mode>=4.
- Use a SIM card with PIN check disabled (see +CLCK AT command) if power saving is used with <max_sleep_mode>=3 or <max_sleep_mode>=4.
- The DTE can runtime prevent the module from entering specific deep-sleep modes by issuing the +USLPVOTE AT command.

15.2 Power Saving Mode Setting +CPSMS

+CPSMS						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	partial	Yes	NVM / OP	No	< 10 s	+CME Error

15.2.1 Description

Controls the setting of the UEs Power Saving Mode (PSM) parameters. The command controls whether the UE wants to apply PSM or not, as well as:

- The requested extended periodic RAU value in GERAN/UTRAN
- The requested GPRS READY timer value in GERAN/UTRAN
- The requested extended periodic TAU value in E-UTRAN
- The requested Active Time value.

The +CPSMS <mode> parameter defines whether the Power Saving Mode (PSM) feature usage is requested to the network.

- If Power Saving Mode (PSM) is requested (+CPSMS: 1) and granted by the network, i.e. Active Time has been assigned, PSM deep-sleep can be entered: after the expiry of the assigned Active Time (T3324) every SW and HW component on the device powers down except for the real time clock (RTC) (notified via the +UUPSMR URC if enabled). It stays powered down until the expiry of the assigned extended periodic TAU value (T3412_ext) or the assigned periodic TAU value (T3412) (if the former has not been assigned) or an early wake-up event (which consists in a proper toggling of the PWR_ON input line).
- PSM deep-sleep is not entered if PSM is disabled (+CPSMS: 0) or not granted by the network.

Check whether the Active Time and the extended periodic TAU have been assigned to the UE by means of the AT+CEREG=4 AT command.

☞ LEXI-R10
The assigned extended periodic TAU value and periodic TAU value can be checked by means of the AT +UCGED=8 AT command.

☞ LEXI-R10
See the +UPSCONFIG AT command to enable "PSM without network coordination": this feature allows to enter PSM even if Power Saving Mode is not granted by the network.

15.2.2 Syntax

Type	Syntax	Response	Example
Set	AT+CPSMS=[<mode>[,<Requested_Periodic_RAU>[,<Requested_GPRS_READY_timer>[,<Requested_Periodic_TAU>,[<Requested_Active_Time>]]]]]	OK	AT+CPSMS=1,,,"01000011","01000011" OK
Read	AT+CPSMS?	+CPSMS: <mode>,[<Requested_Periodic_RAU>],[<Requested_GPRS_READY_timer>],[<Requested_Periodic_TAU>],[<Requested_Active_Time>] OK	+CPSMS: 1,,,"01000011","01000011" OK
Test	AT+CPSMS=?	+CPSMS: (list of supported <mode>s),(list of supported <Requested_Periodic_RAU>s),(list of supported <Requested_GPRS_READY_timer>s),(list of supported <Requested_Periodic_TAU>s),(list of supported <Requested_Active_Time>s) OK	+CPSMS: (0,1,2),,,("00000000"-"11111111"),("00000000"-"11111111") OK

15.2.3 Defined values

Parameter	Type	Description
<mode>	Number	Indication to disable or enable the use of PSM in the UE. Allowed values: • 0 (default value): disable the use of PSM • 1: enable the use of PSM • 2: disable the use of PSM and reset all parameters for PSM to factory-programmed values. Factory-programmed value: • LEXI-R10 - 0
<Requested_Periodic_RAU>	String	One byte in an 8 bit format. Requested extended periodic RAU value (T3312_ext) to be allocated to the UE in GERAN/UTRAN. The requested extended periodic RAU value is coded as one byte (octet 3) of the GPRS Timer 3 information element coded as bit format (e.g. "01000111" equals 70 hours). For the coding and the value range, see the GPRS Timer 3 IE in 3GPP TS 24.008 table 10.5.163a/3GPP TS 24.008 [84]. See also

Parameter	Type	Description
		3GPP TS 23.682 [84]. See also 3GPP TS 23.682 [159] and 3GPP TS 23.060 [82]. The factory-programmed value is: • LEXI-R10 - The parameter is not supported.
<Requested_GPRS_READY_timer>	String	One byte in an 8 bit format. Requested GPRS READY timer value (T3314) to be allocated to the UE in GERAN/UTRAN. The requested GPRS READY timer value is coded as one byte (octet 2) of the GPRS Timer information element coded as bit format (e.g. "01000011" equals 3 decihours or 18 minutes). For the coding and the value range, see the GPRS Timer IE in 3GPP TS 24.008 table 10.5.172/3GPP TS 24.008 [84]. See also 3GPP TS 23.060 [82]. The factory-programmed value is: • LEXI-R10 - The parameter is not supported.
<Requested_Periodic_TAU>	String	One byte in an 8 bit format. Requested extended periodic TAU value (T3412_ext) to be allocated to the UE in E-UTRAN. The requested extended periodic TAU value is coded as one byte (octet 3) of the GPRS Timer 3 information element coded as bit format (e.g. "01000111" equals 70 hours). For the coding and value range, see the GPRS Timer 3 IE in 3GPP TS 24.008 table 10.5.163a/3GPP TS 24.008 [84]. See also 3GPP TS 23.682 [159] and 3GPP TS 23.401 [160]. • LEXI-R10 - The default and factory-programmed value is "00110100" (20 hours).
<Requested_Active_Time>	String	One byte in an 8 bit format. Requested Active Time value (T3324) to be allocated to the UE in GERAN/UTRAN or in EUTRAN. The requested Active Time value is coded as one byte (octet 3) of the GPRS Timer 2 information element coded as bit format (e.g. "00100100" equals 4 minutes). For the coding and value range, see the GPRS Timer 2 IE in 3GPP TS 24.008 table 10.5.163/3GPP TS 24.008 [84]. See also 3GPP TS 23.682 [159], 3GPP TS 23.060 [82] and 3GPP TS 23.401 [160]. • LEXI-R10 - The default and factory-programmed value is "00100101" (5 minutes).

15.2.4 Notes

LEXI-R10

- The <mode> parameter is mandatory.
- The <Requested_Periodic_RAU> and <Requested_GPRS_READY_timer> parameters are not supported and must be left empty.
- The PIN insertion is not mandatory before the command execution.
- The maximum achievable deep-sleep level is configured independently from the PSM feature by +UPSV AT command. For more details, see the corresponding application development guide.

15.3 Deep-sleep mode indication +UPSMR

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

15.3.1 Description

Enables or disables the URC that conveys information on deep-sleep (RTC-only) mode states, i.e. deep-sleep entry, exit and notification if there is some embedded SW client or peripheral activity postponing the entrance into deep-sleep mode. See +UPSMVER to check the available deep-sleep mode options.

15.3.2 Syntax

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

Type	Syntax	Response	Example
		OK	
Generic syntax			
URC		+UUPSMR: <state>[,<param1>]	+UUPSMR: 1
Module exiting deep-sleep mode			
URC		+UUPSMR: 0	+UUPSMR: 0
Module entering deep-sleep mode			
URC		+UUPSMR: 1[,<image>]	+UUPSMR: 1,1
Client preventing deep-sleep mode entry (<state>=2 or <state>=3)			
URC		+UUPSMR: <state>,<client_id>	+UUPSMR: 2,2

15.3.3 Defined values

Parameter	Type	Description
<mode>	Number	Indication to disable or enable the +UUPSMR URC: • 0 (factory-programmed value): the +UUPSMR URC is disabled • 1: the +UUPSMR URC is enabled
<state>	Number	Indication of the state of the module with respect to deep-sleep mode: • 0: the module is out of deep-sleep mode • 1: the module is entering deep-sleep mode. The FW image that will be loaded when exiting deep-sleep mode is indicated by the <image> parameter (where supported) • 2: deep-sleep client identified by <client_id> is preventing module from entering deep-sleep mode • 3: the module entered PSM/eDRX and the protocol stack is in suspension, but the deep-sleep client identified by <client_id> is preventing module from entering the deep-sleep mode Allowed values: • LEXI-R10 - 0, 1
<image>	Number	Identifies the FW image loaded when exiting deep-sleep mode: • 1: full image is being loaded • 2: paging only image is being loaded (only possible in case of eDRX deep-sleep)
<client_id>	Number	Identifies the deep-sleep client that is preventing the module from entering deep-sleep mode:
<param1>	Number	Supported content depends on the related <state> (details are given above).

15.3.4 Notes

LEXI-R10

- The <image> and <client_id> parameters are not supported.
- The URC is printed at PSM entry (<state>=1) and exit (<state>=0).

15.4 Deep-sleep URCs configuration +USLPURC

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

15.4.1 Description

Enables or disables URCs to be sent when the module enters and exits deep-sleep modes. For further details about entering deep-sleep modes, see the +UPSV AT command and the System Integration Manual [23].

The command settings are stored in the profile. Issue the AT&W AT command to save the command setting.

15.4.2 Syntax

Type	Syntax	Response	Example
Set	AT+USLPURC=<deep_sleep_mode>,<enable_urc>	OK	AT+USLPURC="SLEEP1",1 OK
Read	AT+USLPURC?	+USLPURC: <deep_sleep_mode>,<enable_urc> OK	+USLPURC: "SLEEP1":0,"SLEEP2":0,"HIBNATE":0 OK
Test	AT+USLPURC=?	+USLPURC: (list of supported <deep_sleep_mode>s),(list of supported <enable_urc> values) OK	+USLPURC: ("SLEEP1","SLEEP2","HIBNATE"),(0-1) OK
URC		+UUSLPURC: <deep_sleep_mode_short> <mode_transition>	+UUSLPURC: HIB 1

15.4.3 Defined values

Parameter	Type	Description
<deep_sleep_mode>	String	Configures URCs related to the selected deep-sleep mode: • "SLEEP1": configure URCs related to Sleep-1 mode • "SLEEP2": configure URCs related to Sleep-2 mode • "HIBNATE": configure URCs related to Hibernate mode
<enable_urc>	Number	Enables or disables URC when the module enters and exits the selected <deep_sleep_mode>: • 0 (default and factory-programmed value): disable URC • 1: enable URC
<deep_sleep_mode_short>	String	Deep-sleep mode indication in URC: • SLP1: Sleep-1 • SLP2: Sleep-2 • HIB: HIbernate
<mode_transition>	Number	Deep-sleep mode transition: • -1: fail to enter deep-sleep mode • 0: wake up from deep-sleep mode • 1: enter deep-sleep mode

15.4.4 Notes

LEXI-R10

- Sleep URCs are discarded on the AT interfaces with an ongoing command. The URCs are normally issued on all the other AT interfaces.

15.5 Sleep-mode voting+USLPVOTE

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

15.5.1 Description

Allows the DTE to prevent the module from entering the specified deep-sleep mode (the maximum achievable deep-sleep level is configured with +UPSV AT command).

In case the DTE votes down for Sleep-2/Hibernate on one or more AT terminals, the module can enter Sleep-1 mode.

In case the DTE votes down for Sleep-1 on one or more AT terminals, the module will not enter any deep-sleep mode.

All negative votes are counted and their number determines the module behavior, but it is possible to clear all votes with a single AT command issued on any AT terminal.

15.5.2 Syntax

Type	Syntax	Response	Example
Set	AT+USLPVOTE=<op_cmd>,<param>[,<reset_vote_state>]	OK	AT+USLPVOTE=0,0 OK
Read	AT+USLPVOTE?	+USLPVOTE: <current_voted_state>,<vote_cnt>,<configured_vote_state> OK	+USLPVOTE: 3,2,3 OK
Test	AT+USLPVOTE=?	+USLPVOTE: 0,(list of supported <vote> values) +USLPVOTE: 1,(list of supported <configured_vote_state> values),(list of <reset_vote_state> modes) OK	+USLPVOTE: 0,(0-2) +USLPVOTE: 1,(2-3),(0-1) OK

15.5.3 Defined values

Parameter	Type	Description
<op_cmd>	Number	Voting operation: • 0: select voting mode (up/down/reset) for <configured_vote_state> • 1: configure vote state
<param>	Number	Voting mode when <op_cmd>=0: • 0: vote down <configured_vote_state> • 1: vote up <configured_vote_state> • 2: reset all votes for <configured_vote_state> <configured_vote_state> when <op_cmd>=1: • 2: vote state is configured against Sleep-1 • 3 (default value): vote state is configured against Sleep-2/Hibernate
<reset_vote_state>	Number	Optional parameter to allow change of <configured_vote_state> only when <op_cmd>=1: • 0 (default value): do not allow change of vote state if there is at least one vote down • 1: allow change of configured vote state regardless the number of votes, next vote down will reset previous vote state counter
<current_voted_state>	Number	Current actual voted state value: • 2: current voted state is against Sleep-1 • 3: current voted state is against Sleep-2/Hibernate
<vote_cnt>	Number	Number of votes against current voted state: • 0: minimum vote against current voted state • 255: maximum vote against current voted state
<configured_vote_state>	Number	Configured vote state value (terminal specific): • 2: vote against Sleep-1 • 3: vote against Sleep-2/Hibernate

16 GPIO

16.1 Introduction

The section describes the AT commands used to configure the GPIO pins provided by u-blox cellular modules.

16.1.1 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 Table 17 for an overview of the custom functions supported by u-blox cellular modules.

<gpio_mode>	Output	Input	Network status indication	External GNSS supply enable	External GNSS data ready	External GNSS RTC sharing	Jamming detection indication	SIM card detection	Headset detection	GSM Tx burst indication	Module status indication	Module operating mode indication	I2S digital audio interface	SPI serial interface	Master clock generation	UART (DSR, DTR, DCD and RI) interface	Wi-Fi enable	Ring indicator	Last gasp	External GNSS antenna / LNA control	Time pulse GNSS	Time pulse output	Time stamp of external interrupt	Fast power-off	LwM2M pulse	Hardware flow control (RTS, CTS)	Antenna dynamic tuning	External GNSS time pulse input	External GNSS time stamp of external interrupt	DTR mode for power saving control	32.768 kHz output	Safe memory and power-off	UPSV control	Pad disabled
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	18	19	20	21	22	23	24	25	26	27	28	29	30	32	33	34	255
LEXI-R10	*	*	*					*			*							*						*								*	*	*

Table 17: GPIO custom functions overview

The configuration of the GPIO pins (i.e. the setting of the parameters of the +UGPIOC AT command) is saved in the NVM and used at the next power-on.

LEXI-R10
For more details on the antenna dynamic tuning control feature, see the +UATUN AT command.

16.1.2 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.

See the corresponding module system integration manual for the functions supported by each GPIO.

16.1.2.1 LEXI-R10 GPIO mapping

<gpio_id>	Pin name	Pin number	Factory-programmed function	Remarks
14	GPIO1	14	Pin disabled	-
15	GPIO2	15	Pin disabled	-
16	GPIO3	16	Pin disabled	-
17	GPIO4	17	Pin disabled	-
18	GPIO5	18	Pin disabled	-
29	GPIO6	29	Pin disabled	Only pin 29 can be configured for "SIM card detection" functionality

<gpio_id>	Pin name	Pin number	Factory-programmed function	Remarks
23	GPIO7	23	Pin disabled	-
24	GPIO8	24	Pin disabled	-
25	GPIO9	25	Pin disabled	-
26	GPIO10	26	Pin disabled	-

Table 18: LEXI-R10 GPIO mapping

16.1.2.2 Additional notes

LEXI-R10
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.

16.1.3 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 home network 4G: indicates registered state on home network in 4G RAT
- Registered home network NB-IoT: indicates registered state on home network in NB-IoT
- 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)
- Registered roaming 4G: indicates registered state with visitor 4G network (roaming in 4G RAT)
- Registered roaming NB-IoT: indicates registered state with visitor NB-IoT network (roaming in NB-IoT)
- 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

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.

16.1.3.1 No service (no network coverage or not registered)

- Continuous Output / Low



Figure 1: GPIO pin progress for no service

16.1.3.2 Registered home network 2G

- Cyclic Output / High for 100 ms, Output / Low for 2 s

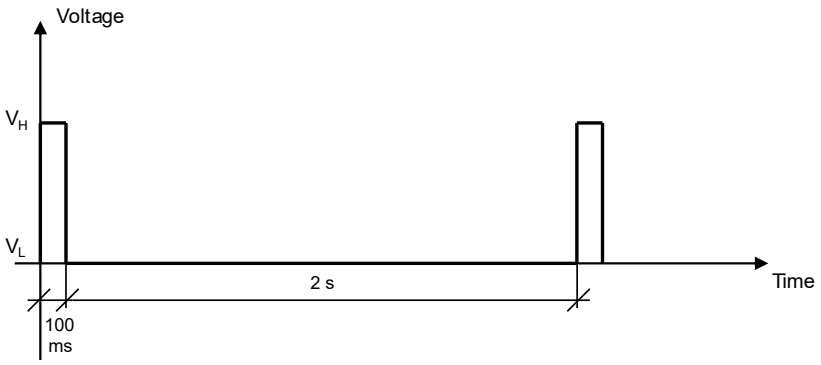


Figure 2: GPIO pin progress for registered home network 2G

16.1.3.3 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

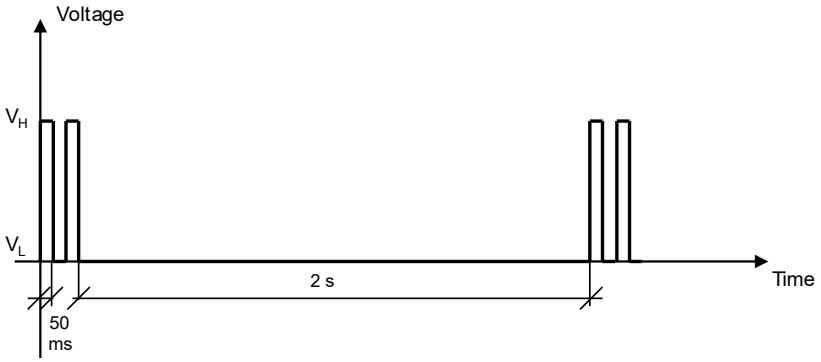


Figure 3: GPIO pin progress for registered home network 3G

16.1.3.4 Registered home network 4G

- Cyclic Output / High for 75 ms, Output / Low for 75 ms, Output / High for 75 ms, Output / Low for 75 ms, Output / High for 75 ms, Output / Low for 3 s

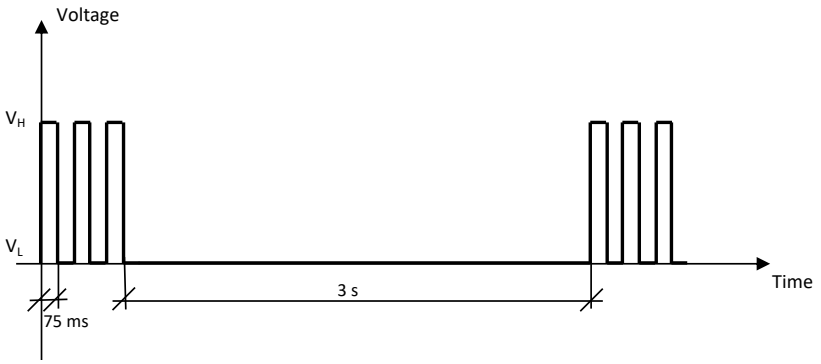


Figure 4: GPIO pin progress for registered home network 4G

16.1.3.5 Registered home network NB-IoT

- Cyclic Output / High for 100 ms, Output / Low for 30 s

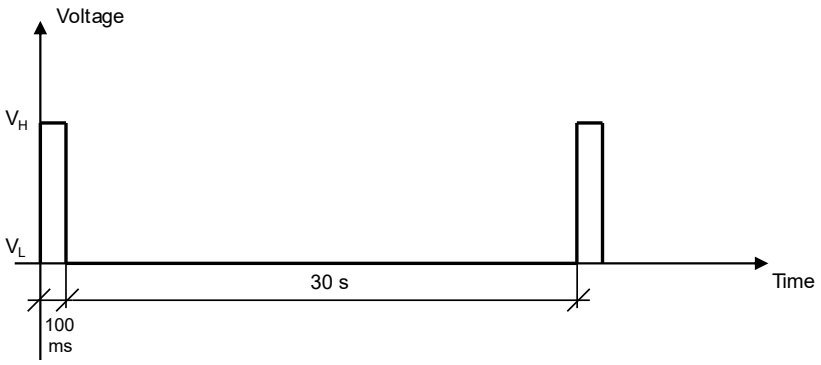


Figure 5: GPIO pin progress for registered home network NB-IoT

16.1.3.6 Registered roaming 2G

- Cyclic Output / High for 100 ms, Output / Low for 100 ms, Output / High for 100 ms, Output / Low for 2 s

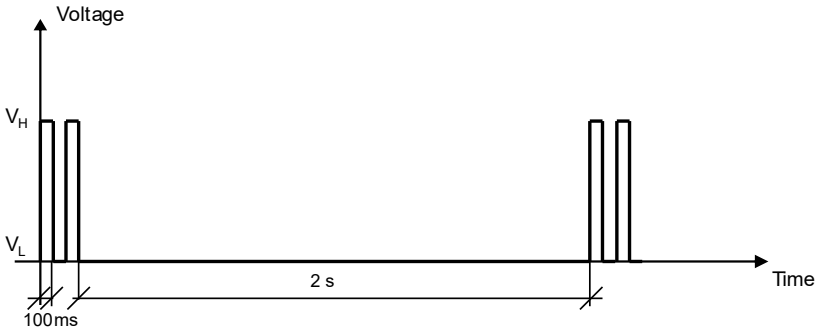


Figure 6: GPIO pin progress for registered roaming 2G

16.1.3.7 Registered roaming 3G

- Cyclic Output / High for 50 ms, Output / Low for 50 ms, Output / High for 50 ms, Output / Low for 100 ms

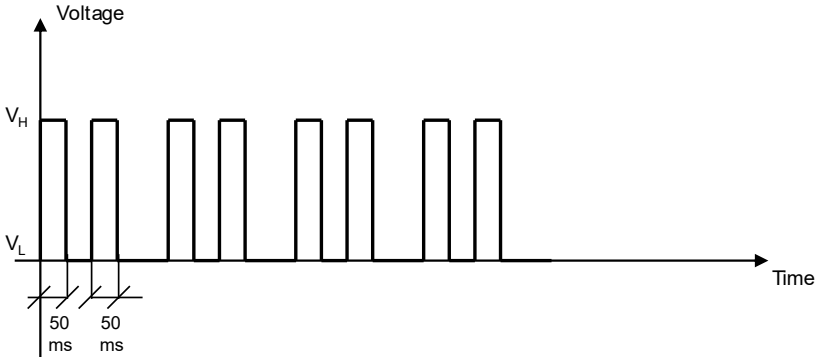


Figure 7: GPIO pin progress for registered roaming 3G

16.1.3.8 Registered roaming 4G

- Cyclic Output / High for 150 ms, Output / Low for 150 ms, Output / High for 150 ms, Output / Low for 3 s

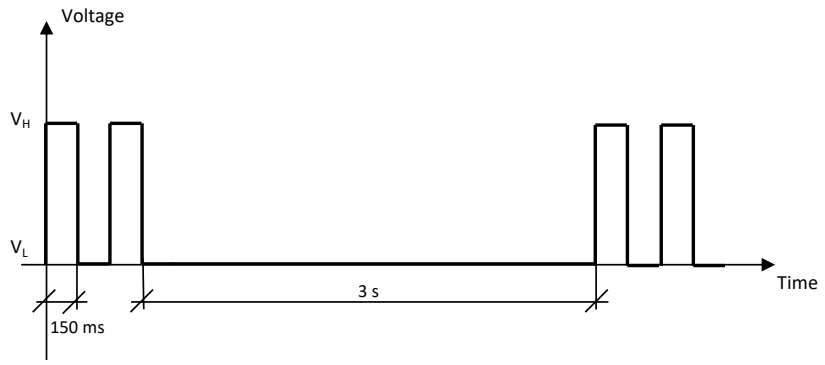


Figure 8: GPIO pin progress for registered roaming 4G

16.1.3.9 Registered roaming NB-IoT

- Cyclic Output / High for 100 ms, Output / Low for 100 ms, Output / High for 100 ms, Output / Low for 30 s

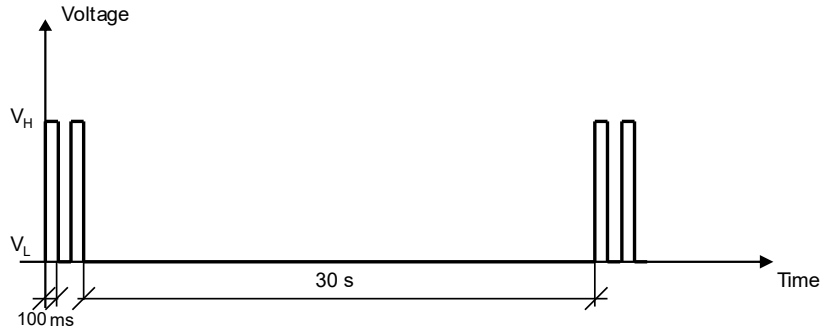


Figure 9: GPIO pin progress for registered roaming NB-IoT

16.1.3.10 Data transmission

- Continuous Output / High

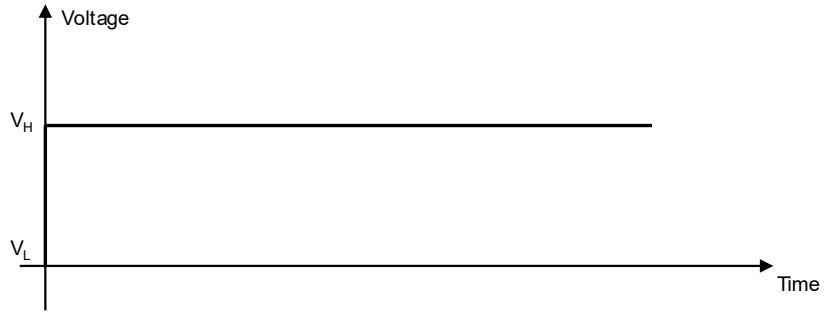


Figure 10: GPIO pin progress for data transmission

16.1.3.11 Data transmission roaming

- Cyclic Output / High for 800 ms, Output / Low for 200 ms

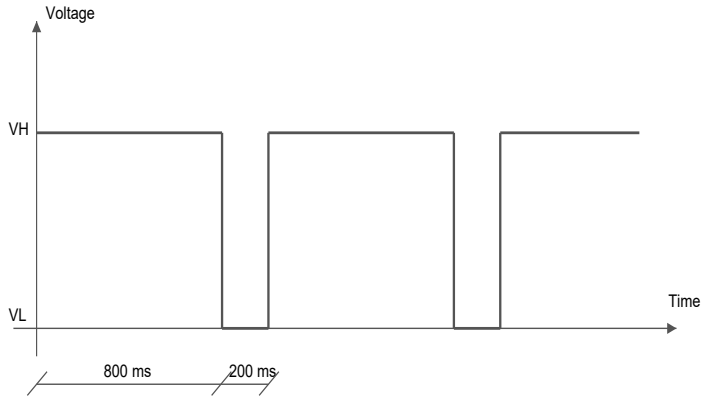


Figure 11: GPIO pin progress for data transmission roaming

LEXI-R10
When registered on 4G (LTE) network, the GPIO pin progress is the same as for data transmission (Figure 10) because a PDP context/EPS bearer is available.

16.1.4 UART (DSR, DTR, DCD e RI) interface

The UART interface lines (DSR, DTR, DCD and RI) can be set on GPIO pins. For more details, see the corresponding module system integration manual.

16.1.5 Module status indication

When a GPIO pin is configured to provide module status indication, its progress depends on the current module status (power-off mode, i.e. module switched off, or deep-sleep mode versus idle, active or connected mode, i.e. module switched on):

- Output / High, when the module is switched on (any operating mode during module normal operation: idle, active or connected mode)
- Output / Low, when the module is switched off (power-off mode)

16.1.6 Module operating mode indication

When a GPIO pin is configured to provide module operating mode indication, its progress depends on the current module operating mode (the low power idle mode versus active or connected mode):

- Output / High, when the module is in active or connected mode
- Output / Low, when the module is in idle mode (that can be reached if the power saving is enabled by the +UPSV AT command)

16.2 GPIO select configuration command +UGPIOC

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

16.2.1 Description

Configures the GPIO pins as input, output, or to handle a custom function. When a GPIO pin is configured as an output pin (<gpio_mode>=0), it is possible to set the output value <gpio_out_val> which will be returned in the information text response to +UGPIOR read command (where supported). When a GPIO pin is configured as an input pin (<gpio_mode>=1), it is possible to set the input value <gpio_in_pull> which will be returned in the information text response to +UGPIOR read command (where supported). When the GPIO pin is configured as a

SIM card detection (<gpio_mode>=7), it is possible to set the SIM polarity <gpio_sim_det_logic>; the parameter setting will be returned in the information text response to +UGPIOC read command.

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").
Where supported, the following custom functions cannot be simultaneously configured on 2 GPIOs:

- Network status indication
- External GNSS supply enable
- External GNSS data ready
- External GNSS RTC sharing
- Jamming detection indication
- SIM card detection
- Headset detection
- GSM Tx burst indication
- Module status indication
- Module operating mode indication
- Ring indicator
- Last gasp
- External GNSS antenna / LNA control
- Time pulse GNSS
- Time pulse output
- Time stamp of external interrupt
- Fast power-off
- External GNSS time pulse input
- External GNSS time stamp of external interrupt
- DTR mode for power saving control
- 32.768 kHz output
- Safe memory and power-off
- UPSV control
- Primary UART DTR line on GPIO pin

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.

16.2.2 Syntax

Type	Syntax	Response	Example
Set	AT+UGPIOC=<gpio_id>,<gpio_mode>[,<gpio_out_val>\<gpio_in_pull>\<gpio_sim_det_logic>]	OK	AT+UGPIOC=42,7,1 OK
Read	AT+UGPIOC?	+UGPIOC: <gpio_id>,<gpio_mode> [<gpio_id>,<gpio_mode> [....]] OK	+UGPIOC: 20,255 21,3 23,255 24,255 42,7,1 OK
Test	AT+UGPIOC=?	+UGPIOC: (list of supported <gpio_id>),(list of supported <gpio_	+UGPIOC: (20,21,23,24,42),(0-5,7,9,255),(0-2)

Type	Syntax	Response	Example
		mode>),(list of supported <gpio_out_val>\<gpio_in_pull>\<gpio_sim_det_logic>) [<gpio_id1>,<gpio_mode> ... <gpio_idN>,<gpio_mode>] OK	OK

16.2.3 Defined values

Parameter	Type	Description
<gpio_id>	Number	GPIO pin identifier: pin number 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 See the GPIO functions for custom functions supported by different u-blox cellular modules series and product version. Allowed values: • 0: output • 1: input • 2: network status indication • 3: external GNSS supply enable • 4: external GNSS data ready • 5: external GNSS RTC sharing • 6: jamming detection indication • 7: SIM card detection • 8: headset detection • 9: GSM Tx burst indication • 10: module status indication • 11: module operating mode indication • 12: I^2S digital audio interface • 13: SPI serial interface • 14: master clock generation • 15: UART (DSR, DTR, DCD e RI) interface • 16: Wi-Fi enable • 18: ring indicator • 19: last gasp • 20: external GNSS antenna / LNA control enable • 21: time pulse GNSS • 22: time pulse output • 23: time stamp of external interrupt • 24: fast power-off • 25: LwM2M pulse • 26: hardware flow control (RTS, CTS) • 27: antenna dynamic tuning • 28: external GNSS time pulse input • 29: external GNSS time stamp of external interrupt • 30: DTR mode for power saving control • 32: 32.768 kHz output • 33: safe memory and power-off

Parameter	Type	Description
		• 34: UPSV control • 255: pad disabled
<gpio_out_val>	Number	GPIO output value (for output function <gpio_mode>=0 only): • 0 (default value): low • 1: high
<gpio_in_pull>	Number	GPIO input value (for input function <gpio_mode>=1 only): • 0 (default value): no resistor activated • 1: pull up resistor active • 2: pull down resistor active
<gpio_sim_det_logic>	Number	SIM detection polarity (for SIM detection function <gpio_mode>=7 only): • 0 (default value): SIM detection high polarity activated • 1: SIM detection low polarity activated (reverse SIM detection logic)

16.2.4 Notes

LEXI-R10

- <gpio_in_pull> is supported with limitations.
- The network status indication (<gpio_mode>=2) and ring indicator function (<gpio_mode>=18) can be set on every pin except GPIO3 and GPIO6.
- The module status indication function (<gpio_mode>=10) can be set on GPIO2 and GPIO4 only.
- The following features can be set on GPIO3 and GPIO6 only: fast power-off (<gpio_mode>=24), safe memory and power-off (<gpio_mode>=33), UPSV control (<gpio_mode>=34).

16.3 GPIO read command +UGPIOR

+UGPIOR						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	full	No	No	No	< 10 s	+CME Error

16.3.1 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.

16.3.2 Syntax

Type	Syntax	Response	Example
Set	AT+UGPIOR=<gpio_id>	+UGPIOR: <gpio_id>,<gpio_val> OK	AT+UGPIOR=20 +UGPIOR: 20,0 OK
Test	AT+UGPIOR=?	+UGPIOR: (list of supported <gpio_id>s) OK	+UGPIOR: (20, 21) OK

16.3.3 Defined values

Parameter	Type	Description
<gpio_id>	Number	GPIO pin identifier: pin number 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.

16.3.4 Notes

- The set command works only if the <gpio_mode> parameter of the +UGPIOC AT command is set to 0 or 1.

16.4 GPIO set command +UGPIOW

+UGPIOW						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	full	No	No	No	< 10 s	+CME Error

16.4.1 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).

16.4.2 Syntax

Type	Syntax	Response	Example
Set	AT+UGPIOW=<gpio_id>,<gpio_out_val>	OK	AT+UGPIOW=20,1 OK
Test	AT+UGPIOW=?	+UGPIOW: (list of supported <gpio_id>s),(list of supported <gpio_out_val>s) OK	+UGPIOW: (20, 21),(0-1) OK

16.4.3 Defined values

Parameter	Type	Description
<gpio_id>	Number	GPIO pin identifier: pin number 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.

16.4.4 Notes

- The set command works only if the <gpio_mode> parameter of the +UGPIOC AT command is set to 0.

17 End user test

17.1 Toggle test mode +UTEST=0, +UTEST=1

+UTEST=0						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	partial	No	No	No	Up to 1 s	+CME Error

17.1.1 Description

Enables the production test (or non-signaling) mode or returns to the normal (signaling) operating mode. The AT+UTEST=0 command exits production test mode, while AT+UTEST=1 enters it.

Signaling mode is the default operating state after boot: the protocol stack is operating and the module can connect to the cellular network normally. In non-signaling mode, the module switches off the protocol stack for running tests which could not otherwise be performed.

In signaling mode:

- The only allowed +UTEST command is the AT+UTEST=1 used to enable the testing interface
- All other +UTEST commands return an error result code ("+CME ERROR: operation not allowed" or "+CME ERROR: 3" depending on the +CMEE AT command setting)

To enter production test mode:

- LEXI-R10 - deactivate the protocol stack issuing the `AT+CFUN=0` command before entering the non-signaling mode.

To return to the normal mode, perform one of these actions:

- LEXI-R10 - a module reset
- LEXI-R10 - power off the module
- LEXI-R10 - send `AT+UTEST=0` (depending on the module series, a reboot could be automatically performed)

When the module returns the normal mode, the network registration status stored in the profile will be restored. Use the `AT+CFUN=1` command to restore the module full functionality.

17.1.2 Syntax

Type	Syntax	Response	Example
Generic syntax			
Set	AT+UTEST=<mode>	[+UTEST: <mode>] OK	AT+UTEST=0 OK
Entering normal mode			
Set	AT+UTEST=0	OK	AT+UTEST=0 OK
Entering test mode			
Set	AT+UTEST=1	OK	AT+UTEST=1 OK
Read	AT+UTEST?	+UTEST: <mode> OK	+UTEST: 1 OK
Test	AT+UTEST=?	+UTEST: (list of supported <mode>s) OK	+UTEST: (0-4) OK

17.1.3 Defined values

Parameter	Type	Description
<mode>	Number	Test mode setting: • 0: the module returns to the normal mode • 1: the module enters the test mode

17.2 Digital pins testing +UTEST=10

+UTEST=10						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	partial	No	No	No	Up to 1 s	+CME Error

17.2.1 Description

Performs functional testing on the digital pins of the module.

The module 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.

This command is intended for production or prototype testing: to check the correct digital pins behavior and to detect possible soldering or functional problems. The execution of these actions is performed only in non-signaling mode. If the module has not been set into non-signaling mode (with AT+UTEST=1) prior to using +UTEST=10, this command will return "+CME ERROR: operation not allowed" or "+CME ERROR: 3" error result code, depending on the +CMEE AT command setting.

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 to the module.

The command only accepts the parameter 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" or "+CME ERROR: 4" depending on the +CMEE AT command setting).

For more details on test command examples, guidance about test equipment setup and more information on module reboot see the application development guide and the corresponding data sheet for pins levels characteristics.

17.2.2 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" OK
Restoring original configuration			
Set	AT+UTEST=10,0	OK	AT+UTEST=10,0 OK
Pins set definition			
Set	AT+UTEST=10,2,[<bit_padding>]<pin_seq>	OK	AT+UTEST=10,2,"0000000C300000003000" OK
Pins configuration			
Set	AT+UTEST=10,3,[<bit_padding>]<pin_seq>	OK	AT+UTEST=10,3,"0000000420000001000" OK
Output pins definition			
Set	AT+UTEST=10,4,[<bit_padding>]<pin_seq>	OK	AT+UTEST=10,4,"00000000100000002000" OK
Digital testing execution			
Set	AT+UTEST=10,5	OK	AT+UTEST=10,5 OK
Digital value measurement			
Set	AT+UTEST=10,6	<bit_padding>]<pin_seq> OK	AT+UTEST=10,6 00000004100000003000 OK

17.2.3 Defined values

Parameter	Type	Description
<op_code>	Number	Test mode setting: • 0: restores the pins to the original configuration • 2: defines and initializes a set of pins to be tested. The original pins configuration is kept for final restore. In the [<bit_padding>]<pin_seq> parameter use this notation to represent each module pin with its binary digit: o 0: the pin will not be tested o 1: the pin will be tested (as digital input or output) • 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 issued. If a non-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: o 0: the pin will be set as an output o 1: the pin will be set as an input • 4: configures the value of the output pins under testing; the command has effect only if AT+UTEST=10,3 has been issued; The command is not mandatory if there are no output pins to configure. In the [<bit_padding>]<pin_seq> parameter use this notation to represent each module pin with its binary digit: o 0: the pin will output a "low" logic level

Parameter	Type	Description
		o 1: the pin will output a "high" logic level • 5: applies 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. • 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: o 0: "low" logic digital level measured at the module pin o 1: "high" logic digital level measured at the module pin
[<bit_padding>]<pin_seq>	Number	Sequence of hexadecimal digits containing the pin information and the action to execute: • LEXI-R10 - See the Notes for detailed number description

17.2.4 Notes

- The <op_code>, <bit_padding>, <pin_seq> parameters setting is not stored in the NVM.
- Follow these steps to construct the [<bit_padding>]<pin_seq> sequence:
  1. Consider the number of bits available to select the module's pins
     - LEXI-R10 - 56 bits
  2. The status of the n-th pin is represented by the corresponding n-th bit; see the <op_code> description for the notation of each mode setting
  3. Convert each group of four binary digits into its hexadecimal representation
- LEXI-R10 - When a non-testable pin is selected, the command returns an error result code and the value is not considered and not applied.

18 File System

18.1 File tags

18.1.1 Description

File system commands have the optional <tag> parameter that allows the user to specify a file type when a file system 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.

The file tag applicability depends on the module series: see Table 19 for the allowed tags supported by the interested product. An overview about each file tag is provided in Table 20.

Module	"USER"	"FOAT"	"AUDIO"	"ECALL_EXT"	"FOTA_EXT"	"AUDIO_EXT"	"PROFILE"	"GNSS"	"CALLSRV_EXT"	"XLWM2M"	"MNO"	"UNVM"	"SCM"
LEXI-R10	*												

Table 19: Tag applicabilities to module series

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. Example: `AT+UDWNFILE="foobar",25,"USER"` is the same as `AT+UDWNFILE="foobar",25`
"FOAT"	FOAT file system	This tag is used to specify the file type as a firmware update package. It will place the firmware update package in the proper file cache to be used later by the +UFWINSTALL command.
"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 ATZ<X>. ☞ The "audio_gain_calibration<X>.xml" and "voice<X>.nvm" files can be overwritten with AT&W<X> command.
"ECALL_EXT"	eCall controller configuration and custom eCall prompts	This tag is used to read, download and delete the eCall controller configuration (see the eCall implementation in u-blox cellular modules application note [59]) or download and delete custom eCall prompts (see the eCall Prompts section). Reading and downloading commands use a dedicated channel of the USB CDC-ACM interface. To download the eCall controller configuration or custom eCall prompts in the module, use the +UDWNFILE command. To read the eCall controller configuration from the module, use the +URDFILE command. To delete eCall controller configuration or custom eCall prompts from the module, use the +UDELFILE command.
"FOTA_EXT"	Firmware for FOTA procedure	This tag has to be used to store the firmware file for the FOTA procedure using a dedicated channel of the USB CDC-ACM interface.
"AUDIO_EXT"	Audio configuration	This tag is used to read or download audio configuration (see Audio parameters tuning section).
"PROFILE"	Profile files	This tag refers to the profile files that can be loaded on to the module to support Mobile Network Operators (MNOs) specific configurations. For more

Tag	Name	Specification
		details on the profiles, see the +UMNOPROF command. The +URDFILE and +ULSTFILE AT commands are not allowed with this tag, the user can only download or delete these files.
"GNSS"	GNSS files	This tag has to be used to store the firmware file for the internal GNSS receiver.

"CALLSRV_EXT"	Emergency Call Number List (ECNL) management	This tag is used to manage the Emergency Call Number List (ECNL) file stored in NVM. All numbers in the list will be treated as emergency numbers when dialled and will result in disabling the thermal daemon software shutdown.
		Some notes about ECNL:
		• If eCall is enabled, the ECNL list is not used and call is treated as any normal call.
		• Conflict manager will not manage these calls, meaning no ongoing calls will be dropped.
		• Maximum allowed numbers in the ECNL list is 20. Numbers after 20 will be ignored.
		• Reboot is required to reload the ECNL list after download.
		File should be composed by text lines consisting of 'type','number' lines that end with carriage return where 'type' is a type of the number in 'number' according to one of the formats supported by 3GPP TS 24.008 [84] sub-clause 10.5.4.7).
		All numbers that start with '00' should be stored with '+' instead in order to keep only one occurrence for international number. In order to manage numbers properly the configuration file should contain the number with international prefix and without it.
		Example of a two line ECNL file:
		`2,+390123456789`
		`2,390123456789`

"XLWM2M"	LwM2M object script files	This tag is used to read or store Lua files defining a LwM2M object for use by the LwM2M client. The file specified with the "XLWM2M" can be only downloaded completely (see +UDWNFILE AT command), deleted (see +UDELFILE AT command), fully or partially read (see +URDFILE or +URDBLOCK) and queried (see +ULSTFILE AT command).
"MNO"	ICCID and MCC/MNC MNO lists	This tag refers to the files containing the ICCID and MCC/MNC MNO lists used by the SIM ICCID/IMSI selection (see the +UMNOPROF AT command). The file specified with the "MNO" tag can be downloaded to the module (see the +UDWNFILE AT command), deleted (see the +UDELFILE AT command), fully or partially read (see the +URDFILE or +URDBLOCK AT commands) and queried (see the +ULSTFILE AT command). Depending on the file name (<filename>) the file contains the ICCID and MCC/MNC MNO lists. The allowed file names are: • "iccid_list": SIM Issuer Identifier Number (IIN) list. The list format is: `MNO1%number of MNO1's iccid%iccid1%iccid2%MNO2%number of MNO2's iccid%iccid3%iccid4...%MNOn%number of MNOn's iccid%iccidm`. By factory-programmed configuration no iccid_list file is stored in the module file system. • "mno_list": MCC and MNC list. The list format: `MNO1%number of MNO1's mccmnc%mcc1mnc1%mcc2mnc2%MNO2%number of MNO2's mccmnc%mcc3mnc3...%MNOn%number of MNOn's mccmnc%mcckmnck`. By factory-programmed configuration the following mno_list file is stored in the module file system: `2%9%310150%310170%310410%310560%311180%310030%310280%310950%313790%3%41%310890%311480%311270%310010%310012%310013%310590%310890%310910%311110%311270%311271%311272%311273%311274%311275%311276%311277%311278%311279%311280%311281%311282%311283%311284%311285%311286%311287%311288%311289%311390%311480%311481%311482%311483%311484%311485%311486%311487%311488`

Tag	Name	Specification
		%311489%4%5%50501%50511%50539%50571%50572%206%6 %313100%312670%313130%313140%313110%313120%5%16 %310160%310200%310210%310220%310230%310240%310250 %310260%310270%310310%310490%310660%310800%311660 %311882%312250%28%4%44000%44020%44021%44101%20%1 %44010%41%12%44050%44051%44052%44053%44054%44070 %44071%44072%44073%44074%44075%44076%39%3%45005 %45011%45012%43%1%302720%21%2%302220%302760%32 %3%310730%311220%311580%47%3%302610%302640%302690 %38%1%45006 Allowed MNO1,..., MNOn values for both iccid_list and mno_list files are the same of <MNO> in +UMNOPROF command. In the previous list 2%9%310150%310170%310410%310560%311180%310030%310280 %310950%313790 2 means AT&T, 9 is the number of the next MCC and MNC. The maximum entries number in the MCC/MNC list and ICCID list is 256 and the file overall maximum size is 2048 bytes.
"UNVM"	Saving in NVM	This tag is used to list or delete the NVM items related to AT commands with parameter configuration saved in the UNVM section. The AT commands with parameters in this section can be listed with the +UNVMCFG test command. Deletion of a UNVM item restores the factory-programmed configuration at next boot. To delete a UNVM item use the +UDELFILE AT command. To list all the UNVM items, use the +ULSTFILE AT command. ☞ If the UNVM item of an AT command is not listed by +ULSTFILE AT command, the factory-programmed settings are in use.
"SCM"	SCM configuration files	This tag is used to read or store SCM configuration files.

Table 20: Tag meanings

18.2 List files information +ULSTFILE

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

18.2.1 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.

18.2.2 Syntax

Type	Syntax	Response	Example
Generic syntax			
Set	AT+ULSTFILE=[<op_code>[,<param1>[,<param2>]]]	+ULSTFILE: [<param3>,...[,<paramN>]]	AT+ULSTFILE= +ULSTFILE: "filename1","filename2"

Type	Syntax	Response	Example
		OK	OK
List of files stored into the FS			
Set	AT+ULSTFILE=[0[,<tag>]]	+ULSTFILE: [<filename1>[,<filename2>[,...[,<filenameN>]]]] OK See notes below	AT+ULSTFILE= +ULSTFILE: "filename1","filename2" OK See notes below
Remaining free FS space expressed in bytes			
Set	AT+ULSTFILE=1[,<tag>]	+ULSTFILE: <free_fs_space> OK	AT+ULSTFILE=1 +ULSTFILE: 236800 OK
Size of the specified file			
Set	AT+ULSTFILE=2,<filename>[,<tag>]	+ULSTFILE: <file_size> OK	AT+ULSTFILE=2,"filename" +ULSTFILE: 784 OK

18.2.3 Defined values

Parameter	Type	Description
<op_code>	Number	Allowed values are: • 0 (default value): lists the files belonging to <tag> file type • 1: gets the free space for the specific <tag> file type • 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	Filename. For file system filename 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).

18.2.4 Notes

LEXI-R10

- The <tag> parameter is accepted, but ignored. USER taken as default.

18.3 Open file +FOPEN

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

18.3.1 Description

Opens a file in USER file system with the specified name filename parameter, returning its handle that can be used for future read/write operations.

The returned handle can be disassociated from the file by calling AT+FCLOSE.

☞ File should be considered a stream: once opened, the position indicator (internal pointer) points to the beginning of the file. Each following read/write activity will change the position affecting the point from where the next command applies.

18.3.2 Syntax

Type	Syntax	Response	Example
Set	AT+FOPEN=<filename>[,<mode>]	+FOPEN: <filehandle> OK	AT+FOPEN="filename" +FOPEN: 1 OK
List of currently opened files with mode and total number of bytes wrote in current session			
Read	AT+FOPEN?	[+FOPEN: <filename>,<filehandle>,<mode>,<size> [...]] OK	AT+FOPEN? +FOPEN: filename1,1,0,10B +FOPEN: filename2,2,0,0B +FOPEN: filename3,3,1,5B OK
Test	AT+FOPEN=?	+FOPEN=<filename>[,<mode>] OK	AT+FOPEN=? +FOPEN=<filename>[,<mode>] OK

18.3.3 Defined values

Parameter	Type	Description
<filename>	String	Filename. For file system filename and data size limits see File system limits.
<filehandle>	Number	Handle of the file opened, assigned starting from 1, maximum files opened simultanously: 15.
<mode>	Number	Allowed values are: • 0 (default value): if the file does not exist, a new file is created; If the file exists, open the file directly. The files in both cases are readable and writable • 1: if the file does not exist, a new file is created; If the file exists, the file is cleared and overwritten. The files in both cases are readable and writable • 2: if the file exists, open the file and the file is only readable; If the file does not exist, an error is returned
<size>	Number	Written payload expressed in bytes.

18.4 Read file +FREAD

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

18.4.1 Description

Reads data from file opened with AT+FOPEN, starting from the current position indicator.

☞ Each byte read will move forward the position indicator, closing and reopening the file will reset it to the beginning of the file. To start from a specific offset, use AT+FSEEK to move position indicator to the needed point.

18.4.2 Syntax

Type	Syntax	Response	Example
Set	AT+FREAD=<filehandle>[,<length>]	CONNECT <read_length>	AT+FREAD=1

Type	Syntax	Response	Example
		<data> OK	CONNECT 36 these bytes are the data of the file OK
Test	AT+FREAD=?	+FREAD:<filehandle>[,<length>] OK	AT+FREAD=? +FREAD:<filehandle>[,<length>] OK

18.4.3 Defined values

Parameter	Type	Description
<filehandle>	Number	File handle, given by AT+FOPEN.
<length>	Number	Number of bytes to be read.
<read_length>	Number	Number of bytes actually read by the command, can be less than <length> if file has not enough data.
<data>	String	Content of the file read.

18.4.4 Notes

LEXI-R10

- +FREAD set the AT terminal to direct link mode, thus direct link limitations apply for this command as well. Only one direct link connection at a time can be activated. When considering the number of active direct links, take into account also the connection established by the +USODL AT command and the UHTTP direct link mode (see parameters http_command=6 and http_command=7 in +UHTTPC command).

18.5 Write file +FWRITE

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

18.5.1 Description

Writes data to file opened with AT+FOPEN, starting from the current position indicator.

To start from a specific offset, use AT+FSEEK to move position indicator to the needed point before starting write.

18.5.2 Syntax

Type	Syntax	Response	Example
Set	AT+FWRITE=<filehandle>[,<length>[,<timeout>]]	CONNECT <data> +FWRITE: <written_length>,<total_length> OK	AT+FWRITE=1,5 CONNECT hello +FWRITE: 5,5 OK
Test	AT+FWRITE=?	+FWRITE:<filehandle>[,<length>[,<timeout>]] OK	AT+FWRITE=? +FWRITE:<filehandle>[,<length>[,<timeout>]] OK

18.5.3 Defined values

Parameter	Type	Description
<filehandle>	Number	File handle, given by AT+FOPEN.
<length>	Number	Number of bytes to be written. Despite there is no file size limit, the command accepts only 10240 bytes at a time.
<timeout>	Number	Waiting time from last received data, expressed in seconds. Default value is 5, maximum value is 100.
<data>	String	Stream of bytes to be written, only text data (printable characters) is accepted.
<written_length>	Number	Total number of bytes written by the current command, should be equal to <length>.
<total_length>	Number	Total number of bytes in the file, can be more than <length> if the file was already existing.

18.5.4 Notes

LEXI-R10

- While +FWRITE set command is in execution, an error result code will be returned to +FWRITE and +FWRITEHEX set commands issued on another AT interface.

18.6 Write file +FWRITEHEX

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

18.6.1 Description

Writes HEX data to file opened with AT+FOPEN, starting from the current position indicator.

☞ To start from a specific offset, use AT+FSEEK to move position indicator to the needed point before starting write.

18.6.2 Syntax

Type	Syntax	Response	Example
Set	AT+FWRITEHEX=<filehandle>[,<length>[,<timeout>]]	CONNECT <data> +FWRITE: <written_length>,<total_length> OK	AT+FWRITEHEX=1,10 CONNECT 48656C6C6F +FWRITE: 5,5 OK
Test	AT+FWRITEHEX=?	+FWRITEHEX:<filehandle>[,<length>[,<timeout>]] OK	AT+FWRITEHEX=? +FWRITEHEX:<filehandle>[,<length>[,<timeout>]] OK

18.6.3 Defined values

Parameter	Type	Description
<filehandle>	Number	File handle, given by AT+FOPEN.
<length>	Number	Number of hex bytes to be sent. Despite there is no file size limit, the command accepts only 10240 bytes at a time.
<timeout>	Number	Waiting time from last received data, expressed in seconds. Default value is 5, maximum value is 100.
<hexdata>	String	Stream of bytes to be written, every byte is sent as two hexadecimal numbers (e.g. "Hello" -> "48656C6C6F").

Parameter	Type	Description
<written_length>	Number	Total number of bytes written by the current command, typically half of <length>.
<total_length>	Number	Total number of bytes in the file, can be more than <written_length> if the file was already existing.

18.6.4 Notes

LEXI-R10

- While +FWRITEHEX set command is in execution, an error result code will be returned to +FWRITEHEX and +FWRITE set commands issued on another AT interface.

18.7 Close file +FCLOSE

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

18.7.1 Description

Closes an opened file flushing its contents in file system and frees the associated handle.

18.7.2 Syntax

Type	Syntax	Response	Example
Set	AT+FCLOSE=<filehandle>	OK	AT+FCLOSE=1 OK
Test	AT+FCLOSE=?	+FCLOSE:<filehandle> OK	AT+FCLOSE=? +FCLOSE:<filehandle> OK

18.7.3 Defined values

Parameter	Type	Description
<filehandle>	Number	File handle, given by AT+FOPEN.

18.8 Set position indicator +FSEEK

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

18.8.1 Description

Sets the position indicator associated with the handle to a new position.

18.8.2 Syntax

Type	Syntax	Response	Example
Set	AT+FSEEK=<filehandle>,<offset>[,<position>]	OK	AT+FSEEK=1,10 OK
Test	AT+FSEEK=?	+FSEEK:<filehandle>,<offset>[,<position>] OK	AT+FSEEK=? +FSEEK:<filehandle>,<offset>[,<position>]

Type	Syntax	Response	Example
			OK

18.8.3 Defined values

Parameter	Type	Description
<filehandle>	Number	File handle, given by AT+FOPEN.
<offset>	Number	Number of bytes to offset from <position>.
<position>	Number	Position used as reference for the <offset>, allowed values are: • 0 (default value): beginning of file • 1: current position indicator • 2: end of file

18.9 Get position indicator +FPOSITION

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

18.9.1 Description

Gets the current position indicator of the file associated with the handle.

18.9.2 Syntax

Type	Syntax	Response	Example
Set	AT+FPOSITION=<filehandle>	+FPOSITION:<offset> OK	AT+FPOSITION=1 +FPOSITION=7 OK
Test	AT+FPOSITION=?	+FPOSITION:<offset> OK	AT+FPOSITION=? +FPOSITION:<offset> OK

18.9.3 Defined values

Parameter	Type	Description
<filehandle>	Number	File handle, given by AT+FOPEN.
<offset>	Number	Number of bytes from beginning of file.

18.10 Truncate file +FTUCAT

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

18.10.1 Description

Truncates the file associated with the handle at its current position indicator.

Command can be used at the end of a file overwrite, to eliminate the remaining data. To truncate at specific offset, use AT+FSEEK to move position indicator to the needed point.

18.10.2 Syntax

Type	Syntax	Response	Example
Set	AT+FTUCAT=<filehandle>	OK	AT+FTUCAT=1 OK
Test	AT+FTUCAT=?	+FTUCAT:<filehandle> OK	AT+FTUCAT=? +FTUCAT:<filehandle> OK

18.10.3 Defined values

Parameter	Type	Description
<filehandle>	Number	File handle, given by AT+FOPEN.

18.11 Erase file +FERASE

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

18.11.1 Description

Erases the content of the file, leaving it still open and setting its position indicator to the beginning. File size is zeroed.

18.11.2 Syntax

Type	Syntax	Response	Example
Set	AT+FERASE=<filehandle>	OK	AT+FERASE=1 OK
Test	AT+FERASE=?	+FERASE:<filehandle> OK	AT+FERASE=? +FERASE:<filehandle> OK

18.11.3 Defined values

Parameter	Type	Description
<filehandle>	Number	File handle, given by AT+FOPEN.

18.12 Delete file +FDELETE

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

18.12.1 Description

Deletes the open file from filesystem, freeing the associated handle.

18.12.2 Syntax

Type	Syntax	Response	Example
Set	AT+FDELETE=<filehandle>	OK	AT+FDELETE=1

Type	Syntax	Response	Example
			OK
Test	AT+FDELETE=?	+FDELETE:<filehandle>	AT+FDELETE=?
		OK	+FDELETE:<filehandle>
			OK

18.12.3 Defined values

Parameter	Type	Description
<filehandle>	Number	File handle, given by AT+FOPEN.

18.13 File system limits

18.13.1 Allowed characters in filenames

A filename cannot contain the following characters: / * : % | " < > ?

LEXI-R10
Filenames starting with a dot (.) are not valid.

18.13.2 Limits

Here below are listed the maximum filename length, the maximum data size of the file system and the maximum number of files for the u-blox cellular modules.

Maximum filename length:

- LEXI-R10 - 63 characters

Maximum file size:

Maximum number of files:

The theoretical maximum file size and the maximum number of files also includes system, hidden and temporary files whose number is not statically predictable, so the actual numbers can be less than stated.

19 DNS

DNS service requires the user to define and activate a connection profile, either PSD or CSD.

LEXI-R10
If not specified, the <cid> and the <preferred_protocol_type> parameters set by means of the +UDCONF=19 AT command are used.
See +CGACT AT command for activating a PDP context.

19.1 Resolve name / IP number through DNS +UDNSRN

+UDNSRN						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	full	No	No	No	Appendix B.4	TCP/UDP/IP Error

19.1.1 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 a GPRS activation or a CSD establishment. They are automatically used in the resolution process if available. The resolver will use first the primary DNS, otherwise if there is no answer, the second DNS will be involved.

LEXI-R10
The user can replace each network provided DNS by setting its own DNS for a PSD context by means of the +UDNSCFG AT command.

The DNS resolution timeout depends on the number of DNS servers available to the DNS resolution system. The response time for the DNS resolution is estimated if 8 servers are used to perform this task.

19.1.2 Syntax

Type	Syntax	Response	Example
Set	AT+UDNSRN=<resolution_type>, <domain_ip_string>[,<async>[, <cid>[,<preferred_protocol_type>]]]	+UDNSRN: <resolved_ip_address> OK or +UDNSRN: <resolved_domain_name> OK or OK	AT+UDNSRN=0,"www.google.com" +UDNSRN: "216.239.59.147" OK AT+UDNSRN=0,"www.dau.dau",1,1,0 OK +UUDNSRN: 0,"172.22.1.201" AT+UDNSRN=0,"www.rs-ipv6-test.com",1,1,1 OK +UUDNSRN: 0,"FC01:CAFE::1" AT+UDNSRN=0,"www.google.com",1 OK +UUDNSRN: "216.239.59.147" AT+UDNSRN=0,"www.google.com",0 +UDNSRN: "216.239.59.147" OK

Type	Syntax	Response	Example
Test	AT+UDNSRN=?	+UDNSRN: (list of supported <resolution_type>s),"remote_host",(list of supported <async>s),(list of supported <cid>s),(list of supported <preferred_protocol_type>s) OK	+UDNSRN: (0),"remote_host",(1),(1-15),(0,1) OK
URC		+UUDNSRN: <result_code>[,<resolved_ip_address>[,<ttl>]]	+UUDNSRN: 0,"216.239.59.147,60"
		+UUDNSRN: <result_code>[,<resolved_domain_name>]	+UUDNSRN: 0,"somedomain.com"
		+UUDNSRN: -1	+UUDNSRN: -1

19.1.3 Defined values

Parameter	Type	Description
<resolution_type>	Number	Type of resolution operation: • 0: domain name to IP address • 1: IP address to domain name (host by name)
<domain_ip_string>	String	Domain name (<resolution_type>=0) or the IP address in (<resolution_type>=1) to be resolved
<async>	Number	Asynchronous DNS resolution flag. Allowed values: • 0 (default value): the final result code is returned only once the DNS response is available, locking the AT interface until the DNS activity is running • 1: a final result code (OK or an error result code) is returned immediately unlocking the AT interface and making it available for the execution of other AT commands. Once the result of DNS resolution becomes available, it is notified to the AT interface through the +UUDNSRN URC
<cid>	Number	See <cid>. For more details on the default value of the parameter (where supported), see DNS.
<preferred_protocol_type>	Number	Select the specific IP type between IPv4 and IPv6. Allowed values: • 0: IPv4 • 1: IPv6 For more details on the default value of the parameter (where supported), see DNS.
<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
<result_code>	Number	Result code of DNS resolution: • 0: no error • -1: DNS resolution failed. In this case the <resolved_ip_address> or the <resolved_domain_name> fields are not present
<ttl>	Number	The value of TTL received in the incoming packet.

19.1.4 Notes

LEXI-R10

- <resolution_type>=1 is not supported.
- <async> =1 is the default and the only supported value.
- +USOER error codes are not supported.

19.2 Override DNS configuration +UDNSCFG

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

19.2.1 Description

Overrides the primary and/or the secondary DNS defined for a selected context identifier.

It is also possible to delete an overridden DNS or list all overridden DNS, the list is empty in case no overridden DNSs are defined.

LEXI-R10
DNS configuration is only effective if followed by the corresponding <cid> activation by means of +CGACT AT command.
<cid> deactivation and activation is required, if the corresponding <cid> is already activated.

19.2.2 Syntax

Type	Syntax	Response	Example
Generic syntax			
Set	AT+UDNSCFG=<cid>[,<index>,<ip_type>[,<ipv4_or_ipv6_address>]]	OK	AT+UDNSCFG=1,1,0,"8.8.8.8" OK
Read all the overridden DNS for a selected <cid>			
Set	AT+UDNSCFG=<cid>	+UDNSCFG: <cid>,<index>,<ip_type>,<ipv4_or_ipv6_address> [[...] +UDNSCFG: <cid>,<index>,<ip_type>,<ipv4_or_ipv6_address>] OK	AT+UDNSCFG=2 +UDNSCFG: 2,1,0,"8.8.8.8" +UDNSCFG: 2,2,0,"9.9.9.9" OK
Delete an overridden DNS			
Set	AT+UDNSCFG=<cid>,<index>,<ip_type>	OK	AT+UDNSCFG=1,1,0 OK
Override a DNS			
Set	AT+UDNSCFG=<cid>,<index>,<ip_type>,<ipv4_or_ipv6_address>	OK	AT+UDNSCFG=2,2,0,"8.8.8.8" OK
Read all overridden DNS			
Read	AT+UDNSCFG?	+UDNSCFG: <cid>,<index>,<ip_type>,<ipv4_or_ipv6_address> [[...] +UDNSCFG: <cid>,<index>,<ip_type>,<ipv4_or_ipv6_address>] OK	+UDNSCFG: 1,1,0,"8.8.8.8" +UDNSCFG: 2,1,0,"8.8.8.8" OK
Test	AT+UDNSCFG=?	+UDNSCFG: (list of supported <cid>),(list of supported <index>),(0,1),<ipv4_or_ipv6_address> OK	+UDNSCFG: (1-24),(1-2),(0-1),"ipv4_or_ipv6_address" OK

19.2.3 Defined values

Parameter	Type	Description
<cid>	Number	PDP context identifier used for the DNS communication. The allowed range is product specific, see <cid>. LEXI-R10 The allowed values goes from 1 to 3.
<index>	Number	Index of the DNS to be overridden: • 1: primary DNS • 2: secondary DNS • 3: tertiary DNS Allowed values: • LEXI-R10 - 1, 2
<ip_type>	Number	Allowed values: • 0: IPv4 • 1: IPv6
<ipv4_or_ipv6_address>	String	DNS IP address, see IPv4/IPv6 addressing.

20 Internet protocol transport layer

20.1 Introduction

TCP and UDP sockets are independently and simultaneously managed via dedicated AT commands over the same EPS bearer/PDP context. AT commands for both reading and writing data on sockets are provided, and incoming data and transmission result are notified to the external application via URCs, therefore polling is not needed.

When socket commands report an error result code which is not a +CME ERROR, the error result code can be queried using the +USOER or +USOCTL (specifying the socket ID and with <param_id>=1) AT commands.

LEXI-R10
If not specified, the <cid> and the <preferred_protocol_type> parameters set by the +UDCONF=19 AT command are used. In LTE there is no need to establish a packet data connection explicitly, as the device automatically establishes it as part of the network registration procedure. See +CGACT AT command for activating a PDP context on a <cid> different from 1 and in 2G and 3G RAT.

LEXI-R10
The <preferred_protocol_type> parameter specifies the requested protocol type: if an IP address of the requested type is not available, there will be no connection attempt.

The UDP protocol has no flow control mechanism and uplink packets might be lost in the following scenarios:

- No network signal is available
- Unreliable radio interface (e.g. mobility with radio link failures, which can lead to data loss, that in GPRS can be contrasted with the usage of LLC ack reliability QoS parameter)

LEXI-R10
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 option with 1 minute delay (see the +USOSO AT command).

When both TCP and UDP sockets 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

20.1.1 <socket>

The <socket> parameter sets the socket identifier to be used for any future operation on that socket. <socket> range lists the allowed range:

Product	Maximum number of sockets	Allowed range
LEXI-R10	7[2]	0-6

Table 21: <socket> range

[2] The maximum number of plain sockets that can be simultaneously used is 4. The maximum number of secure sockets that can be simultaneously used is 2. If one secure socket is used, at most 2 additional plain sockets can be simultaneously used.

20.2 IPv4/IPv6 addressing

20.2.1 Introduction

The section describes the IP addressing formats and IP address rules used by TCP/IP UDP/IP enabled applications.

20.2.2 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.
- 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 22: IPv4 address format examples

20.3 Sockets Always On feature

20.3.1 Introduction

The section describes the Socket Always On feature and how it affects the module's operations in power saving.

20.3.2 Description

When power saving is enabled on the module (see +UPSV AT command), socket creation and socket operations can affect the entrance into deep-sleep modes depending on the socket's Always On (AoN) attribute.

In particular, the creation of a socket not configured as AoN prevents the module from entering Hibernate and Sleep-2 deep-sleep modes, allowing only to enter Sleep-1 deep-sleep mode. The status of a socket configured as AoN is instead maintained when the module enters deep-sleep modes and its creation imposes no constraints on the achievable deepest level of power saving.

Listed below are other conditions that prevent or limit the setting of a socket as AoN:

- Only one TCP socket and one UDP socket can be set as AoN.
- A socket is automatically set as AoN if there are no other AoN sockets of the same protocol type (TCP or UDP) already open.
- An AoN TCP socket set in listening mode (+USOSLI AT command) automatically becomes not AoN.
- An AoN socket configured as secure (+USOSEC AT command) automatically becomes not AoN.
- A secure socket configured as not secure (+USOSEC AT command) can become AoN if no other sockets AoN of the same protocol (TCP or UDP) are already open.

The following operations prevent the module from entering Hibernate or Sleep-2 modes even when applied to sockets set as AoN:

- The execution of any socket's command that requires sending/receiving data to/from the remote peer (e.g. +USOCO AT command) until the result is returned on the AT interface.
- Setting any socket in direct link state (+USODL AT command).

- The execution of a socket command in binary mode (+USOWR or +USOST AT commands).
- The execution of an asynchronous command until the procedure is completed and the corresponding URC is issued on the AT interface.
- If there is data in the RX buffer, until all bytes have been read.

☞ To know if a socket is set as Always On use the <report_AoN> parameter when creating a socket with the +USOCR AT command. The +USOCR read command reports also the Always On attribute of all created sockets.

20.4 Create Socket +USOCR

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

20.4.1 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; for the maximum number of sockets that can be created, see the <socket> parameter description. 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 for both TCP and UDP sockets. When the PDP context is IPv4v6, it is possible to set the preferred address type (IPv4 or IPv6) using the <preferred_protocol_type> parameter. A socket can select the PDP context to be used via the <cid> parameter; if <cid> is not supported or not specified, created sockets are mapped to the default CID. Where supported, the read command reports the open sockets.

☞ The socket creation can be performed only after the PDP context activation of the default or specified CID.

☞ LEXI-R10
The Socket Always On feature is supported. For more details, see Sockets Always On.

20.4.2 Syntax

Type	Syntax	Response	Example
Set	AT+USOCR=<protocol>[,<local_port>[,<preferred_protocol_type>[,<cid>[,<report_AoN>]]]]	+USOCR: <socket>[,<AoN_state>] OK	AT+USOCR=17 +USOCR: 2 OK
Read	AT+USOCR?	+USOCR: <socket>,<protocol>,<AoN_state> [[...] +USOCR: <socket>,<protocol>,<AoN_state>] OK	+USOCR: 0,6,1 +USOCR: 1,6,0 +USOCR: 2,17,1 +USOCR: 3,17,0 OK
Test	AT+USOCR=?	+USOCR: (list of supported <protocol>s),(list of supported <local_port>s),(list of supported <preferred_protocol_type>s)[,(list of supported <cid>s)[,(list of supported <report_AoN>s)]] OK	+USOCR: (6,17),(1-65535),(0,1),(1-24) OK

20.4.3 Defined values

Parameter	Type	Description
<protocol>	Number	Allowed values: • 6: TCP • 17: UDP
<local_port>	Number	Local port to be used while sending data. The range goes from 1 to 65535. If the parameter is omitted it will be set to 0; in this case a random port will be used while sending data.
<socket>	Number	See <socket>.
<preferred_protocol_type>	Number	Selects the specific IP type (for the required <socket>) between IPv4 and IPv6 when <PDP_type> is set to "IPV4V6" while the PDP context is created by means of +CGDCONT AT command. Allowed values: • 0: IPv4 • 1: IPv6 For more details on the default value of the parameter (where supported), see Internet protocol transport layer.
<cid>	Number	Specifies the PDP context that will be used for the socket operations. For the parameter range, see <cid>. For more details on the default value of the parameter (where supported), see Internet protocol transport layer.
<report_AoN>	Number	Specifies if the set command response shall report if the created socket is configured as Always On (AoN). • 0 (default value): do not report the AoN attribute • 1: report the AoN attribute
<AoN_state>	Number	Specifies if the socket is configured as Always On (AoN). • 0: socket is not AoN • 1: socket is AoN

20.5 SSL/TLS/DTLS mode configuration on TCP/UDP socket +USOSEC

+USOSEC						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	full	No	No	No	Appendix B.4	+CME Error

20.5.1 Description

Enables or disables the use of SSL/TLS/DTLS connection (where supported) on a TCP/UDP socket. The configuration of the SSL/TLS/DTLS properties is provided with an SSL/TLS/DTLS 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/DTLS is enabled on the interested socket.

☞ The enable or disable operation can be performed only after the socket has been created with +USOCR AT command.

☞ The SSL/TLS/DTLS is supported only with +USOCO command (socket connect command). The SSL/TLS/DTLS is not supported with +USOLI command (socket set listen command is not supported and the +USOSEC settings will be ignored).

☞ The command response time may vary depending on the module series. For more details, see the Appendix B.4.

20.5.2 Syntax

Type	Syntax	Response	Example
Set	AT+USOSEC=<socket>,<ssl_tls_dtls_status>[,<usecmng_profile_id>]	OK	AT+USOSEC=0,1,1 OK
Read	AT+USOSEC=<socket>	+USOSEC: <socket>,<ssl_tls_dtls_status>[,<usecmng_profile_id>] OK	AT+USOSEC=0 +USOSEC: 0,1,1 OK
Test	AT+USOSEC=?	+USOSEC: (list of supported <socket>s),(list of supported <ssl_tls_dtls_status>s),(list of supported <usecmng_profile_id>s) OK	+USOSEC: (0-6),(0,1),(0-4) OK

20.5.3 Defined values

Parameter	Type	Description
<socket>	Number	See <socket>.
<ssl_tls_dtls_status>	Number	• 0 (default value): disable the SSL/TLS/DTLS on the socket. • 1: enable the socket security; 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/DTLS properties to be used for the SSL/TLS/DTLS connection. The range goes from 0 to 4. If no profile is set a default USECMNG profile is used (see USECMNG section).

20.6 Set socket option +USOSO

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

20.6.1 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.

20.6.2 Syntax

Type	Syntax	Response	Example
Set	AT+USOSO=<socket>,<level>,<opt_name>,<opt_val>[,<opt_val2>]	OK	AT+USOSO=2,6,1,1 OK
Test	AT+USOSO=?	+USOSO: (list of supported <socket>s),(list of supported <level>s) OK	+USOSO: (0-6),(0,6,65535) OK

20.6.3 Defined values

Parameter	Type	Description
<socket>	Number	See <socket>.
<level>	Number	Allowed values: • 0: IP protocol

Parameter	Type	Description
		<opt_name> for IP protocol level may be: o 1: type of service (TOS) <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 [175] o 2: time-to-live (TTL) <opt_val>: unsigned 8 bit value representing the TTL. The range is 0-255 (the default value is 255) • 6: TCP protocol <opt_name> for TCP protocol level may be: o 1: no delay option; do not delay send to coalesce packets; <opt_val>: numeric parameter, it enables/disables the "no delay" option: - 0 (default value): disabled - 1: enabled o 2: keepidle option: send keepidle probes when it is idle for <opt_val> milliseconds <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) • 65535: socket <opt_name> for socket level options may be: o 4: local address re-use. <opt_val>: numeric parameter, it configures the "local address re-use" option. - 0 (default value): disabled - 1: enabled o 8: keep connections alive. <opt_val>: numeric parameter, it configures "keep connections alive" option. - 0 (default value): disabled - 1: enabled o 32: sending of broadcast messages. <opt_val>: numeric parameter, it configures "sending of broadcast messages". - 0 (default value): disabled - 1: enabled o 128: linger on close if data present. <opt_val>: numeric parameter, it configures the "linger" option. - 0 (default value): disabled - 1: enabled <opt_val2>: signed 16 bit numeric parameter, it sets the linger time, the range goes from 0 to 32767 in seconds. The default value is 0. o 512: local address and port re-use. <opt_val>: numeric parameter, it configures the "local address and port re-use". - 0 (default value): disabled - 1: enabled
<opt_name>	Number	Type and supported content depend on the related <level> parameter value (details are given above).
<opt_val>	Number	Type and supported content depend on the related <level> parameter value (details are given above).
<opt_val2>	Number	Type and supported content depend on the related <level> parameter value (details are given above).

20.6.4 Notes

LEXI-R10

- <level>=65535 (socket), <opt_name>=512 (local address and port re-use) is not supported.

20.7 Get Socket Option +USOGO

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

20.7.1 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.

20.7.2 Syntax

Type	Syntax	Response	Example
Set	AT+USOGO=<socket>,<level>,<opt_name>	+USOGO: <opt_val>[,<opt_val2>] OK	AT+USOGO=0,0,2 +USOGO: 255 OK
Test	AT+USOGO=?	+USOGO: (list of supported <socket>s),(list of supported <level>s) OK	+USOGO: (0-6),(0,6,65535) OK

20.7.3 Defined values

Parameter	Type	Description
<socket>	Number	See <socket>.
<level>	Number	• 0: IP Protocol <opt_name> for IP protocol level may be: o 1: type of service <opt_val>: 8 bit mask that represents the flags of IP TOS. For more information see the RFC 791 [175]. The range is 0-255. The default value is 0 o 2: time-to-live <opt_val>: unsigned 8 bit value representing the TTL. The range is 0-255. The default value is 0. • 6: TCP Protocol <opt_name> for TCP protocol level may be: o 1: no delay option: do not delay send to coalesce packets <opt_val>: numeric parameter, it enables/disables the "no delay" option - 0 (default value): disabled - 1: enabled o 2: keepidle option: send keepidle probes when idle for <opt_val> milliseconds <opt_val>: signed 32 bit number value representing the milliseconds for "keepidle" option. The range 0-2147483647. The default value is 7200000 (2 hours) • 65535: socket <opt_name> for the socket level options may be: o 4: local address re-use <opt_val>: numeric parameter, it configures the "local address re-use" option: - 0 (default value): disabled - 1: enabled o 8: keep connections alive <opt_val>: numeric parameter, it configures the "keep connections alive" option: - 0 (default value): disabled - 1: enabled

Parameter	Type	Description
		o 32: sending of broadcast messages <opt_val>: numeric parameter, it configures the "sending of broadcast messages": - 1: enabled - 0 (default value): disabled o 128: linger on close if data present <opt_val>: numeric parameter, it sets on/off the "linger" option. - 0 (default value): disabled - 1: enabled <opt_val2>: signed 16 bit numeric value, linger time, the range goes from 0 to 32767 in seconds. The default value is 0. o 512: local address and port re-use <opt_val>: numeric parameter, it enables/disables "local address and port re-use": - 0 (default value): disabled - 1: enabled

20.7.4 Notes

LEXI-R10

- <level>=65535 (socket), <opt_name>=512 (local address and port re-use) is not supported.

20.8 Close Socket +USOCL

+USOCL						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	partial	No	No	No	Appendix B.4	+CME Error

20.8.1 Description

Closes the specified socket, like the BSD close routine. In case of remote socket closure the user is notified via the URC.

By default the command blocks the AT command interface until the completion of the socket close operation. By enabling the <async_close> flag, the final result code is sent immediately. The following +UUSOCL URC will indicate the closure of the specified socket.

The command response time may vary depending on the module series. For more details, see the Appendix B.4.

20.8.2 Syntax

Type	Syntax	Response	Example
Set	AT+USOCL=<socket>[,<async_close>]	OK	AT+USOCL=2 OK
Test	AT+USOCL=?	+USOCL: (list of supported <socket>s) OK	+USOCL: (0-6),(0-1) OK
URC		+UUSOCL: <socket>	+UUSOCL: 2

20.8.3 Defined values

Parameter	Type	Description
<socket>	Number	See <socket>.

Parameter	Type	Description
<async_close>	Number	Asynchronous close flag. The flag has effect for TCP connections only. Allowed values: • 0 (default value): the operation result is returned only once the result of the TCP close becomes available, locking the AT interface until the connection closes. • 1: the final result code is returned immediately unlocking the AT interface and making it available for the execution of other AT commands. Once the result of TCP close becomes available, it is notified to the AT interface through the +UUSOCL URC.

20.8.4 Notes

LEXI-R10

- The <async_close> parameter is not supported.

20.9 Get Socket Error +USOER

+USOER						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	full	No	No	No	-	TCP/UDP/IP Error +CME Error

20.9.1 Description

Retrieves the last error occurred in the last socket operation, stored in the BSD standard variable error.

20.9.2 Syntax

Type	Syntax	Response	Example
Action	AT+USOER	+USOER: <socket_error> OK	+USOER: 104 OK
Set	AT+USOER=<cid>	+USOER: <socket_error> OK	+USOER: 104 OK

20.9.3 Defined values

Parameter	Type	Description
<cid>	Number	Retrieve error on the specific <cid> listed using +CGDCONT AT command. Minimun and maximum values depends on platform specification.
<socket_error>	Number	Code of the last error occurred in a socket operation. The allowed values are listed in Appendix A.6: • 0: no error

20.9.4 Notes

LEXI-R10

- The <cid> parameter is not supported.

20.10 Connect Socket +USOCO

+USOCO						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	partial	No	No	No	Appendix B.4	+CME Error

20.10.1 Description

Establishes a peer-to-peer connection of the socket to the specified remote host on the given remote port, like the BSD connect routine. If the socket is a TCP socket, the command will actually perform the TCP negotiation (3-way handshake) to open a connection. If the socket is a UDP socket, this function will just declare the remote host address and port for later use with other socket operations (e.g. +USOWR, +USORD). This is important to note because if <socket> refers to a UDP socket, errors will not be reported prior to an attempt to write or read data on the socket.

☞ The estimated response time depends also by the DNS resolution. For further details about the estimated response time related to the DNS resolution, see the +UDNSRN AT command.

20.10.2 Syntax

Type	Syntax	Response	Example
Set	AT+USOCO=<socket>,<remote_addr>,<remote_port>[,<async_connect>]	OK	AT+USOCO=3,"151.63.16.9",1200 OK
			AT+USOCO=2,"151.63.16.9",8200,1 OK +UUSOCO: 2,0
			AT+USOCO=2,"151.63.16.9",8230,0 OK
Test	AT+USOCO=?	+USOCO: (list of supported <socket>s),"remote_host",(list of supported <remote_port>s),(list of supported <async_connect>s) OK	+USOCO: (0-6),"remote_host",(1-65535),(0-1) OK
URC		+UUSOCO: <socket>,<socket_error>	+UUSOCO: 2,0

20.10.3 Defined values

Parameter	Type	Description
<socket>	Number	See <socket>.
<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
<async_connect>	Number	Asynchronous connect flag. The flag has effect for TCP connections only. Allowed values: • 0 (default value): the operation result is returned only once the TCP connection is established, locking the AT interface until the connection activity is running • 1: the final result code is returned immediately unlocking the AT interface and making it available for the execution of other AT commands. Once the result of TCP connection becomes available, it is notified to the AT interface through the +UUSOCO URC.
<socket_error>	Number	Code of the last error occurred in a socket operation. The allowed values are listed in Appendix A.6: • 0: no error, connection successful

20.10.4 Notes

- In case of the socket connection with the asynchronous flag:
  - the socket will be closed if a further +USOCO AT command is issued before having received the +UUSOCO URC of the first AT command.
  - it is not possible to connect a second socket before the reception of the +UUSOCO URC related to the pending socket connection.

20.11 Write socket data +USOWR

+USOWR						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	partial	No	No	No	Appendix B.4	+CME Error

20.11.1 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]

Regarding 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 behavior
- 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.

Regarding 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 acknowledgment received by the remote server the socket is connected to.

The command response time may vary depending on the module series. For more details, see the Appendix B.4.

20.11.2 Syntax

Type	Syntax	Response	Example
Base syntax			
Set	AT+USOWR=<socket>,<length>,<data>	+USOWR: <socket>,<length> OK	AT+USOWR=3,12,"Hello world!" +USOWR: 3,12 OK

Type	Syntax	Response	Example
Binary syntax			
Set	AT+USOWR=<socket>,<length>	@<data> +USOWR: <socket>,<length> OK	AT+USOWR=3,16 @16 bytes of data +USOWR: 3,16 OK
Test	AT+USOWR=?	+USOWR: (list of supported <socket>s),(list of supported <length>s),"HEX data" +USOWR: (list of supported <socket>s),(list of supported <length>s),"data" +USOWR: (list of supported <socket>s),(list of supported <length>s) OK	+USOWR: (0-6),(0-512),"HEX data" +USOWR: (0-6),(0-1024),"data" +USOWR: (0-6),(0-1024) OK

20.11.3 Defined values

Parameter	Type	Description
<socket>	Number	See <socket>.
<length>	Number	Number of data bytes to write: • Base syntax normal mode: range 1-1024 • Base syntax HEX mode: range 1-512 • Binary extended syntax: range 1-1024
<data>	String	Data bytes to be written. Not all of the ASCII charset can be used.

20.11.4 Notes

- For base syntax:
  - 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 [86], 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.
- For <data> parameter not all of the ASCII charset can be used.

20.12 SendTo command (UDP only) +USOST

+USOST						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	full	No	No	No	Appendix B.4	+CME Error

20.12.1 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. To enable it, see the AT+UDCONF=1 command description.
- **Binary extended syntax**: mandatory for writing any character in the ASCII range [0x00, 0xFF].

☞ If no network signal is available, outcoming UDP packet may be lost.

☞ The information text response to the test command provides the information about the binary extended syntax only where supported.

☞ The command response time may vary depending on the module series. For more details, see the Appendix B.4.

☞ In binary mode the command will never return if less characters than the expected length are issued after the prompt.

20.12.2 Syntax

Type	Syntax	Response	Example
Base syntax			
Set	AT+USOST=<socket>,<remote_addr>,<remote_port>,<length>,<data>,[<seq_no>]	+USOST: <socket>,<length> OK	AT+USOST=3,"151.9.34.66",449,16,"16 bytes of data" +USOST: 3,16 OK
Binary syntax			
Set	AT+USOST=<socket>,<remote_addr>,<remote_port>,<length> After the"@" prompt <length> bytes of data are entered	@<data> +USOST: <socket>,<length> OK	AT+USOST=3,"151.9.34.66",449,16 @16 bytes of data +USOST: 3,16 OK
Test	AT+USOST=?	+USOST: (list of supported <socket>s),"remote_host",(list of supported <remote_port>s),(list of supported <length>s),(list of supported <seq_no>s),"HEX data" +USOST: (list of supported <socket>s),"remote_host",(list of supported <remote_port>s),(list of supported <length>s),(list of supported <seq_no>s),"data" [+USOST: (list of supported <socket>s),"remote_host",(list of	+USOST: (1-8),"remote_host",(1-65535),(1-512),(1-255),"HEX data" +USOST: (1-8),"remote_host",(1-65535),(1-1024),(1-255),"data" OK

Type	Syntax	Response	Example
		supported <remote_port>s),(list of supported <length>s)] OK	

20.12.3 Defined values

Parameter	Type	Description
<socket>	Number	See <socket>.
<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
<length>	Number	Number of data bytes to write:
<data>	String	Data bytes to be written (not all of the ASCII charset can be used)

20.12.4 Notes

- For base syntax:
  - 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 [86], 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
  - In binary mode the command response time value specified in Estimated command response time takes effect after the last expected character has been issued

20.13 Read Socket Data +USORD

+USORD						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	full	No	No	No	Appendix B.4	+CME Error

20.13.1 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.

☞ If the UART interface of the application processor has a RX FIFO of only 1 character, it is highly recommended to set the <length> parameter lower than 64.

☞ (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.

20.13.2 Syntax

Type	Syntax	Response	Example
Set	AT+USORD=<socket>,<length>	+USORD: <socket>,<length>,<data in the ASCII [0x00,0xFF] range> OK	AT+USORD=3,16 +USORD: 3,16,"16 bytes of data" OK
Test	AT+USORD=?	+USORD: (list of supported <socket>s),(list of supported <length>s) OK	+USORD: (0-6),(0-1024) OK
URC		+UUSORD: <socket>,<length>	+UUSORD: 3,16

20.13.3 Defined values

Parameter	Type	Description
<socket>	Number	See <socket>.
<length>	Number	Number of data bytes • to read stored in buffer, in range 0-1024 in the set command • read from buffer, in range 0-1024 • stored in buffer for the URC
<data>	String	Data bytes to be read

20.13.4 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>.

20.14 Receive From command (UDP only) +USORF

+USORF						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	full	No	No	No	< 1 s (except URC)	+CME Error

20.14.1 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.

20.14.2 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> OK	AT+USORF=3,16 +USORF: 3,"151.9.34.66",2222,16,"16 bytes of data" OK
Test	AT+USORF=?	+USORF: (list of supported <socket>s),(list of supported <length>s) OK	+USORF: (0-6),(0-1024) OK
URC		+UUSORF: <socket>,<length>	+UUSORF: 3,16

20.14.3 Defined values

Parameter	Type	Description
<socket>	Number	See <socket>.
<remote_ip_addr>	String	Remote host IP address. For IP address format reference see the IP addressing.
<remote_port>	Number	Remote host port, in range 1-65535
<length>	Number	Number of data bytes to read stored in buffer (if in the set command), or read from the buffer (if in the information text response to the set command), or stored in the buffer (for the URC). The allowed range when issued in the set command or returned in the information text response is: • LEXI-R10 - 0-1024
<data>	String	Data bytes to be read

20.14.4 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>.

LEXI-R10

- The +USORF AT command should not be used for a DTLS connection, that is when the connection has been configured using the +USOCO and the +USOSEC AT commands. For DTLS connections the +USOCO, +USOSEC, +USORD and +USOWR AT commands need to be used.

20.15 Set Listening Socket +USOLI

+USOLI						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	full	No	No	No	Appendix B.4	+CME Error

20.15.1 Description

Sets the specified socket in listening mode on the specified port of service, waiting for incoming connections (TCP) or data (UDP):

- For **TCP sockets**, incoming connections will be automatically accepted and notified via the URC **+UUSOLI: <socket>,<ip_address>,<port>,<listening_socket>,<local_ip_address>,<listening_port>,** carrying the connected socket identifier, the remote IP address and port.
- For **UDP sockets**, incoming data will be notified via URC **+UUSORF: <listening_socket>,<length>.** To know from which remote IP address and port the data is coming from, use the AT+USORF command.

20.15.2 Syntax

Type	Syntax	Response	Example
Set	AT+USOLI=<socket>,<port>	OK	**TCP sockets** AT+USOLI=2,1200 OK +UUSOLI: 3,"151.63.16.7",1403,2, "82.89.67.164",1200
			UDP sockets AT+USOLI=0,1182 OK +UUSORF: 0,1024

Type	Syntax	Response	Example
Test	AT+USOLI=?	+USOLI: (list of supported <socket>s),(list of supported <port>s) OK	+USOLI: (0-6),(1-65535) OK
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

20.15.3 Defined values

Parameter	Type	Description
<socket>	Number	See <socket>.
<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 AT+USORF command.

20.15.4 Notes

- In case of notification via the URC +UUSOLI <port> is intended as the remote port.

20.16 HEX mode configuration +UDCONF=1

+UDCONF=1						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	full	No	No	No	-	+CME Error

20.16.1 Description

Enables/disables the HEX mode for +USOWR, +USOST, +USORD and +USORF AT commands.

20.16.2 Syntax

Type	Syntax	Response	Example
Set	AT+UDCONF=1,<enable_hex_mode>	OK	AT+UDCONF=1,0 OK
Read	AT+UDCONF=1	+UDCONF: 1,<enable_hex_mode> OK	AT+UDCONF=1 +UDCONF: 1,1 OK

20.16.3 Defined values

Parameter	Type	Description
<enable_hex_mode>	Number	Enables/disables the HEX mode for +USOWR, +USOST, +USORD and +USORF AT commands. Allowed values: • 0 (factory-programmed value): HEX mode disabled • 1: HEX mode enabled

20.17 Set socket in Direct Link mode +USODL

+USODL						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	full	No	No	No	< 1 s	+CME Error

20.17.1 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 or via the DTR line transition according the &D configuration. The socket will remain connected and communication can be re-established any time.

When the transparent communication is exited, the DISCONNECT intermediate result code is sent to the terminal to notify the disconnection. The DISCONNECT intermediate result code is preceeded and followed by a <CR><LF> (ASCII 0x0D 0x0A) sequence.

⚠ The host application shall monitor the serial port for the complete <CR><LF>DISCONNECT<CR><LF> sequence to detect unexpected termination of the transparent communication. When the direct link mode is exited due to abnormal cases like the elapsing of the congestion timer (see Congestion timer), or a failed registration due to mobility, the DISCONNECT intermediate result code is followed by an ERROR final result code.

⚠ The DSR line is moved from LOW to HIGH when the module enters the transparent mode. When the module exits from the transparent mode, the DSR line is moved again to LOW state. There is a fine tuning of the DSR line transition from HIGH to LOW (make it happen before or after the DISCONNECT sequence), which can be configured via +UDCONF=10 AT command.

The number of sockets that can be connected in direct link mode is usually limited by the number of AT terminals that can be used in parallel; exceptions are specified in the Notes.

☞ LEXI-R10
Escape sequence +++ is detected when it is received by the module in a single separate frame of 3 bytes length: to avoid missed detection of the escape sequence, it is suggested to send +++ when the COM port has CTS asserted/flow control disabled. For more details, see the LEXI-R10 series Internet applications development guide [24].

⚠ When using Direct Link with UDP sockets, if no network signal is available, outgoing UDP packet may be lost.

20.17.2 Syntax

Type	Syntax	Response	Example
Set	AT+USODL=<socket>	**Normal exit** CONNECT DISCONNECT OK	AT+USODL=0 CONNECT ... data ...

Type	Syntax	Response	Example
			+++ (user terminates the direct link) DISCONNECT OK
		Abnormal exit CONNECT DISCONNECT ERROR	AT+USODL=0 CONNECT Abnormal event (congestion, NW detach) DISCONNECT ERROR
Test	AT+USODL=?	+USODL: (list of supported <socket>s) OK	+USODL: (0-6) OK

20.17.3 Defined values

Parameter	Type	Description
<socket>	Number	See <socket>.

20.17.4 Notes

LEXI-R10

- Only one direct link connection at a time can be activated. When considering the number of active direct links, take into account also the connection established by the UHTTP direct link mode (see parameters http_command=6 and http_command=7 in +UHTTPC command) and the +FREAD AT command.

20.17.5 Enhanced Direct Link

LEXI-R10
Character Trigger 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.

20.17.5.1 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 +UDCONF=5 command can configure the timer trigger.

20.17.5.2 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.

The minimum data length is 3, the maximum data length is 2048 bytes for TCP and 1472 bytes for UDP.

The +UDCONF=6 command can configure the data length trigger.

20.17.5.3 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.

20.17.5.4 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.

20.17.5.5 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.

20.17.5.6 Data from the network

The data received from the network is immediately forwarded to the serial interface.

20.17.5.7 Congestion timer

The congestion timer represents the time after which, in case of network congestion, the module exits from direct link.

20.18 Internal TCP/IP stack handling configuration+UDCONF=101

+UDCONF=101						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	full	No	NVM	No	-	+CME Error

20.18.1 Description

Configures the discard of received TCP packets not fitting the available window size, which is often required for better interoperability with mobile networks. If discard is enabled, a TCP packet larger than the window size is discarded. If discard is disabled, a TCP packet exceeding the window size is partially received and acknowledged for the part fitting the window size, and the exceeding part is discarded.

20.18.2 Syntax

Type	Syntax	Response	Example
Set	AT+UDCONF=101,<discard>	OK	AT+UDCONF=101,1 OK
Read	AT+UDCONF=101	+UDCONF: 101,<discard> OK	+UDCONF: 101,1 OK

20.18.3 Defined values

Parameter	Type	Description
<discard>	Number	TCP packets discard option: • 0: partially acknowledges packets larger than the window size

Parameter	Type	Description
		• 1 (factory-programmed value): discards packets not fitting window size.

20.19 Socket control +USOCTL

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

20.19.1 Description

Allows interaction with the low level socket layer.

20.19.2 Syntax

Type	Syntax	Response	Example
Set	AT+USOCTL=<socket>,<param_id>	+USOCTL: <socket>,<param_id>,<param_val>[,<param_val2>] OK	AT+USOCTL=0,2 +USOCTL: 0,2,38 OK
Test	AT+USOCTL=?	+USOCTL: (list of supported <socket>s),(list of supported <param_id>s) OK	+USOCTL: (0-6),(0-4,10-11) OK

20.19.3 Defined values

Parameter	Type	Description
<socket>	Number	See <socket>.
<param_id>	Number	Control request identifier: • 0: query for socket type • 1: query for last socket error • 2: get the total amount of bytes sent from the socket • 3: get the total amount of bytes received by the socket • 4: query for remote peer IP address and port • 10: query for TCP socket status (only TCP sockets) • 11: query for TCP outgoing unacknowledged data (only TCP sockets) • 5-9, 12-99: RFU Allowed values: • LEXI-R10 - 0, 1, 2, 3, 4, 5-9, 10, 11, 12-99
<param_val>	Number / String	This value may assume different means depending on the <param_id> parameter. If <param_id>=0, <param_val> can assume these values: • 6 TCP socket • 17: UDP socket If <param_id>=1, <param_val> can assume these values: • N: last socket error If <param_id>=2, <param_val> can assume these values: • N: the total amount (in bytes) of sent (acknowledged + unacknowledged) data If <param_id>=3, <param_val> can assume these values: • N: the total amount (in bytes) of received (read) data If <param_id>=4, <param_val> can assume these values: • A string representing the remote peer IP address expressed in dotted decimal form If <param_id>=10, <param_val> can assume these values:

Parameter	Type	Description
		• 0: the socket is in INACTIVE status (it corresponds to CLOSED status defined in RFC793 "TCP Protocol Specification" [183]) • 1: the socket is in LISTEN status • 2: the socket is in SYN_SENT status • 3: the socket is in SYN_RCVD status • 4: the socket is in ESTABILISHED status • 5: the socket is in FIN_WAIT_1 status • 6: the socket is in FIN_WAIT_2 status • 7: the sokcet is in CLOSE_WAIT status • 8: the socket is in CLOSING status • 9: the socket is in LAST_ACK status • 10: the socket is in TIME_WAIT status If <param_id>=11, <param_val> can assume these values: • 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.

20.20 Iperf application+UIPERF

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

20.20.1 Description

Measure the throughput of IP traffic on the cellular network. It supports tuning of various parameters related to timing, buffers and protocols (TCP and UDP with IPv4 and IPv6).The +UUIPERF URC reports the IPERF service result.

The command setting is volatile.

20.20.2 Syntax

Type	Syntax	Response	Example
Set	AT+UIPERF=<action>[,<protocol>[,<port>[,<ipaddr>[,<tpt>[,payload_size[,<packet_number>[,<duration>[,<report_interval>]]]]]]]	OK	AT+UIPERF=1,1,8080,"10.0.0.1",10000,1472,10,30 OK
Test	AT+UIPERF=?	+UIPERF: (list of suppprted <action>s),(list of supported <protocol>s),(list of supported <port>s), (list of supported <tpt>s), (list of supported <payload_size>s),(list of supported <packet_number>s), (list of supported <duration>s),(list of supported <report_interval>s) OK	+UIPERF: (0-5),(0,1),(1-65535),(1-12000000),(36-1472),(0-65000),(1-65000),(1-65000) OK
Client mode (<action>=1,2)			
URC		**IPERF client IP throughput progress** +UUIPERF: Client PROGRESS, sent bytes: <num_bytes>, UL throughput: <tpt>	+UUIPERF: Client PROGRESS, sent bytes: 1621, UL throughput: 1831

Type	Syntax	Response	Example
URC		**IPERF client IP throughput end** +UUIPERF: Client END, sent bytes: <num_bytes>, UL throughput: <tpt>	+UUIPERF: Client END, sent bytes: 13720, UL throughput: 10976
URC		**IPERF client error** +UUIPERF: Client FAIL, <err>	+UUIPERF: Client FAIL, 3
Server mode (<action>=3,4,5)			
URC		**IPERF server IP throughput progress** +UUIPERF: Server PROGRESS, recv bytes: <num_bytes>, DL throughput: <tpt>	+UUIPERF: Server PROGRESS, recv bytes: 560, DL throughput: 1165
URC		**IPERF Server IP throughput end** +UUIPERF: Server END, recv bytes: <num_bytes>, DL throughput: <tpt>	+UUIPERF: Server END, recv bytes: 2829, DL throughput: 3487
URC		**IPERF Server error** +UUIPERF: Server FAIL, <err>	+UUIPERF: Server FAIL, 2

20.20.3 Defined values

Parameter	Type	Description
<action>	Number	Represents the IPERF services. Allowed values: • 0: terminate all IPERF services • 1: start IPERF client • 2: stop IPERF client • 3: start IPERF server • 4: start IPERF UDP NAT server • 5: stop IPERF server
<protocol>	Number	Represents the transport protocol: • 0 (default value): UDP • 1: TCP
<port>	Number	UDP/TCP port number. The range goes from 1 to 65535. The default value is 5001. • If <action> is 1 or 4, <port> is the destination server port number. • If <action> is 3, <port> is the local IPERF server port number.
<ipaddr>	String	IP address • if <action> is 1 or 4, the <ipaddr> paramter is mandatory, and indicates the destination server address. • If <action> is 3 and the test domain is ipv6 domain, the <ipaddr> parameter is mandatory. It must be the UE local IPV6 address.
<tpt>	Number	Throughput expressed in bit/s. The range goes from 1 to 12000000. The default value is 20000.
<payload_size>	Number	Payload size of UL UDP/TCP IPERF packet. The range goes from 36 to 1472. The default value is 1350.
<packet_number>	Number	Number of packets the UE will send, when working in client mode. The range goes from 0 to 65000. The default value is 0, indicates that the UE will continously send packets.
<duration>	Number	IPERF service duration, expressed in seconds. The range goes from 1 to 65000. The default value is 65000, indicates that the IPERF would not stop before encountering an error or receiving a terminate command.
<report_interval>	Number	Indicates the reporting interval of the +UUIPERF URCs. The reporting interval is expressed in seconds. The range goes from 1 to 65000. The default value is 10.
<num_bytes>	Number	Indicates the number of sent bytes in client mode and number of received bytes in server mode.
<err>	Number	Indicates the error result code for both client and server mode: • 2: invalid input parameter • 3: socket error • 4: memory error

21 Device and data security

21.1 Introduction

Nowadays the security is very important to secure personal or confidential data from unauthorized access and therefore it is important to secure the IoT devices to protect the business and the data.

In the IoT security, a weak point is a defect which is called a vulnerability and it may become a safety issue; IoT devices connects/links physical objects and so in IoT it is needed to secure of course data traffic and networks but also the network of "things" or physical objects (i.e. medical devices, infrastructure, utility meters, vehicles, etc.) must be secured.

Some definitions are needed to understand the foundations of security:

- **Integrity** is about making sure that some pieces of data have not been altered from some "reference version".
- **Authentication** is about making sure that a given entity (with whom you are interacting) is who the user believes it to be.
- **Authenticity** is a special case of integrity, where the "reference version" is defined as "whatever it was when it was under control of a specific entity".
- **Confidentiality** means no unauthorized access to data (i.e. encryption/cryptography).

The u-blox security solution lets secure the IoT devices from end-to-end:

- **Device security**, the privacy of data is protected from the devices to the cloud (confidentiality, integrity and authenticity).
- **Data security**, the devices are protected from attack, they can be trusted and controlled (identity, authenticity and firmware protection).
- **Access Management**, it can be controlled who has access to data and products (device policies, data policies and feature authorization)

The pillars of the u-blox security are:

- **Unique device identity**, an immutable chip ID and a robust Root-of-Trust (RoT) provides the foundational security.
- **Secure boot sequence and updates**, only authenticated and authorized firmware and updates can run on the device.
- **Hardware-backed crypto functions**, a Secure Client Library (SCL) generates keys and crypto functions to securely connect to the cloud.

The IoT device is secured through different steps:

- **Provision trust**: insert Root-of-Trust at production. An immutable chip ID and hardware-based Root-of-Trust provide foundational security and a unique device identity.
- **Leverage trust**: derive trusted keys. Secure libraries allow generation of hardware-backed crypto functions and keys that securely connect to the cloud.
- **Guarantee trust**: use keys to secure any function. It ensures authenticity, integrity, and confidentiality to maintain control of device and data.

21.2 Device security

21.2.1 Introduction

These AT commands maintain device integrity over the entire lifecycle.

- LEXI-R10 - The **+USECCHIP** AT command queries the immutable chip ID.

21.2.2 Read the module chip ID +USECCHIP

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

21.2.2.1 Description

Queries the chip ID of the module and returns it.

21.2.2.2 Syntax

Type	Syntax	Response	Example
Action	AT+USECCHIP	+USECCHIP: <chip_id> OK	+USECCHIP: "12345678" OK

21.2.2.3 Defined values

Parameter	Type	Description
<chip_id>	String	Chip ID of the module.

21.3 Data security provided by secure connections (SSL/TLS/DTLS)

21.3.1 Introduction

SSL/TLS/DTLS (where supported) provides a secure connection between two entities using TCP/UDP socket for communication (i.e. HTTP/FTP server and HTTP/FTP client).

The SSL/TLS/DTLS 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/DTLS configuration and features supported by the communicating entities.

u-blox cellular modules support all the described aspects of SSL/TLS/DTLS security protocol with these AT commands:

- AT+USECMNG: import, removal, list and information retrieval of certificates or private keys;
- AT+USECPRF: configuration of USECMNG (u-blox SECurity MaNaGement) profiles used for an SSL/TLS/DTLS connection.

The USECMNG provides a default SSL/TLS/DTLS profile which cannot be modified. The default USECMNG profile provides the following SSL/TLS/DTLS settings:

Setting	Value	Meaning
Certificates validation level	Level 0	The server certificate will not be checked or verified.
Minimum SSL/TLS/DTLS version	Any	The server can use any of the TLS1.0/TLS1.1/TLS1.2/DTLS1.2 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.
Server certificate pinning	"" (none)	No server certificate will be used.

Setting	Value	Meaning
Server certificate pinning level	Level 0	No server certificate will be used.

For the configuration of the settings listed above, see the +USECPRF AT command.

LEXI-R10
During the handshake a not-activity timer is started at every received or transmitted packet. The timeout of the not-activity timer is set to 60 s. At the timer expiration the secure connection is aborted, since the handshake has not been completed successfully.

21.3.2 SSL/TLS certificates and private keys manager +USECMNG

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

21.3.2.1 Description

Manages the X.509 certificates and private keys with the following functionalities:

- 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

For more details on X.509 certificates and private keys see RFC 5280 [202].

The number and the format of the certificates and the private keys accepted depend on the module series:

- LEXI-R10 - certificates and private keys both in DER (Distinguished Encoding Rules) and in PEM (Privacy-Enhanced Mail) format are accepted. If the provided format is PEM, the imported certificate or private key will be automatically converted in DER format for the internal storage. It is also possible to validate certificates and private keys. Up to 10 certificates or private keys can be imported.

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 or private key (stored in DER format) can be retrieved.

LEXI-R10
The SSL/(D)TLS connection with Server and/or Mutual Authentication can be successfully performed using the following key size:

- for Rivest-Shamir-Adleman (RSA) keys at least 2048-bits.
- for Elliptic Curve Digital Signature Algorithm (ECDSA) keys at least 192-bits.

The same limitation is applied also to the keys used for the certificates generation.

LEXI-R10
Data for certificate or private key import can be provided with a stream of byte similar to +FOPEN or from a file stored on the FS.

When using the stream of byte import functionality:

- If the data transfer is stopped before its completion, 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.

All the imported certificates or private keys are listed if the type of the security data is omitted.

LEXI-R10

The imported certificates and private keys are:

- PRESERVED after the module FW is upgraded using +UFWINSTALL or +NFWUPD AT commands.
- NOT PRESERVED (deleted) after a factory reset using +UFACTORY AT command.
- NOT PRESERVED after the module FW is upgraded using EasyFlash.

☞ The USECMNG import command supports only X.509 certificate format.

☞ The X.509 certificate DN (Distinguished Name) is composed of value fields which uniquely define an entity being authenticated. For security reasons some limitations (related to DN fields) described below are applied:

- The USECMNG import functionality allows the following DN value fields:
  - commonName (http://oid-info.com/get/2.5.4.3)
  - serialNumber (http://oid-info.com/get/2.5.4.5)
  - countryName (http://oid-info.com/get/2.5.4.6)
  - localityName (http://oid-info.com/get/2.5.4.7)
  - stateOrProvinceName (http://oid-info.com/get/2.5.4.8)
  - organizationName (http://oid-info.com/get/2.5.4.10)
  - organizationalUnitName (http://oid-info.com/get/2.5.4.11)
  - userID (http://oid-info.com/get/0.9.2342.19200300.100.1.1)
  - domainComponent (http://oid-info.com/get/0.9.2342.19200300.100.1.25)
  - pkcs9_emailAddress (http://oid-info.com/get/1.2.840.113549.1.9.1)
  - pkcs9_unstructuredName (http://oid-info.com/get/1.2.840.113549.1.9.2)
- The import of an X.509 certificate with DN containing other value fields (not in the above list) will result in an import error (error result code: USECMNG invalid certificate/key format).

☞ The USECMNG private key import command does not support private keys in PEM format with extension headers (i.e. "EC PARAMETERS").

21.3.2.2 Syntax

Type	Syntax	Response	Example
Generic syntax:			
Action	AT+USECMNG=<op_code>,[<type>[,<internal_name>[,<param1>[,<param2>]]]]	OK	-
Import a certificate or private key from serial I/O:			
Action	AT+USECMNG=0,<type>,<internal_name>,<data_size>[,<password>]	> Start transfer of data ... +USECMNG: 0,<type>,<internal_name>,<md5_string> OK	AT+USECMNG=0,0,"AddTrustCA",1327 >-----BEGIN CERTIFICATE----- (...other certificate data bytes...) +USECMNG: 0,0,"AddTrustCA","77107370ec4db40a0 8a6e36a64a1435b" OK
Import a certificate or private key from a file stored on FS:			
Action	AT+USECMNG=1,<type>,<internal_name>,<filename>[,<password>]	+USECMNG: 1,<type>,<internal_name>,<md5_string> OK	AT+USECMNG=1,0,"AddTrustCA","addtrust.cert" +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"

Type	Syntax	Response	Example
			OK
List imported certificates or private keys:			
Read	AT+USECMNG=3[,<type>]	<cert_type>,<internal_name>[,<common_name>,<expiration_date>] ... OK	AT+USECMNG=3 "CA","AddTrustCA","AddTrust External CA Root","2020/05/30" "CA","GlobalSignCA","GlobalSign", "2029/03/18" "CC","JohnDoeCC","GlobalSign","2010/01/01" "PK","JohnDoePK" 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> OK	AT+USECMNG=4,0,"AddTrustCA" +USECMNG: 4,0,"AddTrustCA", "77107370ec4db40a0 8a6e36a64a1435b" OK
Test	AT+USECMNG=?	+USECMNG: (list of supported <op_code>s),(list of supported <type>s) OK	+USECMNG: (0-4),(0-2) OK

21.3.2.3 Defined values

Parameter	Type	Description
<op_code>	Number	Type of operation: • 0: import a certificate or a private key (data provided by the stream of byte) • 1: import a certificate or a private key (data provided from a file on FS) • 2: remove an imported certificate or private key • 3: list imported certificates or private keys • 4: retrieve the MD5 of an imported certificate or private key
<type>	Number	Type of the security data: • 0: trusted root CA (certificate authority) certificate • 1: client certificate • 2: client private key • 3: server certificate • 4: signature verification certificate • 5: signature verification public key Allowed values: • LEXI-R10 - 0, 1, 2, 3
<cert_type>	String	Type of the security data in verbose format: • "CA": trusted root CA (certificate authority) certificate • "CC": client certificate • "PK": client private key • "SC": server certificate • "VC": signature verification certificate • "PU": signature verification public key Allowed values: • LEXI-R10 - "CA", "CC", "PK", "SC"
<internal_name>	String	Unique identifier of an imported certificate or private key. If an existing name is used the data will be overridden. • LEXI-R10 - The maximum length for the imported certs/keys is 30 characters. The maximum length for the preinstalled certs/keys is 60 characters.
<data_size>	Number	Size in bytes of a certificate or private key being imported. • LEXI-R10 - The maximum allowed size is 8192 bytes.

Parameter	Type	Description
<password>	String	Decryption password; applicable only for PKCS8 encrypted client private keys. The maximum length is 128 characters.
<filename>	String	Name of the FS file containing the certificate or private key data to be imported. • LEXI-R10 - The maximum allowed file size is 8192 bytes. • LEXI-R10 - The maximum filename length is 63 characters.
<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.
<param2>	Number/ String	Type and supported content depend on the related <op_code> parameter; see the <op_code> specification.

21.3.2.4 Notes

LEXI-R10

- The import of the following client private key formats is not supported:
  - PKCS1 RSA formatted encrypted private key

LEXI-R10

- The following certificates are pre-installed on the module and cannot be deleted/changed by the customer via AT commands:

Internal name	Common name	Expiration date
ubx_digicert_global_root_ca	DigiCert Global Root CA	2031/11/10 00:00:00
ubx_digicert_global_root_g2	DigiCert Global Root G2	2038/01/15 12:00:00
ubx_digicert_trusted_root_g4	DigiCert Trusted Root G4	2038/01/15 12:00:00
ubx_digicert_eccp384_root_g5	DigiCert TLS ECC P384 Root G5	2046/01/14 23:59:59
ubx_digicert_rsa4096_root_g5	DigiCert TLS RSA4096 Root G5	2046/01/14 23:59:59
ubx_baltimore_cybertrust_root	Baltimore CyberTrust Root	2025/05/12 23:59:00
ubx_tmo_usa_enterprise_root_ca	T-Mobile USA Enterprise Root CA	2040/11/03 20:28:54
ubx_starfield_service_root_ca_g2	Starfield Services Root Certificate Authority - G2	2034/06/28 17:39:16

21.3.3 +USECMNG AT command example

LEXI-R10

Here below is reported an example with a PEM encoded trusted root certificate.

Command	Response	Description
Step 1: Import a trusted root certificate using the stream of byte similar to +FOPEN		
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","8ccadc0 b22cef5be72ac411a11a8d812" 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" OK	List all available certificates and private keys.
Step 3: Set the security profile 2 validation level to trusted root		

Command	Response	Description
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
BAMTFnRoYXd0ZSBQcmltYXJ5IFJvb3QgQ0EwHhcNMDYxMTE3MDAwMDAwWhcNMzYw
NzE2MjM1OTU5WjCBqTELMAkGA1UEBhMCVVMxFTATBgNVBAoTDHRoYXd0ZSwgSW5j
LjEoMCYGA1UECxMfQ2VydGlmaWNhdGlvbiBTZXJ2aWNlcyBEaXZpc2lvbjE4MDYG
A1UECxMvKGMpIDIwMDYgdGhhd3RlLCBJbmMuIC0gRm9yIGF1dGhvcml6ZWQgdXNl
IG9ubHkxHzAdBgNVBAMTFnRoYXd0ZSBQcmltYXJ5IFJvb3QgQ0EwggEiMA0GCSqG
SIb3DQEBAQUAA4IBDwAwggEKAoIBAQCsoPD7gFnUnMekz52hWXMJEEUMDSxuaPFs
W0hoSVk3/AszGcJ3f8wQLZU0HObrTQmnHNK4yZc2AreJ1CRfBsDMRJSUjQJib+ta
3RGNKJpchJAQeg29dGYvajig4tVURObdB58Hum/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-----
```

21.3.4 Notes

Due to significant memory fingerprint of an SSL/TLS connection, the number of concurrent SSL/TLS connections is limited. The USECMNG and the underlying SSL/TLS infrastructure allows 4 concurrent SSL/TLS connections (i.e. 4 HTTPS requests or 2 HTTPS and 2 FTPS request).

21.3.5 SSL/TLS/DTLS security layer profile manager +USECPRF

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

21.3.5.1 Description

Manages security profiles for the configuration of the following SSL/TLS/DTLS 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).
  - Level 3: certificate validation with an additional check on the certificate validity date.

  CA certificates should be imported with the +USECMNG AT command
- **SSL/TLS version to be used:**
  - Any of the TLS versions supported by the module
  - TLS 1.0
  - TLS 1.1
  - TLS 1.2
  - TLS 1.3
- **DTLS version to be used:**
  - DTLS 1.2
- **Cipher suite to be configured using the following methods:**
  - **Legacy cipher suite** to be used. See Syntax description and Table 23 for the supported cipher suites.
  - **Additional cipher suite** to be used with Internet Assigned Numbers Authority (IANA) enumeration set command. See Syntax description and Table 23 for the supported cipher suites.
  - **List of cipher suites** to be used is configured with add / remove commands and using IANA enumeration. See Syntax description and Table 23 for the supported cipher suites.

☞ For the applicability of cipher suite depending on the series module, see Cipher suites applicability.

☞ Cipher suite configuration methods are exclusive and the last configured method is used.

☞ The cipher suite configuration read command response is related to the selected cipher suite type, see Syntax description for more details.

- **Certificate to be used for server and mutual authentication:**
  - The trusted root certificate. The CA certificate should be imported with the +USECMNG AT command.
  - The client certificate that should be imported with the +USECMNG AT command.
  - The client private key that should be imported with the +USECMNG AT command.
  - The server certificate that should be imported with the +USECMNG AT command.
- **Database selection.** Accordingly to the +USECMNG AT command the certificates and keys can be imported in the user database, or can be already present in the pre-installed database. The security profile can be configured to use certificates and clients from all available databases or from a specific database.
- **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. When SNI is not used the modules might receive a non host specific SSL/TLS configuration (version/cipher suites/certificate) when used with virtual hosts.
- **(D)TLS session resumption.** The session resumption feature allows to reuse the secure session data to reestablish a SSL/(D)TLS secure session. Since the secure session data are available, the full SSL/(D)TLS handshake is not performed during the session resumption. Once the session resumption feature is enabled, the session resumption type and the secure session data (negotiated during the SSL/(D)TLS

handshake) are displayed via +UUSECPRF URC message. The session resumption feature configuration and secure session data are not stored in the NVM, hence the session resumption may be performed until power cycle. Once the session data related to the session resumption via session ticket (<sess_type>=1 or <sess_type>=11) or via the session resumption via PSK-based session ticket (<sess_type>=3 or <sess_type>=13) are properly retrieved from the server, they are directly configured in the USECPRF profile and a +UUSECPRF URC message reporting the session resumption status is issued. Conversely, once the session data related to the session resumption via session ID (<sess_type>=0 or <sess_type>=10) are properly retrieved from the server, an +UUSECPRF URC message reporting the session resumption type and an +UUSECPRF URC message reporting the session resumption data are issued, furthermore the session resumption data are not stored in the USECPRF profile.

- **ZTP-provided credentials.** The credentials to establish the secure connection will be provided by Zero Touch Provisioning (ZTP). In the specific case the credentials provided by the ZTP will be the CA certificate, or/and the client certificates and client private key. The CA certificate, and if applicable, the client certificate, are sent to the server during the handshake. The CA certificate and the client certificate are concatenated in a certificate chain.
- **Application Layer Protocol Name (ALPN).** With ALPN the client sends the list of supported application protocols as part of the TLS ClientHello message. The server can select one protocol and send it as part of the TLS ServerHello message. The application protocol negotiation can thus be accomplished within the TLS handshake, without adding network round-trips, and allows the server to associate a different certificate according to the indicated application protocol, if desired. For more details on ALPN, Extension protocol see RFC 7301 [188].

☞ When ZTP-provided credentials feature is enabled (<op_code>=14) for a certain USECPRF profile, the client certificate and client key set by the <op_code>=5 (client certificate internal name) and <op_code>=6 (client private key internal name) are ignored, and the underlying SSL/TLS uses the ZTP provided ones.

☞ 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/DTLS version, ...).

☞ To reset (set to factory-programmed value) all the parameters of a specific security profile, issue the AT +USECPRF=<profile_id> command.

21.3.5.2 Syntax

Type	Syntax	Response	Example
Generic syntax			
Set	AT+USECPRF=<profile_id>[,<op_code>[,<param_val1>[,<param_val2>[,<param_val3>]]]]	OK	AT+USECPRF=0,0,0 OK
Read	AT+USECPRF=<profile_id>,<op_code>	+USECPRF: <profile_id>,<op_code>,<param_val1> OK	AT+USECPRF=0,0 +USECPRF: 0,0,0 OK
URC		+UUSECPRF: <profile_id>,<op_code>[,<param_val1>[,<param_val2>[,<param_val3>]]] OK	+UUSECPRF: 0,13,1,0 OK
Legacy cipher suite selection			
Set	AT+USECPRF=<profile_id>,2,<legacy_cs>	OK	AT+USECPRF=0,2,2 OK
Cipher suite selection using IANA enumeration			
Set	AT+USECPRF=<profile_id>,2,99,<iana_b1>,<iana_b2>	OK	AT+USECPRF=0,2,99,"C0","2B" OK
Read	AT+USECPRF=<profile_id>,2	+USECPRF: <profile_id>,2,99,<iana_b1>,<iana_b2> OK	AT+USECPRF=0,2 +USECPRF: 0,2,99,"C0","2B" OK

Type	Syntax	Response	Example
Add/remove of IANA cipher suite to the configured cipher suites list			
Set	AT+USECPRF=<profile_id>,2,100,<iana_b1>,<iana_b2>,<operation>	OK	AT+USECPRF=0,2,100,"C0","2A",0 OK
Add an IANA cipher suite to the configured cipher suites list			
Set	AT+USECPRF=<profile_id>,2,100,<iana_b1>,<iana_b2>,0	OK	AT+USECPRF=0,2,100,"C0","2A",0 OK
Remove an IANA cipher suite from the configured cipher suites list			
Set	AT+USECPRF=<profile_id>,2,100,<iana_b1>,<iana_b2>,1	OK	AT+USECPRF=0,2,100,"C0","2B",1 OK
Read the list of configured cipher suites			
Read	AT+USECPRF=<profile_id>,2	+USECPRF: <profile_id>,2,100,<list of configured cipher suites separated by ";"> OK	AT+USECPRF=0,2 +USECPRF: 0,2,100,"C02A;C02C" OK
Pre-shared key configuration			
Set	AT+USECPRF=<profile_id>,8,<preshared_key>[,<string_type>]	OK	AT+USECPRF=0,8,"0sFpZ0AZqE0N6Ti9s0qt40ZP5Eqx" OK
Pre-shared key identity configuration			
Set	AT+USECPRF=<profile_id>,9,<preshared_key_id>[,<string_type>]	OK	AT+USECPRF=0,9,"0ceEZ0AZqP0K60i9o04xz0ZP8zyu0Eqx" OK
Server certificate pinning			
Set	AT+USECPRF=<profile_id>,12,<server_certificate>,<pinning_level>	OK	AT+USECPRF=0,12,"my_srv_cert",0 OK
(D)TLS session resumption generic syntax			
Set	AT+USECPRF=<profile_id>,13,<sess_tag>,<param_val1>[,<param_val2>]	OK	AT+USECPRF=0,13,0,1 OK
Read	AT+USECPRF=<profile_id>,13,<sess_tag>	+USECPRF: <profile_id>,13,<sess_tag>,<param_val1>[,<param_val2>] OK	AT+USECPRF=0,13,0 +USECPRF: 0,13,0,1 OK
URC		+UUSECPRF: <profile_id>,13,<sess_tag>,<param_val1>[,<param_val2>] OK	+UUSECPRF: 0,13,1,0 OK
(D)TLS session resumption status			
Set	AT+USECPRF=<profile_id>,13,0,<sess_status>	OK	AT+USECPRF=0,13,0,1 OK
Read	AT+USECPRF=<profile_id>,13,0	+USECPRF: <profile_id>,13,0,<sess_status> OK	AT+USECPRF=0,13,0 +USECPRF: 0,13,0,1 OK
URC		+UUSECPRF: <profile_id>,13,0,<sess_status>	+UUSECPRF: 0,13,0,2
(D)TLS session resumption session type			
Set	AT+USECPRF=<profile_id>,13,1,<sess_type>	OK	AT+USECPRF=0,13,1,0 OK
Read	AT+USECPRF=<profile_id>,13,1	+USECPRF: <profile_id>,13,1,<sess_type> OK	AT+USECPRF=0,13,1 +USECPRF: 0,13,1,0

Type	Syntax	Response	Example
			OK
URC		+UUSECPRF: <profile_id>,13,1, <sess_type>	+UUSECPRF: 0,13,1,0
(D)TLS session resumption session data having session ID as session resumption type			
Set	AT+USECPRF=<profile_id>,13,2, <session_id_b64>,<master_secret_ b64>	OK	AT+USECPRF=0,13,2,"VWY5UENs0 Hh3VWR1MjB2WTVMYVZ5TTdE0 WpMeWZWeHo=","SHVSODByUit0 My9OMEtIT2ZsVVFRcUsyTkdvaz0 nWVFhRzdQZUpndG9IMzN4ZTBo" OK
Read	AT+USECPRF=<profile_id>,13,2	+USECPRF: <profile_id>,13,2, <session_id_b64>,<master_secret_ b64> OK	AT+USECPRF=0,13,2 +USECPRF: 0,13,2,"VWY5UENs0 Hh3VWR1MjB2WTVMYVZ5TTdE0 WpMeWZWeHo=","SHVSODByUit0 My9OMEtIT2ZsVVFRcUsyTkdvaz0 nWVFhRzdQZUpndG9IMzN4ZTBo" OK
URC		+UUSECPRF: <profile_id>,13,2, <session_id_b64>,<master_secret_ b64>	+UUSECPRF: 0,13,2,"VWY5UENs0 Hh3VWR1MjB2WTVMYVZ5TTdE0 WpMeWZWeHo=","SHVSODByUit0 My9OMEtIT2ZsVVFRcUsyTkdvaz0 nWVFhRzdQZUpndG9IMzN4ZTBo"
(D)TLS session resumption session data having session ticket as session resumption type			
Set	AT+USECPRF=<profile_id>,13,3, <session_data_b64>,<session_ data_b64_size>	OK	AT+USECPRF=0,13,3, "MIHOAgECAgMAzKgEMDZV [...] NuPf3pFw4tJjU2gjKg2ipCBW0 rTrfTyQ==",332 OK
Read	AT+USECPRF=<profile_id>,13,3	+USECPRF: <profile_id>,13,3, <session_data_b64>,<session_ data_b64_size> OK	AT+USECPRF=0,13,3 +USECPRF: 0,13,3, "MIHOAgECAgMAzKgEMDZV [...] NuPf3pFw4tJjU2gjKg2ipCBW0 rTrfTyQ==",332 OK
(D)TLS session resumption session data having PSK-based session ticket as session resumption type			
Set	AT+USECPRF=<profile_id>,13,5, <session_data_b64_size> > <session_data_b64>	OK	AT+USECPRF=0,13,5,2320 > NjQwM0IwMDEzMDgyMDFB0 QzAyMDEwMTAyMDEwMDAy0 MDEwMTAyMDIxQzIwMDIw [...] MDAwMDAwMDAwMDAwMDAw0 MDAwMDAwMDAwMDAwMDAw0 MDAwMDAwMDAyMDIxMzAy OK
Read	AT+USECPRF=<profile_id>,13,5	+USECPRF: <profile_id>,13,5, <session_data_b64>,<session_ data_b64_size>	AT+USECPRF=0,13,5

Type	Syntax	Response	Example
		OK	+USECPRF: 0,13,5,"Nj0QwM0 lwMDEzMDgyMDFBQz0 AyMDEwMTAyMDEwMDAyMD [...] AwMDAwMDAwMDAwMDAwMD0 AwMDAwMDAwMDAwMDAwMD0 AwMDAyMDIxMzAy",2320 OK
(D)TLS session resumption session data having encrypted session ID with local encryption as session resumption type			
Set	AT+USECPRF=<profile_id>,13,12, <enc_session_data_b64>,<enc_ session_data_b64_size>	OK	AT+USECPRF=0,13,12, "AAECAwQFBgcICQoLDA0 ODxAREhMUFRYXGBkaGxwdHh/ Ljgstf1cLaEO2D8IMbxHcQIGfhVxC0 in6aGVISJGBWCAAKJo6Qw5Q +ugXaRZFquG0 O69WeHnPRBkcwY2SN4bwnDbyR +709i0pt2nIaYMSCL77MAA=",156 OK
Read	AT+USECPRF=<profile_id>,13,12	+USECPRF: <profile_id>,13,12,<enc_ session_data_b64>,<enc_session_ data_b64_size> OK	AT+USECPRF=0,13,12 +USECPRF: 0,13,12, "AAECAwQFBgcICQoLDA0 ODxAREhMUFRYXGBkaGxwdHh/ Ljgstf1cLaEO2D8IMbxHcQIGfhVxC0 in6aGVISJGBWCAAKJo6Qw5Q +ugXaRZFquG0 O69WeHnPRBkcwY2SN4bwnDbyR +709i0pt2nIaYMSCL77MAA=",156 OK
URC		+UUSECPRF: <profile_id>,13,12, <enc_session_data_b64>,<enc_ session_data_b64_size>	+UUSECPRF: 0,13,12, "AAECAwQFBgcICQoLDA0 ODxAREhMUFRYXGBkaGxwdHh/ Ljgstf1cLaEO2D8IMbxHcQIGfhVxC0 in6aGVISJGBWCAAKJo6Qw5Q +ugXaRZFquG0 O69WeHnPRBkcwY2SN4bwnDbyR +709i0pt2nIaYMSCL77MAA=",156
(D)TLS session resumption session data having encrypted session ticket with local encryption as session resumption type			
Set	AT+USECPRF=<profile_id>,13,13, <enc_session_data_b64>,<enc_ session_data_b64_size>	OK	AT+USECPRF=0,13,13, "MIHOAgECAgMAzKwsa64L [...] dQE2VcxYvD0VcrR2jKg2ipCBW0 rTrfTyQ==",364 OK
Read	AT+USECPRF=<profile_id>,13,13	+USECPRF: <profile_id>,13,13,<enc_ session_data_b64>,<enc_session_ data_b64_size> OK	AT+USECPRF=0,13,13 +USECPRF: 0,13,13, "MIHOAgECAgMAzKwsa64L [...] QE2VcxYvD0VcrR2jKg2ipCBW0 rTrfTyQ==",364 OK

Type	Syntax	Response	Example
(D)TLS session resumption session data having PSK-based session ticket with local encryption as session resumption type			
Set	AT+USECPRF=<profile_id>,13,15,<enc_session_data_b64_size> > <enc_session_data_b64>	OK	AT+USECPRF=0,13,15,2408 > MDBGMDRCREYwODYwREYw0 RDFDNjk1NUU5OUY5NjAw0 MDA1QjlCN0QxMUYzM0Qy [...] Njg4MkEzQzJCRjA5NEFF0 QzJFQUFFOTNBNjY2RkNE0 QzM3RDJERTYyRDIxNQ== OK
Read	AT+USECPRF=<profile_id>,13,15	+USECPRF: <profile_id>,13,15,<enc_session_data_b64>,<enc_session_data_b64_size> OK	AT+USECPRF=0,13,15 +USECPRF: 0,13,15,"M0 DBGMDRCREYwODYwREYwR0 DFDNjk1NUU5OUY5NjAwM [...] EzQzJCRjA5NEFFQzJFQU0 FFOTNBNjY2RkNEQzM3RD0 JERTYyRDIxNQ==",2408 OK
ZTP-provided credentials			
Set	AT+USECPRF=<profile_id>,14,<ZTP_tag>	OK	AT+USECPRF=0,14,0 OK
Read	AT+USECPRF=<profile_id>,14	+USECPRF: <profile_id>,14,<ZTP_tag> OK	AT+USECPRF=0,14 +USECPRF: 0,14,2 OK
ALPN extension protocol			
Set	AT+USECPRF=<profile_id>,15,<string_type>	OK	AT+USECPRF=0,15,"FTP" OK
Read	AT+USECPRF=<profile_id>,15	+USECPRF: <profile_id>,15,<string_type> OK	AT+USECPRF=0,15 +USECPRF: 0,15,"FTP" OK
Database selection			
Set	AT+USECPRF=<profile_id>,16,<db_to_use>	OK	AT+USECPRF=0,16,1 OK
Read	AT+USECPRF=<profile_id>,16	+USECPRF: <profile_id>,16,<db_to_use> OK	AT+USECPRF=0,16 +USECPRF: 0,16,2 OK
Test	AT+USECPRF=?	+USECPRF: (list of supported <profile_id>s),(list of supported <op_code>s) OK	+USECPRF: (0-4),(0-16) OK

21.3.5.3 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).

Parameter	Type	Description
<op_code>	Number	• 0: certificate validation level; allowed values for <param_val1> (number): o 0: level 0 - No validation; the server certificate will not be checked or verified. The server in this case is not authenticated. 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. o 2: level 2 - Root certificate validation with URL integrity check. Level 1 validation with an additional URL integrity check. o 3: level 3 - Root certificate validation with check of certificate validity date. Level 2 validation with an additional check of certificate validity date. The factory-programmed value for <param_val1> is: o LEXI-R10 - 1 • 1: SSL/TLS version to use; allowed values for <param_val1>(number): o 0: any; the server can use any TLS version, which is supported by the module, for the connection. For more details on the supported TLS versions, see Notes. o 1: TLS v1.0; connection allowed only to TLS/SSL servers which support TLS v1.0 o 2: TLS v1.1; connection allowed only to TLS/SSL servers which support TLS v1.1 o 3: TLS v1.2; connection allowed only to TLS/SSL servers which support TLS v1.2 o 4: TLS v1.3; connection allowed only to TLS/SSL servers which support TLS v1.3 The factory-programmed value for <param_val1> is: o LEXI-R10 - 0 • 2: cipher suite; allowed values for <legacy_cs> (number) legacy cipher suites are listed in Table 23. The factory-programmed value for <legacy_cs> is 0. For <legacy_cs>=0 a list of default cipher suites is proposed at the beginning of handshake process, and a cipher suite will be negotiated among the cipher suites proposed in the list. For <legacy_cs>=99 the cipher suite selection is performed with IANA enumeration, <iana_b1> and <iana_b2> are strings containing the 2 bytes that compose the IANA enumeration, see Table 23. For <legacy_cs>=100 the list of cipher suites is configured using IANA enumeration, <iana_b1> and <iana_b2> are strings containing the 2 bytes that compose the IANA enumeration, see Table 23. ☞ The cipher suite configuration read command response is related to the selected cipher suite type. In the case of <legacy_cs>=99 the configured <byte_1> and <byte_2> are reported in the information text response to the read command. In the case of <legacy_cs>=100 a ";" separated list with configured cipher suites is reported in the information text response to the read command. ☞ For <legacy_cs>=100, when all added cipher suites are removed the cipher suite is automatically set to 0 (factory-programmed value). ☞ For the applicability of default cipher suite lists depending on the series module, see Cipher suites applicability. • 3: trusted root certificate internal name; o <param_val1> (string) is the internal name identifying a trusted root certificate; the maximum length is 200 characters. The factory-programmed value is an empty string. • 4: expected server hostname; o <param_val1> (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. • 5: client certificate internal name; o <param_val1> (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. • 6: client private key internal name; o <param_val1> (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. • 7: client private key password; o <param_val1> (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. • 8: pre-shared key;

Parameter	Type	Description
		o <preshared_key> (string) is the pre-shared key used for connection; the factory-programmed value is an empty string. The accepted string type and length depends on the <string_type> value. o <string_type> (number) defines the type and the maximum length of the <preshared_key> string. Allowed values for <string_type>: - 0 (default value): <preshared_key> is an ASCII string and its maximum length is 64 characters - 1: <preshared_key> is an hexadecimal string and its maximum length is 128 characters • 9: pre-shared key identity; o <preshared_key_id> (string) is the pre-shared key identity used for connection; the factory-programmed value is an empty string. The accepted string type and length depends on the <string_type> value. o <string_type> (number) defines the type of the <preshared_key_id> string. Allowed values for <string_type>: - 0 (default value): <preshared_key_id> is an ASCII string and its maximum length is 128 characters - 1: <preshared_key_id> is an hexadecimal string and its maximum length is 256 characters • 10: SNI (Server Name Indication); o <param_val1> (string) value for the additional negotiation header SNI (Server Name Indication) used in SSL/TLS connection negotiation; the maximum length is 128 characters. The factory-programmed value is an empty string. • 11: PSK key and PSK key identity generated by RoT (Root of trust); allowed values for <param_val1> (number): o 0 (factory-programmed value): OFF - The PSK and PSK key ID are NOT generated by RoT o 1: ON - The PSK and PSK key ID are generated by RoT in the process of SSL/TLS connection negotiation • 12: server certificate pinning; o <server_certificate> (string) internal name identifying a certificate configured to be used for server certificate pinning; the maximum length is 200 characters. The factory-programmed value is an empty string. o <pinning_level> (number) defines the certificate pinning information level. Allowed values for <pinning_level>: - 0: pinning based on information comparison of received and configured certificate public key - 1: pinning based on binary comparison of received and configured certificate public key - 2: pinning based on binary comparison of received and configured certificate • 13: (D)TLS session resumption; • 14: ZTP-provided credentials; o <ZTP_tag> (number) defines the ZTP-provided credentials level. Allowed values for <ZTP_tag>: - 0: no credentials are obtained via ZTP - 1: CA certificate and client certificate/key are obtained via ZTP. The CA certificate and client certificate will be concatenated together in a certificate chain and provided to the server - 2: client certificate/key are provided via ZTP. The client certificate will be provided to the server • 15: Application-Layer Protocol Negotiation (ALPN); o <string_type> (string) value for the protocol name to be added in the Application Layer Protocol Negotiation Extension used in SSL/TLS connection negotiation; the maximum length is 255 characters. It is possible to set a protocol IDs listed at https://www.iana.org/assignments/tls-extensiontype-values/tls-extensiontype-values.xhtml#alpn-protocol-ids or a custom string. The factory-programmed value is an empty string. • 16: database selection; o <db_to_use> (number) defines the database to use, from where to retrieve the certificates and keys to establish the secure connection. Allowed values for <db_to_use>: - 0 (factory-programmed value): all available databases are used - 1: only user database is used - 2: only pre-installed database is used Allowed values:

Parameter	Type	Description
		• LEXI-R10 - 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 13, 15, 16
<legacy_cs>	Number	Legacy cipher suite enumeration
<iana_b1>	String	First byte of IANA cipher suite enumeration
<iana_b2>	String	Second byte of IANA cipher suite enumeration
<operation>	Number	Operation to execute when using <legacy_cs>=100 configuration using a list of IANA enumeration. Allowed values for <operation>: • 0: add cipher suite defined by <iana_b1> and <iana_b2> to the list • 1: remove cipher suite defined by <iana_b1> and <iana_b2> from the list
<sess_tag>	Number	Configures the (D)TLS session resumption. Allowed values: • 0: session resumption status • 1: session resumption type • 2: session resumption data when the session resumption type is session ID • 3: session resumption data when the session resumption type is session ticket. • 5: session resumption data when the session resumption type is PSK-based session ticket. TLS v1.3 must be enabled (+USECPRF: <profile_id>,1,4). • 12: session resumption data when the session resumption type is encrypted session ID with local encryption • 13: session resumption data when the session resumption type is encrypted session ticket with local encryption • 15: session resumption data when the session resumption type is encrypted PSK-based session ticket with local encryption. TLS v1.3 must be enabled (+USECPRF: <profile_id>,1,4). Allowed values: • LEXI-R10 - 0, 1, 3
<sess_status>	Number	(D)TLS session resumption status. Allowed values: • 0 (factory-programmed value): disabled • 1: enabled • 2: session data configured Allowed values: • LEXI-R10 - 0, 1, 2
<sess_type>	Number	(D)TLS session resumption type. Allowed values: • 0: session ID • 1: session ticket • 3: PSK-based session ticket. TLS v1.3 must be enabled (+USECPRF: <profile_id>,1,4) • 10: encrypted session ID with local encryption • 11: encrypted session ticket with local encryption • 13: encrypted PSK-based session ticket with local encryption. TLS v1.3 must be enabled (+USECPRF: <profile_id>,1,4) Allowed values: • LEXI-R10 - 1
<session_id_b64>	String	Base64 encoded session ID value. The maximum length is 44 characters.
<master_secret_b64>	String	Base64 encoded session master key. The maximum length is 64 characters.
<session_data_b64_size>	Number	Length of base64 encoded session data value. The maximum size is 8192.
<session_data_b64>	String	Base64 encoded session data value. The string length is determined by <session_data_b64_size>.
<enc_session_data_b64>	String	Base64 encoded session data value encrypted with local encryption. The string length is determined by <enc_session_data_b64_size>
<enc_session_data_b64_size>	Number	Length of base64 encoded session data value encrypted with local encryption. The maximum size is 8192.
<param_val1>	String	Type and supported content depend on related <op_code> (details are given above)
<param_val2>	String	Type and supported content depend on related <op_code> (details are given above)
<param_val3>	String	Type and supported content depend on related <op_code> (details are given above)

21.3.5.4 Notes

LEXI-R10

- TLS v1.3 is not supported, therefore if <op_code>=1 (SSL/TLS version to use), <param_val1>=4 (TLS v1.3) is not supported.
- If <op_code>=1 (SSL/TLS version) and <param_val1>=0 (default) the server can use only TLS v1.2 for the connection.
- If <op_code>=2 (cipher suite) the <legacy_cs>=100 (cipher suite list configuration using IANA enumeration) is not supported.
- If <op_code>=9 (pre-shared key identity) the <string_type> parameter is not supported. The <preshared_key_id> parameter is an ASCII string (maximum length 128 characters).
- If <op_code>=2 (cipher suite) the <legacy_cs>=10,11,12,15,16 are not supported.

21.3.5.5 List of the supported cipher suites

Cipher suite IANA code	Cipher suite name	Legacy cipher suite configuration	IANA enumeration cipher suite configuration	
		<legacy_cs>	<iana_b1>	<iana_b2>
0x0000	TLS_NULL_WITH_NULL_NULL		"00"	"00"
0x000A	TLS_RSA_WITH_3DES_EDE_CBC_SHA	5	"00"	"0A"
0x0013	TLS_DHE_DSS_WITH_3DES_EDE_CBC_SHA		"00"	"13"
0x0015	TLS_DHE_RSA_WITH_DES_CBC_SHA		"00"	"15"
0x0016	TLS_DHE_RSA_WITH_3DES_EDE_CBC_SHA		"00"	"16"
0x001A	TLS_DH_anon_WITH_DES_CBC_SHA		"00"	"1A"
0x001B	TLS_DH_anon_WITH_3DES_EDE_CBC_SHA		"00"	"1B"
0x002F	TLS_RSA_WITH_AES_128_CBC_SHA	1	"00"	"2F"
0x0032	TLS_DHE_DSS_WITH_AES_128_CBC_SHA		"00"	"32"
0x0033	TLS_DHE_RSA_WITH_AES_128_CBC_SHA		"00"	"33"
0x0034	TLS_DH_anon_WITH_AES_128_CBC_SHA		"00"	"34"
0x0035	TLS_RSA_WITH_AES_256_CBC_SHA	3	"00"	"35"
0x0039	TLS_DHE_RSA_WITH_AES_256_CBC_SHA		"00"	"39"
0x003A	TLS_DH_anon_WITH_AES_256_CBC_SHA		"00"	"3A"
0x003C	TLS_RSA_WITH_AES_128_CBC_SHA256	2	"00"	"3C"
0x003D	TLS_RSA_WITH_AES_256_CBC_SHA256	4	"00"	"3D"
0x0040	TLS_DHE_DSS_WITH_AES_128_CBC_SHA256		"00"	"40"
0x0041	TLS_RSA_WITH_CAMELLIA_128_CBC_SHA		"00"	"41"
0x0045	TLS_DHE_RSA_WITH_CAMELLIA_128_CBC_SHA		"00"	"45"
0x0067	TLS_DHE_RSA_WITH_AES_128_CBC_SHA256		"00"	"67"
0x006B	TLS_DHE_RSA_WITH_AES_256_CBC_SHA256		"00"	"6B"
0x006C	TLS_DH_anon_WITH_AES_128_CBC_SHA256		"00"	"6C"
0x006D	TLS_DH_anon_WITH_AES_256_CBC_SHA256		"00"	"6D"
0x0084	TLS_RSA_WITH_CAMELLIA_256_CBC_SHA		"00"	"84"
0x0088	TLS_DHE_RSA_WITH_CAMELLIA_256_CBC_SHA		"00"	"88"
0x008A	TLS_PSK_WITH_RC4_128_SHA		"00"	"8A"
0x008B	TLS_PSK_WITH_3DES_EDE_CBC_SHA	8	"00"	"8B"
0x008C	TLS_PSK_WITH_AES_128_CBC_SHA	6	"00"	"8C"
0x008D	TLS_PSK_WITH_AES_256_CBC_SHA	7	"00"	"8D"
0x008E	TLS_DHE_PSK_WITH_RC4_128_SHA		"00"	"8E"
0x008F	TLS_DHE_PSK_WITH_3DES_EDE_CBC_SHA		"00"	"8F"
0x0090	TLS_DHE_PSK_WITH_AES_128_CBC_SHA		"00"	"90"
0x0091	TLS_DHE_PSK_WITH_AES_256_CBC_SHA		"00"	"91"
0x0092	TLS_RSA_PSK_WITH_RC4_128_SHA		"00"	"92"
0x0093	TLS_RSA_PSK_WITH_3DES_EDE_CBC_SHA	11	"00"	"93"
0x0094	TLS_RSA_PSK_WITH_AES_128_CBC_SHA	9	"00"	"94"
0x0095	TLS_RSA_PSK_WITH_AES_256_CBC_SHA	10	"00"	"95"
0x009C	TLS_RSA_WITH_AES_128_GCM_SHA256		"00"	"9C"
0x009D	TLS_RSA_WITH_AES_256_GCM_SHA384		"00"	"9D"

Cipher suite IANA code	Cipher suite name	Legacy cipher suite configuration	IANA enumeration cipher suite configuration	
		<legacy_cs>	<iana_b1>	<iana_b2>
0x009E	TLS_DHE_RSA_WITH_AES_128_GCM_SHA256		"00"	"9E"
0x009F	TLS_DHE_RSA_WITH_AES_256_GCM_SHA384		"00"	"9F"
0x00A8	TLS_PSK_WITH_AES_128_GCM_SHA256	16	"00"	"A8"
0x00A9	TLS_PSK_WITH_AES_256_GCM_SHA384	17	"00"	"A9"
0x00AA	TLS_DHE_PSK_WITH_AES_128_GCM_SHA256		"00"	"AA"
0x00AB	TLS_DHE_PSK_WITH_AES_256_GCM_SHA384		"00"	"AB"
0x00AC	TLS_RSA_PSK_WITH_AES_128_GCM_SHA256	18	"00"	"AC"
0x00AD	TLS_RSA_PSK_WITH_AES_256_GCM_SHA384	19	"00"	"AD"
0x00AE	TLS_PSK_WITH_AES_128_CBC_SHA256	12	"00"	"AE"
0x00AF	TLS_PSK_WITH_AES_256_CBC_SHA384	13	"00"	"AF"
0x00B2	TLS_DHE_PSK_WITH_AES_128_CBC_SHA256		"00"	"B2"
0x00B3	TLS_DHE_PSK_WITH_AES_256_CBC_SHA384		"00"	"B3"
0x00B6	TLS_RSA_PSK_WITH_AES_128_CBC_SHA256	14	"00"	"B6"
0x00B7	TLS_RSA_PSK_WITH_AES_256_CBC_SHA384	15	"00"	"B7"
0x00BA	TLS_RSA_WITH_CAMELLIA_128_CBC_SHA256		"00"	"BA"
0x00BE	TLS_DHE_RSA_WITH_CAMELLIA_128_CBC_SHA256		"00"	"BE"
0x00C0	TLS_RSA_WITH_CAMELLIA_256_CBC_SHA256		"00"	"C0"
0x00C4	TLS_DHE_RSA_WITH_CAMELLIA_256_CBC_SHA256		"00"	"C4"
0xC002	TLS_ECDH_ECDSA_WITH_RC4_128_SHA		"C0"	"02"
0xC003	TLS_ECDH_ECDSA_WITH_3DES_EDE_CBC_SHA		"C0"	"03"
0xC004	TLS_ECDH_ECDSA_WITH_AES_128_CBC_SHA		"C0"	"04"
0xC005	TLS_ECDH_ECDSA_WITH_AES_256_CBC_SHA		"C0"	"05"
0xC007	TLS_ECDHE_ECDSA_WITH_RC4_128_SHA		"C0"	"07"
0xC008	TLS_ECDHE_ECDSA_WITH_3DES_EDE_CBC_SHA	20	"C0"	"08"
0xC009	TLS_ECDHE_ECDSA_WITH_AES_128_CBC_SHA	21	"C0"	"09"
0xC00A	TLS_ECDHE_ECDSA_WITH_AES_256_CBC_SHA	22	"C0"	"0A"
0xC00C	TLS_ECDH_RSA_WITH_RC4_128_SHA		"C0"	"0C"
0xC00D	TLS_ECDH_RSA_WITH_3DES_EDE_CBC_SHA		"C0"	"0D"
0xC00E	TLS_ECDH_RSA_WITH_AES_128_CBC_SHA		"C0"	"0E"
0xC00F	TLS_ECDH_RSA_WITH_AES_256_CBC_SHA		"C0"	"0F"
0xC010	TLS_ECDHE_RSA_WITH_NULL_SHA		"C0"	"10"
0xC011	TLS_ECDHE_RSA_WITH_RC4_128_SHA		"C0"	"11"
0xC012	TLS_ECDHE_RSA_WITH_3DES_EDE_CBC_SHA	23	"C0"	"12"
0xC013	TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA	24	"C0"	"13"
0xC014	TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA	25	"C0"	"14"
0xC017	TLS_ECDH_anon_WITH_3DES_EDE_CBC_SHA		"C0"	"17"
0xC018	TLS_ECDH_anon_WITH_AES_128_CBC_SHA		"C0"	"18"
0xC019	TLS_ECDH_anon_WITH_AES_256_CBC_SHA		"C0"	"19"
0xC023	TLS_ECDHE_ECDSA_WITH_AES_128_CBC_SHA256	26	"C0"	"23"
0xC024	TLS_ECDHE_ECDSA_WITH_AES_256_CBC_SHA384	27	"C0"	"24"
0xC025	TLS_ECDH_ECDSA_WITH_AES_128_CBC_SHA256		"C0"	"25"
0xC026	TLS_ECDH_ECDSA_WITH_AES_256_CBC_SHA384		"C0"	"26"
0xC027	TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA256	28	"C0"	"27"
0xC028	TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA384	29	"C0"	"28"
0xC029	TLS_ECDH_RSA_WITH_AES_128_CBC_SHA256		"C0"	"29"
0xC02A	TLS_ECDH_RSA_WITH_AES_256_CBC_SHA384		"C0"	"2A"
0xC02B	TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256	30	"C0"	"2B"
0xC02C	TLS_ECDHE_ECDSA_WITH_AES_256_GCM_SHA384	31	"C0"	"2C"
0xC02D	TLS_ECDH_ECDSA_WITH_AES_128_GCM_SHA256		"C0"	"2D"
0xC02E	TLS_ECDH_ECDSA_WITH_AES_256_GCM_SHA384		"C0"	"2E"
0xC02F	TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256	32	"C0"	"2F"
0xC030	TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384	33	"C0"	"30"

Cipher suite IANA code	Cipher suite name	Legacy cipher suite configuration	IANA enumeration cipher suite configuration	
		<legacy_cs>	<iana_b1>	<iana_b2>
0xC031	TLS_ECDH_RSA_WITH_AES_128_GCM_SHA256		"C0"	"31"
0xC032	TLS_ECDH_RSA_WITH_AES_256_GCM_SHA384		"C0"	"32"
0xC033	TLS_ECDHE_PSK_WITH_RC4_128_SHA		"C0"	"33"
0xC034	TLS_ECDHE_PSK_WITH_3DES_EDE_CBC_SHA		"C0"	"34"
0xC035	TLS_ECDHE_PSK_WITH_AES_128_CBC_SHA		"C0"	"35"
0xC036	TLS_ECDHE_PSK_WITH_AES_256_CBC_SHA		"C0"	"36"
0xC037	TLS_ECDHE_PSK_WITH_AES_128_CBC_SHA256		"C0"	"37"
0xC038	TLS_ECDHE_PSK_WITH_AES_256_CBC_SHA384		"C0"	"38"
0xC072	TLS_ECDHE_ECDSA_WITH_CAMELLIA_128_CBC_ SHA256		"C0"	"72"
0xC073	TLS_ECDHE_ECDSA_WITH_CAMELLIA_256_CBC_ SHA384		"C0"	"73"
0xC074	TLS_ECDH_ECDSA_WITH_CAMELLIA_128_CBC_SHA256		"C0"	"74"
0xC075	TLS_ECDH_ECDSA_WITH_CAMELLIA_256_CBC_SHA384		"C0"	"75"
0xC076	TLS_ECDHE_RSA_WITH_CAMELLIA_128_CBC_SHA256		"C0"	"76"
0xC077	TLS_ECDHE_RSA_WITH_CAMELLIA_256_CBC_SHA384		"C0"	"77"
0xC078	TLS_ECDH_RSA_WITH_CAMELLIA_128_CBC_SHA256		"C0"	"78"
0xC079	TLS_ECDH_RSA_WITH_CAMELLIA_256_CBC_SHA384		"C0"	"79"
0xC07A	TLS_RSA_WITH_CAMELLIA_128_GCM_SHA256		"C0"	"7A"
0xC07B	TLS_RSA_WITH_CAMELLIA_256_GCM_SHA384		"C0"	"7B"
0xC07C	TLS_DHE_RSA_WITH_CAMELLIA_128_GCM_SHA256		"C0"	"7C"
0xC07D	TLS_DHE_RSA_WITH_CAMELLIA_256_GCM_SHA384		"C0"	"7D"
0xC086	TLS_ECDHE_ECDSA_WITH_CAMELLIA_128_GCM_ SHA256		"C0"	"86"
0xC087	TLS_ECDHE_ECDSA_WITH_CAMELLIA_256_GCM_ SHA384		"C0"	"87"
0xC088	TLS_ECDH_ECDSA_WITH_CAMELLIA_128_GCM_SHA256		"C0"	"88"
0xC089	TLS_ECDH_ECDSA_WITH_CAMELLIA_256_GCM_SHA384		"C0"	"89"
0xC08A	TLS_ECDHE_RSA_WITH_CAMELLIA_128_GCM_SHA256		"C0"	"8A"
0xC08B	TLS_ECDHE_RSA_WITH_CAMELLIA_256_GCM_SHA384		"C0"	"8B"
0xC08C	TLS_ECDH_RSA_WITH_CAMELLIA_128_GCM_SHA256		"C0"	"8C"
0xC08D	TLS_ECDH_RSA_WITH_CAMELLIA_256_GCM_SHA384		"C0"	"8D"
0xC08E	TLS_PSK_WITH_CAMELLIA_128_GCM_SHA256		"C0"	"8E"
0xC08F	TLS_PSK_WITH_CAMELLIA_256_GCM_SHA384		"C0"	"8F"
0xC090	TLS_DHE_PSK_WITH_CAMELLIA_128_GCM_SHA256		"C0"	"90"
0xC091	TLS_DHE_PSK_WITH_CAMELLIA_256_GCM_SHA384		"C0"	"91"
0xC092	TLS_RSA_PSK_WITH_CAMELLIA_128_GCM_SHA256		"C0"	"92"
0xC093	TLS_RSA_PSK_WITH_CAMELLIA_256_GCM_SHA384		"C0"	"93"
0xC094	TLS_PSK_WITH_CAMELLIA_128_CBC_SHA256		"C0"	"94"
0xC095	TLS_PSK_WITH_CAMELLIA_256_CBC_SHA384		"C0"	"95"
0xC096	TLS_DHE_PSK_WITH_CAMELLIA_128_CBC_SHA256		"C0"	"96"
0xC097	TLS_DHE_PSK_WITH_CAMELLIA_256_CBC_SHA384		"C0"	"97"
0xC098	TLS_RSA_PSK_WITH_CAMELLIA_128_CBC_SHA256		"C0"	"98"
0xC099	TLS_RSA_PSK_WITH_CAMELLIA_256_CBC_SHA384		"C0"	"99"
0xC09A	TLS_ECDHE_PSK_WITH_CAMELLIA_128_CBC_SHA256		"C0"	"9A"
0xC09B	TLS_ECDHE_PSK_WITH_CAMELLIA_256_CBC_SHA384		"C0"	"9B"
0xC09C	TLS_RSA_WITH_AES_128_CCM		"C0"	"9C"
0xC09D	TLS_RSA_WITH_AES_256_CCM		"C0"	"9D"
0xC09E	TLS_DHE_RSA_WITH_AES_128_CCM		"C0"	"9E"
0xC09F	TLS_DHE_RSA_WITH_AES_256_CCM		"C0"	"9F"
0xC0A0	TLS_RSA_WITH_AES_128_CCM_8		"C0"	"A0"
0xC0A1	TLS_RSA_WITH_AES_256_CCM_8		"C0"	"A1"
0xC0A2	TLS_DHE_RSA_WITH_AES_128_CCM_8		"C0"	"A2"

Cipher suite IANA code	Cipher suite name	Legacy cipher suite configuration	IANA enumeration cipher suite configuration	
		<legacy_cs>	<iana_b1>	<iana_b2>
0xC0A3	TLS_DHE_RSA_WITH_AES_256_CCM_8		"C0"	"A3"
0xC0A4	TLS_PSK_WITH_AES_128_CCM		"C0"	"A4"
0xC0A5	TLS_PSK_WITH_AES_256_CCM		"C0"	"A5"
0xC0A6	TLS_DHE_PSK_WITH_AES_128_CCM		"C0"	"A6"
0xC0A7	TLS_DHE_PSK_WITH_AES_256_CCM		"C0"	"A7"
0xC0A8	TLS_PSK_WITH_AES_128_CCM_8		"C0"	"A8"
0xC0A9	TLS_PSK_WITH_AES_256_CCM_8		"C0"	"A9"
0xC0AA	TLS_PSK_DHE_WITH_AES_128_CCM_8		"C0"	"AA"
0xC0AB	TLS_PSK_DHE_WITH_AES_256_CCM_8		"C0"	"AB"
0xC0AC	TLS_ECDHE_ECDSA_WITH_AES_128_CCM		"C0"	"AC"
0xC0AD	TLS_ECDHE_ECDSA_WITH_AES_256_CCM		"C0"	"AD"
0xC0AE	TLS_ECDHE_ECDSA_WITH_AES_128_CCM_8		"C0"	"AE"
0xC0AF	TLS_ECDHE_ECDSA_WITH_AES_256_CCM_8		"C0"	"AF"
0xCCA8	TLS_ECDHE_RSA_WITH_CHACHA20_POL1305_SHA256		"CC"	"A8"
0xCCA9	TLS_ECDHE_ECDSA_WITH_CHACHA20_POL1305_ SHA256		"CC"	"A9"
0xCCAA	TLS_DHE_RSA_WITH_CHACHA20_POL1305_SHA256		"CC"	"AA"
0xCCAB	TLS_PSK_WITH_CHACHA20_POL1305_SHA256		"CC"	"AB"
0xCCAC	TLS_ECDHE_PSK_WITH_CHACHA20_POL1305_SHA256		"CC"	"AC"
0xCCAD	TLS_DHE_PSK_WITH_CHACHA20_POL1305_SHA256		"CC"	"AD"
0xCCAE	TLS_RSA_PSK_WITH_CHACHA20_POL1305_SHA256		"CC"	"AE"
0x1301	TLS_AES_128_GCM_SHA256		"13"	"01"
0x1302	TLS_AES_256_GCM_SHA384		"13"	"02"
0x1303	TLS_CHACHA20_POLY1305_SHA256		"13"	"03"
0x1304	TLS_AES_128_CCM_SHA256		"13"	"04"
0x1305	TLS_AES_128_CCM_8_SHA256		"13"	"05"

Table 23: Supported cipher suite

21.3.6 Cipher suite applicability

21.3.6.1 Cipher suite applicability accordingly to the modules

This section provides a list of cipher suites that are available on the series modules. The allowed cipher suites can be selected when <op_code>=2 (cipher suite) with:

- The <legacy_cs> parameter
- The <legacy_cs>=99 specifying <iana_b1> and <iana_b2> parameters
- The <legacy_cs>=100 specifying <iana_b1> and <iana_b2> parameters

For proper <legacy_cs> value, see the +USECPRF AT command.

The cipher suites marked with (D) are the default cipher suites that are proposed to the server when <op_code>=2 (cipher suite) and <legacy_cs>=0. The secure connection will be established if the server supports at least one of the proposed cipher suites.

LEXI-R10

The available cipher suites are presented in the following list:

- (0x000A) TLS_RSA_WITH_3DES_EDE_CBC_SHA
- (0x002F) TLS_RSA_WITH_AES_128_CBC_SHA
- (0x0035) TLS_RSA_WITH_AES_256_CBC_SHA
- (0x003C) TLS_RSA_WITH_AES_128_CBC_SHA256
- (0x003D) TLS_RSA_WITH_AES_256_CBC_SHA256
- (0x008B) TLS_PSK_WITH_3DES_EDE_CBC_SHA
- (0x008C) TLS_PSK_WITH_AES_128_CBC_SHA

- (0x008D) TLS_PSK_WITH_AES_256_CBC_SHA
- (0x009C) TLS_RSA_WITH_AES_128_GCM_SHA256 (D)
- (0x009D) TLS_RSA_WITH_AES_256_GCM_SHA384 (D)
- (0x009E) TLS_DHE_RSA_WITH_AES_128_GCM_SHA256 (D)
- (0x009F) TLS_RSA_WITH_AES_256_GCM_SHA384 (D)
- (0x00A8) TLS_PSK_WITH_AES_128_GCM_SHA256 (D)
- (0x00A9) TLS_PSK_WITH_AES_256_GCM_SHA384 (D)
- (0x00AA) TLS_DHE_PSK_WITH_AES_128_GCM_SHA256 (D)
- (0x00AB) TLS_DHE_PSK_WITH_AES_256_GCM_SHA384 (D)
- (0x00AC) TLS_RSA_PSK_WITH_AES_128_GCM_SHA256 (D)
- (0x00AD) TLS_RSA_PSK_WITH_AES_256_GCM_SHA384 (D)
- (0x00AE) TLS_PSK_WITH_AES_128_CBC_SHA256 (D)
- (0x00AF) TLS_PSK_WITH_AES_256_CBC_SHA384 (D)
- (0xC003) TLS_ECDH_ECDSA_WITH_3DES_EDE_CBC_SHA
- (0xC004) TLS_ECDH_ECDSA_WITH_AES_128_CBC_SHA
- (0xC005) TLS_ECDH_ECDSA_WITH_AES_256_CBC_SHA
- (0xC008) TLS_ECDHE_ECDSA_WITH_3DES_EDE_CBC_SHA
- (0xC009) TLS_ECDHE_ECDSA_WITH_AES_128_CBC_SHA
- (0xC00A) TLS_ECDHE_ECDSA_WITH_AES_256_CBC_SHA
- (0xC00D) TLS_ECDH_RSA_WITH_3DES_EDE_CBC_SHA
- (0xC00E) TLS_ECDH_RSA_WITH_AES_128_CBC_SHA
- (0xC00F) TLS_ECDH_RSA_WITH_AES_256_CBC_SHA
- (0xC012) TLS_ECDHE_RSA_WITH_3DES_EDE_CBC_SHA
- (0xC013) TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA
- (0xC014) TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA
- (0xC023) TLS_ECDHE_ECDSA_WITH_AES_128_CBC_SHA256 (D)
- (0xC024) TLS_ECDHE_ECDSA_WITH_AES_256_CBC_SHA384
- (0xC025) TLS_ECDH_ECDSA_WITH_AES_128_CBC_SHA256
- (0xC026) TLS_ECDH_ECDSA_WITH_AES_256_CBC_SHA384
- (0xC027) TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA256
- (0xC028) TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA384
- (0xC029) TLS_ECDH_RSA_WITH_AES_128_CBC_SHA256
- (0xC02A) TLS_ECDH_RSA_WITH_AES_256_CBC_SHA384
- (0xC02B) TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256 (D)
- (0xC02C) TLS_ECDHE_ECDSA_WITH_AES_256_GCM_SHA384 (D)
- (0xC02D) TLS_ECDH_ECDSA_WITH_AES_128_GCM_SHA256 (D)
- (0xC02F) TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256 (D)
- (0xC030) TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384 (D)
- (0xC031) TLS_ECDH_RSA_WITH_AES_128_GCM_SHA256
- (0xC032) TLS_ECDH_RSA_WITH_AES_256_GCM_SHA384
- (0xC037) TLS_ECDHE_PSK_WITH_AES_128_CBC_SHA256 (D)
- (0xC038) TLS_ECDHE_PSK_WITH_AES_256_CBC_SHA384 (D)
- (0xC09C) TLS_RSA_WITH_AES_128_CCM (D)
- (0xC0A1) TLS_RSA_WITH_AES_256_CCM_8 (D)
- (0xC0A4) TLS_PSK_WITH_AES_128_CCM (D)
- (0xC0A5) TLS_PSK_WITH_AES_256_CCM (D)
- (0xC0A6) TLS_DHE_PSK_WITH_AES_128_CCM (D)
- (0xC0A7) TLS_DHE_PSK_WITH_AES_256_CCM (D)
- (0xC0A8) TLS_PSK_WITH_AES_128_CCM_8 (D)

- (0xC0A9) TLS_PSK_WITH_AES_256_CCM_8 (D)
- (0xC0AA) TLS_PSK_DHE_WITH_AES_128_CCM_8 (D)
- (0xC0AB) TLS_PSK_DHE_WITH_AES_256_CCM_8 (D)
- (0xC0AC) TLS_ECDHE_ECDSA_WITH_AES_128_CCM (D)
- (0xC0AD) TLS_ECDHE_ECDSA_WITH_AES_256_CCM (D)
- (0xC0AE) TLS_ECDHE_ECDSA_WITH_AES_128_CCM_8 (D)
- (0xC0AF) TLS_ECDHE_ECDSA_WITH_AES_256_CCM_8 (D)

22 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. The HTTP client requires an active connection to work. Some products require additional commands to provide connectivity to the application.

LEXI-R10
If not specified, the default CID (<cid>=1) is used. If not specified and the protocol type is IPv4v6, then the preferred protocol type is IPv4.
First connection attempt will be performed using selected preferred type and in case of failure it will try with other protocol type. Error returned in case of connection failure will be related to latest protocol type used.
See +CGACT AT command for activating a PDP context.
The only profile allowed is number 0 for HTTP operations.

When these commands report an HTTP error, the error code of latest failure can be queried using the +UHTTPER AT command.

22.1 Common parameters definition

22.1.1 <profile_id>

The HTTP client can support multiple HTTP profiles, the <profile_id> is a number starting from 0:

22.2 HTTP control +UHTTP

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

22.2.1 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>

22.2.2 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" OK

Type	Syntax	Response	Example
Read	AT+UHTTP=<profile_id>,<op_code>	+UHTTP: <profile_id>,<op_code>,<param_val>[,<param_val1>] OK	AT+UHTTP=2,0 +UHTTP: 2,0,"125.24.51.133" OK
HTTP server IP address			
Set	AT+UHTTP=<profile_id>,0,<HTTP_server_IP_address>	OK	AT+UHTTP=2,0,"125.24.51.133" OK
Read	AT+UHTTP=<profile_id>,0	+UHTTP: <profile_id>,0,<HTTP_server_IP_address> OK	AT+UHTTP=2,0 +UHTTP: 2,0,"125.24.51.133" OK
HTTP server name			
Set	AT+UHTTP=<profile_id>,1,<HTTP_server_name>	OK	AT+UHTTP=2,1,"www.u-blox.com" OK
Read	AT+UHTTP=<profile_id>,1	+UHTTP: <profile_id>,1,<HTTP_server_name> OK	AT+UHTTP=2,1 +UHTTP: 2,1,"www.u-blox.com" OK
Username			
Set	AT+UHTTP=<profile_id>,2,<username>	OK	AT+UHTTP=2,2,"my_user" OK
Read	AT+UHTTP=<profile_id>,2	+UHTTP: <profile_id>,2,<username> OK	AT+UHTTP=2,2 +UHTTP: 2,2,"my_user" OK
Password			
Set	AT+UHTTP=<profile_id>,3,<password>	OK	AT+UHTTP=2,3,"pwd" OK
Read	AT+UHTTP=<profile_id>,3	+UHTTP: <profile_id>,3,<password> OK	AT+UHTTP=2,3 +UHTTP: 2,3,"pwd" OK
Authentication type			
Set	AT+UHTTP=<profile_id>,4,<HTTP_authentication>	OK	AT+UHTTP=2,4,1 OK
Read	AT+UHTTP=<profile_id>,4	+UHTTP: <profile_id>,4,<HTTP_authentication> OK	AT+UHTTP=2,4 +UHTTP: 2,4,1 OK
HTTP server port			
Set	AT+UHTTP=<profile_id>,5,<HTTP_port>	OK	AT+UHTTP=2,5,30 OK
Read	AT+UHTTP=<profile_id>,5	+UHTTP: <profile_id>,5,<HTTP_port> OK	AT+UHTTP=2,5 +UHTTP: 2,5,30 OK
HTTP secure option			
Set	AT+UHTTP=<profile_id>,6,<HTTP_secure>[,<USECMNG_profile>]	OK	AT+UHTTP=2,6,1 OK
Read	AT+UHTTP=<profile_id>,6	+UHTTP: <profile_id>,6,<HTTP_secure>[,<USECMNG_profile>] OK	AT+UHTTP=2,6 +UHTTP: 2,6,1 OK

Type	Syntax	Response	Example
HTTP request timeout and TCP socket linger timer			
Set	AT+UHTTP=<profile_id>,7,<HTTP_timeout>[,<linger_timer>]	OK	AT+UHTTP=2,7,150,5 OK
Read	AT+UHTTP=<profile_id>,7	+UHTTP: <profile_id>,7,<HTTP_timeout>,<linger_timer> OK	AT+UHTTP=2,7 +UHTTP: 2,7,150,5 OK
HTTP add custom request headers			
Set	AT+UHTTP=<profile_id>,9,<custom_request_header>	OK	AT+UHTTP=2,9,"0:hdr0:val0" OK
Read	AT+UHTTP=<profile_id>,9	+UHTTP: <profile_id>,9,<custom_request_header> OK	AT+UHTTP=2,9 +UHTTP: 2,9,"0:hdr0:val0" OK
HTTP output mode option			
Set	AT+UHTTP=<profile_id>,10,<output_mode>	OK	AT+UHTTP=0,10,1 OK
Read	AT+UHTTP=<profile_id>,10	+UHTTP: <profile_id>,10,<output_mode> OK	AT+UHTTP=0,10 +UHTTP: 0,10,1 OK
HTTP context id			
Set	AT+UHTTP=<profile_id>,20,<cid>[,<preferred_protocol_type>]	OK	AT+UHTTP=2,20,2 OK
Read	AT+UHTTP=<profile_id>,20	+UHTTP: <profile_id>,20,<cid>,<preferred_protocol_type> OK	AT+UHTTP=2,20 +UHTTP: 2,20,2,0 OK
Read	AT+UHTTP=<profile_id>	OK	AT+UHTTP=2 OK
Test	AT+UHTTP=?	+UHTTP: (list of supported <profile_id>s),(list of supported <op_code>s) OK	+UHTTP: (0-3),(0-9,20) OK

22.2.3 Defined values

Parameter	Type	Description
<profile_id>	Number	See <profile_id>.
<op_code>	Number	Allowed values: • 0: HTTP server IP address • 1: HTTP server name • 2: username • 3: password • 4: authentication type • 5: HTTP server port • 6: HTTP Secure option (SSL encryption) • 7: HTTP request timeout and TCP socket linger timer • 8: reserved for internal use only • 9: HTTP add custom request headers • 10: HTTP output mode • 20: HTTP context id and preferred IP type Allowed values: • LEXI-R10 - 0, 1, 2, 3, 4, 5, 6, 7, 9, 10, 20

Parameter	Type	Description
<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 (e.g. "http.server.com"). The factory-programmed value is an empty text string. The maximum length is:
<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 used for the HTTP login procedure if the authentication is used: • LEXI-R10 - The maximum length is 30 characters The factory-programmed value is an empty text string.
<HTTP_authentication>	Number	HTTP authentication method; the allowed values are: • 0 (factory-programmed value): no authentication • 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: • 0 (factory-programmed value): HTTPS (SSL encryption) disabled and the HTTP server port set to 80 • 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
<HTTP_timeout>	Number	HTTP request timeout in seconds (number); the range is 30 - 180. It is the timeout in seconds to be used for all the HTTP requests with the specified profile. The factory-programmed value is 180 s.
<linger_timer>	Number	TCP linger timer for socket close expressed in seconds (number).
<custom_request_header>	String	Sets/clears the custom request header (string); the custom header option follows a defined format "hdr_id:hdr_name:hdr_value"; the hdr_id is a number in the range [0-4]; the hdr_name and hdr_value are strings (see examples below). • "0:hdr0:val0": set header 0 with name hdr0 and value val0 • "0:": clear header 0 • "1:hdr1:val1": set header 1 with name hdr1 and value val1 • "1:": clear header 1 • "2:hdr2:val2": set header 2 with name hdr2 and value val2 • "2:": clear header 2 • "3:hdr3:val3": set header 3 with name hdr3 and value val3 • "3:": clear header 3 • "4:hdr4:val4": set header 4 with name hdr4 and value val4 • "4:": clear header 4 The following character is not allowed in the <custom_request_header> parameter: • 0x3A (:) The hdr_name and hdr_value each have a maximum length of: • LEXI-R10 - 512 characters
<output_mode>	Number	HTTP output mode; the allowed values are: • 0 (factory-programmed value): use file system to transmit and receive http request and response • 1: use direct link to transmit and receive data
<cid>	Number	Specifies the PDP context that will be used for the HTTP data. For the parameter range, see <cid>. For more details on the default value of the parameter (where supported), see HTTP.
<preferred_protocol_type>	Number	In case of a context id with IPv4v6 PDP type it is possible to select: • 0: IPv4 • 1: IPv6 For more details on the default value of the parameter (where supported), see HTTP.
<param_val>	Number / String	Type and supported content depend on the related <op_code> parameter; details are given above

Parameter	Type	Description
<param_val1>	Number / String	Type and supported content depend on the related <op_code> parameter; details are given above.

22.2.4 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.

LEXI-R10

- The <linger_timer> parameter is not supported.

22.3 HTTP advanced control+UHTTPAC

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

22.3.1 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.

22.3.2 Syntax

Type	Syntax	Response	Example
Set	AT+UHTTPAC=<profile_id>,<param_tag>,<key>,<value>	OK	AT+UHTTPAC=0,0,0,"UBLX_SESSION_COOKIE_0" OK
Read	AT+UHTTPAC=<profile_id>,<param_tag>,<key>	+UHTTPAC: <profile_id>,<param_tag>,<key>,<value> OK	AT+UHTTPAC=0,0,0 +UHTTPAC: 0,0,0,"UBLX_SESSION_COOKIE_0" OK
Test	AT+UHTTPAC=?	+UHTTPAC: (list of supported <profile_id>s),(list of supported <param_tag>s),(list of supported <key>s) OK	+UHTTPAC: (0-3),(0),(0-3) OK

22.3.3 Defined values

Parameter	Type	Description
<profile_id>	Number	See <profile_id>.
<param_tag>	Number	• 0: HTTP request COOKIES; manage request COOKIES sent to the HTTP server. 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. o <value>: value of the cookie (string); the maximum length is 512 characters. The cookie values respect the following rules: - Empty string (""): the cookie will be cleared and will not be present in the request; - Simple one-value cookie: the cookie will be set and sent in the request; - 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(" ");

Parameter	Type	Description
<key>	Number/ String	Content depends on the related <param_tag> (see above).
<value>	Number/ String	Content depends on the related <param_tag> (see above).

22.3.4 Examples and use cases

In this section some +UHTTPAC AT command examples and use cases are listed.

Command	Response	Description
Example 1		
AT+UHTTPAC=0,0,0,""	OK	Clear the HTTP request cookie at index 0.
Example 2		
AT+UHTTPAC=0,0,0,"SIMPLE_COOKIE"	OK	Set a simple HTTP request cookie at index 0.
Example 3		
AT+UHTTPAC=0,0,0,"COMPLEX_COOKIE; COMPLEX_ COOKIE"	OK	Overwrite the HTTP request cookie at index 0 with a complex cookie.

22.4 HTTP command +UHTTPC

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

22.4.1 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.

HTTP can be used also in direct link mode when available. In this mode, module will handle the initial steps of the HTTP protocol sending HTTP header for request issued. In this case 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 content via the serial interface. Once finished, the server will replies using same serial interface. Every operation can be aborted using the +++ sequence to switch off the direct link mode. When data are send to server, user must wait at least 2 s before sending the +++ abort sequence.

☞ The timing before the +UUHTTPCR URC is issued on the AT terminal also depends by the DNS resolution. For further details about the estimated response time related to the DNS resolution, see the +UDNSRN AT command.

22.4.2 Syntax

Type	Syntax	Response	Example
Generic syntax			
Set	AT+UHTTPC=<profile_id>,<http_ command>,<path>,<filename>[, <param1>[,<param2>[,<param3>]]]	OK	AT+UHTTPC=0,1,"/path/file.html", "responseFilename" OK
HEAD command			
Set	AT+UHTTPC=<profile_id>,0,<path>, <filename>	OK	AT+UHTTPC=0,0,"/path/file.html", "responseFilename" OK
GET command			

Type	Syntax	Response	Example
Set	AT+UHTTPC=<profile_id>,1,<path>,<filename>	OK	AT+UHTTPC=0,1,"/path/file.html","responseFilename" OK
DELETE command			
Set	AT+UHTTPC=<profile_id>,2,<path>,<filename>	OK	AT+UHTTPC=0,2,"/path/file.html","responseFilename" OK
PUT command			
Set	AT+UHTTPC=<profile_id>,3,<path>,<filename>,<filesystem_name>[,<HTTP_content_type>[,<user_defined_content_type>]]	OK	AT+UHTTPC=0,3,"/path/file.html","responseFilename","filesystemName" OK
POST file command			
Set	AT+UHTTPC=<profile_id>,4,<path>,<filename>,<filesystem_name>,<HTTP_content_type>[,<user_defined_content_type>]	OK	AT+UHTTPC=0,4,"/path/file.html","responseFilename","filesystemName",0 OK
POST data command			
Set	AT+UHTTPC=<profile_id>,5,<path>,<filename>,<data>,<HTTP_content_type>[,<user_defined_content_type>]	OK	AT+UHTTPC=0,5,"/path/file.html","responseFilename","data",0 OK
PUT command in direct link			
Set	AT+UHTTPC=<profile_id>,6,<path>,[<HTTP_content_type>],[<user_defined_content_type>],<data_length>	OK	AT+UHTTPC=0,6,"/path/file.html",1,,30 CONNECT <data> <http_server_reply> DISCONNECT OK
POST command in direct link			
Set	AT+UHTTPC=<profile_id>,7,<path>,[<HTTP_content_type>],[<user_defined_content_type>],<data_length>	OK	AT+UHTTPC=0,7,"/path/file.html",1,,30 <data> <http_server_reply> DISCONNECT OK
GET FOTA update file			
Set	AT+UHTTPC=<profile_id>,100,<path>	OK	AT+UHTTPC=0,100,"/path/file.html" OK
Test	AT+UHTTPC=?	+UHTTPC: (list of supported <profile_id>s),(list of supported <http_command>s) OK	+UHTTPC: (0-3),(0-5),100 OK
URC		+UUHTTPCR: <profile_id>,<http_command>,<http_result>[,<http_status_code>,<md5_sum>]	+UUHTTPCR: 0,1,1

22.4.3 Defined values

Parameter	Type	Description
<profile_id>	Number	See <profile_id>.
<http_command>	Number	• 0: HEAD command; issue an HEAD request to the HTTP server. This command can be used in direct link mode. • 1: GET command; perform a GET request to the HTTP server. This command can be used in direct link mode. • 2: DELETE command; send a DELETE request to the HTTP server. This command can be used in direct link mode. • 3: PUT command; perform a PUT request to the HTTP server. • 4: POST a file command; issue a POST request for sending a file to the HTTP server. • 5: POST data command; send a POST request to the HTTP server using the data specified in <data> parameter. • 6: PUT data in direct link mode. • 7: POST data in direct link mode. • 100: GET FOTA update file; download the FOTA update file. Allowed values: • LEXI-R10 - 0, 1, 2, 3, 4, 5, 6, 7, 100
<path>	String	Path of HTTP server resource; the maximum length is: • LEXI-R10 - 1536 characters
<filename>	String	Filename where the HTTP server response will be stored. If the file already exists, it will be overwritten. If the parameter 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.
<filesystem_name>	String	File system filename representing the file system filename to be sent to the HTTP server within the POST / PUT request. For file system file name and data size limits see File system limits.
<HTTP_content_type>	Number	HTTP Content-Type identifier. It represents the HTTP Content-Type identifier. Allowed values: • 0: application/x-www-form-urlencoded • 1: text/plain • 2: application/octet-stream • 3: multipart/form-data • 4: application/json (supported only for PUT and POST file command) • 5: application/xml • 6: user defined with <user_defined_content_type>
<user_defined_content_type>	Number	Used only when <HTTP_content_type>=6 (user defined Content-Type). The maximum length is
<data>	String	It represents 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 <HTTP_content_type> parameter. The maximum length is:
<data_length>	String	It represents total data that will be sent with direct link PUT/POST request. After this threshold is achieved, further data will be ignored. User can use abort sequence +++ to stop data transfert waiting at least 2s.
<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 • 1: success
<http_status_code>	Number	HTTP status code reported in the server response header after a GET FOTA update file request. This parameter is issued only for AT+UHTTPC=<profile_id>,100,<path> AT command.
<md5_sum>	String	MD5 checksum of the FOTA update file. This parameter is issued only for AT +UHTTPC=<profile_id>,100,<path> AT command.

22.4.4 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.

- If <http_command>=4 (POST a file) and the <HTTP_content_type>=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="<user_defined_content_type>"\r\n
Content-Length: <length of file specified with <user_defined_content_type>>\r\n
Content-Type: application/octet-stream\r\n
\r\n
<content of file specified with <user_defined_content_type>>\r\n
--U1Blox2Http3Unique4Boundary5--\r\n
\r\n
```

- The response headers string (headers received in the HTTP response) must not exceed the maximum length of 255 bytes.
  - The response header string limit is extended to 1024 bytes.

LEXI-R10

- Only one direct link connection at a time can be activated. When considering the number of active direct links, take into account also the connection established by the +USODL and +FREAD AT commands.

22.5 HTTP protocol error +UHTTPER

+UHTTPER						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	full	No	No	No	-	+CME Error Appendix A.7

22.5.1 Description

Retrieves the error class and code of the latest HTTP operation on the specified HTTP profile.

22.5.2 Syntax

Type	Syntax	Response	Example
Set	AT+UHTTPER=<profile_id>	+UHTTPER: <profile_id>,<error_class>,<error_code> OK	AT+UHTTPER=1 +UHTTPER: 1,0,0 OK

22.5.3 Defined values

Parameter	Type	Description
<profile_id>	Number	See <profile_id>.
<error_class>	Number	List of the allowed values is available in Appendix A.7
<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.7.1

22.6 Save/Restore HTTP profile from NVM +UHTTPNV

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

22.6.1 Description

Either saves all of the HTTP client profile parameters to NVM (non-volatile memory) or sets all of the HTTP client profile parameters to either factory-programmed or non-volatile stored values.

For the complete list of parameters that can be stored in the NVM, see the +UHTTP and +UHTTPAC AT commands.

22.6.2 Syntax

Type	Syntax	Response	Example
Set	AT+UHTTPNV=<profile_id>,<NVM_mode>	OK	AT+UHTTPNV=0,2 OK
Read	AT+UHTTPNV?	+UHTTPNV: <profile_id>,<NVM_status> OK	AT+UHTTPNV? +UHTTPNV: 0,1 OK
Test	AT+UHTTPNV=?	+UHTTPNV: (allowed <profile_id>),(list of <NVM_mode>s) OK	+UHTTPNV: 0,(0-2) OK

22.6.3 Defined values

Parameter	Type	Description
<profile_id>	Number	See <profile_id>.
<NVM_mode>	Number	Operation to set or save the HTTP client profile parameters as follows: • 0: restore HTTP client profile parameters to the factory-programmed setting • 1: set HTTP client profile parameters to values previously stored in the NVM • 2: store current HTTP client profile parameters to the NVM
<NVM_status>	Number	Reports if configuration is loaded/stored from/to NVM as follow: • 0: configuration is not loaded/stored once. • 1: configuration is loaded/stored once. Value is set to 0 on boot and if +UHTTPNV: <profile_id>,0 is addressed.

23 Ping

The ping service requires the user to define and activate a connection profile before executing the +UPING AT command. Some products require additional commands to provide connectivity to the application.

LEXI-R10
If not specified the default CID (<cid>=1) is used. If not specified and the protocol type is IPv4v6, then the preferred protocol type is IPv4.
See +CGACT AT command for activating a PDP context.

23.1 Ping command +UPING

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

23.1.1 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 [178]. 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 set command 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.

23.1.2 Syntax

Type	Syntax	Response	Example
Set	AT+UPING=<remote_host>[,<retry_num>,<p_size>,<timeout>,<ttl>[,<cid>[,<preferred_protocol_type>]]]	OK	AT+UPING="www.google.com" OK
Test	AT+UPING=?	+UPING: "remote_host",(list of supported <retry_num>),(list	+UPING: "remote_host",(1-64),(4-1460),(10-60000),(1-255)

Type	Syntax	Response	Example
		of supported <p_size>),(list of supported <timeout>),(list of supported <ttl>,(list of supported <cid>),(list of supported <preferred_protocol_type>) 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

23.1.3 Defined values

Parameter	Type	Description
<remote_host>	String	IP address (dotted decimal representation) or domain name of the remote host: • Maximum length: 128 characters
<retry_num>	Number	Indicates how many times iterate the ping command: • Range: 1-64 • Default value: 4
<p_size>	Number	Size in bytes of the echo packet payload: • LEXI-R10 - The range goes from 4 to 1460. The default value is 32.
<timeout>	Number	The maximum time in milliseconds to wait for an echo reply response: • Range: 10-60000 • 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: • Range: 1-255 • Default value: 32
<cid>	Number	PDP context identifier used for the PING communication. The allowed range is product specific, see <cid>. For more details on the default value of the parameter (where supported), see PING.
<preferred_protocol_type>	Number	Preferred protocol type to be specified when the <cid> protocol type is IPv4v6. Allowed values: • 0: IPv4 • 1: IPv6 For more details on the default value of the parameter (where supported), see PING.
<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.

23.1.4 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.

LEXI-R10

- The <ttl> parameter is not supported however it is returned via the URC:
  - The set command expects an empty value, The "+CME ERROR: operation not supported" error result code (if +CMEE: 2) is returned while setting any value in the <ttl> parameter position.
  - Internally the TTL value=255 is used with every ping retry.

  - In the +UUPING URC output the <ttl> parameter is returned.
- The "+CME ERROR: operation not allowed" error result code (if +CMEE: 2) is returned when the +UPING AT command is entered before a previous +UPING AT command is completed.

24 Positioning

24.1 Positioning server configuration +UGSRV

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

24.1.1 Description

Configures the network connection to a Multi GNSS Assistance (MGA) server used also per CellLocate. The configuration is saved in NVM and applied at the next GNSS power cycle or next CellLocate request. 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. The set command registers a token for gathering assistance data from MGA servers.

Setting up an internet connection and network registration is not part of this command and must be handled by the user separately to this command.

LEXI-R10
If not specified, the <cid> parameter set by means of the +UDCONF=19 AT command is used.
See +CGACT AT command for activating a PDP context.

For more details about Multi GNSS Assistance (MGA) feature, see to AssistNow services.

24.1.2 Syntax

Type	Syntax	Response	Example
Set	AT+UGSRV=[<mga_primary_server>],[<mga_secondary_server>],<auth_token>[,<days>[,<period>[,<resolution>[,<GNSS_types>[,<mode>[,<datatype>[,<cid>]]]]]]]	OK	AT+UGSRV="cell-live1.services.u-blox.com","cell-live2.services.u-blox.com","123456789abcdefghijklm",14,4,1,65,0,1,1 OK
Read	AT+UGSRV?	+UGSRV: <mga_primary_server>,<mga_secondary_server>,<auth_token>,<days>,<period>,<resolution>,<GNSS_types>,<mode>,<datatype>,<cid> OK	+UGSRV: "cell-live1.services.u-blox.com","cell-live2.services.u-blox.com","123456789abcdefghijklm",14,4,1,65,0,1,1 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),(list of supported <cid>s) OK	+UGSRV: "srv1","srv2","token",(1,2,3,5,7,10,14),(1-5),(1-3),(1-77),(0-2),(0-15),(0,254) OK

24.1.3 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. If the primary MGA server is omitted, the current stored value is preserved. • LEXI-R10 - The default and factory-programmed value is "cell-live1.services.u-blox.com".
<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: • 1 (default and factory-programmed value): every day • 2: every other day • 3: every third day
<GNSS_types>	Number	Bitmask for combining the desired GNSS for the (offline) aiding • 1: GPS • 4: Galileo • 8: BeiDou • 64: GLONASS The default and factory-programmed value is GPS+GLONASS (65). If the parameter is omitted, the current stored value is preserved. Bitmask values: • LEXI-R10 - The parameter has no effect
<mode>	Number	Mode of operation of AssistNow Online data management • 0 (default and factory-programmed value): AssistNow Online data are downloaded at GNSS receiver power up • 1: AssistNow Online data automatically kept alive • 2: manual AssistNow Online data download
<datatype>	Number	Bitmask for combining the desired data types for the (online) aiding • 0: time • 1: position • 2: ephemeris • 4: almanac • 8: auxiliary • 16: ephemeris of satellites which are likely to be visible from the position estimated by current registered network. This flag has no effect if the ephemeris flag is set to 0. The default and factory-programmed value is all aidings without filter on visible satellites (15)
<cid>	Number	PDP context identifier. See <cid>. For more details on the default and factory-programmed value, see the command description.

24.1.4 Notes

LEXI-R10

- The <days>, <period>, <resolution>, <GNSS_types>, <mode> and <datatype> parameters have no effect.

24.2 CellLocate® and hybrid positioning

24.2.1 Ask for localization information +ULOC

+ULOC						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	full	No	No	No	< 10 s	+CME Error

24.2.1.1 Description

Requests cellular module to provide the location data; the location can be determined using the supported sensors such as:

- GNSS receiver
- CellLocate® (location based on network cells data)
- SpotNow sensor (location based on GPS signal processed through cellular module)
- Wi-Fi sensor (location based on nearby access points)
- Combination of different technologies (hybrid)

A partial operation can also be performed by starting a scan of the cellular network and saving the data obtained in the file system. In this case, no position request is sent to the CellLocate service. The user's application can separately forward the saved file to the CellLoLocate service to locate its own device.

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.

To use simultaneously GNSS interface and CellLocate® where both are supported, the GNSS shall not be a sensor for +ULOC: if the GNSS sensor is reserved to another interface (e.g. +UGPS) and is selected as a sensor also for +ULOC, 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 (if supported) 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.

☞ 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, CellLocate® or SpotNow solutions are present, the previous position degradated is used instead.

☞ 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.

☞ LEXI-R10
To establish a PSD connection see the +CGDCONT and +CGACT AT commands.

24.2.1.2 Syntax

Type	Syntax	Response	Example
Set	AT+ULOC=<mode>,<sensor>, <response_type>,<timeout>, <accuracy>[,<num_hypothesis>]	OK	AT+ULOC=2,3,0,120,1 OK

Type	Syntax	Response	Example
Read	AT+ULOC?	+ULOC: <mode>,<sensor>,<response_type>,<timeout>,<accuracy>,<num_hypotesis> OK	+ULOC: 2,3,1,0,20,0 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 <accuracy>s),(list of supported <num_hypotesis>s) OK	+ULOC: (0-2),(0-63),(0-2),(1-999),(1-999999),(1-16) OK
URC		**If <response_type>=0:** +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: +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: +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: +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: +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

24.2.1.3 Defined values

Parameter	Type	Description
<mode>	Number	Allowed values: • 0: reserved • 1: reserved • 2: single shot position
<sensor>	Number	Sensor selection: it is possible to combine different sensors summing <sensor> values of the selected sensors:

Parameter	Type	Description
		• 0: use the last fix in the internal database and stop the GNSS receiver • 1: use the GNSS receiver for localization • 2: use cellular CellLocate® location information • 4: use Wi-Fi CellLocate® location information • 8: use external sensor CellLocate® location information • 16: use SpotNow sensor (location based on GPS signal processed through cellular module) • 32: perform a network scan and save the data in file system Allowed sensors:
<response_type>	Number	Type of response: • 0: standard (single-hypothesis) response • 1: detailed (single-hypothesis) response • 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[3] (DD/MM/YY) of the estimated position
<time>	String	GPS time[3] (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[4]
<uncertainty>	Number	Estimated 50% confidence level error, in meters (0 - 20000000)
<speed>	Number	Speed over ground m/s[4]
<direction>	Number	Course over ground in degree (0 deg - 360 deg)(4)
<vertical_acc>	Number	Vertical accuracy, in meters[4]
<sensor_used>	Number	Sensor used for the position calculation
<SV_used>	Number	Number of satellite used to calculate the position[4]
<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)(4). For more details, see the u-blox GNSS receiver protocol specification
<jamming_status>	Number	Jamming status[4]. For more details, see the u-blox GNSS receiver protocol specification

24.2.1.4 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).

[3] Coming either from the CellLocate® server or the GNSS receiver (GPS time)
[4] only for GNSS positioning, 0 in case of CellLocate®

- If <sensor>=1 (use the GNSS receiver for localization), <response_type>=2 (multi-hypotheses response) is not supported.
- 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.

LEXI-R10

- Wi-Fi scanning can only be executed when the PHY is in an idle state.

24.2.2 Localization information request status unsolicited indication +ULOCIND

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

24.2.2.1 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.

A URC is issued for each check in of an MGA server (primary and secondary).

24.2.2.2 Syntax

Type	Syntax	Response	Example
Set	AT+ULOCIND=<mode>	OK	AT+ULOCIND=1 OK
Read	AT+ULOCIND?	+ULOCIND: <mode> OK	+ULOCIND: 1 OK
Test	AT+ULOCIND=?	+ULOCIND: (list of supported <mode>'s) OK	+ULOCIND: (0-1) OK
URC		**If <mode>=1:** +UULOCIND: <step>,<result>	+UULOCIND: 1,0

24.2.2.3 Defined values

Parameter	Type	Description
<mode>	Number	URC configuration: • 0 (default value): disabled • 1: enabled • 2: reserved Allowed values:
<step>	Number	Informs the user about the operation in progress: • 0: network scan start • 1: network scan end • 2: requesting data to the server • 3: received data from the server • 4: sending feedback to the server • 5: saving network scan data in filesystem • 6: Wi-Fi scan start • 7: Wi-Fi scan end
<result>	Number	Represents the result of the aiding operation: • 0: no error • 1: wrong URL • 2: HTTP error • 3: create socket error

Parameter	Type	Description
		• 4: close socket error • 5: write to socket error • 6: read from socket error • 7: connection/DNS error • 8: authentication token missing or wrong (required for aiding for u-blox M8 and future versions) • 9: generic error • 10: user terminated • 11: no data from server • 13: network scan data file saving error • 14: Wi-Fi scan error

24.2.2.4 Notes

LEXI-R10

- The command setting is not stored in the NVM.

25 Networking

25.1 System networking modes

25.1.1 LEXI-R10 Router mode

In **router mode**, 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.

A DHCP server will provide to the connected hosts the configuration of the private network provided by the module. Only the IPv4 address is allowed.

25.1.1.1 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.

25.1.1.2 IPv6

☞ LEXI-R10
Router mode is not supported in IPv6. Module is forced to work in bridge mode even if configured for router mode.

25.1.2 LEXI-R10 Bridge mode

In **bridge mode**, 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.

At the EPS bearer/PDP context activation the module will receive the IP configuration from the cellular network. It will use the received IP configuration to properly set the parameters of the DHCP server. The host will receive within the DHCP protocol the correct configuration to obtain connectivity. The IP configuration consists of the IP address of the activated EPS bearer/PDP context, the IP address of the gateway needed by the host to set the connectivity, and the list of DNS servers provided by the cellular network (additionally a fallback DNS server is provided). After the PDP context activation it is suggested for the DTE to perform a DHCP request to obtain the updated IP configuration.

☞
- It supports only one active packet data context.
- For more details on the bridge mode configuration, see the +UNETCFG AT command.

25.1.2.1 IPv4

- For each active context the module creates an IP interface (which takes care of replying to ARP requests)
- The module will perform routing over contexts using the IP alias set by the DTE

☞
- The DTE should use automatic configuration of the virtual interface via the DHCP protocol as the preferred method over manual configuration.

- The DTE can manually configure its virtual interface with the information obtained using the appropriate AT commands:
  - Retrieve the associated public IP address via the +CGDCONT AT command and assign it as IP alias
  - Retrieve the module's local configuration of the bridged interface (IP address and subnet mask) and add the required routing rules. The value of the <ipv4_address> of the RNDIS or ECM interface of the module may be used as the default gateway of the DTE virtual interface.

25.1.2.2 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
- 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).

25.2 Get the USB IP configuration +UIPADDR

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

25.2.1 Description

Returns the current configuration of the network interface mapped to the required active <cid> of the internal context and the USB IP configuration in bridge mode. If the <cid> parameter is omitted, the information text response will display all the active <cid>s.

25.2.2 Syntax

Type	Syntax	Response	Example
Set	AT+UIPADDR=[<cid>]	+UIPADDR: <cid>,<if_name>,<ipv4_address>,<subnet_mask>,<ipv6_global_address>[,<ipv6_link_local_address>][,<ipv4_primary_dns>,<ipv4_secondary_dns>,<ipv6_primary_dns>,<ipv6_secondary_dns>] [...] OK	See Examples
Test	AT+UIPADDR=?	+UIPADDR: (list of <cid>'s active virtual device) OK	+UIPADDR: 1,2 OK

25.2.3 Defined values

Parameter	Type	Description
<cid>	Number	Specifies the active PDP context. By default the active <cid> is reported. If the <cid> parameter is omitted, all the active <cid>s are reported.For the parameter range, see <cid>.
<if_name>	String	Interface name. For more details on interface nomenclature, see Notes.

Parameter	Type	Description
<ipv4_address>	String	IPv4 address of the interface. The IPv4 address consists of 4 octets: "ddd.ddd.ddd.ddd". The default value is "192.168.1.1".
<subnet_mask>	String	The subnet mask consists of 4 octets: "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 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.
<ipv6_link_local_address>	String	Link Local IPv6 address of the interface. 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.
<ipv4_primary_dns>	String	IPv4 address of primary DNS used by the interface. The IPv4 address consists of 4 octets: "ddd.ddd.ddd.ddd".
<ipv4_secondary_dns>	String	IPv4 address of secondary DNS used by the interface. The IPv4 address consists of 4 octets: "ddd.ddd.ddd.ddd".
<ipv6_primary_dns>	String	IPv6 address of primary DNS used by the interface. 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.
<ipv6_secondary_dns>	String	IPv6 address of secondary DNS used by the interface. 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.

25.2.4 Notes

- If the requested <cid> is not active the command will reply with an error result code.

LEXI-R10

- The <ipv6_link_local_address> parameter is not supported.
- For the **internal context** the interface name (see the <if_name> parameter) is "app_net(x)", where:
  - The "app_net(x)" is the name of the internal network interface mapped to an activated CID.
  - The x parameter is in the range from 1 to 15.
  - Example: "app_net1" interface is mapped to the PDP context with CID 1.
- The interface name (see the <if_name> parameter) is either "ECM" or "RNDIS" based on +UUSBCONF configuration.
  - The values reported for the USB IP configuration in both **bridge** and **router mode** should be used by the DTE to set its interface when it uses the manual configuration (for more details, see the System networking modes section).

25.2.5 Examples

LEXI-R10

Description	Command	Response
Internal context (IPv4 context)	AT+UIPADDR=1	+UIPADDR: 1,"app_net1","192.168.21.1","255.255.255.0","","185.215.195.114","185.215.195.115","","" OK
Internal context (IPv6 context)	AT+UIPADDR=1	+UIPADDR: 1,"app_net1","","","2A0B:AD40:1:10 44:15E3:6CD4:8B8C:84E2","","","2A0B:AD40:1:100::114","" OK
Internal context (IPv4v6 context)	AT+UIPADDR=1	+UIPADDR: 1,"app_net1","192.168.20.34","255.255.255.0", "2A0B:AD40:1:1044:15E3:6CD4:8B8C:84E2","185.215.195.114", "185.215.195.115","2A0B:AD40:1:100::114",""

Description	Command	Response
		OK
ECM Bridge mode (IPv4 context)	AT+UIPADDR=1	+UIPADDR: 1,"ECM","10.12.6.148","255.255.255.248","","217.200.201.65","217.200.201.64","",""
		OK
RNDIS Bridge mode (IPv6 context)	AT+UIPADDR=1	+UIPADDR: 1,"RNDIS","","","2001:468:3000:1:2C6C:4615:B341:FA8C","","","2A0B:AD40:1:100::114","::"
		OK
ECM Bridge mode (IPv4v6 context)	AT+UIPADDR=1	+UIPADDR: 1,"ECM","192.168.21.1","255.255.255.252","2001:468:3000:1:2C6C:4615:B341:FA8C","185.215.195.114","185.215.195.115","2A0B:AD40:1:100::114","::"
		OK
RNDIS router mode (IPv4 context)	AT+UIPADDR=1	+UIPADDR: 1,"RNDIS","192.168.2.1","255.255.255.0","","217.200.201.65","217.200.201.64","",""
		OK
Wrong CID	AT+UIPADDR=4	ERROR
IPv4v6 context (check active CID)	AT+UIPADDR=?	+UIPADDR: 1,2
		OK

25.3 Set network adapter parameters +UNETCFG

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

25.3.1 Description

Configures the network adapter parameters.

For ECM or RNDIS USB networking (virtual ethernet), it enables or disables the NAT (Network Address Translation) and hence the selection between router and bridge modes.

- When router mode is enabled, it configures the local host IP address.
- When bridge mode is enabled, it configures the local host IP address to be as the global IP address allocated by LTE network.

For PPP dial-up established on UART or USB CDC-ACM interface, it configures the PPP authentication rule.

- It selects whether to use the authentication credentials manually set via +CGAUTH command or to get them from the host via the PPP LCP protocol.

☞ LEXI-R10

- The command is accepted even if USB is not present, but USB networking requires a configured USB profile exposing either ECM or RNDIS protocol.

25.3.2 Syntax

Type	Syntax	Response	Example
Generic syntax			
Set	AT+UNETCFG=<option>,[<... option_specific_params ...>]	OK	AT+UNETCFG="nat",0,"192.168.10.2"
			OK
Read	AT+UNETCFG?	+UNETCFG: <option1>,<... option_specific_params ...>	+UNETCFG: "nat",0,"192.168.10.2"
		+UNETCFG: <option2>,<... option_specific_params ...>	+UNETCFG: "pppauthselect",0
			OK

Type	Syntax	Response	Example
		OK	
Test	AT+UNETCFG=?	+UNETCFG: <option1>,<... range_of_option1_params ...> +UNETCFG: <option2>,<... range_of_option2_params ...> OK	+UNETCFG: "nat",(0,1),("192.168.(0-255).(2-254)") +UNETCFG: "pppauthselect",(0,1) OK
Interface Nat configuration			
Set	AT+UNETCFG="nat",<nat_value>[,<host_addr>]	OK	AT+UNETCFG="nat",0,"192.168.10.2" OK
PPP authentication select			
Set	AT+UNETCFG="pppauthselect",<pppauth>	OK	AT+UNETCFG="pppauthselect",0 OK

25.3.3 Defined values

Parameter	Type	Description
<option>	String	Command options • "nat": networking mode configuration • "pppauthselect": PPP authentication rule
<nat_value>	Number	NAT setting (router or bridge mode configuration) • 0 (factory-programmed value): NAT is disabled (bridge mode) • 1: NAT is enabled (router mode)
<host_addr>	String	Local host IPv4 address, if router mode is enabled • 192.168.10.2 (default value) • 192.168.(0-255).(2-254): available IPv4 addresses range
<pppauth>	Number	Selection of PPP authentication parameters • 0 (factory-programmed value): PPP dial-up authentication parameters are predefined by +CGAUTH. • 1: PPP dial-up authentication parameters are defined in the PPP link control protocol (LCP) procedure.

25.3.4 Notes

LEXI-R10

- The set command has immediate effect for all setting with the exception of <option> = "nat" configuration, which requires a power cycle to be correctly applied.

25.4 Configure and control the data path for the network adapter +UNETDEVCTL

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

25.4.1 Description

Controls the data path for the network adapter.

- Activate the network adapter and the associated data path; this includes binding the assigned TCP/IP stack resources to the selected PDN context.
- Deactivate the network adapter and the associated data path; this includes unbinding the assigned TCP/IP stack resources to the selected PDN context.

☞ LEXI-R10

- Only one network adapter can be activated, since the module supports just one virtual network interface.
- Network adapter presence (either ECM or RNDIS USB virtual ethernet) is determined by the support of either ECM or RNDIS protocol in the USB profile in use.
- The required USB profile (including either ECM or RNDIS protocol) must be selected via +UUSBCONF AT command.
- Command shall be used after a proper configuration of the network adapter executed via +UNETCFG AT command.

25.4.2 Syntax

Type	Syntax	Response	Example
Set	AT+UNETDEVCTL=<op>,<cid>,[,<urc_en>]	OK	AT+UNETDEVCTL=1,1,1 OK
Read	AT+UNETDEVCTL?	+UNETDEVCTL: <op>,<cid>,<urc_en>,<state> OK	+UNETDEVCTL: 1,1,1,1 OK
Test	AT+UNETDEVCTL=?	+UNETDEVCTL: (list of supported (<op>,<cid>,<urc_en>)s) OK	+UNETDEVCTL: (0-3),(1-15),(0-1) OK
URC		+UUNETDEVCTL: <state>	+UUNETDEVCTL: 0

25.4.3 Defined values

Parameter	Type	Description
<op>	Number	Binding option • 0 (factory-programmed value): unbind the specified <cid> to the assigned TCP/IP stack resources • 1: bind the specified <cid> to the assigned TCP/IP stack resources once and no re-bind if the PDN context is re-activated upond deactivation • 2: bind the specified <cid> to the assigned TCP/IP stack resources and re-bind if the PDN context is re-activated upond deactivation • 3: auto activate and bind the specified <cid> to the assigned TCP/IP stack resources when power on (setting saved in NVM)
<cid>	Number	Identifier of the PDN context to be bound • 1-15: supported cid number
<urc_en>	Number	URC reporting • 0 (default and factory-programmed value): +UUNETDEVCTL: <state> URC is disabled • 1: +UUNETDEVCTL: <state> URC is enabled
<state>	Number	Activation state • 0: Activation of network adapter and data path has failed • 1: Activation of network adapter and data path has succeeded

25.4.4 Notes

LEXI-R10

- If the <cid> for the PDN context is defined but deactivated, the binding of this cid auto activates the PDN context.
- If the <cid> for the PDN context is undefined, the binding of this cid causes a failure in the network adapter activation.
- If the router networking mode is selected via +UNETCFG AT command, the network interface appears enabled at host side, even before the data path is activated.

- Only the configuration applied with <op>=3 is persistent. Any other configuration results in factory-programmed values stored in NVM.

26 MQTT

26.1 Introduction

☞ MQTT AT commands are implemented according to MQTT version 3.1.1. For a more detailed overview on MQTT protocol, see MQTT version 3.1.1 - OASIS standard [221].

The Message Queueing Telemetry Transport (MQTT) protocol specifies a simple and lightweight messaging protocol, designed for constrained devices and low-bandwidth, high-latency, or unreliable networks. An MQTT client uses publish and subscribe methods to interact over a TCP connection with an MQTT message broker (henceforth referred to as an MQTT server). u-blox modules can be configured to operate as an MQTT client.

To publish or subscribe, the MQTT client must first establish a TCP connection to an MQTT server.

The MQTT protocol specifies case-sensitive topics, with topic names containing topic level separators "/" to which messages will be published. For example, a message of "78 Fahrenheit or 25 Celsius" could be published to the topic name of "/heat/sensor/SD/bldg5/DelMarConfRm". MQTT clients subscribe to topic filters to determine if the client receives messages published to a given topic name.

The topic filters may exactly specify a topic name or may contain either of the following wildcards:

- **'+'** - (single level wildcard) applies to a single topic level;
- **'#'** - (multi-level wildcard) applies to potentially many topic levels (and must be the last character specified in a topic filter).

'#' can be specified on its own or following a topic level separator ('/'). For example, the topic filter, "/heat/sensor/SD/#", would receive any messages published to the "/heat/sensor/SD/bldg5/DelMarConfRm" topic name.

☞ MQTT specification states that topic filters starting with either wildcard will not match any topic name that starts with "$".

The MQTT protocol also specifies a Quality of Service (QoS) level to be applied to message transactions:

- **0** (default setting): at most once delivery
- **1**: at least once delivery
- **2**: exactly once delivery

The MQTT protocol also allows an MQTT client to create a will message, which the MQTT remote server will store and only publish (to the topic name specified as the will topic name) when the MQTT client gets disconnected from the MQTT server, but not if the MQTT client explicitly sends a disconnect command.

A PSD connection must be active before using MQTT AT commands. Some products require additional commands to provide connectivity to the application.

☞ LEXI-R10
If not specified, the <cid> and the <preferred_protocol_type> parameters set by means of the +UDCONF=19 AT command are used.
See +CGACT AT command for activating a PDP context.

26.2 MQTT profile configuration +UMQTT

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

26.2.1 Description

Configures or reads the parameter value of an MQTT client profile. Issue a set command for each <op_code> parameter to set all of the parameters in an MQTT client profile.

26.2.2 Syntax

Type	Syntax	Response	Example
Generic syntax			
Set	AT+UMQTT=<op_code>[,<param1>[,<param2>]]	+UMQTT: <op_code>,<result> OK	AT+UMQTT=12,1 +UMQTT: 12,1 OK
MQTT unique client ID			
Set	AT+UMQTT=0,<client_id>	+UMQTT: 0,<result> OK	AT+UMQTT=0,"352753090041680" +UMQTT: 0,1 OK
MQTT local TCP port number			
Set	AT+UMQTT=1,<local_port>	+UMQTT: 1,<result> OK	AT+UMQTT=1,1883 +UMQTT: 1,1 OK
MQTT server name			
Set	AT+UMQTT=2,<server_name>[,<server_port>]	+UMQTT: 2,<result> OK	AT+UMQTT=2,"www.commercialmqttbroker.com" +UMQTT: 2,1 OK
MQTT server IP address			
Set	AT+UMQTT=3,<IP_address>[,<server_port>]	+UMQTT: 3,<result> OK	AT+UMQTT=3,"192.168.1.0",1883 +UMQTT: 3,1 OK
User name and password			
Set	AT+UMQTT=4,<username>,<password>	+UMQTT: 4,<result> OK	AT+UMQTT=4,"test","abc123" +UMQTT: 4,1 OK
Last will QoS			
Set	AT+UMQTT=6,<will_QoS>	OK	AT+UMQTT=6,1 OK
Last will retain			
Set	AT+UMQTT=7,<will_retain>	OK	AT+UMQTT=7,1 OK
Last will topic			
Set	AT+UMQTT=8,<will_topic>	OK	AT+UMQTT=8,"u-blox/publish" OK
Last will message			
Set	AT+UMQTT=9,<will_message>[,<hex_mode>]	OK	AT+UMQTT=9,"Unrequested disconnect" OK
Keep alive and linger time			
Set	AT+UMQTT=10,<keep_alive>[,<linger_time>]	+UMQTT: 10,<result> OK	AT+UMQTT=10,3600,20 +UMQTT: 10,1 OK
MQTT secure option			
Set	AT+UMQTT=11,<MQTT_secure>[,<USECMNG_profile>]	+UMQTT: 11,<result> OK	AT+UMQTT=11,1,2 +UMQTT: 11,1

Type	Syntax	Response	Example
			OK
MQTT clean session			
Set	AT+UMQTT=12,<clean_session>	+UMQTT: 12,<result> OK	AT+UMQTT=12,1 +UMQTT: 12,1 OK
MQTT server response time			
Set	AT+UMQTT=13,<server_response_time>	OK	AT+UMQTT=13,60 OK
MQTT PDP context configuration			
Set	AT+UMQTT=20,<cid>[,<preferred_protocol_type>]	OK	AT+UMQTT=20,2,1 OK
Read	AT+UMQTT=<op_code>	+UMQTT: <op_code>,<param1>[,<param2>] OK	AT+UMQTT=4 +UMQTT: 4,"my_username" OK
Read	AT+UMQTT?	+UMQTT: 0,<client_id> +UMQTT: 2,<server_name>,<server_port> +UMQTT: 3,IP_address>,<server_port> +UMQTT: 4,<username> +UMQTT: 6,<will_QoS> +UMQTT: 7,<will_retain> +UMQTT: 8,<will_topic> +UMQTT: 9,<wm_length>,<will_message> +UMQTT: 10,<keep_alive>,<linger_time> +UMQTT: 11,<MQTT_secure>[,<USECMNG_profile>] +UMQTT: 13,<server_response_time> +UMQTT: 20,<cid>,<preferred_protocol_type> OK	+UMQTT: 0,"352848080012186" +UMQTT: 2,"",1883 +UMQTT: 3,"",1883 +UMQTT: 4,"" +UMQTT: 6,0 +UMQTT: 7,0 +UMQTT: 8,"" +UMQTT: 9,0,"" +UMQTT: 10,0,10 +UMQTT: 11,0 +UMQTT: 13,30 +UMQTT: 20,1,0 OK
Test	AT+UMQTT=?	+UMQTT: (list of supported <op_code>s) OK	+UMQTT: (0,2-4,6-11,13,20) OK
URC		+UUMQTT<op_code>: <param1>[,<param2>]	+UUMQTT0: "352753090041680"

26.2.3 Defined values

Parameter	Type	Description
<op_code>	Number	MQTT parameter: • 0: MQTT unique client id • 1: MQTT local port number • 2: MQTT server name • 3: MQTT IP address

Parameter	Type	Description
		• 4: MQTT username and password • 6: MQTT last will QoS value • 7: MQTT last will retain • 8: MQTT last will topic • 9: MQTT last will message • 10: MQTT keep alive time period and linger time • 11: MQTT secure • 12: MQTT clean session • 13: MQTT server response time • 14: MQTT terse/verbose mode; the set command is not supported • 20: MQTT PDP context configuration Allowed values: • LEXI-R10 - 0, 2, 3, 4, 6, 7, 8, 9, 10, 11, 13, 20
<result>	Number	Allowed values: • 0: failure • 1: success
<client_id>	String	Client identifier for the MQTT session. • LEXI-R10 - The maximum length is 256 characters. The default value is the IMEI of the MT.
<local_port>	Number	MQTT client TCP port. The range goes from 1 to 65535. If the MQTT client port number is not specified, the default port number is the IANA assigned port of 1883 for non-TLS MQTT and 8883 for TLS MQTT.
<server_name>	String	Remote server name. • LEXI-R10 - The maximum length is 128 characters. The default value is an empty string.
<IP_address>	String	Remote server IP address. The default value is an empty string. For IP address format reference, see the IP addressing.
<server_port>	Number	MQTT server port. The range goes from 1 to 65535. The default value is 1883 for non-TLS MQTT, 8883 for TLS MQTT. • LEXI-R10 - the set command also accepts 0: it is used to automatically reset the <server_port> to the default value (1883 or 8883).
<username>	String	User name for the MQTT login procedure. The default value is an empty string: • LEXI-R10 - The maximum length is 512 characters.
<password>	String	Password for the MQTT login procedure. The default value is an empty string: • LEXI-R10 - The maximum length is 512 characters.
<keep_alive>	Number	Keep alive time expressed in seconds. According to the MQTT specification, an MQTT server must disconnect a client if it receives nothing from the client within 1.5x the keep alive time. If the keep alive value is 0 the server is not required to disconnect. The default value is 0. The maximum value is 65535 (corresponding to 18 hours, 12 minutes and 15 seconds).
<linger_time>	Number	Linger time expressed in seconds. The range goes from 0 to 120 s; 0 means linger time is not set. The default value is 10 s.
<will_QoS>	Number	MQTT last will Quality of Service: • 0 (default value): at most once delivery • 1: at least once delivery • 2: exactly once delivery
<will_retain>	Number	Whether or not the last will message will be retained across disconnects: • 0 (default value): the last will message will not be retained by the MQTT broker • 1: the last will message will be retained by the MQTT broker
<will_topic>	String	Last will topic name. The default value is an empty string. • LEXI-R10 - The maximum length is 256 characters.
<will_message>	String	Last will message: string of characters (ASCII or hexadecimal octets). • LEXI-R10 - The maximum length is 256 characters. In case of hexadecimal data, the number of characters must be even (one hexadecimal octet is composed of 2 characters).
<hex_mode>	Number	Allowed values: • 0 (default value): ASCII input for <will_message> • 1: hexadecimal input for <will_message>

Parameter	Type	Description
<wm_length>	Number	Two meanings: • ASCII input: number of ASCII characters in <will_message> • Hexadecimal input: number of octets in <will_message>
<MQTT_secure>	Number	Enables / disables the secure option of MQTT service: • 0 (default value): no TLS encryption • 1: enable the MQTT TLS encryption
<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 AT command description).
<clean_session>	Number	Clean session value. Allowed values: • 0: indicates that the client subscription and delivered messages received by the client should be remembered across disconnects by both the MQTT client and the MQTT server • 1: (default value) indicates that disconnects clean all session state information
<cid>	Number	PDP context identifier used for the MQTT communication. The allowed range is product specific, see <cid>. For more details on the default value of the parameter (where supported), see MQTT.
<preferred_protocol_type>	Number	Preferred protocol type to be specified when the <cid> protocol type is IPv4v6. Allowed values: • 0: IPv4 • 1: IPv6 For more details on the default value of the parameter (where supported), see MQTT.
<server_response_time>	Number	Indicates the maximum waiting time of a server response after a request was sent to the server via +UMQTTC AT command. It is expressed in seconds. The default value is 30 s. The range goes from 5 s to 255 s (corresponding to 4 minutes and 15 seconds).
<param1>	Number / String	Type and supported content depend on the related <op_code> parameter (details are given above). If <param1> is not specified the value of the corresponding parameter <op_code> is reset to the default value.
<param2>	Number / String	Type and supported content depend on the related <op_code> parameter (details are given above). If <param2> is not specified the value of the corresponding parameter <op_code> is reset to the default value.

26.2.4 Notes

- The information text response to the read command does not display the password.
- Some network operators do not allow secure MQTT. In this case the AT+UMQTTC=1 command (MQTT login) will return a failure response by means of the +UUMQTTC URC after an TLS timeout of 30 s.

LEXI-R10

- The set command does not provide the +UMQTT: <op_code>,<result> information text response: only the final result code is issued.
- The +UUMQTT URC is not supported.
- The MQTT session is always cleaned on disconnection.
- See the Appendix A.1 for the allowed error result codes.
- <op_code>=2 (MQTT server name) and <op_code>=3 (MQTT IP address) are equivalent and mutually exclusive: if value for <op_code>=2 is specified by user, then value for <op_code>=3 is reset or vice versa.

26.3 Save/Restore MQTT profile from NVM +UMQTTNV

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

26.3.1 Description

Either saves all of the MQTT client profile parameters to NVM (non-volatile memory) or sets all of the MQTT client profile parameters to either factory-programmed or non-volatile stored values.

For the complete list of parameters that can be stored in the NVM, see the +UMQTT AT command.

LEXI-R10
The set command does not provide the information text response: only the final result code is issued.

26.3.2 Syntax

Type	Syntax	Response	Example
Set	AT+UMQTTNV=<NVM_mode>	[+UMQTTNV: <NVM_mode>,<result>] OK	AT+UMQTTNV=2 +UMQTTNV: 2,1 OK
Test	AT+UMQTTNV=?	+UMQTTNV: (list of <NVM_mode>s) OK	+UMQTTNV: (0-2) OK

26.3.3 Defined values

Parameter	Type	Description
<NVM_mode>	Number	Operation to set or save the MQTT client profile parameters as follows: • 0: restore MQTT client profile parameters to the factory-programmed setting • 1: set MQTT client profile parameters to values previously stored in the NVM • 2: store current MQTT client profile parameters to the NVM
<result>	Number	Operation result: • 0: failure • 1: success

26.4 MQTT command +UMQTTC

+UMQTTC						
Modules	All products					
Attributes	**Syntax**	**PIN required**	**Settings saved**	**Can be aborted**	**Response time**	**Error reference**
	partial	Yes	No	No	Appendix B.4	+CME Error

26.4.1 Description

Triggers the MQTT actions corresponding to the <op_code> parameter. The final result code indicates if sending the command request to the MQTT process was successful or not.

The +UUMQTTC URC provides the result of the requested action from the MQTT broker. In addition, the +UUMQTTC URC also provides notification that unread messages are available from the MQTT server. The +UUMQTTC URC is by default enabled.

LEXI-R10
An MQTT command can be considered completed only after receiving the related +UUMQTTC URC.
The "+CME ERROR: operation not allowed" error result code is returned if an MQTT command is entered before the previous one is completed.

☞ LEXI-R10
The +UUMQTTC: 0,100 URC is notified when the MQTT broker releases the connection after a period of inactivity (keep alive time expired).
The +UUMQTTC: 0,101 URC is notified when the network connection is lost.

☞ LEXI-R10
The +UUMQTTC: 0,102 URC is notified when the MT releases the connection because there is a protocol violation in receiving an MQTT message.

26.4.2 Syntax

Type	Syntax	Response	Example
Generic syntax			
Set	AT+UMQTTC=<op_code>[,<param1>[,<param2>][,<param3>][,<param4>][,<param5>]]	OK	AT+UMQTTC=1 OK
URC		+UUMQTTC: <op_code>,<param1>[,<param2>,<param3>]	+UUMQTTC: 4,0,2,"sensor/heat/#"
MQTT logout			
Set	AT+UMQTTC=0	OK	AT+UMQTTC=0 OK
URC		+UUMQTTC: 0,<logout_result>	+UUMQTTC: 0,1
MQTT login			
Set	AT+UMQTTC=1	OK	AT+UMQTTC=1 OK
URC		+UUMQTTC: 1,<MQTT_result>	+UUMQTTC: 1,1
MQTT publish to a topic			
Set	AT+UMQTTC=2,<QoS>,<retain>,[<hex_mode>],<topic_name>,<pub_msg>	OK	AT+UMQTTC=2,0,0,0,"sensor/heat/SD/bldg5/DelMarConfRm","23 degrees Celsius" OK
			AT+UMQTTC=2,0,0,1,"sensor/heat/SD/bldg5/DelMarConfRm","32332064656772656573 2043656C73697573" OK
URC		+UUMQTTC: 2,<MQTT_result>	+UUMQTTC: 2,1
MQTT publish a file to a topic			
Set	AT+UMQTTC=3,<QoS>,<retain>,<topic_name>,<filename>	OK	AT+UMQTTC=3,0,0,"home/u-blox","msg.txt" OK
URC		+UUMQTTC: 3,<MQTT_result>	+UUMQTTC: 3,1
MQTT subscribe to the specified topic filter			
Set	AT+UMQTTC=4,<max_QoS>,<topic_filter>	OK	AT+UMQTTC=4,0,"sensor/heat/#" OK
URC		+UUMQTTC: 4,<MQTT_result>[,<QoS>,<topic_name>] **In case of success** +UUMQTTC: 4,1,<QoS>,<topic_name> **In case of failure** +UUMQTTC: 4,0	+UUMQTTC: 4,1,0,"sensor/heat/#"

Type	Syntax	Response	Example
MQTT unsubscribe from the specified topic filter			
Set	AT+UMQTTC=5,<topic_filter>	OK	AT+UMQTTC=5,"sensor/heat/#" OK
URC		+UUMQTTC: 5,<MQTT_result>	+UUMQTTC: 5,1
MQTT read message			
Set	AT+UMQTTC=6[,[<one_message>][,<hex_mode_out>]]	+UMQTTC: 6,<QoS>,<topic_msg_length>,<topic_length>,<topic_name>,<read_msg_length>,<read_msg> OK	AT+UMQTTC=6,1 +UMQTTC: 6,0,31,13,"sensor/heat/#",18,"23 degrees Celsius" OK AT+UMQTTC=6,,1 +UMQTTC: 6,0,31,13,"sensor/heat/#",18,"32332064656772656573 2043656C73697573" OK
URC		+UUMQTTC: 6,<num_unread_msgs>,<memory_full>	+UUMQTTC: 6,3,0
Ping MQTT broker			
Set	AT+UMQTTC=8,<ping_ON_OFF>	OK	AT+UMQTTC=8,1 OK
URC (only in case of no ping response received)		+UUMQTTC: 8,0	+UUMQTTC: 8,0
Publish a binary message to a topic			
Set	AT+UMQTTC=9,<QoS>,<retain>,<topic_name>,<pub_msg_length> After the ">" prompt <pub_msg_length> bytes of data are entered	><pub_bin_message> OK	AT+UMQTTC=9,1,0,"u-blox/test",33 >AABB--> execute this \nand "this" OK
URC		+UUMQTTC: 9,<MQTT_result>	+UUMQTTC: 9,1
Test	AT+UMQTTC=?	+UMQTT: (list of supported <op_codes>s) OK	+UMQTTC: (0-9) OK

26.4.3 Defined values

Parameter	Type	Description
<op_code>	Number	MQTT command request. • 0: logs out/disconnects from MQTT server. The will message will not be sent • 1: logs in/connects to MQTT server • 2: publish a message to a specific topic to the MQTT message broker • 3: publish a message from a file to a specific topic to the MQTT message broker • 4: subscribe to a topic from the MQTT message broker • 5: unsubscribe to a topic from the MQTT message broker. This should exactly match the Topic Filter used during the Subscribe • 6: read all unread messages received from MQTT message broker, at the terse/verbose mode set at the time of message reception • 7: sets the terse/verbose format for received messages (i.e. the amount of information and headers with each received MQTT message) • 8: ping the MQTT message broker • 9: publish a message in binary mode. It is used for publishing any binary data Allowed values: • LEXI-R10 - 0, 1, 2, 3, 4, 5, 6, 8, 9
<MQTT_result>	Number	Result of an MQTT command request: • 0: fail; for more details, see the +UMQTTER AT command • 1: success

Parameter	Type	Description
<login_result>	Number	Result of an MQTT login request. Allowed values: • 0: connection accepted • 1: the server does not support the level of the MQTT protocol requested by the client • 2: the client identifier is correct UTF-8 but not allowed by the server • 3: the network connection has been made but the MQTT service is unavailable • 4: the data in the user name or password is malformed • 5: the client is not authorized to connect • 6-255: reserved for future use
<logout_result>	Number	Result of an MQTT command request: • 0: fail; for more details, see the +UMQTTER AT command • 1: success Result of an unsolicited notification for an MQTT session interruption caused by: • 100: keep alive time expired, the MQTT broker released the connection. • 101: lost network connection. • 102: protocol violation in receiving an MQTT message.
<QoS>	Number	Quality of service: • 0 (default value): at most once delivery • 1: at least once delivery • 2: exactly once delivery
<retain>	Number	Whether or not the message will be retained across disconnects. Allowed values: • 0 (default value): the message will not be retained by the MQTT broker • 1: the message will be retained by the MQTT broker
<hex_mode>	Number	Allowed values: • 0 (default value): ASCII input for <pub_msg>/<message> • 1: hexadecimal input for <pub_msg>/<message>
<pub_msg>	String	ASCII or hexadecimal data.
<message>	String	ASCII or hexadecimal data. The maximum length is 256 characters. The starting quotation mark shall not be taken into account like data. At the end of the byte stream, another quotation mark is provided for user convenience and visualization purposes.
<filename>	String	Filename containing the message to be published. • LEXI-R10 - The maximum parameter length is 250 characters and the maximum file content depends on the file system, see File system limits.
<max_QoS>	Number	Maximum QoS level at which the MQTT broker can send messages to the MT. For more details, see MQTT version 3.1.1 - OASIS standard [221]. • 0: at most once delivery • 1: at least once delivery • 2: exactly once delivery
<topic_filter>	String	An expression to indicate an interest in one or more topics, wildcard characters are used to subscribe/unsubscribe to multiple topics at once. See MQTT introduction. • LEXI-R10 - The maximum length is 256 characters.
<topic_name>	String	Indicates the topic to which the given MQTT message was published. • LEXI-R10 - The maximum length is 256 characters.
<reason>	Number	Result of an MQTT subscribe request: • 0-2: success • 128: failure
<num_unread_msgs>	Number	• LEXI-R10 - For values greater than 0 the parameter represents the number of unread received messages. The maximum number of unread messages is 100. Negative values or 0 indicate a failure during message reception; for more details, see the +UMQTTER AT command.
<format>	Number	Specifies the format of the messages when read using the <op_code>=6. Allowed values: • 0: no formatting. All messages will be concatenated into a single line with no separation between messages • 1 (default value): each message will contain the <topic_name> and <message> • 2: each message will contain the <topic_name>, <msg_length>, <QoS> and <message>
<mqtt_server>	String	IP address or URL of MQTT server.
<one_message>	Number	Allowed values:

Parameter	Type	Description
		• 0: read all received messages • 1: read only one message
<topic_msg_length>	Number	Sum of topic and message length
<topic_length>	Number	Topic length
<msg_length>	Number	Specifies the number of octets in <message> for <op_code>=6 (MQTT read message)
<read_msg_length>	Number	Specifies the number of octets in <read_msg>
<read_msg>	String	Message received from MQTT server. • LEXI-R10 - The maximum length is 12288 octets.
<ping_ON_OFF>	Number	Allowed values: • 0 (default value): ping disabled • 1: ping enabled the MT will ping the MQTT broker. The ping is issued when the MQTT keep alive time period expires. See AT+UMQTT=10.
<memory_full>	Number	Indicates the message memory status. Allowed values: • 0: message memory is available • 1: message memory is full
<pub_msg_length>	Number	Specifies the number of octets in <pub_bin_message>. • LEXI-R10 - The maximum length is 4096 octets.
<pub_bin_message>	String	Data bytes to be published.
<hex_mode_out>	Number	Allowed values: • 0 (default value): ASCII output for <read_msg> • 1: hexadecimal output for <read_msg>

26.4.4 Notes

- The topic name should not include any wildcards for the publish commands.
- The topic filter could include the '+' wildcard to substitute for a single topic folder or the '#' wildcard to substitute for any number of topic folders. The '#' wildcard must be the last character in a topic filter.

LEXI-R10

- The <memory_full> parameter is not supported.
- If <hex_mode>=1, the publishing message (<pub_msg> parameter) contains a string of hexadecimal nibbles that is transformed into a bytes sequence.
- Publish a binary message to a topic:
  - This feature can be successfully used when there is need to send characters like <CR>, <CTRL-Z>, quotation marks, etc. These characters have a specific meaning and they cannot be used like data in the command itself. For more details, see 3GPP TS 27.005 [86].
  - 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.
  - In binary mode the module does not display the echo of data bytes.
- If <QoS>=1 or <QoS>=2, the publish command does not automatically retry to send the packet after a timeout failure. Furthermore, it is not possible to manually send an exact duplicate of the original MQTT packet.
- The time to establish the secure session (when using +UMQTT: 11,1[,<USECMNG_profile>]) could require up to 150 s in one of these cases:
  - RoT generated PSK (+USECPRF: <profile_id>,11)
  - encrypted session resumption (+USECPRF: <profile_id>,13,2,10)

  This is due to "security heartbeat" message operation. For more details on when this scenario occurs, see the +USECCONN AT command.
- The PING command activates an internal loop of ping requests and responses to and from the MQTT server. The ping requests are sent when the MQTT keep alive time period expires (see MQTT version 3.1.1 - OASIS standard [221]). Before establishing a connection with the server the keep alive time must be set

to a non-zero value, see AT+UMQTT=10. Avoid a value of few seconds otherwise the application will be busy in sending ping requests at the expense of other MQTT requests.

26.5 MQTT error +UMQTTER

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

26.5.1 Description

Retrieves the error class and code of the last MQTT operation that provided an error.

26.5.2 Syntax

Type	Syntax	Response	Example
Action	AT+UMQTTER	+UMQTTER: <error_code1>,<error_code2> OK	AT+UMQTTER +UMQTTER: 1,1 OK

26.5.3 Defined values

Parameter	Type	Description
<error_code1>	Number	• LEXI-R10 - Value of error class. Values are listed in Internet suite error classes.
<error_code2>	Number	• LEXI-R10 - Value of class-specific error code. The values are listed in MQTT class error codes.

A Appendix: Error result codes

A.1 Mobile termination error result codes +CME ERROR

Error result code	Description
0	Phone failure
1	No connection to phone
2	Phone-adaptor link reserved
3	Operation not allowed
4	Operation not supported
5	PH-SIM PIN required
6	PH-FSIM PIN required
7	PH-FSIM PUK required
10	SIM not inserted
11	SIM PIN required
12	SIM PUK required
13	SIM failure
14	SIM busy
15	SIM wrong
16	Incorrect password
17	SIM PIN2 required
18	SIM PUK2 required
20	Memory full
21	Invalid index
22	Network not found
23	Memory failure
24	Text string too long
25	Invalid characters in text string
26	Dial string too long
27	Invalid characters in dial string
30	No network service
31	Network timeout
32	Network not allowed - emergency calls only
40	Network 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
51	Command implemented but currently disabled
52	Command aborted by user
53	Not attached to network due to MT functionality restrictions
54	Modem not allowed - MT restricted to emergency calls only
55	Operation not allowed because of MT functionality restrictions
56	Fixed dial number only allowed - called number is not a fixed dial number
57	Temporarily out of service due to other MT usage

Error result code	Description
100	Unknown
103	Illegal MS
106	Illegal ME
107	GPRS services not allowed
108	GPRS and non GPRS services not allowed
111	PLMN not allowed
112	Location area not allowed
113	Roaming not allowed in this location area
114	GPRS services not allowed in this PLMN
115	No Suitable Cells In Location Area
122	Congestion
125	Not authorized for this CSG
126	Insufficient resources
127	Missing or unknown APN
128	Unknown PDP address or PDP type
129	User authentication failed
130	Request rejected by Serving GW or PDN GW
131	Request rejected, unspecified
132	Service option not supported
133	Requested service option not subscribed
134	Service option temporarily out of order
135	NS-api already used
137	EPS QoS not accepted
138	Network failure
140	Feature not supported
141	Semantic error in the TFT operation
142	Syntactical error in the TFT operation
143	Unknown PDP context
144	Semantic errors in packet filter(s)
145	Syntactical errors in packet filter(s)
146	PDP context without TFT already activated
147	PTI mismatch
148	Unspecified GPRS error
149	PDP authentication failure
150	Invalid mobile class
153	ESM information not received
154	PDN connection does not exist
155	Multiple PDN connections for a given APN not allowed
156	User Busy
159	Uplink Busy/ Flow Control
160	Bearer handling not supported
165	Maximum number of EPS bearers reached
166	Requested APN not supported in current RAT and PLMN combination
168	Network failure
169	IMSI unknown in VLR
170	Congestion
171	Last PDN disconnection not allowed
172	Semantically incorrect message
173	Mandatory information element error

Error result code	Description
174	Information element non-existent or not implemented
175	Conditional IE error
176	Protocol error, unspecified
177	Operator determined barring
178	Maximum number of PDP contexts reached
179	Requested APN not supported in current RAT and PLMN combination
180	Request rejected, bearer control mode violation
181	Invalid PTI value
189	Semantically incorrect message
190	Invalid mandatory IE
191	Message type non existent
192	Message type not compatible
193	IE non existent
194	Conditional IE error
195	Message not compatible
197	Protocol error unspecified
254	Invalid error mapping
255	Internal error
262	SIM blocked
300	ME failure
301	SMS service of ME reserved
302	Operation not allowed ☞ LEXI-R10 UE busy
303	Operation not supported ☞ LEXI-R10 SIM not powered on
304	Invalid PDU mode parameter ☞ LEXI-R10 PDN not activated
305	Invalid text mode parameter ☞ LEXI-R10 PDN not valid
306	PDN invalid type
307	PDN no parameter
308	UE fail
309	PDP APN and PDP type duplicate used
310	(U)SIM not inserted ☞ LEXI-R10 PDP PAP and EITF not matched
311	(U)SIM PIN required ☞ LEXI-R10 (U)SIM PIN disabled
312	PH-(U)SIM PIN required

Error result code	Description
	LEXI-R10 (U)SIM PIN already enabled
313	(U)SIM failure LEXI-R10 (U)SIM PIN wrong format
314	(U)SIM busy LEXI-R10 PDN not allowed by RPM
315	(U)SIM wrong
316	(U)SIM PUK required
317	(U)SIM PIN2 required
318	(U)SIM PUK2 required
320	Memory failure
321	Invalid memory index
322	Memory full
330	SMSC address unknown
331	No network service
332	Network timeout
340	No +CNMA acknowledgement expected
401	Invalid PLMN
402	PLMN duplicate used
403	PLMN not found
404	PLMN table empty
405	PLMN table full
406	No ESM cause
407	Unknown ESM cause
408	Command not successful
500	Unknown error
512	Required parameter not configured
513	TUP not registered
514	AT internal error
515	CID is active
516	Incorrect state for the command
517	CID is invalid
518	CID is not active
520	Deactivate the last active CID
521	CID is not defined
522	UART parity error
523	UART frame error
524	UE is in minimal function mode
525	AT command aborted: in processing
526	AT command aborted: error
527	Command interrupted
528	Configuration conflicts
529	During FOTA updating
530	Not the AT allocated socket

Error result code	Description
531	USIM PIN is blocked
532	USIM PUK is blocked
533	Not mipi module
534	File not found
535	conditions of use not satisfied
536	AT UART buffer error
537	Back off timer is running
538	CID defined counter value greater than ZERO
539	Operation not allowed cid not defined
540	CID active counter value greater than ZERO
608	Voice call active
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
1041	Temporary failure
1042	Switching equipment congestion
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
1056	Collision with network initiated request
1057	Bearer capability not authorized
1058	Bearer capability not presently available
1059	Unsupported QCI value
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

Error result code	Description
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
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
1112	APN restriction value incompatible with active EPS bearer context
1127	Interworking, unspecified
1142	Network Error
1143	Invalid EPS bearer identity
1149	Last PDN disconnection not allowed
1243	Emm Error Unspecified
1244	Esm Error Unspecified
1279	Number not allowed
1283	CCBS possible
1400	Wrong RAT
1500	Wrong GPIO identifier
1501	Set GPIO default error
1502	Select GPIO mode error
1503	Read GPIO error
1504	Write GPIO error
1505	GPIO busy
1520	Wrong ADC identifier
1521	Read ADC error
1530	IPv4 only allowed
1531	IPv6 only allowed
1540	Wrong ringer identifier
1542	LLC or SNDCP failure
1543	Regular deactivation
1544	Reactivation requested
1545	Single address bearers only allowed
1546	Invalid transaction identifier value
1547	APN restriction val incompatible with PDP context
1548	PDP activation rejected
1549	unknown PDP address or PDP type
1550	GPRS generic operation error
1551	GPRS invalid APN
1552	GPRS authentication failure
1553	GPRS QoS parameters inconsistent
1554	GPRS network failure
1555	GPRS context busy
1556	CSD generic operation error

Error result code	Description
1557	CSD undefined profile
1558	CSD context busy
1559	PLMN scan not allowed
1600	FFS error
1560	PDP type IPv4 only allowed
1561	PDP type IPv6 only allowed
1612	FILE NOT FOUND
1613	Cannot open file
1614	TAC value not allowed
1615	OTP failure
1616	Wrong Check Digit
1620	Buffer full
1621	FFS initializing
1622	FFS already open file
1623	FFS not open file
1624	FFS file not found
1625	FFS file already created
1626	FFS illegal id
1627	FFS illegal file handle
1628	FFS illegal type
1629	FFS illegal mode
1630	FFS file range
1631	FFS operation not possible
1632	FFS write error
1633	FFS user id error
1634	FFS internal fatal error
1635	FFS memory resource error
1636	FFS maximum number of files exceeded
1637	FFS memory not available
1638	FFS invalid filename
1639	FFS streaming not enabled
1640	FFS operation not allowed on static file
1641	FFS memory table inconsistency
1642	FFS not a factory default file
1643	FFS requested memory temporary not available
1644	FFS operation not allowed for a directory
1645	FFS directory space not available
1646	FFS too many streaming files open
1647	FFS requested dynamic memory temporary not available
1648	FFS user provided a NULL parameter instead of a suitable buffer
1649	FFS timeout
1650	Command line too long
1660	Call barred - Fixed dialing numbers only
1670	SEC remote object wrong state
1671	SEC ROT not personalized
1672	SEC loss of connectivity
1673	SEC service not authorized
1674	SEC FW package installation required
1675	SEC FW package not valid

Error result code	Description
1676	SEC resource not available
1677	SEC data not available
1678	SEC timeout
1679	SEC data inconsistent or unsupported
1680	SEC pspk lock pending
1681	SEC C2C already paired
1682	SEC C2C channels consumed
1683	SEC C2C pairing not present
1684	SEC busy
1685	SEC connection failed due to a DNS resolution error
1686	SEC restore pending
1687	SEC RoT IO error
1688	SEC RoT IO pending
1689	SEC disabled
1700	GPS GPIO not configured
1701	GPS GPIO ownership error
1702	Invalid operation with GPS ON
1703	Invalid operation with GPS OFF
1704	Invalid GPS aiding mode
1705	Reserved GPS aiding mode
1706	GPS aiding mode already set
1707	Invalid GPS trace mode
1708	Parameter valid only in case of GPS OTA
1709	GPS trace invalid server
1710	Invalid TimeZone
1711	Invalid value
1712	Invalid parameter
1713	Invalid operation with LOC running / GPS Busy
1800	No ongoing call
1801	IBM busy / eCall already armed/active
1802	IBM feature off / eCall feature off
1803	Wrong IBM requested
1804	Audio resource not available
1805	ECALL restriction
1806	eCall invalid dial number
1900	No SAP Server Connection
1901	SAP Protocol Error
1902	SAP Connection failure
1903	SAP Server Disconnection
1904	SAP Other terminal using service
1910	USECMNG import timeout expired (no input for > 20 s)
1911	USECMNG import file size exceeds limit
1912	USECMNG no memory available
1913	USECMNG invalid certificate/key format
1914	USECMNG database full
1915	USECMNG database internal error
1916	USECMNG internal name not found
1917	USECMNG internal name already present
1918	USECMNG private key format error

Error result code	Description
1919	USECMNG MD5 checksum error
1920	USECMNG PEM DER conversion error
1921	USECMNG certificate date error
1922	USECMNG certificate common name error
1950	CDC-ECM is not available
1951	CDC-ECM is busy
1952	No DHCP Packets received from the DTE
2000	Command timeout
3000	Command aborted
4000	APN configuration mismatch
4001	IP type configuration mismatch
5000	FOTA package download state or name mismatch
5001	FOTA package data corrupted
5002	FOTA memory is in use

A.2 Message service error result codes +CMS ERROR

Error result code	Description
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

Error result code	Description
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
297	Out of service due to DUAL SIM operation
300	ME failure
301	SMS service of ME reserved
302	Operation not allowed
303	operation not supported
304	Invalid PDU mode parameter
305	Invalid Text mode parameter
310	SIM not inserted
311	SIM PIN required
312	PH-SIM PIN required
313	SIM failure
314	SIM busy
315	SIM wrong
320	memory failure
321	invalid memory index
322	memory full
330	SMSC address unknown
331	no network service
332	network timeout
340	no +CNMA acknowledgement expected
350	Unassigned (unallocated) number
351	Operator determined barring
352	Call barred
353	ME failure
354	Short message transfer rejected
355	Number changed
356	Destination out of order

Error result code	Description
357	Unidentified subscriber
358	Facility rejected
359	Unknown subscriber
364	Requested facility not subscribed
365	Requested facility not implemented
368	Invalid mandatory information
369	Message type non-existent or not implemented
370	Message not compatible with short message protocol state
371	Information element non-existent or not implemented
372	Protocol error, unspecified
373	Interworking, unspecified
360	Network out of order
361	Temporary failure
362	Congestion
363	Resources unavailable, unspecified
366	Invalid short message transfer reference value
367	Invalid message, unspecified
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

Error result code	Description
543	SMS rejected By SMS CONTROL
543	FDN check failed
544	Service Centre Address(SCA) FDN failed
545	Destination Address(DA) FDN failed
546	BDN check failed
547	Unspecified SMS PP error
548	Undefined Result
548	No Route To Destination
549	Channel Unacceptable
555	No Circuit/Channel Available
556	Access Information Discarded
557	Requested Circuit/Channel Not Available By Other Side
558	Quality Of Service Unavailable
560	Bearer Capability Not Authorized
561	Bearer Capability Not Presently Available
562	Service or Option Not Available, Unspecified
563	Bearer Service Not Implemented
564	ACM Equal to or Greater Than ACMmax
565	Only Restricted Digital Information Bearer Capability Is Available
566	Service or Option Not Implemented, Unspecified
567	User Not Member of CUG
568	Incompatible By Destination
569	Invalid Transit Network Selection
571	Message Not Compatible With Protocol State
572	Recovery On Timer Expiry
576	Data Call Active
577	Speech Call Active
579	MOC Setup Rejected Due to Missing ACM Info
580	Temporary Forbidden Call Attempt
581	Called Party is Blacklisted
583	Temporary Forbidden Call Attempt No Service
584	Temporary Forbidden Call Attempt Limited Service
585	Client Temporary Barred
586	Dual Service Call Active
587	Atc Fclass Not Speech
590	Client Not Registrated
591	Active Client Gone
595	Rejected By Call Control
601	Invalid ALS Line
604	MM No Service (out of coverage)
605	MM Access Class Barred (RR_REL_IND During RR Conn. Establishment)
606	ME Busy -CM Service Request Already Pending
608	Rejected Due To SUP Timer Expiry
609	Rejected Due To USSD Busy
610	Rejected Due To SS Busy
612	SIM Toolkit Request Is Rejected, Because Another SIM Toolkit Request Is Pending
614	Rejected Because SIM Toolkit Request Is Not Yet Answered By The User
615	MN Setup SS Error

Error result code	Description
616	Call Controller Blocked (Other Call Command Pending)
618	Environment Parameter Not Set Correctly (Fclass/Cmod)
619	Other Blocking Call Present
620	Lower Layer Failure
621	The Authentication Proedure Failed
622	The Packet-Switched Registration Procedure Failed
623	CM Service Reject From The Network
624	The ABORT Message Was Received From The Network
625	Timer Expiry
626	IMSI Deatch Was Initiated
627	Normal RR Connection Release (2G)
628	Registration Failed
630	Failure Due To Handover
631	Link Establishment Failure
632	Random Access Failure
633	Radio Link Aborted
634	Lower Layer Failure in Layer 1
635	Immediate Assignment Reject
636	Failure Due To Paging
637	Abnormal Release Unspecified
638	Abnormal Release Channel Unacceptable
639	Abnormal Release Timer Expired
640	Abnormal Release No Act On Radio Path
641	Preemptive Release
642	UTRAN Configuration Unknown
643	Handover Impossible
644	Channel Mode Unacceptable
647	Lower Layer Failure From NW
649	Conditional IE Error
650	No Cell Allocation Available
653	Re Establishment Reject
654	Directed Sigconn Re Establishment
656	Release of RRC connection Witout Network Activity(3G) Lower Layer Failure Downlink
657	Lower Layer Failure Uplink
658	Cell Barred Due To Authentication Failure
659	Signalling Connection Release
660	CS Connection Release Triggered By MM
661	RRC Connection Establishment Failure
662	RRC Connection Establsihment Reject With Redirection
663	Resource Conflict
664	Lower Layer Failure in Layer 2
665	L2 Cause T200 Expiry N200 Plus 1 Times
669	RR Connection Release Due to BAND Change (2G)
670	Release of the RRC Connection Due to Out of Service in Cell_Fach (3G)
671	Release of the RRC Connection Due to Not Matching PLMN in Shared Networks(3G)
672	Error Happens While Call Is Already Disconnected / Late Error
674	SIM Toolkit Cannot Initiate A Call, Because MMI Is Not Registered

Error result code	Description
675	SIM Toolkit Call Setup Request Is Rejected Due User Did Not Accept
676	Proactive SIM Appl Terminated By User
677	SIM Toolkit Originated SIM Reset (Refresh Request)
680	Dial String/Number Incorrect

A.3 +CEER error result codes

A.3.1 LEXI-R10 series

The following table lists the supported values for <cause> (number) and <error_description> (string) for +CEER AT command if <type> has the following value:

- EMM cause

<cause>	<error_description>
0	No cause information available
2	IMSI unknown in HSS
3	Illegal UE
5	IMEI not accepted
6	Illegal ME
7	EPS services not allowed
8	EPS services and non-EPS services not allowed
9	UE identity cannot be derived by the network
10	Implicitly detached
11	PLMN not allowed
12	Tracking area not allowed
13	Roaming not allowed in this tracking area
14	EPS services not allowed in this PLMN
15	No suitable cells in tracking area
16	MSC temporarily not reachable
17	Network failure
18	CS domain not available
19	ESM failure
20	MAC (Message Authentication Code) failure
21	Synch failure
22	Congestion
23	UE security capabilities mismatch
24	Security mode rejected, unspecified
25	Not authorized for this CSG
26	Non-EPS authentication unacceptable
35	Requested service option not authorized in this PLMN
39	CS service temporarily not available
40	No EPS bearer context activated
42	Severe network failure
95	Semantically incorrect message
96	Invalid mandatory information
97	Message type non-existent or not implemented
98	Message type not compatible with protocol state
99	Information element non-existent or not implemented
100	Conditional IE error
101	Message not compatible with protocol state

<cause>	<error_description>
111	Protocol error, unspecified

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:

- ESM cause
- EMM cause ESM failure

<cause>	<error_description>
0	No cause information available
8	Operator Determined Barring
26	Insufficient resources
27	Missing or unknown APN
28	Unknown PDN type
29	User authentication failed
30	Request rejected by Serving GW or PDN GW
31	Request rejected, unspecified
32	Service option not supported
33	Requested service option not subscribed
34	Service option temporarily out of order
35	PTI already in use
36	Regular deactivation
37	EPS QoS not accepted
38	Network failure
39	Reactivation requested
41	Semantic error in the TFT operation
42	Syntactical error in the TFT operation
43	Invalid EPS bearer identity
44	Semantic errors in packet filter(s)
45	Syntactical error in packet filter(s)
46	EPS bearer context without TFT already activated
47	PTI mismatch
49	Last PDN disconnection not allowed
50	PDN type IPv4 only allowed
51	PDN type IPv6 only allowed
52	Single address bearers only allowed
53	ESM information not received
54	PDN connection does not exist
55	Multiple PDN connections for a given APN not allowed
56	Collision with network initiated request
57	PDN type IPv4v6 only allowed
58	PDN type non IP only allowed
59	Unsupported QCI value
81	Invalid PTI value
95	Semantically incorrect message
96	Invalid mandatory information
97	Message type non-existent or not implemented
98	Message type not compatible with protocol state
99	Information element non-existent or not implemented
100	Conditional IE error
101	Message not compatible with protocol state

<cause>	<error_description>
111	Protocol error, unspecified
112	APN restriction value incompatible with active EPS bearer context
113	Multiple accesses to a PDN connection is not allowed

A.4 Firmware install final result codes

The +UFWINSTALL AT command issues a final result code providing the result of the FW install procedure. In case the FW install procedure fails, the error result code provides some indication about the error cause (syntax error or issue during the installation procedure).

A.4.1 LEXI-R10 final result codes from command syntax

Syntax error resulting from the +UFWINSTALL command:

Error result code	Verbose description	Description
4	+CME ERROR: not supported	One of the following cases: • Wrong serial port number • Wrong baud rate • Number of parameters not allowed • Filename too long
1624	+CME ERROR: FFS file not found	The delta file is not stored in the module FS or the filename is wrong

A.4.1.1 LEXI-R10 final result codes table

This table lists +UUFWINSTALL URCs applicable to LEXI-R10 series modules during the execution of the +UFWINSTALL AT command:

Error result code	Description
128	Firmware install success
129	Firmware install generic failure
158	Delta file not recognized. It happens trying to update from a no delta file format
168	Source firmware in flash memory mismatch with the one expected by the delta file
180	Package size more than allowed

A.5 LEXI-R10 FOAT error result codes

This table lists the allowed error result codes applicable to LEXI-R10 series modules during the execution of the +NFWUPD AT command:

Error result code	Description
ERROR: PARAM INVALID	A parameter is out of range
ERROR: OPER UNSUPPORTED	Command other than the supported AT+NFWUPD=? and AT +NFWUPD=
ERROR: PACKET NOT VALID	Delta packet is corrupted or not recognized
ERROR: SOURCE FIRMWARE MISMATCH	Current installed firmware is not as expected
ERROR: 3	+NFWUPD=1 command, package size zero or more than allowed
ERROR: 4	+NFWUPD=1 command, sequence number not starting from zero or not consecutive
ERROR: 5	+NFWUPD=1 command, current packet XOR8 check error
ERROR: 6	Flash not erased, do +NFWUPD=0 before starting download
ERROR: 7	Internal error occurred during flash erase
ERROR: 8	Internal error occurred during write or data readback
ERROR: 9	Internal error occurred during read

Error result code	Description
ERROR: 10	Internal logic error, should not be seen

A.6 Internal TCP/UDP/IP stack class error codes

A.6.1 LEXI-R10 series

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.

Error result code	Description	Resulting from the following commands
0	No error	+USOCR, +USOSO, +USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI
1	EDOM - Argument out of domain	+USOCR, +USOSO, +USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI
2	ERANGE - Result not representable	+USOCR, +USOSO, +USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI
3	ESRCH - No such process	+USOCR, +USOSO, +USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI
4	EILSEQ - Illegal byte sequence	+USOCR, +USOSO, +USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI
5	EINVAL - Invalid argument	+USOCR, +USOSO, +USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI
6	ENOMEM - Out of memory (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	+USOCO, +USOWR
12	EPERM - Operation not permitted (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	ENOENT - No such resource (internal error)	+USOCR, +USOSO, +USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI
32	EPIPE - Broken pipe (internal error)	+USOCR, +USOSO, +USOWR, +USOST, +USORD, +USORF, +USOLI
33	EINTR - Interrupted system call (internal error)	+USOCR, +USOSO, +USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI
34	EIO - I/O error (internal error)	+USOCR, +USOSO, +USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI
38	ENOSYS - Function not implemented	+USOCTL
64	ENONET - Machine is not on the internet	+USOCR, +USOWR, +USOST, +USORD, +USORF, +USOLI
65	EEOF - End of file	+USOWR, +USOST, +USORD, +USORF

Error result code	Description	Resulting from the following commands
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, +USOSO, +USOGO
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, +USOSO
98	EADDRINUSE - Address already in use	+USOCR, +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, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI
104	ECONNRESET - Connection reset by peer	+USOCR, +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, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI
108	ESHUTDOWN - Cannot send after transport endpoint shutdown	+USOCR, +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
115	EINPROGRESS - Operation now in progress	+USOCR, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI

A.7 Internet suite error classes

The following table lists all allowed error classes that can be provided by the <error_class> parameter for these AT error commands:

- LEXI-R10 - +UHTTPER, +UMQTTER that provide the error of the last HTTP, MQTT operation.

<error_class>	Description	<error_codes>	Resulting from the following commands
0	OK, no error occurred		All
3	HTTP protocol error class	See the Appendix A.7.1	+UHTTP, +UHTTPC
4	Flash file system error class	See the Appendix A.7.2	+UFTPC, +UFTPER, +UHTTPC
5	DNS error class		+UFTPC, +UHTTPC, +USMTPC

<error_class>	Description	<error_codes>	Resulting from the following commands
6	Socket error class	BSD error codes standard	All
7	Dynamic memory error	0	All
10	Wrong HTTP API usage (e.g. missing/null parameters)	See the Appendix A.7.1	+UHTTP, +UHTTPC
11	Syntax error in high layer protocol (wrong/missing/ corrupted data)		+UFTPC, +UHTTPC, +USMTPC
12	Unspecified error	0	All
13	MQTT error class	See the Appendix A.7.3	+UMQTT, +UMQTTC, +UMQTTWTOPIC, +UMQTTWMSG

A.7.1 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 (for more details, see the +UHTTP and +UHTTPC AT commands description).

Error result code	Description
0	No error
1	Invalid profile ID
2	Invalid input
3	Server hostname too long
4	Invalid server hostname
5	Invalid server IP address
6	Invalid authorization method
7	Server missing
8	Username length exceeded
9	Password length exceeded
10	Internal error
11	Server connection error
12	Error occurred in HTTP request
13	Internal error
14	Internal error
15	Invalid POST data size
16	Empty FFS filename
17	Invalid FFS file length
18	Invalid content-type specified
19	Internal error
20	Internal error
21	Internal error
22	PSD or CSD connection not established
23	Server or proxy hostname lookup failed
24	User authentication failed on server
25	User authentication failed on proxy
26	Connection timed out
27	Request prepare timeout expired
28	Response receive timeout expired
29	Request send timeout expired
30	HTTP operation in progress
31	Invalid HTTP parameter TCP port not in range (1-65535)
32	Invalid HTTP parameter secure

Error result code	Description
33	Invalid HTTP parameter authentication username
34	Invalid HTTP parameter authentication password
35	Invalid HTTP parameter output filename
36	Invalid HTTP parameter output filename length
37	Invalid HTTP parameter server path
38	Invalid HTTP parameter server path length
39	Invalid HTTP parameter content filename length
40	Invalid custom content type string
41	Output file open error
42	Output file close error
43	Output file write error
44	Connection lost
45	Operation not allowed in current state
46 - 72	Internal error
73	Secure socket connect error

A.7.2 File system class error codes

LEXI-R10

The following table lists the available values of <error_code> parameter of the last HTTP operation provided through the +UHTTPER AT commands.

Error result code	Description
2	Operation performed with success
3	Initialization in progress
4	File already opened
5	File not opened
6	File not found
7	File already created
8	Illegal id
9	Illegal file handle
10	Illegal type
11	Illegal mode
12	File range error
13	The operation is not possible
14	Write error
15	User id error
16	Internal fatal error
17	Memory resource error
18	Maximum number of files exceeded
19	Memory not available
20	Invalid filename
21	Streaming not enabled
22	Operation not allowed on static file
23	Memory table inconsistency
24	Not a factory default file
25	Requested memory temporary not available
26	Operation not allowed for a directory
27	Space in the directory space not available
28	Too many streaming files opened

Error result code	Description
29	Requested dynamic memory temporary not available
30	The user provided a NULL parameter instead of a suitable buffer

A.7.3 MQTT error codes

A.7.3.1 LEXI-R10 MQTT class error codes

The following table lists the available values of <error_code> parameter of the last MQTT operation provided through the +UMQTTER AT command.

Error result code	Description
0	Operation performed with success
1	Memory failure
2	Invalid parameter
3	Invalid parameter range
4-7	Internal error
8	Cannot set secure socket
9	Invalid client identifier
10	Client identifier length out of range
11	Syntax error in client identifier
12	Invalid broker
13	Broker length out of range
14	Broker port out of range
15	Invalid username or password
16	Username length out of range
17	Password length out of range
18	Keep alive time out of range
19	Security mode out of range
20	Wrong Security Manager Profile
21	Security Manager Profile out of range
22	Invalid topic
23	Topic length out of range
24	Missing message or filename
25	Cannot get file size
26	File size out of range
27	Cannot open file
28	Cannot read file
29	QOS out of range
30	Retain out of range
31	Wrong will message length
32	Wrong publish message length
33	Timeout error
34	No Network service
35	Broker not connected
36	Broker connection refused
37	Broker connection refused, wrong protocol version
38	Broker connection refused, identifier rejected
39	Broker connection refused, server unavailable
40	Broker connection refused, bad user name or password
41	Broker connection refused, not authorized
42	MQTT client out of buffer
43	MQTT client malformed remaining length
44	MQTT client packet type mismatch
45	MQTT client packet Id mismatch
46	MQTT client invalid internal state
47	MQTT client TLS connect error

Error result code	Description
48	MQTT client STDIN Wake error
49	Incoming message cannot be saved, the buffer is full
50	PSD or CSD connection not established
51	Error in callback
52	Malformed packet
53	MQTT session active, profile configuration not allowed
54	Incoming publish packet too long
55	Keep alive time is 0, ping loop not activated
56	Communication closed by server
57	Cannot enter in binary mode

A.8 Ping error result codes

The following table lists the available values of <error_code> parameter of the last ping operation provided through +UUPINGER URC (for more details, see the +UPING AT command description).

Error result code	Description
0	Success (no error)
1 - 6	Internal error (ping level)
7	Empty remote host
8	Cannot resolve host
9	Unsupported IP version (RFU)
10	Invalid IPv4 address
11	Invalid IPv6 address (RFU)
12	Remote host too long
13	Invalid payload size
14	Invalid TTL value
15	Invalid timeout value
16	Invalid retries number
17	PSD or CSD connection not established
100 - 105	Internal error (ICMP level)
106	Error creating socket for ICMP
107	Error settings socket options for ICMP
108	Cannot end ICMP packet
109	Read for ICMP packet failed
110	Received unexpected ICMP packet
111-115	Internal error (socket level)

A.9 SNTP error result codes

The following table lists the available values of <error_code> parameter of the last SNTP operation provided through +UUSNTPER URC (for more details, see the +USNTP AT command description).

Error result code	Description
1	Error in socket creation
2	Parameter invalid
3	URL not valid
4	Network error
5	Time out error
6	Cid is not activated

B Appendix: AT Commands List

	AT command	File System											
		+FCLOSE	+FDELETE	+FERASE	+FOPEN	+FPOSITION	+FREAD	+FSEEK	+FTUCAT	+FWRITE	+FWRITEHEX	+ULSTFILE	
LEXI	R10401D-00B	•	•	•	•	•	•	•	•	•	•	•	
	R10801D-00B	•	•	•	•	•	•	•	•	•	•	•	

AT command		General commands										
		+CCID	+CGMI	+CGMM	+CGMR	+CGSN	+CIMI	+CSCS	+GMI	+GMM	I	
LEXI	R10401D-00B	•	•	•	•	•	•	•	•	•	•	
	R10801D-00B	•	•	•	•	•	•	•	•	•	•	

AT command		GPIO interface			
		+UGPIOC	+UGPIOR	+UGPIOW	
LEXI	R10401D-00B	•	•	•	
	R10801D-00B	•	•	•	

AT command		Internet suite								
		+UDNSCFG	+UDNSRN	+UHTTP	+UHTTPAC	+UHTTPC	+UHTTPER	+UHTTPNV	+UPING	
LEXI	R10401D-00B	•	•	•	•	•	•	•	•	
	R10801D-00B	•	•	•	•	•	•	•	•	

AT command		Device and data security			
		+USECCHIP	+USECMNG	+USECPRF	
LEXI	R10401D-00B	•	•	•	
	R10801D-00B	•	•	•	

AT command		Localization features			
		+UGSRV	+ULOC	+ULOCIND	
LEXI	R10401D-00B	•	•	•	
	R10801D-00B	•	•	•	

	AT command	Mobile equipment control and status									
		+CCLK	+CEER	+CFUN	+CMEE	+CPWROFF	+CSGT	+CTZR	+CTZU	+USNTP	
LEXI	R10401D-00B	•	•	•	•	•	•	•	•	•	
	R10801D-00B	•	•	•	•	•	•	•	•	•	

	AT command	Network service																						
		+CEDRXRDP	+CEDRXS	+CESQ	+CNEC	+CNUM	+COPS	+CPLS	+CPOL	+CREG	+CSCON	+CSQ	+UBANDCONF	+UCELLBAR	+UCESQS	+UCGED	+UCONNREL	+UDRX	+UFPLMNDEL	+UFREQLOCK	+UMACQOSTMR	+UMNOPROF	+UNASTCFG	+UPSCONFIG
LEXI	R10401D-00B	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
	R10801D-00B	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

AT command		Network service						
		+UPSSTAT	+URPMCONF	+URPMPARAM	+URPMVERSION	+USCANSTAT	+UUSERSCAN	
LEXI	R10401D-00B	•	•	•	•	•	•	
	R10801D-00B	•	•	•	•	•	•	

AT command		Networking			
		+UIPADDR	+UNETCFG	+UNETDEVCTL	
LEXI	R10401D-00B	•	•	•	
	R10801D-00B	•	•	•	

	AT command	Packet switched data services																		
		+CEMODE	+CEREG	+CGACT	+CGAPNRC	+CGATT	+CGAUTH	+CGCMOD	+CGCONTRDP	+CGDCONT	+CGDSCONT	+CGEQOS	+CGEQOSRDP	+CGEREP	+CGPADDR	+CGTFT	+UDCONF=19	+UDCONF=9	D*	H	
LEXI	R10401D-00B	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	R10801D-00B	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	

AT command		Device lock				
		+CLCK	+CPIN	+CPINR	+CPWD	
LEXI	R10401D-00B	•	•	•	•	
	R10801D-00B	•	•	•	•	

AT command		Serial interface														
		&C	&D	&F	&K	&V	&W	+CMUX	+ICF	+IFC	+IPR	E	O	Q	V	
LEXI	R10401D-00B	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	R10801D-00B	•	•	•	•	•	•	•	•	•	•	•	•	•	•	

AT command		Short Messages Service																			
		+CMGC	+CMGD	+CMGF	+CMGL	+CMGR	+CMGS	+CMGW	+CMMS	+CMSS	+CNMA	+CNMI	+CPMS	+CSCA	+CSCB	+CSDH	+CSMP	+CSMS	+UCMGR	+UCMGS	+USMSSEND	
LEXI	R10401D-00B	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	R10801D-00B	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	

AT command		SIM functionalities									
		+CCHC	+CCHO	+CGLA	+CRSM	+CSIM	+STKPROF	+UBIP	+UDCONF=50	+USIMSTAT	
LEXI	R10401D-00B	•	•	•	•	•	•	•	•	•	
	R10801D-00B	•	•	•	•	•	•	•	•	•	

AT command		System features																					
		+NFWUPD	+UANTR	+UATUN	+UDCONF=201	+UFACTORY	+UFWINSTALL	+UNVMCFG	+UNVMF	+UNVMR	+UNVMW	+URING	+USIO	+UTEMP	+UTEST=0	+UTEST=10	+UTEST=2	+UUARTCONF	+UURCCFG	+UURCSTAT	+UUSBCONF	+UUSBSLPCONF	+UWIFISCAN	
LEXI	R10401D-00B	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	R10801D-00B	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	

AT command		Power management					
		+CPSMS	+UPSMR	+UPSV	+USLPURC	+USLPVOTE	
LEXI	R10401D-00B	•	•	•	•	•	
	R10801D-00B	•	•	•	•	•	

	AT command	Internet protocol transport layer																	
		+UDCONF=1	+UDCONF=101	+UIPERF	+USOCL	+USOCO	+USOCR	+USOCTL	+USODL	+USOER	+USOGO	+USOLI	+USORD	+USORF	+USOSEC	+USOSO	+USOST	+USOWR	
LEXI	R10401D-00B	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
	R10801D-00B	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	

	AT command	MQTT				
		+UMQTT	+UMQTTC	+UMQTTER	+UMQTTNV	
LEXI	R10401D-00B	•	•	•	•	
	R10801D-00B	•	•	•	•	

B.1 Parameters stored in profiles

The parameter settings of some commands can be stored in the profiles available in the memory module.

LEXI-R10
To store and display these profiles, see the AT&W and AT&V commands description.

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.

LEXI-R10
Since each AT interface has its own configuration in RAM and NVM, AT configuration sharing is an exceptional condition. See Chapter 1.4

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 / Remarks
&C	DCD status	No	1 (DCD enabled)
&D	DTR status	No	1 (DTR enabled)
&K	Flow control status	No	• LEXI-R10 - The command setting is stored in the NVM
+CEDRXS	eDRX setting	No	• LEXI-R10 - 0 (use of eDRX disabled)
+CEREG	EPS Network registration status reporting	Yes	• LEXI-R10 - 0 (network registration URC disabled)
+CGEREP	EPS Network registration status reporting	No	• LEXI-R10 - 0 (event reporting disabled), 0 (buffer cleared when switching mode)
+CMEE	Mobile termination error reporting	Yes	
+CMGF	Preferred message format	Yes	• LEXI-R10 - 1 (format of messages in Text mode)
+CNEC	Network error code reporting	No	0 (URC reporting disabled)
+CNMI	New message indication	Yes	• 1 (discard indication and reject new received message URCs when MT-DTE link is reserved) • 0 (no SMS-DELIVER indications are routed to the TE) • 0 (no CBM indications to the DTE) • 0 (no SMS-STATUS-REPORTs are routed to the DTE) • 0 (MT buffer of URCs defined within this command is flushed to the DTE when >mode< 1...3 is entered) • LEXI-R10 - The command setting is stored in the NVM
+COPS	Operator selection	Yes	
+CPMS	Preferred message storage	No	• LEXI-R10 - The command setting is stored in the NVM
+CREG	Network registration status reporting	Yes	• LEXI-R10 - 0 (network registration URC disabled)
+CSCA	Service center address	No	• LEXI-R10 - The command setting is stored in the NVM.

AT command	Description	AT interface configuration sharing	Factory-programmed value / Remarks
+CSCB	Cell broadcast message types	No	
+CSMP	Select message service	No	
+CSCS	Select character set configuration	No	• LEXI-R10 - The command setting is not stored in the profile
+CSMS	Select message service	No	• LEXI-R10 - 0 <service>
+CSDH	Show text mode parameters	No	• LEXI-R10 - 0 <show>
+CTZR	Time zone reporting	Yes	
+ICF	DTE-DCE character framing	No	• LEXI-R10 - 3, 1 (framing format: 8 data 1 stop, no parity) • LEXI-R10 - The command settings is stored in the NVM
+IFC	DTE-DCE local flow control	No	• LEXI-R10 - 2 (<DCE_by_DTE> on circuit 106 (CTS)), 2 (<DTE_by_DCE> on circuit 105 (RTS)) • LEXI-R10 - The command settings is stored in the NVM
+IPR	Baud rate	No	• LEXI-R10 - The command settings is stored in the NVM
+UCESQS	Signal quality change reporting control	No	0 (event reporting disabled), 0 (report all events, when enabled)
+UPSV	Power saving control	Yes	• LEXI-R10 - The command setting is stored in the NVM
+USLPURC	Enables or disables URCs to be sent when the module enters and exits deep-sleep modes	No	"SLEEP1":0, "SLEEP2":0, "HIBNATE":0
+USIO	Serial interfaces configuration	Yes	• LEXI-R10 - The command setting is stored in the NVM
+UURCSTAT	Multiple URCs reporting	No	Reporting disabled for all the considered URCs
E	Echo status	No	1 (echo enabled)
Q	Result code suppression	No	0 (DCE transmits result codes)
V	DCE response format	No	1 (Verbose response text)

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
E	Echo status	• LEXI-R10 - The command setting is stored in the personal profile
&C	DCD status	• LEXI-R10 - The command setting is stored in the personal profile
&D	DTR status	• LEXI-R10 - The command setting is stored in the personal profile
&K	Flow control status	• LEXI-R10 - 3 (RTS/CTS DTE flow control enabled)
+CCLK	Clock	
+CEDRXS	eDRX setting	• LEXI-R10 - 0 (use of eDRX disabled), 4 (LTE), "0011", "0001"
+CEMODE	UE modes of operation for EPS	
+CGDCONT	PDP context definition	
+CGEQOS	Define EPS quality of service	
+COPS	Operator selection	

AT command	Description	Factory-programmed value / Comment
+CPMS	Preferred message storage	
+CPSMS	Power Saving Mode setting	
+CSCA	Service center address setting	• LEXI-R10 - service center address is read from SIM and populated in NVM
+CSCON	Connection status signalling	• LEXI-R10 - The command setting is stored in the personal profile
+CSCS	Select character set configuration	• LEXI-R10 - "IRA" (International Reference Alphabet)
+CSGT	Set greeting text	
+CSMP	Select message service	
+CSMS	Message service configuration	• LEXI-R10 - The command setting is stored in the personal profile
+CNMI	New message indication	• LEXI-R10 - 1 <mode>, 2 <mt>, 0 <bm>, 0 <ds>, 0 <bfr>
+CTZR	Time zone reporting	• LEXI-R10 - 0 (disable the time zone change event reporting)
+CTZU	Automatic time zone update	• LEXI-R10 - 1 (automatic time zone via NITZ enabled)
+IPR	Baud rate	
+UBANDCONF	Band configuration	• LEXI-R10401D - 2, 4, 5, 12, 13, 66, 71 • LEXI-R10801D - 1, 3, 5, 7, 8, 20, 28
+UFREQLOCK	Frequency / Cell Lock	0 (disabled cell/frequency locks)
+UBIP	Bearer Independent Protocol status indication	0 (BIP status indication disabled) • LEXI-R10 - The command setting is stored in the personal profile
+UDCONF=9	Uplink user data plane configuration	
+UDCONF=19	Default CID and preferred protocol type configuration	1 (<cid>), 0 (IPv4)
+UDCONF=50	SIM hot insertion detection	0 (disabled)
+UDCONF=101	Discarding configuration for TCP packets not fitting windows size	1 (discard enabled)
+UDCONF=121	Disable the deep cells scan for database feeding in AssistNow Online operation	0 (deep cells scan enabled)
+UFACTORY	Restore factory configuration	0 (no FS factory restore), 0 (no NVM factory restore)
+UGPIOC	GPIO functionality setting	• LEXI-R10 - GPIO1: 255, GPIO2: 255, GPIO3: 255, GPIO4: 255, GPIO5: 255, GPIO6: 255, I2S_WA: 255, I2S_TXD: 255, I2S_CLK: 255, I2S_RXD: 255
+UGSRV	Aiding server configuration	"cell-live1.services.u-blox.com" (primary MGA server), "cell-live2.services.u-blox.com" (secondary MGA server), 14 (Number of days for validation of Offline data), 4 (Number of weeks for validation of Offline data), 1 (Resolution of offline data for MGA), 65 (Desired GNSS for the (offline) aiding: GPS and GLONASS), 0 (AssistNow Online data are downloaded at GNSS receiver power up), 15 (all the desired data types for the (online) aiding are set), 1 (PDP context identifier)
+ULOCIND	Localization information request status unsolicited indication	• LEXI-R10 - The command setting is not stored in the NVM
+UMACQOSTMR	MAC QoS inactivity timer(s)	• LEXI-R10 - The command setting is not stored in the NVM.
+UMNOPROF	MNO profile configuration	
+UNASTCFG	NAS timers configuration	• T3482 timer configuration (+UNASTCFG=1) o 8 (T3482 timer value: 8 s) o 5 (PDN connectivity request attempts) • T3492 timer configuration (+UNASTCFG=2) o 6 (T3492 timer value: 6 s) o 5 (PDN disconnect request attempts)

AT command	Description	Factory-programmed value / Comment
+UNETCFG	Set network adapter parameters	• networking mode configuration("nat") o 0 (NAT is disabled (bridge mode)) • ppp authentication rule ("pppauthselect") o 0 (PPP dial-up authentication parameters are predefined)
+UNETDEVCTL	Controls the data path for the network adapter	• Binding option o 0 (no binding) • cid o 0 (invalid cid) • URC reporting o 0 (URC disabled) • Activation state o 0 (not activated)
+UNVMCFG	NVM RAM mode management	• LEXI-R10 NVM RAM mode management o 0 ("generic" class mode) o 0 ("gnss" class mode) o LEXI-R10 0 ("aonnvm" class mode) o LEXI-R10 0 ("aonnvmbckp" class mode) • LEXI-R10 NVM URC management o 0 ("urc" setting)
+UPSV	Power saving control	• LEXI-R10 - 0 (power saving disabled)
+UPSCONFIG	USIM simulator and PS configuration	"REL": 13 (UE release 13), "PWC": 3 (UE power class 3)
+UPSMR	Deep-sleep mode indication	0 (deep-sleep mode URC disabled)
+URING	RING line handling	0 (feature disabled (RING line is only asserted on incoming call and incoming SMS))
+URPMCONF	Radio Policy Manager (RPM) configuration	• LEXI-R10 - <PLMN> list: "901.40","276.01","232.03","232.07","230.01","219.01","262.01","202.01","216.30","294.01","297.02","220.04","204.16","204.20","260.02","226.03","226.06","231.02","262.06","999.01"
+URPMPARAM	Radio Policy Manager (RPM) parameters configuration	• <rpmflag>: 0 • <N1>: 1 • <T1>: 60 (minutes) • <T1_ext>: 48 (hours) • <F1>: 60 • <F2>: 30 • <F3>: 60 • <F4>: 30 • <isOmParamsValid>: 1 (Operational management functionality enabled) • <CBR1>: 0 • <CR1>: 0 • <CPDP1>: 0 • <LR1>: 0 • <LR2>: 0 • <LR3>: 0
+USIMSTAT	(U)SIM initialization status reporting	0 (URC +UUSIMSTAT disabled)
+USIO	Serial interfaces configuration	• LEXI-R10 - 0 (AT command on 9-wire UART, USB1 and USB3, diagnostic log on USB2, no AUX UART)
+UATUN	Antenna dynamic tuner	Antenna dynamic tuner control: 0 (disabled)
+UUARTCONF	UART baud rate and flow control NVM management	
+UURCCFG	URC reporting behavior configuration	• LEXI-R10 o <config_item>= 0: The command setting is not saved in the NVM o <config_item>= 1: 1 (URC deferring enabled)
+UUSBCONF	USB profiles configuration	

AT command	Description	Factory-programmed value / Comment
+UUSBSLPCONF	Configures USB capability to allow module to enter sleep state	0 (usb_allow_sleep), 0 (usb_min_allowed_sleep)
V	DCE response format	

B.3 Saving AT commands configuration

The following procedure can be used to store the AT commands configuration of each AT interface for the AT commands listed in Appendix B.1:

- LEXI-R10 - Write the run-time configuration (if changed) of the AT commands listed in Appendix B.1 to the NVM by means of the AT&W command (e.g. AT&W0)

The following procedure can be used to store the AT commands configuration for the AT commands listed in Appendix B.2:

- LEXI-R10 - 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 maximum command response time

After having sent a command to a u-blox cellular module, the time to obtain a result code depends on the SIM and the network. Immediate response is possible, if the command does not interact with either the SIM or the network.

The following table reports the maximum time to get the result code for the AT commands, which are grouped by categories.

Category	Estimated maximum time to get response	Commands
Power off	• LEXI-R10 - 5 s	+CPWROFF
Set module functionality	• LEXI-R10 - 25 s	+CFUN
Call control	• LEXI-R10 - Up to 50 seconds	H
Dial	• LEXI-R10 - Up to 50 seconds	D*
Data connection commands	• LEXI-R10 - Up to 45 seconds	+CGATT
Network commands	• LEXI-R10 - Up to 60 s	+COPS
Network commands	< 10 s	+UMACQOSTMR
Network commands	< 5 s	+UCONNREL, +UFPLMNDEL
Signal quality change reporting control	< 5 s	+UCESQS
Security	• LEXI-R10 - Up to 3 minutes • LEXI-R10 - 5 s	+CLCK, +CPWD
Delete all SMSes	< 55 s	+CMGD
Send SMS	• LEXI-R10 - 60 s (calculated from prompt ">")	+CMGS, +CMGC, +CMSS, +UCMGS
SMS acknowledgement to MT	• LEXI-R10 - 30 s	+CNMA
Inline send message	< 60 s	+USMSSEND
SMS list message	< 10 s	+CMGL
Preferred message storage	< 10 s	+CPMS
SIM management	< 10 s	+CMGW, +CMGR, +UCMGR, +CNUM, +CPIN, +CPINR, +CPOL, +CRSM, +CSCA, +CSCB, +CSMP

Category	Estimated maximum time to get response	Commands
PDP context activation and deactivation	• LEXI-R10 - Up to 45 seconds	+CGACT
PDP context modification	• LEXI-R10 - Up to 45 seconds	+CGCMOD
Restore configuration	< 5 s	+UFACTORY
End user test (antenna dynamic tuner control)	< 5 s	+UATUN
GPIO commands	< 10 s	+UGPIOC, +UGPIOR, +UGPIOW
Internet suite (socket connect)	• LEXI-R10 - < 70 s	+USOCO
Internet suite (socket connect with SSL)	• LEXI-R10 - < 70 s	+USOSEC
Internet suite (socket write)	• LEXI-R10 - < 60 s	+USOWR
Internet suite (UDP socket write)	• LEXI-R10 - < 60 s	+USOST
Internet suite (socket closure)	• LEXI-R10 - 5 s	+USOCL
Internet suite	• LEXI-R10 - 15 s	+USODL, +USOLI, +USORD, +USORF
Resolve name/IP number through DNS	• LEXI-R10 - < 30 s	+UDNSRN
GNSS commands	< 10 s (except +UGPS for which timeout is according to the performed operation)	+ULOC
Wi-Fi scan configuration	< 255 s	+UWIFISCAN
MQTT command	• LEXI-R10 - immediate	+UMQTTC
SNTP Command	< 45 s	+USNTP

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 its own run-time AT commands configuration (AT command profile), which 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 the other physical interfaces (e.g. UART, SPI), AT command interfaces over USB only exist when the module is connected to DTE by USB. 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:

- Any data connection (both circuit switched and packet switched) established over an AT command interface associated to the USB interface is released.
- 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 24 provides the major differences.

AT command	UART / AUX UART (where available)	Multiplexer	USB (where available)	SPI (where available)
&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)
+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)
+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)
+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)
+UPSV	Effective	Returns OK, but it changes UART setting	Returns OK, but it changes UART setting	Returns OK, but it changes UART setting

Table 24: Interface comparison

LEXI-R10
Multiple direct link connections are not allowed. When considering the number of active direct links, take into account also the connection established by the +USODL AT command, the UHTTP direct link mode (see parameters http_command=6 and http_command=7 in +UHTTPC command) and the +FREAD AT command.

C Mobile Network Operator profiles

C.1 LEXI-R10 Introduction

By means of +UMNOPROF AT command the module is able to manage different MNO profiles that configure the module according to the MNO requirements. Reboot the module by means of the +CFUN AT command to make the MNO profile active. For more details, see +UMNOPROF AT command.

Depending on the module type numbers the MNO profile version can assume different settings. The following tables provide an overview of each MNO profile and the list of AT commands whose setting can be overridden by the MNO profile. Depending on MNO profile the corresponding AT command setting can be locked by the MNO profile (see "Locked" field for more details).

☞ The <MNO>=101 (standard Europe No-ePCO) profile factory-programmed configuration is the same of the <MNO>=100 (standard Europe profile), but the ePCO is disabled.

C.2 LEXI-R10401D Americas MNO and conformance profiles table

	AT&T	Verizon	Global	FirstNet
MNO profile				
<MNO>	2	3	90	206
+UBANDCONF				
LTE bands	2,4,5,12,66,71,14	13,5,2,4,12	2,4,5,12,13,14,66,71	14,2,4,5,12,66,71
+CGDCONT				
CID (context ID) 1	"IPV4V6","broadband"	"IPV4V6", "VZWINTERNET"	empty	"IPV4V6","firstnet-broadband"
CID (context ID) 2	empty	"IPV4V6","VZWADMIN"	empty	empty
CID (context ID) 4	empty	"IPV4V6","VZWAPP"	empty	empty
LwM2M feature				
Available	No[5]	Yes	No	No[5]
LwM2M capabilities	None[6]	VZW[7]	None	None[6]
uFOTA-LwM2M capabilities	None[8]	VZW FOTA[8]	None	None[8]
+CEMODE				
Mode configuration	CS/PS mode 2 of operation	CS/PS mode 2 of operation	CS/PS mode 2 of operation	CS/PS mode 2 of operation
Other preconfigured MNO profile fields				
MTU size	From PCO (1430)	From PCO (1428)	From PCO (1500)	From PCO (1342)

[5] LwM2M client can be enabled via +ULWM2M AT command, see LEXI-R10 series LwM2M objects and commands application note.

[6] u-blox and AT&T servers can be enabled via +ULWM2MCONFIG AT command, see LEXI-R10 series LwM2M objects and commands application note [13].

[7] u-blox server can be enabled via +ULWM2MCONFIG AT command, see LEXI-R10 series LwM2M objects and commands application note [13].

[8] uFOTA can be enabled via +ULWM2MCONFIG AT command, see LEXI-R10 series LwM2M objects and commands application note [13].

C.3 LEXI-R10801D Americas MNO and conformance profiles table

	Global
MNO profile	
<MNO>	90
+UBANDCONF	
LTE bands	1,3,5,7,8,20,28
+CGDCONT	
CID (context ID) 1	"IPV4V6",""
LwM2M feature	
Available	No
LwM2M capabilities	None
uFOTA-LwM2M capabilities	None
+CEMODE	
Mode configuration	CS/PS mode 2 of operation
Other preconfigured MNO profile fields	
MTU size	From PCO (1428)

D Appendix: glossary

Abbreviation	Definition
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
CSG	Closed Subscriber Group
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
DM	Device Management
DNS	Domain Name Server
DSR	DSC transponder response
DTE, TE	Data Terminal Equipment
DTMF	Dual Tone Multi Frequency
DTR	Data Terminal Ready
DUT	Device Under Test
EARFCN	E-UTRAN Absolute Radio Frequency Channel Number
eCall	Emergency Call
e-CDRX	Extended Connected Mode DRX
eDRX	Extended Discontinuous Reception
EEP	EEPROM Emulation Parameters

Abbreviation	Definition
EF	Elementary File
EF_{CGST}	Elementary File "Closed Subscriber Group Type"
EF_{HNBN}	Elementary File "Home Node B Number"
$EF_{PLMNwAcT}$	Elementary File "User controlled PLMN Selector with Access Technology"
EF_{HPPLMN}	Elementary File "Higher Priority PLMN search period"
eIM	eCall In-band Modem
EONS	Enhanced Operator Name from SIM-files EF_{OPL} and EF_{PNN}
EPD	Escape Prompt Delay
EPS	Evolved Packet System
eSIM	Embedded Subscriber Identity Module
ETSI	European Telecommunications Standards Institute
E-UTRAN/EUTRAN	Evolved UTRAN
FDN	Fixed Dialling Number
FOAT	Firmware Over AT
FOTA	Firmware Over The Air
FS	File System
FTP	File Transfer Protocol
FW	Firmware
FWINSTALL	Firmware Install
GAS	Grouping information Alpha String
GERAN	GSM/EDGE Radio Access Network
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
HNB	Home Node B
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
IMS	IP Multimedia Subsystem
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

Abbreviation	Definition
LwM2M	Lightweight M2M
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
MSC	Modem Status Command
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
NAA	Network Access Application
NAS	Non Access Stratum
NITZ	Network Identity and Time Zone
NVM	Non-Volatile Memory
ODIS	OMA-DM IMEI Sync
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
PPP	Point-to-Point Protocol
PSAP	Public Safety Answering Point (eCall related)
PSD	Packet-Switched Data
PSK	Private Shared Key
PUK	Personal Unblocking Key
QoS	Quality of Service
RAM	Random Access Memory
RDI	Restricted Digital Information
RFU	Reserved for Future Use
RI	Ring Indicator
RNDIS	Remote Network Driver Interface Specification
RRC	Radio resource control
RTC	Real Time Clock
RTP	Real-time Transport Protocol
RTS	Request To Send
Rx	Receiver
SAP	SIM Access Profile
SC	Service Centre

Abbreviation	Definition
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
SES	Speech Enhancement System
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
ZTP	Zero Touch Provisioning

Related documentation

1. TOBY-L4 series data sheet, UBX-16009856
2. TOBY-L4 series system integration manual, UBX-16024839
3. TOBY-L2 series data sheet, UBX-13004573
4. MPCI-L2 series data sheet, UBX-13004749
5. TOBY-L2 / MPCI-L2 series system integration manual, UBX-13004618
6. LARA-R6 series data sheet, UBX-21004391
7. LARA-L6 series data sheet, UBX-21047783
8. LARA-L6 / LARA-R6 series system integration manual, UBX-21010011
9. LARA-L6 / LARA-R6 series application development guide, UBX-22001850
10. LARA-R6 series Internet applications development guide, UBX-22001854
11. LARA-R6 end user test application note, UBX-22008644
12. LARA-R6 audio application note, UBX-22001999
13. LARA-L6 / LARA-R6 LwM2M objects and commands application note, UBX-22008379
14. LARA-L6 / LARA-R6 firmware update application note, UBX-22008011
15. LARA-R2 series data sheet, UBX-16005783
16. LARA-R2 series system integration manual, UBX-16010573
17. TOBY-R2 series data sheet, UBX-16005785
18. TOBY-R2 series system integration manual, UBX-16010572
19. LENA-R8 series data sheet, UBX-22003110
20. LENA-R8 series system integration manual, UBX-22015376
21. LENA-R8 series application development guide, UBX-22038374
22. LEXI-R10 series data sheet, UBX-23007594
23. LEXI-R10 system integration manual, UBX-23008149
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25. SARA-R5 series data sheet, UBX-19016638
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35. LISA-U1 series data sheet, UBX-13002048
36. LISA-U1 / LISA-U2 series system integration manual, UBX-13001118
37. SARA-G450 data sheet, UBX-18006165
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39. SARA-G3 series data sheet, UBX-13000993
40. SARA-G3 / SARA-U2 series system integration manual, UBX-13000995
41. LEON-G1 series data sheet, UBX-13004887
42. LEON-G1 series system integration manual, UBX-13004888
43. SARA-N2 series data sheet, UBX-15025564
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46. SARA-N2 / SARA-N3 series system integration manual, UBX-17005143
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48. TOBY-R2 / LARA-R2 "03B" audio application note, UBX-20036864
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50. u-blox multiplexer implementation application note, UBX-13001887
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53. End user test application note, UBX-13001922
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63. SARA-U2 audio application note, UBX-14002981
64. SARA-U2 series audio extended tuning application note, UBX-17012797
65. LISA-U1 / LISA-U2 audio application note, UBX-13001835
66. SARA-G450 audio interface application note, UBX-20028599
67. SARA-G450 audio tuning commands application note, UBX-20013500
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69. LEON-G1 audio application note, UBX-13001890
70. SARA-R5 series firmware update with uFOTA, FOAT and EasyFlash application note, UBX-20033314
71. SARA-R4 series firmware update with uFOTA, FOAT and EasyFlash application note, UBX-17049154
72. LEXI-R422 / SARA-R4 / SARA-R5 LwM2M objects and commands application note, UBX-18068860
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77. 3GPP TS 22.030 - Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Man-Machine Interface (MMI) of the User Equipment (UE)
78. 3GPP TS 22.090 - Unstructured Supplementary Service Data (USSD); Stage 1
79. 3GPP TS 23.038 - Alphabets and language-specific information
80. 3GPP TS 23.040 - Technical realization of Short Message Service (SMS)
81. 3GPP TS 23.041 - Technical realization of Cell Broadcast Service (CBS)
82. 3GPP TS 23.060 - Technical Specification Group Services and System Aspects; General Packet Radio Service (GPRS); Service description
83. 3GPP TS 24.007 - Mobile radio interface signalling layer 3; General aspects
84. 3GPP TS 24.008 - Mobile radio interface layer 3 specification
85. 3GPP TS 24.011 - Point-to-point (PP) Short Message Service (SMS) support on mobile radio interface
86. 3GPP TS 27.005 - Technical Specification Group Terminals; Use of Data Terminal Equipment - Data Circuit terminating Equipment (DTE-DCE) interface for Short Message Services (SMS) and Cell Broadcast Service (CBS)
87. 3GPP TS 27.060 - Technical Specification Group Core Network; Packet Domain; Mobile Station (MS) supporting Packet Switched Services
88. 3GPP TS 51.011 - Digital cellular telecommunications system (Phase 2+); Specification of the Subscriber Identity Module - Mobile Equipment (SIM - ME) interface
89. 3GPP TS 31.102 - Characteristics of the Universal Subscriber Identity Module (USIM) application
90. 3GPP TS 05.08 - Radio subsystem link control

91. 3GPP TS 22.087 - User-to-User Signalling (UUS)
92. 3GPP TS 22.022 - Personalisation of Mobile Equipment (ME)
93. 3GPP TS 22.082 - Call Forwarding (CF) supplementary services
94. 3GPP TS 22.083 - Call Waiting (CW) and Call Holding (HOLD)
95. 3GPP TS 22.081 - Line identification Supplementary Services- Stage 1
96. 3GPP TS 23.081 - Line identification supplementary services- Stage 2
97. 3GPP TS 22.086 - Advice of Charge (AoC) Supplementary Services
98. 3GPP TS 22.024 - Description of Charge Advice Information (CAI)
99. 3GPP TS 22.085 - Closed User Group (CUG) Supplementary Services
100. 3GPP TS 22.096 - Name identification supplementary services
101. 3GPP TS 04.18 - Mobile radio interface layer 3 specification; Radio Resource Control (RRC) protocol
102. 3GPP TS 05.02 - Multiplexing and Multiple Access on the Radio Path
103. 3GPP TS 51.014 - Specification of the SIM Application Toolkit for the Subscriber Identity Module - Mobile Equipment (SIM - ME) interface
104. 3GPP TS 27.010 V3.4.0 - Terminal Equipment to User Equipment (TE-UE) multiplexer protocol (Release 1999)
105. 3GPP TS 22.060 - General Packet Radio Service (GPRS); Service description; Stage 1
106. 3GPP TS 25.306 - UE Radio Access capabilities
107. 3GPP TS 22.002 - Circuit Bearer Services (BS) supported by a Public Land Mobile Network (PLMN)
108. 3GPP TS 22.067 - enhanced Multi Level Precedence and Pre-emption service (eMLPP); Stage 1
109. 3GPP TS 23.972 - Circuit switched multimedia telephony
110. 3GPP TS 24.615 Communication Waiting (CW) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol Specification
111. 3GPP TS 25.101 - User Equipment (UE) radio transmission and reception (FDD)
112. 3GPP TS 23.122 - NAS Functions related to Mobile Station (MS) in idle mode
113. 3GPP TS 45.005 - Radio transmission and reception
114. 3GPP TS 23.014 Support of Dual Tone Multi-Frequency (DTMF) signalling V11.0.0 (2012-09)
115. 3GPP TS 26.267 V12.0.0 (2012-12) eCall Data Transfer; In-band modem solution; General description (Release 12)
116. 3GPP TS 51.010-1 Mobile Station (MS) conformance specification; Part 1: Conformance specification
117. 3GPP TS 51.010-2 Mobile Station (MS) conformance specification; Part 2: Protocol Implementation Conformance Statement (PICS) proforma specification
118. 3GPP TS 34.121-2 User Equipment (UE) conformance specification; Radio transmission and reception (FDD); Part 2: Implementation Conformance Statement (ICS)
119. 3GPP TS 24.301 Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3
120. 3GPP TS 44.060 General Packet Radio Service (GPRS); Mobile Station (MS) - Base Station System (BSS) interface; Radio Link Control / Medium Access Control (RLC/MAC) protocol
121. 3GPP TS 23.221 Architectural requirements
122. 3GPP TS 23.203 Policy and charging control architecture
123. 3GPP TS 31.101 UICC-terminal interface; Physical and logical characteristics
124. 3GPP TS 25.305 User Equipment (UE) positioning in Universal Terrestrial Radio Access Network (UTRAN); Stage 2
125. 3GPP TS 23.032: Universal Geographical Area Description (GAD)
126. 3GPP TS 25.331 Radio Resource Control (RRC); Protocol specification
127. 3GPP TS 36.101 Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception
128. 3GPP TS 24.173 IMS Multimedia telephony communication service and supplementary services; Stage 3
129. 3GPP TS 24.341 Support of SMS over IP networks; Stage 3
130. 3GPP TS 24.229 IP multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3

131. 3GPP TS 36.306 Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio access capabilities

132. 3GPP TS 36.133 Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management

133. 3GPP TS 25.133 Requirements for support of radio resource management (FDD)

134. 3GPP TS 22.071 Location Services (LCS); Service description

135. 3GPP TS 36.331 Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification (Release 10)

136. 3GPP TS 24.167 3GPP IMS Management Object (MO); Stage 3

137. 3GPP TS 26.201 Speech codec speech processing functions; Adaptive Multi-Rate - Wideband (AMR-WB) speech codec; Frame structure

138. 3GPP TS 24.216 Communication Continuity Management Object (MO)

139. 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)

140. 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)

141. 3GPP TS 23.003 Numbering, addressing and identification

142. 3GPP TS 31.111 Universal Subscriber Identity Module (USIM) Application Toolkit (USAT)

143. 3GPP TS 22.084 MultiParty (MPTY) supplementary service; Stage 1

144. 3GPP TS 24.607 Originating Identification Presentation (OIP) and Originating Identification Restriction (OIR) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification

145. 3GPP TS 24.608 Terminating Identification Presentation (TIP) and Terminating Identification Restriction (TIR) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification

146. 3GPP TS 36.213 Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures

147. 3GPP TS 36.212 Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding

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149. 3GPP TS 29.061 - Interworking between the Public Land Mobile Network (PLMN) supporting packet based services and Packet Data Networks (PDN)

150. 3GPP TS 24.303 - Mobility management based on Dual-Stack Mobile IPv6; Stage 3

151. 3GPP TS 24.327 - Mobility between 3GPP Wireless Local Area Network (WLAN) interworking (I-WLAN) and 3GPP systems; General Packet Radio System (GPRS) and 3GPP I-WLAN aspects; Stage 3

152. 3GPP TS 25.367 - Mobility procedures for Home Node B (HNB); Overall description; Stage 2

153. 3GPP TS 25.304 - User Equipment (UE) procedures in idle mode and procedures for cell reselection in connected mode

154. 3GPP TS 36.304 - Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) procedures in idle mode

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156. 3GPP TS 25.401 - Universal Mobile Telecommunications System (UMTS); UTRAN Overall Description

157. 3GPP TS 24.237 - Technical Specification Group Core Network and Terminals; IP Multimedia (IM) Core Network (CN) subsystem IP Multimedia Subsystem (IMS) Service Continuity; Stage 3

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160. 3GPP TS 23.401 - General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access

161. 3GPP TS 44.018 - Mobile radio interface layer 3 specification; GSM/EDGE Radio Resource Control (RRC) protocol

162. 3GPP TS 43.064 - General Packet Radio Service (GPRS); Overall description of the GPRS radio interface; Stage 2

163. 3GPP TS 36.321 - Evolved Universal Terrestrial Radio Access (E-UTRA); Medium Access Control (MAC) protocol specification

164. 3GPP TS 22.011 - Service accessibility
165. 3GPP2 C.S0015-0 - Short Message Service
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167. ETSI TS 102 221 V8.2.0 (2009-06) Smart Cards; UICC-Terminal interface; Physical and logical characteristics (Release 8)
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171. GSM 03.60 - Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS) Service description; Stage 2
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179. RFC 959 File Transfer Protocol (http://tools.ietf.org/html/rfc959)
180. RFC 1123 File Transfer Protocol (https://www.rfc-editor.org/rfc/rfc1123.html)
181. RFC 2428 FTP Extensions for IPv6 and NATs (https://tools.ietf.org/html/rfc2428)
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Revision history

Revision	Date	Name	Comments
R01	11-Oct-2023	mcel	Initial release
R02	21-Feb-2024	mcel	.... New commands: +UFREQLOCK, +URPMPARAM, +URPMVERSION, +USIMSLEEP, +UATUN, +UURCCFG, +UURCSTAT, +UIPERF, +UWIFISCAN. Modified commands: +UDNSRN, +UTEST=0, +UTEST=10, +FWRITE, I, +CGSN, +CSCS, +UGPIOC, +CGCONTRDP, +CGDCONT, +CGDSCONT, +CGEQOS, +CGEQOSRDP, +CGPADDR, +CGTFT, +UGSRV, +ULOC, +ULOCIND, +UHTTP, +UHTTPAC, +UHTTPC, +CMUX, +UMQTT, +UMQTTC, +UMQTTER, +UMQTTNV, +CEDRXRDP, +CEDRXS, +CESQ, +COPS, +CSQ, +UCGED, +UMACQOSTMR, +UMNOPROF, +URPMCONF, +UIPADDR, +UPING, +CPSMS, +UPSMVER, +UPSV, +CLCK, +CPWD, +STKPROF, +UDCONF=50, +CMGD, +CMGL, +CMGR, +CMGS, +CMGW, +CMMS, +CMSS, +CNMI, +CPMS, +CSCA, +CSCB, +CSDH, +CSMP, +CSMS, +UCMGR, +UCMGS, +UANTR, +UFWINSTALL, +USIO, +UTEMP, +UUARTCONF, +UUSBCONF, +CFUN, +CPWROFF, +USOCL, +USOCR, +USOCTL, +USOER, +USOGO, +USORF, +USOSO
R03	28-Mar-2024	mcel	New commands: +UCONNREL, +UDRX, +UPSSTAT, +USLPURC, +CPINR, +UDCONF=201, +UUSBSLPCONF. Modified commands: +UDNSCFG, +UDNSRN, +UTEST, +UTEST=10, +CEREG, +UDCONF=9, +UHTTPC, +CMUX, +CEDRXRDP, +CEDRXS, +CREG, +UCGED, +UPSCONFIG, +CPSMS, +UPSV, Data Security, Device Security, cipher suites, +USECMNG, +USECPRF, +CCHO, +CRSM, +CSIM, +USIMSTAT, +CNMI, +USMSSEND, +UDCONF=132, +UNVMCFG, +UNVMF, +UNVMR, +UNVMW, +URING, +UURCSTAT, +CEER, +UIPERF, +USODL, +USORF, +ICF, +IFC, +IPR, Operational mode of the AT interface, new CMEE errors, stored parameters.
R04	29-May-2024	mcel	New Sockets Always On feature. New commands: +UHTTPNV, +CNEC, +USLPVOTE, +UDCONF=101. Modified commands: +FREAD, +FWRITE, +FWRITEHEX, +CEREG, +CGEREP, HTTP, +UHTTP, +UHTTPAC, +UHTTPC, +UHTTPER, +CEDRXRDP, +CEDRXS, +COPS, +CREG, +UCESQS, +UFPLMNDEL, +UMNOPROF, +UNASTCFG, +UPSCONFIG, +UPSSTAT, +UPSV, +USLPURC, +USECMNG, +USECPRF, +CMGC, +CMGS, +CMGW, +UCMGS, +NFWUPD, +UFACTORY, +UURCSTAT, +UUSBSLPCONF, +USNTP, +USODL, &V. Modified chapters: MNO profiles, Cipher suite: updated list, SMS: modified commands order, Internet protocol transport layer: maximum number of sockets supported.

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