

SARA-N2 Modules

Power-optimized NB-IoT modules

AT Commands Manual

Abstract

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

Document Information

| | | |
|-------------------------------|--------------------------------|-------------|
| Title | SARA-N2 Modules | |
| Subtitle | Power-optimized NB-IoT modules | |
| Document type | AT Commands Manual | |
| Document number | UBX-16014887 | |
| Revision and date | R11 | 17-Apr-2018 |
| Disclosure restriction | | |

u-blox reserves all rights to this document and the information contained herein. Products, names, logos and designs described herein may in whole or in part be subject to intellectual property rights. Reproduction, use, modification or disclosure to third parties of this document or any part thereof without the express permission of u-blox is strictly prohibited.

The information contained herein is provided "as is" and u-blox assumes no liability for the use of the information. No warranty, either express or implied, is given, including but not limited, with respect to the accuracy, correctness, reliability and fitness for a particular purpose of the information. This document may be revised by u-blox at any time. For most recent documents, visit www.u-blox.com.

Copyright © 2017, u-blox AG

u-blox is a registered trademark of u-blox Holding AG in the EU and other countries.

Preface

Applicable products

This document applies to the following products:

| Name | Type number | Modem version | Application version | PCN reference |
|-----------|------------------|---------------|---------------------|---------------|
| SARA-N200 | SARA-N200-02B-00 | 06.57 | A07.03 | UBX-18005015 |
| SARA-N201 | SARA-N201-02B-00 | 06.57 | A07.03 | UBX-18005015 |
| SARA-N210 | SARA-N210-02B-00 | 06.57 | A07.03 | UBX-18005015 |
| SARA-N211 | SARA-N211-02X-00 | 06.57 | A07.03 | UBX-18005015 |
| SARA-N280 | SARA-N280-02B-00 | 06.57 | A07.03 | UBX-18005015 |

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 MPC1-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 | - | - |

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). In each row the modules are grouped by: form factor (i.e. SARA, LISA), platform technology (e.g. SARA-G), platform generation (e.g. SARA-G3), product name (e.g. SARA-G350) and ordering code (e.g. SARA-G350-00S). In example: if 'LISA-U2' is reported, the command applies to all the modules having LISA form factor, second chipset version provided with any release of firmware.
- **Attributes**
 - **Syntax**
 - **full:** the command syntax is fully compatible among all the products listed in the "Modules" section
 - **partial:** the products support different syntaxes (usually backward compatible with respect to previous cellular standards)
 - **PIN required**
 - **Yes:** it is necessary to insert the PIN before the set and/or read command execution
 - **No:** the PIN insertion is not needed to execute the command
 - **Settings saved**
 - **Profile:** the command setting can be saved in a personal profile as specified in [Chapter 1.2](#)

- **NVM**: the command setting is saved in the non-volatile memory as specified in [Chapter 1.2](#)
- **No**: the current command setting is volatile and cannot be saved
- o **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
- o **Response time**: estimated maximum time to get the final result code for the AT command execution. More precisely, the command response time measures the time from the complete acquisition of the command line to the issuing of the command result code. 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 baudrate, 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 retransmissions.

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.
- o **Error reference**: reference to the error result codes listed in the [Appendix A](#)

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. See [Related documents](#) 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 E-mail

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

Helpful Information when Contacting Technical Support

When contacting Technical Support please have the following information ready:

- Module type (e.g. SARA-G350-00S-00) and firmware version (e.g. 08.49)
- Module configuration
- Clear description of your question or the problem
- A short description of the application
- Your complete contact details

Contents

| | |
|---------------------------------------------------------------|-----------|
| 1 AT command settings..... | 9 |
| 1.1 Definitions..... | 9 |
| 1.2 Storing of AT commands setting..... | 12 |
| 2 General operation..... | 13 |
| 2.1 Start up and initialization..... | 13 |
| 2.2 AT commands types..... | 13 |
| 3 General..... | 15 |
| 3.1 Manufacturer identification +CGMI..... | 15 |
| 3.2 Model identification +CGMM..... | 15 |
| 3.3 Firmware version identification +CGMR..... | 15 |
| 3.4 IMEI identification +CGSN..... | 16 |
| 3.5 Identification information I..... | 17 |
| 3.6 International mobile subscriber identification +CIMI..... | 17 |
| 3.7 Card identification +CCID..... | 18 |
| 3.8 List all available AT commands +CLAC..... | 18 |
| 4 Mobile equipment control and status..... | 19 |
| 4.1 Set module functionality +CFUN..... | 19 |
| 4.2 Clock +CCLK..... | 19 |
| 4.3 Automatic time zone update +CTZU..... | 20 |
| 4.4 Time zone reporting +CTZR..... | 21 |
| 4.5 Report mobile termination error +CMEE..... | 22 |
| 4.6 Extended error report +CEER..... | 22 |
| 4.7 Reboot +NRB..... | 23 |
| 4.8 UE statistics +NUESTATS..... | 23 |
| 4.9 Configure UE behaviour +NCONFIG..... | 26 |
| 5 Network service..... | 28 |
| 5.1 Signal quality +CSQ..... | 28 |
| 5.2 Operator selection +COPS..... | 29 |
| 5.3 MNO configuration +UMNOCNF..... | 30 |
| 5.4 Signalling connection status +CSCON..... | 32 |
| 5.5 Supported bands configuration +NBAND..... | 32 |
| 5.6 Specify search frequencies+NEARFCN..... | 33 |
| 5.7 eDRX setting +CEDRXS..... | 34 |
| 5.8 eDRX read dynamic parameters +CEDRXRDP..... | 35 |
| 5.9 Paging time window value and eDRX setting +NPTWEDRXS..... | 35 |
| 5.10 Power class configuration +NPOWERCLASS..... | 37 |
| 6 Security..... | 38 |
| 6.1 PIN operator +NPIN..... | 38 |
| 7 Short Messages Service..... | 40 |
| 7.1 Introduction..... | 40 |
| 7.2 Select message service +CSMS..... | 40 |
| 7.3 New message acknowledgement to MT +CNMA..... | 41 |
| 7.4 Send message +CMGS..... | 42 |
| 7.5 Service center address +CSCA..... | 43 |
| 7.6 Send SMS command +CMGC..... | 44 |

| | |
|--------------------------------------------------------------------|-----------|
| 7.7 Sending of originating data via the control plane +CSODCP..... | 45 |
| 7.8 Terminating data reporting via control plane +CRTDCP..... | 46 |
| 8 V24 control and V25ter..... | 47 |
| 8.1 Introduction..... | 47 |
| 8.2 Configure AT UART baud rate +NATSPEED..... | 47 |
| 9 Packet switched data services..... | 49 |
| 9.1 PDP contexts and parameter definition..... | 49 |
| 9.2 PDP context definition +CGDCONT..... | 50 |
| 9.3 GPRS attach or detach +CGATT..... | 52 |
| 9.4 PDP context activate or deactivate +CGACT..... | 53 |
| 9.5 Show PDP address +CGPADDR..... | 54 |
| 9.6 EPS network registration status +CEREG..... | 55 |
| 9.7 Initial PDP context activation +CIPCA..... | 56 |
| 9.8 APN rate control +CGAPNRC..... | 57 |
| 10 System features..... | 59 |
| 10.1 End user test +UTEST..... | 59 |
| 10.2 RING line handling +URING..... | 64 |
| 10.3 Debug logging level setting +NLOGLEVEL..... | 65 |
| 10.4 Power Saving Mode Setting +CPSMS..... | 66 |
| 10.5 Power saving mode status report +NPSMR..... | 67 |
| 10.6 Firmware update Over AT (FOAT) +NFWUPD..... | 68 |
| 11 GPIO..... | 69 |
| 11.1 Introduction..... | 69 |
| 11.2 GPIO select configuration command +UGPIOC..... | 73 |
| 12 Internet protocol transport layer..... | 76 |
| 12.1 Introduction..... | 76 |
| 12.2 IPv4/IPv6 addressing..... | 76 |
| 12.3 Create socket +NSOCR..... | 76 |
| 12.4 SendTo command (UDP only) +NSOST..... | 77 |
| 12.5 SendTo command with Flags (UDP only) +NSOSTF..... | 78 |
| 12.6 Received message indication +NSONMI..... | 78 |
| 12.7 Receive command (UDP only) +NSORF..... | 79 |
| 12.8 Close socket +NSOCL..... | 79 |
| 13 Ping..... | 81 |
| 13.1 IP network connectivity testing to a remote host +NPING..... | 81 |
| 14 Datagram messages..... | 82 |
| 14.1 Get message +NMGR..... | 82 |
| 14.2 Send message +NMGS..... | 82 |
| 14.3 New message indications +NNMI..... | 83 |
| 14.4 Query received messages +NQMGR..... | 83 |
| 14.5 Query sent messages +NQMGS..... | 84 |
| 14.6 Send message indications +NSMI..... | 84 |
| 14.7 Chipset vendor CDP IP address +NCDP..... | 85 |
| 14.8 Message registration status +NMSTATUS..... | 86 |
| 15 Constrained Application Protocol (CoAP)..... | 87 |
| 15.1 Introduction..... | 87 |
| 15.2 CoAP profile configuration +UCOAP..... | 87 |
| 15.3 CoAP command +UCOAPC..... | 90 |
| 15.4 CoAP component selection +USELCP..... | 90 |

| | |
|-----------------------------------------------------------|------------|
| 15.5 FOTA server configuration +UCOAPS..... | 91 |
| 15.6 FOTA poll timer configuration +UFOTAPT..... | 92 |
| 15.7 Firmware transfer +UCOAPFWT..... | 92 |
| 15.8 FOTA status +UFOTAS..... | 93 |
| A Appendix: Error result codes..... | 95 |
| A.1 Mobile termination error result codes +CME ERROR..... | 95 |
| A.2 Message service error result codes +CMS ERROR..... | 99 |
| B Appendix: AT Commands List..... | 104 |
| B.1 Parameters stored in profiles..... | 116 |
| B.2 Parameters stored in non volatile memory..... | 116 |
| B.3 Saving AT commands configuration..... | 116 |
| B.4 Estimated command response time..... | 117 |
| C Appendix: Glossary..... | 118 |
| Related documents..... | 121 |
| Revision history..... | 126 |
| Contact..... | 128 |

1 AT command settings

u-blox cellular modules provide at least one physical serial interface that is compliant to V.24 [26]. 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.



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

The DCE/MT interface can operate in these modes:

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






SARA-N2
The data mode is not supported.

1.1.1 Command description

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

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.

1.1.2 Default values

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

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

1.1.3 Command line

The AT commands are typically issued to the cellular modules using a command line with the following generic syntax:




```
"AT"<command_name><string><S3_character>
```

Where:

- "AT": prefix to be set at the beginning of each command line
- <command_name>: command name string; it can have a "+" character as prefix
- <string>: string consisting of the parameters value following the syntax provided in this manual
 - The following rules are used when describing the command syntax:
 - o <...>: the name in angle brackets is a parameter. The brackets themselves do not appear in the command line
 - o [...]: 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:

- o Number: positive and negative counting numbers, as well as zero {..., -2, -1, 0, 1, 2,...}.
- o 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).
-  The command line is not case sensitive unless autobauding is enabled; in this case the prefix "AT" must be typed either as "AT" or "at"; other combinations ("aT" or "Ta") are not allowed.
-  When writing or sending an SMS, Ctrl-Z or ESC terminates the command; <CR> is used between the two parts of the SMS (address and text).

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.

1.1.3.1 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.

1.1.4 Notes

SARA-N2

- The maximum length of the command line is 2048 characters.
- String parameter type limitations - The following characters are not allowed in the parameter string:
 - o 0x00 (NUL)
 - o 0x0D (CR)
 - o 0x15 (NAK)
 - o 0x22 (")
 - o 0x2C (,)

1.1.5 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

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 <i>AT+CMEE</i> command configures the error result format |
| NO DIALTONE | 6 | Final | No dialtone detected |
| BUSY | 7 | Final | Engaged signal detected (the called number is busy) |
| NO ANSWER | 8 | Final | No hang up detected after a fixed network timeout |
| CONNECT<data rate> | 9 | Intermediate | Same as CONNECT including also the data rate (data call). See the <i>+CBST</i> AT command for the allowed values of <data rate>.  In case of data/fax call, see <i>Circuit 108/2, +++ behaviour for the different &D: summarizing table</i> to return in command mode and disconnect the call. |
| Command aborted | 3000 | Final | Command execution aborted issuing a character to the DCE |

Table 1: Allowed result codes

 SARA-N2

- The result code in verbose format is not supported.
- These result codes are not supported: CONNECT, NO CARRIER, NO DIALTONE, BUSY, NO ANSWER, CONNECT<data rate>.
- The RING URC is issued only if enabled by means of the *+URING* AT command.

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 [AT+CMEE](#) 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.

1.2 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. The first profile is the default profile, whose data is by default loaded during the module's power on.

[Appendix B.2](#) lists the complete settings that can be directly stored in NVM and the corresponding commands.



SARA-N2

The module does not store the AT commands setting in the profiles.

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 this phase the module might be not responsive on 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.



SARA-N2

At each module start up or reboot, the "u-blox" greeting text is issued followed by the "OK" final result code.

A complete start up to be able to operate on the cellular network can take place only with a SIM card.

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 a information text response to a previous AT command and can be output, when enabled, at any time to inform the DTE of a specific event or status change.

The URC can have the same name of the command that enables it (e.g. **+CEREG**) or can be enabled by another command (e.g. the **+NPINGERR** URC is triggered by **AT+NPING** AT command).

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.

2.2.7 Reset reasons

If the applications core rebooted for any reason apart from either being power cycled or being externally reset, it will return the reason for the reboot before the greeting text.

The list of possible reboot reasons are:

- REBOOT_CAUSE_SECURITY_RESET_UNKNOWN

- REBOOT_CAUSE_SECURITY_SYSRESETREQ
- REBOOT_CAUSE_SECURITY_WATCHDOG
- REBOOT_CAUSE_SECURITY_SELF
- REBOOT_CAUSE_SECURITY_ALTBOOT
- REBOOT_CAUSE_SECURITY_REGIONS_UPDATED
- REBOOT_CAUSE_PROTOCOL_UNKNOWN
- REBOOT_CAUSE_PROTOCOL_SYSRESETREQ
- REBOOT_CAUSE_PROTOCOL_WATCHDOG
- REBOOT_CAUSE_PROTOCOL_MONITOR_REBOOT_REQ
- REBOOT_CAUSE_APPLICATION_UNKNOWN
- REBOOT_CAUSE_APPLICATION_SYSRESETREQ
- REBOOT_CAUSE_APPLICATION_WATCHDOG
- REBOOT_CAUSE_APPLICATION_AT
- REBOOT_CAUSE_UNKNOWN

3 General

3.1 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 |

3.1.1 Description

Text string identifying the manufacturer.

3.1.2 Syntax

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

3.1.3 Defined values

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

3.2 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 |

3.2.1 Description

Text string identifying the model identification.

3.2.2 Syntax

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

3.2.3 Defined values

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

3.3 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 |

3.3.1 Description

Returns the firmware version of the module.

3.3.2 Syntax

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

3.3.3 Defined values

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

3.4 IMEI 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 |

3.4.1 Description

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

3.4.2 Syntax

| Type | Syntax | Response | Example |
|--------|-----------------|-----------------------------------------|------------------------|
| Action | AT+CGSN[=<snt>] | <sn> OK | 004999010640000 OK |
| Test | AT+CGSN=? | +CGSN: (list of supported <snt>s) OK | +CGSN: (0-3,255) OK |

3.4.3 Defined values

| Parameter | Type | Description |
|-----------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <sn> | String | Serial number, by default the IMEI |
| <snt> | Number | It indicates the requested serial number type. Depending on <snt> value, the <sn> parameter in the information text response provides different information: <ul style="list-style-type: none"> • 0 (default value): 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 |

3.4.4 Notes

SARA-N2

- The <snt> parameter is mandatory.
- <snt>=0 provides the 128-bit UUID of the UE.
- The information text response to <snt>=1 or 2 returns with the "+CGSN:" prefix, e.g. "+CGSN: 357518080013535".
- <snt>=255 is not supported.

3.5 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 |

3.5.1 Description

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



The information text response of AT19 contains the modem version and the application version of the module where applicable; it returns "Undefined" where not applicable.

3.5.2 Syntax

| Type | Syntax | Response | Example |
|--------|------------------------------------------------------|----------------------------------------------|--------------------------------|
| Action | Ordering code request AT1[0] | <type_number> OK | AT10 SARA-G350-00S-00 OK |
| | Modem and application version request AT19 | <modem_version>,<applications_version> OK | AT19 29.90,A01.00 OK |

3.5.3 Defined values

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

3.6 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 |

3.6.1 Description

Request the IMSI (International Mobile Subscriber Identity).

3.6.2 Syntax

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

3.6.3 Defined values

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

3.6.4 Notes

SARA-N2

- The IMSI may not be displayed for a few seconds after the module power-on.

3.7 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 |

3.7.1 Description

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

3.7.2 Syntax

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

3.7.3 Defined values

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

3.7.4 Notes

- The command needs of the SIM to correctly work.

3.8 List all available AT commands +CLAC

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

3.8.1 Description

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

3.8.2 Syntax

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

3.8.3 Defined values

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

4 Mobile equipment control and status

4.1 Set module functionality +CFUN

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

4.1.1 Description

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

4.1.2 SARA-N2 syntax

| Type | Syntax | Response | Example |
|------|---------------|----------------------------------------------------------------------|--------------------------|
| Set | AT+CFUN=<fun> | OK | AT+CFUN=1 OK |
| Read | AT+CFUN? | +CFUN: <fun> OK | +CFUN: 1 OK |
| Test | AT+CFUN=? | +CFUN: (list of supported <fun>'s),(list of supported <rst>'s) OK | +CFUN: (0,1),(0-1) OK |

4.1.3 SARA-N2 defined values

| Parameter | Type | Description |
|-----------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <fun> | Number | Selected functionality: <ul style="list-style-type: none"> 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 |
| <rst> | Number | Reset mode: <ul style="list-style-type: none"> 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> |

4.1.4 Notes

SARA-N2

- The module enters the deep-sleep power mode whenever possible.

4.2 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 |

4.2.1 Description

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

4.2.2 Syntax

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

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

4.2.3 Defined values

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

4.2.4 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](#) command) and the network supports the time zone information.
- The Time Zone information is expressed in steps of 15 minutes and it can assume a value in the range that goes from -96 to +96.

SARA-N2

- Time setting is not permanently stored in NVM.
- The set command is not supported.

4.3 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 |

4.3.1 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).

4.3.2 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: (0-1) OK |

4.3.3 Defined values

| Parameter | Type | Description |
|-----------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <on_off> | Number | Allowed values (see Notes for the factory-programmed value): <ul style="list-style-type: none"> • 0: automatic time zone via NITZ disabled • 1: automatic time zone update via NITZ enabled; if the network supports the service, the local time of the module is changed (not only time zone) |

4.3.4 Notes

SARA-N2

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

4.4 Time zone reporting +CTZR

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

4.4.1 Description

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

4.4.2 Syntax

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

4.4.3 Defined values

| Parameter | Type | Description |
|-----------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <onoff> | Number | <ul style="list-style-type: none"> 0 (default value): 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 |
| <tz> | Number | Indicates the time zone. The range goes from -48 to +56. |
| <time> | String | Current local time in format "yy/MM/dd,hh:mm:ss". The characters indicate year, month, day, hour, minutes, seconds. |
| <dst> | Number | Indicates the daylight saving time. The allowed values are: <ul style="list-style-type: none"> 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. |

4.4.4 Notes

- The time zone reporting is not affected by the automatic time zone setting command [+CTZU](#).
- The time zone information is expressed in steps of 15 minutes.
- The reported <tz> reflects the <dst> offset: if time zone is +1 hour and the daylight saving time is +1 hour, the reported <tz> is +08.

SARA-N2

- +CTZDST URC is not supported.

- Format for <time> will be "yy/MM/dd, hh:mm:ss".

4.5 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 |

4.5.1 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.

4.5.2 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 |

4.5.3 Defined values

| Parameter | Type | Description |
|-----------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <n> | Number | <ul style="list-style-type: none"> • 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 |

4.5.4 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 |

SARA-N2

- <n> = 2 is not supported.

4.6 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 |

4.6.1 Description

Causes the MT to return one or more lines of the information text response which offer an extended report of the reason for:

- the failure in the last unsuccessful call setup or in-call modification,
- the last call release,

- the last unsuccessful GPRS attach or unsuccessful PDP context activation,
- the last GPRS detach or PDP context deactivation,
- the last SM STATUS message sent to the network.


SARA-N2

The last SM STATUS message sent to the network is not supported.

4.6.2 Syntax

| Type | Syntax | Response | Example |
|--------|-----------|-----------------------|---------------------------|
| Action | AT+CEER | +CEER: <report> OK | +CEER: "ILLEGAL ME" OK |
| Test | AT+CEER=? | OK | |

4.6.3 Defined values

| Parameter | Type | Description |
|-----------|--------|-----------------------------------------------------------------------------------------------------------------------|
| <report> | String | The total number of characters, including line terminators, in the information text shall not exceed 2041 characters. |

4.6.4 Notes

SARA-N2

- The GPRS attach/detach is not supported.

4.7 Reboot +NRB

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

4.7.1 Description

Reboots the module. There is a short delay after the command issuing before the module reboot that will be notified by an IRC. No further AT commands will be processed.

4.7.2 Syntax

| Type | Syntax | Response | Example |
|--------|--------|-----------|-----------|
| Action | AT+NRB | | |
| IRC | | REBOOTING | REBOOTING |

4.8 UE statistics +NUESTATS

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

4.8.1 Description

Returns the most recent operational statistics of the module. Depending on the <type> parameter the information text response provides different information as radio specific, cell, application core memory, block error rate or throughput information. All the data will be printed if <type>="ALL".

4.8.2 Syntax

| Type | Syntax | Response | Example |
|-----------------------|--------|----------|---------|
| Generic syntax | | | |

| Type | Syntax | Response | Example |
|-------------------------------------|-----------------------|----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Read | AT+NUESTATS[=<type>] | NUESTATS: <type>,<param_name>,<value> OK | |
| Radio specific information | | | |
| Read | AT+NUESTATS[="RADIO"] | NUESTATS: "RADIO",<param_name>,<value> [[..] [NUESTATS: "RADIO",<param_name>,<value>]] OK | AT+NUESTATS="RADIO" NUESTATS: "RADIO", "Signal_power",-508 NUESTATS: "RADIO", "Total_power",-500 NUESTATS: "RADIO", "TX_power",-30 NUESTATS: "RADIO", "TX_time",2393 NUESTATS: "RADIO", "RX_time",28903 NUESTATS: "RADIO", "Cell_ID",25 NUESTATS: "RADIO", "ECL",1 NUESTATS: "RADIO", "SNR",20 NUESTATS: "RADIO", "EARFCN",30 NUESTATS: "RADIO", "PCI",11 NUESTATS: "RADIO", "RSRQ",0 OK |
| Cell information | | | |
| Read | AT+NUESTATS="CELL" | NUESTATS: "CELL",<earfcn>,<physical_cell_id>,<primary_cell>,<crsrp>,<rsrq>,<rssi>,<snr> OK | AT+NUESTATS="CELL" NUESTATS: "CELL",3569,69,1,23,-1073,-1145,5 OK |
| Block error rate information | | | |
| Read | AT+NUESTATS="BLER" | NUESTATS: "BLER",<param_name>,<value> [[..] [NUESTATS: "BLER",<param_name>,<value>]] OK | AT+NUESTATS="BLER" NUESTATS: "BLER", "RLC_UL_BLER",10 NUESTATS: "BLER", "RLC_DL_BLER",5 NUESTATS: "BLER", "MAC_UL_BLER",8 NUESTATS: "BLER", "MAC_DL_BLER",3 NUESTATS: "BLER", "Total_TX_bytes",1080 NUESTATS: "BLER", "Total_RX_bytes",900 NUESTATS: "BLER", "Total_TX_blocks",80 NUESTATS: "BLER", "Total_RX_blocks",80 NUESTATS: "BLER", "Total_RTX_blocks",100 NUESTATS: "BLER", "Total_ACK/NACK_RX",100 OK |
| Throughput information | | | |
| Read | AT+NUESTATS="THP" | NUESTATS: "THP",<param_name>,<value> [[..] [NUESTATS: "THP",<param_name>,<value>]] OK | AT+NUESTATS="THP" NUESTATS: "THP", "RLC_UL",100 NUESTATS: "THP", "RLC_DL",98 NUESTATS: "THP", "MAC_UL",103 NUESTATS: "THP", "MAC_DL",100 |

| Type | Syntax | Response | Example |
|--------------------------------------------|-----------------------|--------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | | | OK |
| Application core memory information | | | |
| Read | AT+NUESTATS="APPSMEM" | NUESTATS: "APPSMEM",<param_name>:<value> [[..] [NUESTATS: "APPSMEM",<param_name>:<value>]] OK | AT+NUESTATS="APPSMEM" NUESTATS: "APPSMEM", "Current_Allocated":8240 NUESTATS: "APPSMEM", "Total_Free":198 NUESTATS: "APPSMEM", "Max_Free":8496 NUESTATS: "APPSMEM", "Num_Allocs":300 NUESTATS: "APPSMEM", "Num_Frees":240 OK |
| Test | AT+NUESTATS=? | | AT+NUESTATS=? NUESTATS: ("RADIO", "CELL", "BLER", "THP", "APPSMEM", "ALL") OK |

4.8.3 Defined values

UE statistics <type>

| Parameter | Type | Description |
|-----------------------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <type> | String | Type of data to be displayed. Allowed values: <ul style="list-style-type: none"> "RADIO" (default value): radio specific information "CELL": per-cell information for the top 8 cells "BLER": block error rate information "APPSMEM": application Core dynamic memory usage "THP": throughput information "ALL": all information |
| <param_name> | String | Alphabetical names for the specific information, provided with their numeric values for each <type>. |
| <type>="RADIO" | | |
| <value> | Number | Allowed values: <ul style="list-style-type: none"> <power>: NB-IoT signal power expressed in tenth of dBm <tot_power>: total power within receive bandwidth expressed in tenth of dBm <tx_power>: TX power expressed in tenth of dBm <tx_time>: elapsed TX time since last power on event expressed in milliseconds <rx_time>: elapsed RX time since last power on event expressed in milliseconds <cell_ID>: physical ID of the cell providing service to the module <ECL>: last ECL value <snr>: last SNR value <earfcn>: last EARFCN value <pci>: last PCI value <rsrq>: last RSRQ value |
| <type>="BLER" | | |
| <value> | Number | Allowed values: <ul style="list-style-type: none"> <rlc_ul_bler>: uplink block error rate of RLC layer, expressed in percentage <rlc_dl_bler>: downlink block error rate of RLC layer, expressed in percentage <mac_ul_bler>: uplink block error rate of physical layer, expressed in percentage <mac_dl_bler>: downlink block error rate of physical layer, expressed in percentage <total_tx_bytes>: total bytes transmitted <total_rx_bytes>: total bytes received <total_tx_blocks>: transmitted transport blocks <total_rx_blocks>: received transport blocks |

| Parameter | Type | Description |
|-------------------------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | | <ul style="list-style-type: none"> <total_rtx_blocks>: retransmitted transport blocks <total_ack/nack_rx>: total received ack/nack messages |
| <type>="CELL" | | |
| <earfcn> | Number | Absolute radio-frequency channel number |
| <physical_cell_id> | Number | Physical id of the cell |
| <primary_cell> | Number | The current serving cell is indicated by 1 |
| <rsrp> | Number | Reference signal received power |
| <rsrq> | Number | Reference signal received quality |
| <rssi> | Number | Received signal strength indicator |
| <snr> | Number | Signal to noise ratio |
| <type>="THP" | | |
| <value> | Number | Allowed values: <ul style="list-style-type: none"> <rlc_ul>: uplink throughput of RLC layer, expressed in kb/s <rlc_dl>: downlink throughput of RLC layer, expressed in kb/s <mac_ul>: uplink throughput of physical layer, expressed in kb/s <mac_dl>: downlink throughput of physical layer, expressed in kb/s |
| <type>="APPSMEM" | | |
| <value> | Number | Application core dynamic memory usage in KBs. Allowed values: <ul style="list-style-type: none"> <allocated>: current allocated memory <free>: total free memory <max_free>: maximum free memory <num_allocs>: number of Allocs <num_frees>: number of frees |

4.9 Configure UE behaviour +NCONFIG

| +NCONFIG | | | | | | |
|-----------------|--------------|--------------|----------------|----------------|---------------|-------------------|
| Modules | All products | | | | | |
| Attributes | Syntax | PIN required | Settings saved | Can be aborted | Response time | Error reference |
| | full | No | <i>NVM</i> | No | - | <i>+CME Error</i> |

4.9.1 Description

Configures customizable aspects of the UE (e.g Auto Attach). It takes a function and a value that controls operation of that function.



The changes are effective after the module reboot by means of the *+NRB* AT command.



The "NAS_SIM_POWER_SAVING_ENABLE" feature shall remain always enabled.

4.9.2 Syntax

| Type | Syntax | Response | Example |
|------|-------------------------------|-----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Set | AT+NCONFIG=<function>,<value> | OK | AT+NCONFIG="AUTOCONNECT", "TRUE" OK |
| Read | AT+NCONFIG? | +NCONFIG: <function>,<value> [[.]] +NCONFIG: <function>,<value> OK | +NCONFIG: "AUTOCONNECT", "TRUE" +NCONFIG: "CR_0354_0338_ SCRAMBLING", "TRUE" +NCONFIG: "CR_0859_SI_AVOID", "TRUE" +NCONFIG: "COMBINE_ATTACH", "FALSE" +NCONFIG: "CELL_RESELECTION", "TRUE" +NCONFIG: "ENABLE_BIP", "FALSE" |

| Type | Syntax | Response | Example |
|------|--------------|---------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | | | +NCONFIG: "NAS_SIM_POWER_SAVING_ENABLE", "TRUE" OK |
| Test | AT+NCONFIG=? | +NCONFIG: (<function>,(list of supported <value>s)) [[.]] +NCONFIG: (<function>,(list of supported <value>s)) OK | +NCONFIG: ("AUTOCONNECT", ("FALSE", "TRUE")) +NCONFIG: ("CR_0354_0338_SCRAMBLING", ("FALSE", "TRUE")) +NCONFIG: ("CR_0859_SI_AVOID", ("FALSE", "TRUE")) +NCONFIG: ("COMBINE_ATTACH", ("FALSE", "TRUE")) +NCONFIG: ("CELL_RESELECTION", ("FALSE", "TRUE")) +NCONFIG: ("ENABLE_BIP", ("FALSE", "TRUE")) +NCONFIG: ("NAS_SIM_POWER_SAVING_ENABLE", ("FALSE", "TRUE")) OK |

4.9.3 Defined values

| Parameter | Type | Description |
|------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <function> | String | <ul style="list-style-type: none"> "AUTOCONNECT": control if the platform will automatically attempt to connect to the network after power-on or reboot. When enabled, will set <code>+CFUN=1</code> and read the PLMN from the SIM. It will use the APN provided by the network "CR_0354_0338_SCRAMBLING": enable/disable the scrambling. See the 3GPP TS 36.211 [152], CR-0354 and CR-0338 "CR_0859_SI_AVOID": enable/disable the scheduling of conflicted NSIB. See the 3GPP TS 36.213 [130], CR-0859 "COMBINE_ATTACH": enable/disable combined EPS/IMSI attach "CELL_RESELECTION": enable support for RRC cell reselection "ENABLE_BIP": enable/disable BIP (Bearer Independent Protocol), where BIP is the interface between SIM/USIM and the ME which provides access to the data bearers supported by the ME "NAS_SIM_POWER_SAVING_ENABLE": enable/disable the feature to powering SIM until PSM, when enabled; the SIM is only powered when it is accessed |
| <value> | String | <ul style="list-style-type: none"> "TRUE" "FALSE" |

5 Network service

5.1 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 |

5.1.1 Description

Returns the Received Signal Strength Indication (RSSI) <rss> 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.

5.1.2 Syntax

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

5.1.3 Defined values

| Parameter | Type | Description |
|-----------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <rss> | Number | <p>The allowed range is 0-31 and 99. Remapped indication of the following parameters:</p> <ul style="list-style-type: none"> the Received Signal Strength Indication (RSSI) in GSM RAT the Received Signal Code Power (RSCP) in UMTS RAT the Reference Signal Received Power (RSRP) in LTE RAT <p>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.</p> |
| <qual> | Number | <p>The allowed range is 0-7 and 99. The information provided depends on the selected RAT:</p> <ul style="list-style-type: none"> In 2G RAT CS dedicated and GPRS packet transfer mode indicates the Bit Error Rate (BER) as specified in 3GPP TS 45.008 [148] In 2G RAT EGPRS packet transfer mode indicates the Mean Bit Error Probability (BEP) of a radio block. 3GPP TS 45.008 [148] 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 (ECNO) ratio in dB levels of the current cell. 3GPP TS 25.133 [106] specifies the range 0-49 for EcNo which is mapped to the range 0-7 of <qual> In LTE RAT indicates the Reference Signal Received Quality (RSRQ). TS 36.133 [105] specifies the range 0-34 for RSRQ which is mapped to the range 0-7 of <qual> <p>See Table 2 for the complete parameter mapping</p> |

5.1.4 Notes

| <qual> | 2G RAT CS and GPRS | 2G RAT EGPRS | UMTS RAT | LTE RAT |
|--------|--------------------|----------------------|---------------------|---------------------|
| 0 | BER < 0.2% | 28 <= MEAN_BEP <= 31 | ECNO_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 |

| <qual> | 2G RAT CS and GPRS | 2G RAT EGPRS | UMTS RAT | LTE RAT |
|--------|--------------------|--------------|----------|-----------------------------|
| 99 | | | | Not known or not detectable |

Table 2: <qual> parameter mapping for each supported RAT
SARA-N2

- Only LTE RAT is supported.
- The <qual> parameter is not supported, and will be always set to 99.
- [Table 3](#) maps the <rssi> parameter value to the RSSI:

| <rssi> | RSSI of the network |
|--------|--------------------------------------------|
| 0 | -113 dBm <= RSSI of the network |
| 1 | -111 dBm |
| 2-30 | -109 dBm <= RSSI of the network <= -53 dBm |
| 31 | -51 dBm <= RSSI of the network |
| 99 | Not detectable |

Table 3: <rssi> parameter mapping to RSSI

5.2 Operator selection +COPS

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

5.2.1 SARA-N2 description

Forces an attempt to select and register with the LTE NB1 network operator. Through <mode> parameter the network selection can automatically be performed or forced by this command.

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 [84], 3GPP TS 34.121-2 [85], 3GPP TS 36.521-2 [115] and 3GPP TS 36.523-2 [116], 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.

To be able to exploit all command functionalities, the SIM card verification is required. The command is accessible also without an inserted SIM. In this case the command AT+COPS=0 always returns an error result code because the network registration cannot be performed without the SIM, while the configuration (i.e. automatic registration) is correctly set. The set value can be checked with the command AT+COPS?.

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

The PLMN search cannot be performed in RRC connected state when the RAT is 3G or 4G, hence no PLMN list will be returned at the end of the PLMN scan attempt.

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 in case overlapping registration and deregistration requests are not handled by the network, and could result in an unpredictable registration state.

5.2.2 SARA-N2 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>] OK | +COPS: 0,0,"vodafone IT" OK |
| Test | AT+COPS=? | +COPS: [(<stat>, long <oper>, short <oper>, numeric <oper>[,<AcT>]),,(list of supported <mode>s),(list of supported <format>s)] OK | +COPS: (1,,,"00101"),,(0-2),(2) OK |

5.2.3 SARA-N2 defined values

| Parameter | Type | Description |
|-----------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <mode> | Number | Is used to chose whether the network selection is automatically done by the MT or is forced by this command to the operator <oper> given in the format <format>: <ul style="list-style-type: none"> 0 (default value and factory-programmed value): automatic (<oper> field is ignored) 1: manual 2: deregister from network |
| <format> | Number | <ul style="list-style-type: none"> 2: numeric <oper> |
| <oper> | String | Given in format <format> this field may be up to 5 or 6 characters long for numeric format (MCC/MNC codes). The factory-programmed value is FFFF (undefined). |
| <stat> | Number | <ul style="list-style-type: none"> 0: unknown 1: available 2: current 3: forbidden |
| <AcT> | Number | Indicates the radio access technology: <ul style="list-style-type: none"> 7: LTE |

5.2.4 Notes

SARA-N2

- The AT command settings are not stored in the NVM/profile.
- The <oper> parameter is not issued in the information text response to the read command if <mode>=2.
- The test command returns the configured values.

5.3 MNO configuration +UMNOCONF

| +UMNOCONF | | | | | | |
|------------|--------------|--------------|----------------|----------------|--------------------|-------------------|
| Modules | All products | | | | | |
| Attributes | Syntax | PIN required | Settings saved | Can be aborted | Response time | Error reference |
| | partial | No | <i>NVM</i> | No | <i>Up to 3 min</i> | <i>+CME Error</i> |

5.3.1 Description

Automatically configures the module to be compliant to the requirements of various Mobile Network Operators. For specific operators like Verizon, MNO requirements are enforced by an internal connection manager application.

When the <MNO> parameter is set to automatic, the module derives the current MNO from the IMSI (<detected_MNO>) and, after the mandatory reboot triggered by the user, it:

- applies the configuration implied by the current <detected_MNO> value,
- starts the MNO detection algorithm, and
- issues a URC any time the <detected_MNO> value changes.

After the URC has been issued, depending on <conf> parameter (bit 0), the module reboot can be either automatic or manual:

- If the <detected_MNO> value is valid, and the automatic power cycle is enabled (bit 0 of <conf> parameter set to 1) then the module will autonomously reboot as if `AT+CFUN=16` were entered. In this case the URC simply warns the user that the module is about to power cycle.
- If automatic power cycle is disabled, the URC warns the user that a module reboot is required in order to have the correct configuration applied.



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 [84], 3GPP TS 34.121-2 [85], 3GPP TS 36.521-2 [115] and 3GPP TS 36.523-2 [116], 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.



SARA-N2

If <MNO> is set to CTCC or CUCC, the corresponding self-registration component will be enabled.

5.3.2 Syntax

| Type | Syntax | Response | Example |
|------|-----------------------------------------------------|---------------------------------------------------------------------------------------------------|--------------------------------------------|
| Set | <code>AT+UMNOCONF=<MNO>[,<conf>]</code> | OK | <code>AT+UMNOCONF=1</code> OK |
| Read | <code>AT+UMNOCONF?</code> | <code>+UMNOCONF: <MNO>,<conf>[,<detected_MNO>]</code> OK | <code>+UMNOCONF: 3,23</code> OK |
| Test | <code>AT+UMNOCONF=?</code> | <code>+UMNOCONF: (list of supported <mode>s),(list of supported <conf>s)</code> OK | <code>+UMNOCONF: (0-3),(0-31)</code> OK |
| URC | | <code>+UMNOCONF: <MNO>,<conf>,<detected_MNO></code> | <code>+UMNOCONF: 1,7,0</code> |

5.3.3 Defined values

| Parameter | Type | Description |
|----------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <MNO> | Number | Mobile Network Operator (MNO) configuration: <ul style="list-style-type: none"> • 0: regulatory. IMS service disabled, Verizon connection manager disabled, all 4G and 3G bands enabled, <conf> is ignored • 1: automatic detection of MNO configuration based on IMSI. • 2: AT&T configuration. IMS service disabled, all supported 4G bands enabled, HSDPA Category set to 14 • 3: Verizon. IMS enabled (SMS only), Verizon connection manager enabled, 4G bands 4 and 13. The Verizon connection manager will always ensure that the proper PDP contexts are defined and active. • 4: Telstra. IMS service disabled, all supported 4G bands enabled. • 5: T-Mobile. IMS service enabled, all supported 4G bands enabled. The LTE initial default bearer (<cid>=1) is opportunely configured • 6: CTCC. The corresponding self-registration is enabled. • 7: CUCC. The corresponding self-registration is enabled Allowed values: <ul style="list-style-type: none"> • SARA-N2 - 0 (regulatory), 6 (CTCC), 7 (CUCC). The default and factory-programmed value is 0. |
| <conf> | Number | Unsigned integer representing a bitmask. |
| <detected_MNO> | Number | Current MNO detected in automatic mode. Allowed values: <ul style="list-style-type: none"> • 0: test SIM/USIM (regulatory) • 1: detection error: the module keeps the current configuration (factory configuration is regulatory) and automatic mode is disabled until the module is rebooted. • 2: AT&T SIM/USIM • 3: Verizon SIM/USIM • 4: Telstra SIM/USIM |

| Parameter | Type | Description |
|-----------|------|------------------------------------------------------------------------|
| | | <ul style="list-style-type: none"> 5: T-Mobile SIM/USIM |

5.3.4 Notes

SARA-N2

- The <conf> and <detected_MNO> parameters are not supported.
- If <MNO>= 0, the self-registration is disabled.
- Set a valid IP address (by means of the [+UCOAPS](#) AT command) before selecting <MNO>=6 or 7.

5.4 Signalling connection status +CSCON

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

5.4.1 Description

Returns details of the current terminal's perceived 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 data. The terminal may think it is "Connected" yet cannot currently use a base station due to a change in the link quality.

5.4.2 Syntax

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

5.4.3 Defined values

| Parameter | Type | Description |
|-----------|--------|-----------------------------------------------------------------------------------------------------------------------------|
| <n> | Number | <ul style="list-style-type: none"> 0 (default value): +CSCON URC disabled 1: +CSCON URC enabled |
| <mode> | Number | Indicates the signalling connection status: <ul style="list-style-type: none"> 0: idle 1: connected |

5.5 Supported bands configuration +NBAND

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

5.5.1 Description

Defines the set of bands to be used.

5.5.2 Syntax

| Type | Syntax | Response | Example |
|------|-------------------------------|-------------------------------------|----------------------|
| Set | AT+NBAND=<n>[,<n>[,<n>[...]]] | OK | AT+NBAND=8,20 OK |
| Read | AT+NBAND? | +NBAND: <n>[,<n>[,<n>[...]]] OK | +NBAND: 8,20 OK |
| Test | AT+NBAND=? | +NBAND: (<n>[,<n>[,<n>[...]]) OK | +NBAND: (8,20) OK |

5.5.3 Defined values

| Parameter | Type | Description |
|-----------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <n> | Number | LTE band expressed as a decimal number. The allowed values depends on the product and can assume these values: 5, 8, 20 and 28. See the data sheet for the LTE bands supported by each product. |

5.6 Specify search frequencies+NEARFCN

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

5.6.1 Description

Locks the module to a specific EUTRA Absolute Radio Frequency Channel Number (EARFCN) and optionally the desired Physical Cell ID (PCI).

If the specified PCI is not present, the UE will enter out of service mode.

 Setting the <earfcn> parameter to 0, will remove the EARFCN restriction and any associated PCI lock.

5.6.2 Syntax

| Type | Syntax | Response | Example |
|---------------------------------------------|----------------------------------------------------|----------|------------------------------|
| Generic syntax | | | |
| Set | AT+NEARFCN=<search_mode>,<param1>[,<param2>[,...]] | OK | |
| Locks the module to a specific EUTRA | | | |
| Set | AT+NEARFCN=<search_mode>,<earfcn>,<ci> | OK | AT+NEARFCN=0,10,"ABCD" OK |
| Test | AT+NEARFCN=? | OK | OK |

5.6.3 Defined values

| Parameter | Type | Description |
|---------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <search_mode> | Number | Specifies the type of search and defines the supplied parameters. Allowed value: <ul style="list-style-type: none"> 0: single point EARFCN search |
| <earfcn> | Number | Indicates the EARFCN to search; the range is 0-65535. Setting the parameter to 0, will remove the EARFCN restriction and any associated PCI lock. |
| <ci> | String | Four byte E-UTRAN cell ID in hexadecimal format in range 0-0x1F7. |

5.7 eDRX setting +CEDRXS

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

5.7.1 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 value for each specified type of radio access technology. If the requested eDRX value is not provided in set command, then the UE will use the eDRX value provided by the network.

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

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

5.7.2 Syntax

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

5.7.3 Defined values

| Parameter | Type | Description |
|--------------------------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <mode> | Number | Indication to disable or enable the use of eDRX in the UE. Allowed values: <ul style="list-style-type: none"> 0 (default value): use of eDRX disabled 1: use of eDRX enabled 2: enable the use of eDRX and enable the URC 3: disable the use of eDRX and reset all parameters for eDRX to factory-programmed values |
| <AcT_type> | Number | Indicates the type of access technology. Allowed values: <ul style="list-style-type: none"> 4: E-UTRAN (WB-S1 mode) 5: E-UTRAN (NB-S1 mode) |
| <Requested_eDRX_value> | String | Requested extended DRX parameters information element, half a byte in a 4 bit format. For the coding and the value range, see the extended DRX parameters information element in Table 10.5.5.32 of 3GPP TS 24.008 [12]. |
| <NW_provided_eDRX_value> | String | New provided extended DRX parameters information element, half a byte in a 4 bit format. For the coding and the value range, see the extended DRX parameters information element in Table 10.5.5.32 of 3GPP TS 24.008 [12]. |
| <Paging_time_window> | String | The paging time window refers to bit 8 to 5 of octet 3 of the extended DRX parameters information element, half a byte in a 4 bit format. For the coding and the value range, see the extended DRX parameters information element in Table 10.5.5.32 of 3GPP TS 24.008 [12]. |

5.7.4 Notes

SARA-N2

- <AcT_type>=4 is not supported.

5.8 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 |

5.8.1 Description

Returns the UEs extended discontinuous reception (eDRX) parameters (<AcT_type> and <Requested_eDRX_value>, <NW_provided_eDRX_value> and <Paging_time_window>) if the eDRX is used for the cell which the MT is currently registered to.

5.8.2 Syntax

| Type | Syntax | Response | Example |
|--------|---------------|--------------------------------------------------------------------------------------------|--------------------------------------------|
| Action | AT+CEDRXRDP | +CEDRXRDP: <AcT_type>,<Requested_eDRX_value>,<NW_provided_eDRX_value>,<Paging_time_window> | +CEDRXRDP: 5, "0010", "1110", "0101" OK |
| Test | AT+CEDRXRDP=? | OK | |

5.8.3 Defined values

| Parameter | Type | Description |
|--------------------------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <AcT_type> | Number | Indicates the type of radio access technology. Allowed values: <ul style="list-style-type: none"> • 0: do not use eDRX • 1: EC-GSM-IoT (A/Gb mode) • 2: GSM (A/Gb mode) • 3: UTRAN (Iu mode) • 4: E-UTRAN (WB-S1 mode) • 5: E-UTRAN (NB-S1 mode) |
| <Requested_eDRX_value> | String | Requested extended DRX parameters information element, half a byte in a 4 bit format. For the coding and the value range, see the extended DRX parameters information element in Table 10.5.5.32 of 3GPP TS 24.008 [12]. |
| <NW_provided_eDRX_value> | String | New provided extended DRX parameters information element, half a byte in a 4 bit format. For the coding and the value range, see the extended DRX parameters information element in Table 10.5.5.32 of 3GPP TS 24.008 [12]. |
| <Paging_time_window> | String | The paging time window refers to bit 8 to 5 of octet 3 of the extended DRX parameters information element, half a byte in a 4 bit format. For the coding and the value range, see the extended DRX parameters information element in Table 10.5.5.32 of 3GPP TS 24.008 [12]. |


5.9 Paging time window value and eDRX setting +NPTWEDRXS

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

5.9.1 Description

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

The set command also enables the +NPTWEDRXS URC, that is issued on any change in the paging time window and eDRX parameters, when enabled by the network.

 <NW_provided_eDRX_value> and <Paging_time_window> are not issued in the read command if they are not set by the network.

5.9.2 Syntax

| Type | Syntax | Response | Example |
|------|----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|
| Set | AT+NPTWEDRXS[=<mode>[,<AcT_type>[,<Requested_paging_time_window>[,<Requested_eDRX_value>]]]] | OK | AT+NPTWEDRXS=1,5,"1110","0101" OK |
| Read | AT+NPTWEDRXS? | [+NPTWEDRXS: <AcT_type>,<Requested_paging_time_window>,<Requested_eDRX_value> [...] [+NPTWEDRXS: <AcT_type>,<Requested_paging_time_window>,<Requested_eDRX_value>] OK | +NPTWEDRXS: 5,"1110","0101" OK |
| Test | AT+NPTWEDRXS=? | +NPTWEDRXS: (list of supported <mode>s),(list of supported <AcT_type>s),(list of supported <Requested_paging_time_window>s),(list of supported <Requested_eDRX_value>s) OK | +NPTWEDRXS: (0-3),(5),("0000"- "1111"),("0000"- "1111") OK |
| URC | | +NPTWEDRXS: <AcT_type>[,<Requested_paging_time_window>[,<Requested_eDRX_value>[,<NW_provided_eDRX_value>[,<Paging_time_window>]]]] | +NPTWEDRXS: 5,"1010","1001","1101", "1011" |

5.9.3 Defined values

| Parameter | Type | Description |
|--------------------------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <mode> | Number | Indication to disable or enable the use of eDRX in the UE. Allowed values: <ul style="list-style-type: none"> 0 (default value): use of requested paging time window and eDRX disabled 1: use of requested paging time window and eDRX enabled 2: enable the use of requested paging time window and eDRX and enable the URC 3: disable the use of requested paging time window and eDRX and reset all parameters to factory-programmed values |
| <AcT_type> | Number | Indicates the type of access technology. Allowed values: <ul style="list-style-type: none"> 0: do not use eDRX, only used in URCs 1: EC-GSM-IoT (A/Gb mode) 2: GSM (A/Gb mode) 3: UTRAN (lu mode) 4: E-UTRAN (WB-S1 mode) 5 (default value): E-UTRAN (NB-S1 mode) |
| <Requested_paging_time_window> | String | The requested paging time window refers to bit 8 to 5 of octet 3 of the extended DRX parameters information element, half a byte in a 4 bit format. Default value is "0111". For the coding and the value range, see the extended DRX parameters information element in 3GPP TS 24.008 [12]. |
| <Requested_eDRX_value> | String | Requested extended DRX parameters information element, half a byte in a 4 bit format. Default value is "0101". For the coding and the value range, see the extended DRX parameters information element in 3GPP TS 24.008 [12]. |
| <NW_provided_eDRX_value> | String | New provided extended DRX parameters information element, half a byte in a 4 bit format. For the coding and the value range, see the extended DRX parameters information element in 3GPP TS 24.008 [12]. |
| <Paging_time_window> | String | The paging time window refers to bit 8 to 5 of octet 3 of the extended DRX parameters information element, half a byte in a 4 bit format. For the coding and the value range, see the extended DRX parameters information element in 3GPP TS 24.008 [12]. |

5.9.4 Notes

SARA-N2

- <AcT_type>=0, 1, 2, 3, 4 are not supported.
- If <mode>=0 and the other parameters are omitted, then the <Requested_Paging_time_window> or <Requested_eDRX_value> parameters are set to invalid values like 0x00.

5.10 Power class configuration +NPOWERCLASS

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

5.10.1 Description

Configures the mapping for band and power class. The read command list all mapping of bands and power class.

5.10.2 Syntax

| Type | Syntax | Response | Example |
|------|-------------------------------------|---------------------------------------------------------------------------------------------|---------------------------------------|
| Set | AT+NPOWERCLASS=<band>,<power_class> | OK | AT+NPOWERCLASS=8,5 OK |
| Read | AT+NPOWERCLASS? | +NPOWERCLASS: <band>,<power_class> [[...] [+NPOWERCLASS: <band>,<power_class>]] OK | +NPOWERCLASS: 8,5 OK |
| Test | AT+NPOWERCLASS=? | +NPOWERCLASS: (list of supported <band>s),(list of supported <power_class>es) OK | +NPOWERCLASS: (5,8,20,28),(3,5) OK |

5.10.3 Defined values

| Parameter | Type | Description |
|---------------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <band> | Number | Band expressed as a decimal number. Only the bands supported by the interested module are allowed. |
| <power_class> | Number | Power class expressed as a decimal number. For details see the 3GPP TS 36.101 [99] subclause 6.2.2F. The allowed values are 3 and 5, where 3 is the factory-programmed value. |

6 Security

6.1 PIN operator +NPIN

| +NPIN | | | | | | |
|------------|--------------|--------------|----------------|----------------|---------------|-------------------|
| Modules | All products | | | | | |
| Attributes | Syntax | PIN required | Settings saved | Can be aborted | Response time | Error reference |
| | full | No | <i>NVM</i> | No | - | <i>+CME Error</i> |

6.1.1 Description

Allows the user to change, verify, enable, disable or unlock the PIN. A URC is issued at each successful operation. If the PIN is enabled, the PIN insertion is mandatory to set the MT to the full functionality (by means of *AT+CFUN=1*).



SIM PIN, SIM PUK refer to the PIN of the selected application on the UICC. For example, in a UTRAN context, the selected application on the currently selected UICC should be a USIM and the SIM PIN then represents the PIN of the selected USIM. See 3GPP TS 31.101 [92] for further details on application selection on the UICC.

6.1.2 Syntax

| Type | Syntax | Response | Example |
|-------------------------|-----------------------------------------------|----------------------|---------------------------------------|
| Generic syntax | | | |
| Set | AT+NPIN=<command>,<parameter1>[,<parameter2>] | OK | AT+NPIN=0,29563248 OK |
| PIN verification | | | |
| Set | AT+NPIN=0,<pin> | OK | AT+NPIN=0,"56783140" OK |
| PIN change | | | |
| Set | AT+NPIN=1,<old_pin>,<new_pin> | OK | AT+NPIN=1,"56783140","67519023" OK |
| PIN enabling | | | |
| Set | AT+NPIN=2,<pin> | OK | AT+NPIN=2,"56783140" OK |
| PIN disabling | | | |
| Set | AT+NPIN=3,<pin> | OK | AT+NPIN=3,"56783140" OK |
| PIN unlock | | | |
| Set | AT+NPIN=4,<puk>,<pin> | OK | AT+NPIN=4,"98204815","56783140" OK |
| URC | | +NPIN: <npin_result> | +NPIN: "OK" |

6.1.3 Defined values

| Parameter | Type | Description |
|-----------------------------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <command> | Number | Operation to be applied on the PIN. Allowed values: <ul style="list-style-type: none"> 0: PIN verification 1: PIN change 2: PIN enabling 3: PIN disabling 4: PIN unlock |
| <pin>, <old_pin>, <new_pin> | String | Personal Identification Number. The parameter length goes from 4 to 8 characters. |
| <puk> | String | Personal Unblocking Key. The parameter length goes from 4 to 8 characters. |

| Parameter | Type | Description |
|-------------------------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <npin_result> | String | Result types regarding the PIN operation. The operation result is provided by means of the corresponding URC: <ul style="list-style-type: none">• "OK"• "ERROR PIN disabled"• "ERROR PIN blocked"• "ERROR wrong PIN <pin_retries_remaining>"• "ERROR wrong format"• "ERROR" |
| <pin_retries_remaining> | Number | Remaining PIN retries. If no retries are left, then the PIN will be blocked. |

6.1.4 Notes

- Power on the MT (by means of [AT+CFUN=1](#)) before issuing the command.

7 Short Messages Service

7.1 Introduction

For a complete overview of SMS, see 3GPP TS 23.040 [8] and 3GPP TS 27.005 [16].

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

7.1.1 Class 0 SMS

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

7.1.2 <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):

SR (Status Report)

7.1.3 Limitations

The following limitations apply related to the SMS usage:

Single SMS

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

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

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

7.2 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 |

7.2.1 Description

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



SARA-N2

The +CMT URC is issued on the reception of the SMS messages. For more details, see the [+CMGC](#) AT command.

7.2.2 Syntax

| Type | Syntax | Response | Example |
|------|-------------------|-----------------------|-----------|
| Set | AT+CSMS=<service> | +CSMS: <mt>,<mo>,<bm> | AT+CSMS=1 |

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

7.2.3 Defined values

| Parameter | Type | Description |
|-----------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <service> | Number | <ul style="list-style-type: none"> 0: see 3GPP TS 23.040 [8] and 3GPP TS 23.041 [9]; syntax of AT commands is compatible with 3GPP TS 27.005 [16] phase 2; phase 2+ features may be supported if no new command syntax is required 1: see 3GPP TS 23.040 [8] and 3GPP TS 23.041 [9]; syntax of AT commands is compatible with 3GPP TS 27.005 [16] phase 2+ |
| <mt> | Number | Mobile terminated messages: <ul style="list-style-type: none"> 0: not supported 1: supported |
| <mo> | Number | Mobile originated messages: <ul style="list-style-type: none"> 0: not supported 1: supported |
| <bm> | Number | Broadcast messages: <ul style="list-style-type: none"> 0: not supported 1: supported |

7.3 New message acknowledgement to MT +CNMA

| +CNMA | | | | | | |
|------------|--------------|--------------|----------------|----------------|---------------|-----------------|
| Modules | All products | | | | | |
| Attributes | Syntax | PIN required | Settings saved | Can be aborted | Response time | Error reference |
| | full | Yes | No | No | < 150 s | +CMS Error |

7.3.1 Description

Confirms the reception of a new message (SMS-DELIVER or SMS-STATUS-REPORT) which is routed directly to the TE (see the [+CNMI](#) command). This acknowledgement command shall be used when [+CSMS](#) parameter <service> equals 1. The MT shall not send another +CMT or +CDS (see the [+CNMI](#) command) unsolicited result codes to the TE before the previous one is acknowledged. If the MT does not get acknowledgement within required time (network timeout), the MT should respond as specified in 3GPP TS 24.011 [13] to the network. The MT shall automatically disable routing to the TE by setting both <mt> and <ds> values of [+CNMI](#) to zero. If the command is executed, but no acknowledgement is expected, or some other MT related error occurs, the final result code +CMS ERROR: <err> is returned.

In PDU mode, it is possible to send either positive (RP-ACK) or negative (RP-ERROR) acknowledgement to the network. The <n> parameter defines which one will be sent. Optionally (when <length> is greater than zero) an acknowledgement TPDU (SMS-DELIVER-REPORT for RP-ACK or RP-ERROR) may be sent to the network. The entering of PDU is done similarly as specified in [+CMGS](#) command, except that the format of <ackpdu> is used instead of <pdu> (i.e. SMSC address field is not present). The PDU shall not be bounded by double quotes.

7.3.2 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> |

| Type | Syntax | Response | Example |
|------|-----------|----------------------------------------------------------------------------------------------------------|--------------------------------|
| Test | AT+CNMA=? | Text mode (+CMGF=1): OK PDU mode (+CMGF=0): +CNMA: (list of supported <n>s) OK | OK OK +CNMA: (0-2) OK |

7.3.3 Defined values

| Parameter | Type | Description |
|-----------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <n> | Number | <ul style="list-style-type: none"> 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 [8] TP-FCS value set to 'FF' (unspecified error cause)) |
| <length> | Number | PDU's length in octets without the Service Center's address |

7.3.4 Notes

SARA-N2

- Only PDU mode is supported.
- <n>=0 is not supported.
- +CNMI is not supported.
- The <length> range goes from 0 to 232.

7.4 Send message +CMGS

| +CMGS | | | | | | |
|------------|--------------|--------------|----------------|----------------|------------------------------------------------|-----------------|
| Modules | All products | | | | | |
| Attributes | Syntax | PIN required | Settings saved | Can be aborted | Response time | Error reference |
| | full | Yes | No | No | Up to 3 min (<1 s for prompt ">" when present) | +CMS Error |

7.4.1 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.



SARA-N2

The +CMT URC is issued on the reception of the SMS messages. For more details, see the [+CMGC](#) AT command.

7.4.2 Syntax

| Type | Syntax | Response | Example |
|------|--------------------------------------------------------------------------------------------|------------------------------|--------------------------------------------------------------------------|
| Set | Text mode (+CMGF=1): AT+CMGS=<da>[,<today>]<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> > 039121430100038166F600000 4E374F80D<Ctrl-Z> |

| Type | Syntax | Response | Example |
|------|-----------|----------|----------------|
| | | | +CMGS: 2 OK |
| Test | AT+CMGS=? | OK | |

7.4.3 Defined values

| Parameter | Type | Description |
|-----------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <da> | String | Destination address |
| <today> | Number | Type of address of <da> - octet |
| <text> | String | SMS String |
| <mr> | Number | Message reference |
| <length> | Number | Two meanings: <ul style="list-style-type: none"> 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 [8] RP-User-Data element of RP-ACK PDU; the format is same as for <PDU> in case of SMS |

7.4.4 Notes

SARA-N2

- Only the PDU mode is supported.
- The <ackpdu> parameter is not issued in the information text response to the set command.
- The <length> range goes from 7 to 220.

7.5 Service center address +CSCA

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

7.5.1 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.

7.5.2 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 | |

7.5.3 Defined values

| Parameter | Type | Description |
|-----------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| <sca> | String | Service center address |
| <tosca> | String | Type of address of <sca> (for more details refer to 3GPP TS 24.008 [12]); the default is 145 when string includes '+', otherwise the default is 129 |

7.5.4 Notes

SARA-N2

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

7.6 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 | Up to 3 min (<1 s for prompt ">" when present) | +CMS Error |

7.6.1 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.

7.6.2 Syntax

| Type | Syntax | Response | Example |
|------|------------------------------------------------------------------------------------|-------------------------------------------|--------------------------------------------------------------------------------------|
| Set | PDU mode (+CMGF=0): AT+CMGC=<length><CR> > <PDU> is given<Ctrl-Z/ESC> | +CMGC: <mr>[,<ackpdu>] OK | AT+CMGC=13<CR> > 039121430100038166F600000 4E374F80D<Ctrl-Z> +CMGC: 2 OK |
| Test | AT+CMGC=? | OK | |
| URC | | +CMT: [<alpha>], <length><CR><LF><pdu> | |

7.6.3 Defined values

| Parameter | Type | Description |
|-----------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <mr> | Number | Message reference |
| <length> | Number | <ul style="list-style-type: none"> 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 [8] 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 [16]. |

7.6.4 Notes

SARA-N2

- The <ackpdu> parameter is not returned in response to the set command.
- The range of <length> parameter goes from 8 to 220.

7.7 Sending of originating data via the control plane +CSODCP

| +CSODCP | | | | | | |
|-------------------|---------------|---------------------|-----------------------|-----------------------|----------------------|------------------------|
| 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

Transmits data over control plane from a DTE to the network. Data is identified by the local context identification parameter <cid>. This command causes transmission of an ESM DATA TRANSPORT message (see the 3GPP TS 24.301 [88] subclause 9.9.4.25).

It optionally indicates that the exchange of data will be completed with:

- Current uplink data transfer
- The next received downlink data

7.7.2 Syntax

| Type | Syntax | Response | Example |
|------|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|
| Set | AT+CSODCP=<cid>,<cpdata_length>,<cpdata>[,<RAI>[,<type_of_user_data>]] | OK | AT+CSODCP=1,3,"AA11BB" OK |
| Test | AT+CSODCP=? | +CSODCP: (range of supported <cid>s), (maximum number of bytes of the <cpdata_length>),(list of supported <RAI>s),(list of supported <type_of_user_data>s) OK | +CSODCP: (0-10),(512),(0,1,2),(0,1) OK |

7.7.3 Defined values

| Parameter | Type | Description |
|---------------------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <cid> | Number | See <cid> |
| <cpdata_length> | Number | Size of the received data. The maximum length is 512 bytes |
| <cpdata> | String | User data container content (see the 3GPP TS 24.301 [88] subclause 9.9.4.24) |
| <RAI> | Number | Indicates the value of the release assistance indication (see the 3GPP TS 24.301 [88] subclause 9.9.4.25) <ul style="list-style-type: none"> • 0 (default value): no information available • 1: data exchange completed with the transmission of the ESM DATA TRANSPORT message. • 2: data exchange completed with the receipt of the ESM DATA TRANSPORT message. |
| <type_of_user_data> | Number | Indicates the type of user data: <ul style="list-style-type: none"> • 0 (default value): regular data • 1: exception data |

7.7.4 Notes

SARA-N2

- Only one message will be buffered one at a time.

7.8 Terminating data reporting via control plane +CRTDCP

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

7.8.1 Description

Configures the terminating data reporting from network to the DTE via the control plane. Data is identified by the local context identification parameter <cid>. When enabled, the URC is sent from the MT upon reception of data from network.

7.8.2 Syntax

| Type | Syntax | Response | Example |
|------|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| Set | AT+CRTDCP=<reporting> | OK | AT+CRTDCP=1 OK |
| Read | AT+CRTDCP? | +CRTDCP: <reporting> OK | +CRTDCP: 1 OK |
| Test | AT+CRTDCP=? | +CRTDCP: (list of supported <reporting>s),(range of supported <cid>s),(maximum number of octets of user data indicated by <cpdata_length>) OK | +CRTDCP: (0-1),(0-10),(512) OK |
| URC | | +CRTDCP: <cid>,<cpdata_length>,<cpdata> | +CRTDCP: 0,2,"ab" |

7.8.3 Defined values

| Parameter | Type | Description |
|-----------------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| <reporting> | Number | <ul style="list-style-type: none"> 0 (default value): reporting disabled 1: reporting enabled by means of the URC +CRTDCP |
| <cid> | Number | See <cid> |
| <cpdata_length> | Number | Size of the received data. The maximum length 512 bytes |
| <cpdata> | String | User data container content (see the 3GPP TS 24.301 [88] subclause 9.9.4.24) |

8 V24 control and V25ter

8.1 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).

8.2 Configure AT UART baud rate +NATSPEED

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

8.2.1 Description

Configures the baud rate at which the DCE accepts AT commands on the UART interface.

8.2.2 Syntax

| Type | Syntax | Response | Example |
|------|---------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|
| Set | AT+NATSPEED=<baud_rate>[,<timeout>[,<store>[,<sync_mode>[,<stop_bits>]]]] | OK | AT+NATSPEED=9600,3,1,2,1 OK |
| Read | AT+NATSPEED? | +NATSPEED: <baud_rate>,<sync_mode>,<stop_bits> OK | +NATSPEED: 9600,2,1 OK |
| Test | AT+NATSPEED=? | +NATSPEED: (list of supported <baud rate>s),(list of supported <timeout>s),(list of supported <store>s),(list of supported <sync_mode>s),(list of supported <stop_bits>s) OK | +NATSPEED: (4800,9600,57600,115200),(0-30),(0,1),(0-3),(1,2) OK |

8.2.3 Defined values

| Parameter | Type | Description |
|-------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <baud_rate> | Number | Requested AT UART baud rate expressed in b/s: <ul style="list-style-type: none"> The factory-programmed value is 9600. Allowed <baud_rate> values are 4800, 9600, 57600, 115200. |
| <timeout> | Number | Indicates the time to wait for communication before switching back to the original speed: <ul style="list-style-type: none"> Range: 0-30 s. The default value is 3 s. If <timeout>=0 the default value will be used |
| <store> | Number | Enable the <baud_rate>, <sync_mode> and <stop_bits> parameters storing in NVM: <ul style="list-style-type: none"> 0 (default value): do not store to NVM 1: store to NVM |
| <sync_mode> | Number | The low power UART synchronizes to each start bit that it detects and uses this to configure its optimum sampling point for each subsequent bit in a data word. The <sync_mode> parameter allows this sampling point to be modified when needed: <ul style="list-style-type: none"> 0: no sampling offset 1: sample later 2 (factory-programmed and default value): sample earlier 3: sample even earlier |
| <stop_bits> | Number | Low power UART stop-bits. Allowed values: <ul style="list-style-type: none"> 1 (factory-programmed and default value): 1 stop bit 2: 2 stop bits |

8.2.4 Notes

SARA-N2

- Setting the <baud_rate> greater than the fastest speed (9600 b/s) supported by the Low Power UART will disable Deep Sleep Low Power Operation.

9 Packet switched data services

9.1 PDP contexts and parameter definition

9.1.1 Multiple PDP contexts



SARA-N2

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 a internal PDP context is supported. This IP instance supports up to 7 sockets;
- Using only external PDP contexts, it is possible to have at most 3 IP instances (with 3 different IP addresses) simultaneously active. If in addition the internal PDP context is used, at most 2 external PDP contexts can be activated.

9.1.2 Parameter definition

9.1.2.1 <APN>

The Access Point Name (APN) is a string parameter, which is a logical name, valid in the current PLMN's domain, used to select the GGSN (Gateway GPRS Support Node) or the external packet data network to be connected to. The APN can be omitted: this is the so-called "blank APN" setting that may be suggested by network operators (e.g. to roaming devices); in this case the APN string is not included in the message sent to the network.

The maximum length of the parameter is 99 characters (the maximum length of coded APN is 100 octets, see 3GPP TS 23.003 [117], subclause 9.1).

9.1.2.2 <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 |
|---------|--------------------------------------|-----------------------------------|
| SARA-N2 | 10 | 1 |



SARA-N2

The 7th <cid> is by default reserved to Bearer Independent Protocol (BIP). To define the <cid>=7 through [AT+CGDCONT](#), disable the BIP flag by means of the [+NCONFIG](#) AT command (<function>="ENABLE_BIP" set to FALSE) and reboot the module.

9.1.2.3 <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,

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

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> parameter 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.ddd.ddd"
- IPv6: "ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd"

9.1.2.4 <PDP_type>

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

- "IP" (default value): Internet Protocol (IETF STD 5)
- "NONIP": None IP
- "IPV4V6": virtual <PDP_type> introduced to handle dual IP stack UE capability (see the 3GPP TS 24.301 [88])
- "IPV6": Internet Protocol, version 6 (see RFC 2460)



SARA-N2
<PDP_type>="IPV4V6" and "IPV6" are not supported.

9.2 PDP context definition +CGDCONT

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

9.2.1 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.

9.2.2 Syntax

| Type | Syntax | Response | Example |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Set | AT+CGDCONT=[<cid>[,<PDP_type>[,<APN>[,<PDP_addr>[,<d_comp>[,<h_comp>[,<IPv4AddrAlloc>[,<emergency_indication>[,<P-CSCF_discovery>[,<IM_CN_Signalling_Flag_Ind>[,<NSLPI>]]]]]]]]]]] | OK | <p>IPv4 example</p> <pre>AT+CGDCONT=1,"IP","APN_name", "1.2.3.4",0,0 OK</pre> <p>IPv4v6 example</p> <pre>AT+CGDCONT=1,"IPV4V6","APN", "0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0",0,0 OK</pre> <p>IPv6 example</p> <pre>AT+CGDCONT=1,"IPV6","APN", "0.0.0.0.0.0.0.0.0.0.0.0.0.0",0,0 OK</pre> |
| Read | AT+CGDCONT? | +CGDCONT: <cid>,<PDP_type>,<APN>,<PDP_addr>,<d_comp>,<h_comp>[,<IPv4AddrAlloc>,<emergency_indication>,<P-CSCF_discovery>,<IM_CN_Signalling_Flag_Ind>[,<NSLPI>] | +CGDCONT: 1,"IP","web.omnitel.it", "91.80.140.199",0,0 OK |

| Type | Syntax | Response | Example |
|------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| | | OK | |
| Test | AT+CGDCONT=? | +CGDCONT: (list of supported <cid>s), <PDP_type>,,,(list of supported <d_comp>s),(list of supported <h_comp>s), (list of supported <IPv4AllocAddr>s),(list of supported <emergency_indication>s), (list of supported <P-CSCF_discovery>s), (list of supported <IM_CN_Signalling_Flag_Ind>s),(list of supported <NSLPI>s)]] | +CGDCONT: (1-3), "IP" ,,,(0-2),(0-4) OK |
| | | OK | |

9.2.3 Defined values

| Parameter | Type | Description |
|-----------------------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <cid> | Number | See <cid> |
| <PDP_type> | String | See <PDP_type> |
| <APN> | String | See <APN> |
| <PDP_addr> | Number | See <PDP_addr> |
| <d_comp> | Number | PDP data compression; it can have the values: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 0 (default value): off • 1: on (predefined compression type, i.e. RFC1144) • 2: RFC1144 • 3: RFC2507 • 4: RFC3095 <p> <h_comp>: the available head-compressions are dependent on configuration of the stack (configured via features in the stack)</p> |
| <IPv4AddrAlloc> | Number | Controls how the MT/TA requests to get the IPv4 address information: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 0 (default value): PDP context is not for emergency bearer services • 1: PDP context is for emergency bearer services |
| <P-CSCF_discovery> | Number | Influences how the MT/TA requests to get the P-CSCF address, see 3GPP TS 24.229 [103] annex B and annex L: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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". <p>The MT utilises the NSLPI information provided as specified in 3GPP TS 24.301 [88] and 3GPP TS 24.008 [12].</p> |

9.2.4 Notes

Additional examples:

| Command | Response | Description |
|--------------|------------------------------------|---------------------------------------------------------------------------------------------------------|
| AT+CGDCONT=? | +CGDCONT: (1-3), "IP" ,,,(0),(0-1) | Configure the error result code format by means of the +CMEE AT command Test command |

| Command | Response | Description |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| | OK | |
| AT+CGDCONT=4,"IP","internet" | +CME ERROR: operation not allowed | Define out of range PDP contexts |
| AT+CGDCONT=2,"IP","internet" | OK | Define allowed PDP contexts |
| AT+CGDCONT=1,"IP","STATREAL" | OK | Define allowed PDP contexts |
| AT+CGDCONT=3,"IP","PAP:tim.ibox.it" | OK | Define allowed PDP contexts |
| AT+CGDCONT=253,"IP","internet" | +CME ERROR: operation not allowed | Define out of range PDP contexts |
| AT+CGDCONT? | +CGDCONT: 2,"IP","internet","0.0.0.0",0,0 +CGDCONT: 1,"IP","STATREAL","0.0.0.0",0,0 +CGDCONT: 3,"IP","tim.ibox.it","0.0.0.0",0,0 OK | Read command |

SARA-N2

- The context's setting is not permanently stored in NVM.
- <PDP_addr>, <d_comp>, <h_comp>, <IPv4AddrAlloc>, <emergency_indication>, <P-CSCF_discovery> and <IM_CN_Signalling_Flag_Ind> parameters are not supported.
- <cid>=0 is read only and is only defined when AUTOCONNECT is enabled.

9.3 GPRS attach or detach +CGATT

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

9.3.1 Description

Register (attach) the MT to, or deregister (detach) the MT from the GPRS service. After this command the MT remains in AT command mode. If the MT is already in the requested state (attached or detached), the command is ignored and OK result code is returned. If the requested state cannot be reached, an error result code is returned. The command can be aborted if a character is sent to the DCE during the command execution. Any active PDP context will be automatically deactivated when the GPRS registration state changes to detached.



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 in case 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 GPRS 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.

9.3.2 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 |

9.3.3 Defined values

| Parameter | Type | Description |
|-----------|--------|-----------------------------------------|
| <state> | Number | Indicates the state of GPRS attachment: |

| Parameter | Type | Description |
|-----------|------|----------------------------------------------------------------------------------------------------|
| | | <ul style="list-style-type: none"> 0: detached 1 (default value): attached |

9.3.4 Notes

SARA-N2

- When <state> = 1 is selected, an automatic network registration (+COPS=0) is automatically triggered.
- Further issuing of the +CGATT AT command prior to the completion of the previous +CGATT AT command will provide an error result code.

9.4 PDP context activate or deactivate +CGACT

| +CGACT | | | | | | |
|----------------|--------------|--------------|----------------|----------------|-------------------------------|-----------------|
| Modules | All products | | | | | |
| Attributes | Syntax | PIN required | Settings saved | Can be aborted | Response time | Error reference |
| | full | Yes | No | Yes | Up to 40-150 s (see below) | +CME Error |

9.4.1 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 (150 s and 40 s respectively).

The command can be aborted if a character is sent to the DCE during the command execution: if a PDP context activation on a specific <cid> was requested, the PDP context deactivation is performed; if a multiple PDP context activation was requested, it is aborted after the pending PDP context activation has finished.



The deactivation action is carried out even if the command is aborted.

9.4.2 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 |

9.4.3 Defined values

| Parameter | Type | Description |
|-----------|--------|---------------------------------------------------------------------------------------------------------------------------------------|
| <status> | Number | Indicates the state of PDP context activation: <ul style="list-style-type: none"> 0: deactivated 1: activated |
| <cid> | Number | See <cid>. |

9.4.4 Notes

SARA-N2

- Only one <cid> parameter can be defined.

- The <status> and <cid> parameters are mandatory in the set command.
- The command cannot deactivate the last defined PDP context.

Examples of usage of **+CGDCONT**, **+CGACT**, **+CGPADDR** command:

| Command sent by the DTE | DCE response | Description |
|---------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
| AT+CMEE=1 | OK | Set the numeric error result codes |
| AT+CFUN=1 | OK | Set the MT to full functionality |
| AT+COPS=0 | OK | Set the automatic registration mode |
| AT+CEREG? | +CEREG: 0,1 OK | Read the registration status |
| AT+CGDCONT=1,"IP","web.omnitel.it" | OK | Define the PDP context 1 |
| AT+COPS=2 | OK | De-register from the network |
| AT+CGACT=1,1 | OK | Activate PDP context 1 |
| AT+CGPADDR | +CGPADDR: 0 +CGPADDR: 1,"91.80.104.82" OK | Show the PDP address of the activated PDP context |
| AT+CGDCONT? | +CGDCONT: 0,"IP","ublox.com",,0,0,,,,,0 +CGDCONT: 1,"IP","web.omnitel.it",,0,0,,,,,1 OK | Read all defined PDP contexts |
| To define another PDP context, MT must be de-registered | | |
| AT+COPS=2 | OK | De-register from the network |
| AT+CGDCONT=3,"IP","internet" | OK | Define the PDP context 3 |
| AT+CGACT=1,3 | OK | Activate the PDP context 3 |
| AT+CGPADDR | +CGPADDR: 0 +CGPADDR: 1 +CGPADDR: 3,"91.80.101.207" OK | Show the PDP address of the activated PDP context |
| AT+CGDCONT? | +CGDCONT: 0,"IP","ublox.com",,0,0,,,,,0 +CGDCONT: 1,"IP","web.omnitel.it",,0,0,,,,,1 +CGDCONT: 3,"IP","internet",,0,0,,,,,1 OK | Read all defined PDP contexts |

9.5 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 |

9.5.1 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.

9.5.2 Syntax

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

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

9.5.3 Defined values

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

9.5.4 Notes

SARA-N2

- When the AUTOCONNECT functionality is enabled by means of the **+NCONFIG** AT command <cid>=0 will not be listed until an IP address is acquired.

9.6 EPS network registration status +CEREG

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

9.6.1 Description

Controls the presentation of the network registration URC. The URC assumes a different syntax depending on the network and the <n> parameter:

- +CEREG: <stat> when <n>=1 and there is a change in the MT's EPS network registration status in E-UTRAN
- +CEREG: <stat>,[<tac>],[<ci>],[<AcT>]] when <n>=2 and there is a change of the network cell in EUTRAN
- +CEREG: <stat>,[<tac>],[<ci>],[<AcT>],[<cause_type>,<reject_cause>]] when <n>=3 and the value of <stat> changes
- +CEREG: <stat>,[<tac>],[<ci>],[<AcT>],[<Active_Time>],[<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>],[<Active_Time>],[<Periodic_TAU>]]]] when <n>=5 and the value of <stat> changes

The parameters <AcT>, <tac>, <ci>, <cause_type>, <reject_cause>, <Active-Time> and <Periodic-TAU> are provided only if available.

The read command returns the status of result code presentation and an integer <stat> which shows whether the network has currently indicated the registration of the MT. The location information elements <tac>, <ci> and <AcT>, if available, are returned only when <n>=2 and the MT is registered with the network. The parameters <cause_type>, <reject_cause>, if available, are returned when <n>=3.

9.6.2 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>]]] OK | +CEREG: 2,1,"3a9b","0000c33d",7 OK |
| Test | AT+CEREG=? | +CEREG: (list of supported <n>s) OK | +CEREG: (0-3) OK |
| URC | | +CEREG: <stat>,[<tac>],[<ci>],[<AcT>],[<cause_type>,<reject_cause>],[<Active-Time>],[<Periodic-TAU>]]]] | +CEREG: 1,"3a9b","0000c33d",7 |

9.6.3 Defined values

| Parameter | Type | Description |
|----------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <n> | Number | Mode configuration: <ul style="list-style-type: none"> 0 (default value): 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>],[<Active-Time>],[<Periodic-TAU>]] enabled 5: PSM, network registration, location information and EMM cause value information URC +CEREG: <stat>,[<tac>],[<ci>],[<AcT>],[<cause_type>],[<reject_cause>],[<Active-Time>],[<Periodic-TAU>]] enabled |
| <stat> | Number | EPS registration status: <ul style="list-style-type: none"> 0: not registered, the MT is not currently searching an operator to register to 1: registered, home network 2: not registered, but the MT is currently trying to attach or searching an operator to register to 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 [12] and 3GPP TS 24.301 [88] that specify the condition when the MS is considered as attached for emergency bearer services) |
| <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 service cell: <ul style="list-style-type: none"> 7: E-UTRAN (see 3GPP TS 44.060 [89] that specifies the System Information messages which give the information about whether the serving cell supports EGPRS) 8: E-UTRAN Cat M1 9: E-UTRAN Cat NB1 |
| <cause_type> | Number | <reject_cause> type: <ul style="list-style-type: none"> 0: indicates that <reject_cause> contains an EMM cause value, see 3GPP TS 24.301 [88] Annex A 1: indicates that <reject_cause> contains a manufacture-specific cause |
| <reject_cause> | Number | Cause of the failed registration. The value is of type as defined by <cause_type> |
| <Active_Time> | String | Indicates the Active Time value (T3324) to be allocated to the UE, one byte in an 8-bit format. For the coding and the value range, see the GPRS Timer 2 IE in 3GPP TS 24.008 [12] |
| <Periodic_TAU> | String | Indicates the extended periodic TAU value (T3412) to be allocated to the UE in EUTRAN, one byte in an 8-bit format. For the coding and the value range, see the GPRS Timer 3 IE in 3GPP TS 24.008 [12] |

9.6.4 Notes

SARA-N2

- <AcT>= 8, 9 is not supported.

9.7 Initial PDP context activation +CIPCA

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

9.7.1 Description

Controls whether an initial PDP context shall be established automatically following an attach procedure when the UE is attached to E-UTRAN RAT with or without a PDN connection.

- If the <n> parameter differs than 0, deactivating the last (active) PDP context can lead to a (re)establishment of the initial PDP context.

- Setting <n>=1 from 0 causes an immediate attempt to (re)establish the initial PDP context if no PDP context is active.
- Setting <n>=2 from 0 (if not roaming, roaming corresponds to being registered to a VPLMN which is not equivalent to HPLMN or EHPLMN) causes an immediate attempt to (re)establish the initial PDP context if no other PDP contexts are active.
- The value of <n>=3 applies to E-UTRAN RAT.

Changing <n> will never cause a PDP context deactivation.

9.7.2 Syntax

| Type | Syntax | Response | Example |
|------|-------------------------------------|--------------------------------------------------------------------------------|-------------------------|
| Set | AT+CIPCA[=<n>[,<AttachWithoutPDN>]] | OK | AT+CIPCA=1 OK |
| Read | AT+CIPCA? | +CIPCA: <n>,<AttachWithoutPDN> OK | +CIPCA: 1,0 OK |
| Test | AT+CIPCA=? | +CIPCA: (list of supported <n>s),(list of supported <AttachWithoutPDN>s) OK | +CIPCA: (3),(0,1) OK |

9.7.3 Defined values

| Parameter | Type | Description |
|--------------------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <n> | Number | Activation of PDP context upon attach. Allowed values: <ul style="list-style-type: none"> • 0: do not activate • 1: always activate • 2: activate when not roaming • 3 (default value): no change in current setting |
| <AttachWithoutPDN> | Number | EPS attach with or without PDN connection: <ul style="list-style-type: none"> • 0 (default value): EPS attach with PDN connection • 1: EPS attach without PDN connection |

9.7.4 Notes

SARA-N2

- Only <n>=3 (applies to E-UTRAN RAT) is supported.

9.8 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 |

9.8.1 Description

Returns the APN rate control parameters (see the 3GPP TS 24.008 [12]) 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.

9.8.2 Syntax

| Type | Syntax | Response | Example |
|------|--------------------|---------------------------------------------------------------------------------------------------------|-----------------------------------------|
| Set | AT+CGAPNRC[=<cid>] | [+CGAPNRC: <cid>[,<Additional_exception_reports>[,<Uplink_time_unit>[,<Maximum_uplink_rate>]]] [...] | AT+CGAPNRC=1 +CGAPNRC: 1,0,2,2 OK |

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

9.8.3 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 [12] subclause 10.5.6.3.2): <ul style="list-style-type: none"> • 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 [12] subclause 10.5.6.3.2): <ul style="list-style-type: none"> • 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 [12] subclause 10.5.6.3.2). |

10 System features

10.1 End user test +UTEST

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

10.1.1 Description

Enables the module testing on the RF parts and all the digital pins.



The usage of this command shall be restricted to controlled (shielded chamber/box) environments and for test purposes only.



u-blox assumes no responsibilities for the inappropriate use of this command.

10.1.2 SARA-N2 RF test description

Sets the module in non-signalling (or test) mode, or returns to the signalling (or normal) mode.

In test/non-signalling mode, the module switches off the protocol stack for performing single tests which could not be performed during signalling mode.



Improper usage of this command on a real network could disturb other users and the network itself.

When entering the test mode, it is possible to sequentially trigger the following actions for testing purposes (also depending on the RATs supported by the module):

- 4G transmission of an LTE SC-FDMA OFDM signal (5 MHz bandwidth) in the desired channel in the FDD band and power level
- Receiving signal detection and RF level measurement on the desired 4G (LTE) channel



Disable the AUTOCONNECT functionality by means of the **+NCONFIG** AT command in order to issue +UTEST AT commands.



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: 4").

The execution of these actions is performed in non-signalling mode. In non-signalling mode:

- The module only accepts +UTEST commands

In normal mode:

- The only allowed +UTEST command is the AT+UTEST=1 used to enable the testing interface
- All other +UTEST commands return an error result code (" +CME ERROR: 3")



The module must not be registered with the network before entering the non-signalling mode, otherwise an error result code (" +CME ERROR: 3") is provided.



The **+CME** command can only be set in normal mode.

To return to the normal mode, perform one of these actions:

- A module reset
- Power off the module
- Send AT+UTEST=0

10.1.3 Syntax

| Type | Syntax | Response | Example |
|------|--------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| Set | AT+UTEST=<mode>,[<par1>],[<par2>],[<par3>],[<par4>],[<par5>] | If <mode>=0 or 1 OK If <mode>=2 or 3 +UTEST: [<par1>,<par2>],[<par3>,<par4>,<par5>],[<min>,<avg>,<max>] OK | AT+UTEST=0 OK AT+UTEST=2,124,250 +UTEST: 124,250,-80,-80,-80 OK |
| Read | AT+UTEST? | +UTEST: <mode> OK | +UTEST: 1 OK |
| Test | AT+UTEST=? | +UTEST: (list of supported <mode>s) OK | +UTEST: (0-3) OK |

10.1.4 Defined values


| Parameter | Type | Description |
|-----------------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <mode> | Number | Test mode setting: <ul style="list-style-type: none"> 0: the module returns to the module normal mode 1: the module enters non-signalling mode 2: RX test mode (measuring the antenna level estimation of the received RF signal) 3: TX test mode (GSMK/8-PSK burst or transmission in 3G bands) |
| <par1>...<par5> | Number | Parameters needed for RX and TX test mode as reported in the table below. |

10.1.5 SARA-N2 Notes

- RX mode setting (<mode>=2)**

| Parameter | Description | Range | Default | Notes | | | | | | | | | | | | | | | |
|-----------------|-------------------------------------|---------------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|----------|--------------|-----------------|--------|---------------|-----------------|--------|---------------|-----------------|-------|---------------|-----------------|-------|---------------|
| <par1> | Channel | 0 ÷ 165535 | 32 | RX channel 4G RAT: the value corresponds to EARFCN with an offset of 100000. <table border="1" data-bbox="826 1171 1422 1328"> <thead> <tr> <th><par1> range</th> <th>LTE band</th> <th>EARFCN range</th> </tr> </thead> <tbody> <tr> <td>[106150-106449]</td> <td>FDD 20</td> <td>[6150 - 6449]</td> </tr> <tr> <td>[109210-109659]</td> <td>FDD 28</td> <td>[9210 - 9659]</td> </tr> <tr> <td>[102400-102649]</td> <td>FDD 5</td> <td>[2400 - 2649]</td> </tr> <tr> <td>[103450-103799]</td> <td>FDD 8</td> <td>[3450 - 3799]</td> </tr> </tbody> </table> | <par1> range | LTE band | EARFCN range | [106150-106449] | FDD 20 | [6150 - 6449] | [109210-109659] | FDD 28 | [9210 - 9659] | [102400-102649] | FDD 5 | [2400 - 2649] | [103450-103799] | FDD 8 | [3450 - 3799] |
| <par1> range | LTE band | EARFCN range | | | | | | | | | | | | | | | | | |
| [106150-106449] | FDD 20 | [6150 - 6449] | | | | | | | | | | | | | | | | | |
| [109210-109659] | FDD 28 | [9210 - 9659] | | | | | | | | | | | | | | | | | |
| [102400-102649] | FDD 5 | [2400 - 2649] | | | | | | | | | | | | | | | | | |
| [103450-103799] | FDD 8 | [3450 - 3799] | | | | | | | | | | | | | | | | | |
| <par2> | Time | 42 ÷ 600000 | 1000 | Time interval for RX test expressed in ms | | | | | | | | | | | | | | | |
| <par3> | Not supported | | | | | | | | | | | | | | | | | | |
| <min> | Minimum antenna RF level estimation | -90 ÷ -20 | | Expressed in dBm. | | | | | | | | | | | | | | | |
| <avg> | Average antenna RF level estimation | -90 ÷ -20 | | Expressed in dBm. | | | | | | | | | | | | | | | |
| <max> | Maximum antenna RF level estimation | -90 ÷ -20 | | Expressed in dBm. | | | | | | | | | | | | | | | |

Table 4: <par1> parameter range

 The "+CME ERROR: 4" error result code will be provided in these cases:

- o A value not belonging to the above ranges is set
- o The RX channel parameter value belongs to a not supported RAT (2G or 3G or 4G RAT) or band

- TX mode setting (<mode>=3)**

| Parameter | Description | Range | Default | Notes | | | | | | |
|-----------------|-------------|-----------------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|----------|--------------|-----------------|-------|-----------------|
| <par1> | Tx channel | 0 ÷ 165535 | 32 | TX channel 4G RAT: the value corresponds to EARFCN with an offset of 100000. <table border="1" data-bbox="826 1926 1422 1986"> <thead> <tr> <th><par1> range</th> <th>LTE band</th> <th>EARFCN range</th> </tr> </thead> <tbody> <tr> <td>[102400-102649]</td> <td>FDD 5</td> <td>[20400 - 20649]</td> </tr> </tbody> </table> | <par1> range | LTE band | EARFCN range | [102400-102649] | FDD 5 | [20400 - 20649] |
| <par1> range | LTE band | EARFCN range | | | | | | | | |
| [102400-102649] | FDD 5 | [20400 - 20649] | | | | | | | | |

| Parameter | Description | Range | Default | Notes | | | | | | | | | | | | |
|-----------------|-------------|-----------------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|----------|--------------|-----------------|-------|-----------------|-----------------|--------|-----------------|-----------------|--------|-----------------|
| | | | | <table border="1"> <thead> <tr> <th><par1> range</th> <th>LTE band</th> <th>EARFCN range</th> </tr> </thead> <tbody> <tr> <td>[121450-121799]</td> <td>FDD 8</td> <td>[21450 - 21799]</td> </tr> <tr> <td>[124150-124449]</td> <td>FDD 20</td> <td>[24150 - 24449]</td> </tr> <tr> <td>[127210-127659]</td> <td>FDD 28</td> <td>[27210 - 27659]</td> </tr> </tbody> </table> | <par1> range | LTE band | EARFCN range | [121450-121799] | FDD 8 | [21450 - 21799] | [124150-124449] | FDD 20 | [24150 - 24449] | [127210-127659] | FDD 28 | [27210 - 27659] |
| <par1> range | LTE band | EARFCN range | | | | | | | | | | | | | | |
| [121450-121799] | FDD 8 | [21450 - 21799] | | | | | | | | | | | | | | |
| [124150-124449] | FDD 20 | [24150 - 24449] | | | | | | | | | | | | | | |
| [127210-127659] | FDD 28 | [27210 - 27659] | | | | | | | | | | | | | | |

Table 5: <par1> parameter range


The "+CME ERROR: 4" error result code will be provided in these cases:

- o A value not belonging to the above ranges is set
- o The TX channel parameter value belongs to a not supported RAT (2G or 3G or 4G RAT) or band

| | | | | |
|--------|---------------------|------------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <par2> | Power control level | -56 ÷ 24 | 5 | For 4G RAT: absolute output power [dBm] <ul style="list-style-type: none"> o [-40 ÷ 24] for all the bands |
| | | | | Only the values indicated in the above ranges are valid, otherwise an error result code will be provided (" +CME ERROR: 4"). |
| <par3> | Not supported | | | |
| <par4> | Not supported | | | |
| <par5> | Time | 0 ÷ 600000 | 1000 | Time interval for TX test expressed in ms <ul style="list-style-type: none"> o 0: burst sequence is continuously transmitted. In this case the command will immediately return the information text response. The command line will be immediately available for any +UATEST command. Provide AT+UATEST=1 command to stop the burst sequence transmission, any other +UATEST commands can be set and the current sequence transmission is stopped. |

10.1.6 Examples



In *RX mode test command examples* the module provides the information text response after the timeout issued in the set command.

| Command | Response | Description |
|--------------------------|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+UATEST=2 | +UATEST: 32,1000,-89,-88,-87 OK | The module measures the antenna RX level at RX channel 32 band GSM 900 for 1 s interval. In the example -89,-88,-87 are the antenna RF level estimation: the numbers are just an example. |
| AT+UATEST=2,885,5000 | +UATEST: 885,5000,-66,-65,-65 OK | The module measures the antenna RX level at RX channel 885 band DCS 1800 for 5 s interval. |
| AT+UATEST=2,10562,2000 | +UATEST: 10562,2000,-60,-60,-59 OK | The module measures the antenna RX level at RX channel 10562 band B1 for 2 s interval on the main antenna path. |
| AT+UATEST=2,10562 | +UATEST: 10562,1000,0,-85,-85,-85 OK | The module measures the antenna RX level at RX channel 10562 band B1 for 1 s interval on the main antenna path. |
| AT+UATEST=2,65,3000,0 | +UATEST: 65,3000,0,-63,-62,-62 OK | The module measures the antenna RX level at RX channel 65 band GSM 900 for 3 s interval on the main antenna path. |
| AT+UATEST=2,4357,,1 | +UATEST: 4357,1000,1,-51,-51,-51 OK | The module measures the antenna RX level at RX channel 4357 band B5 for 1 s interval on the diversity antenna path. |
| AT+UATEST=2,102174,500,0 | +UATEST: 102174,500,0,-71,-70,-70 OK | The module measures the antenna RX level at RX channel 2174 band FDD 4 for 0.5 s interval on the primary antenna path. |
| AT+UATEST=2,105230,,1 | +UATEST: 105230,1000,1,-72,-71,-70 OK | The module measures the antenna RX level at RX channel 5230 band FDD 13 for 1 s interval on the secondary antenna path. |

Table 6: RX mode test command examples

| Command | Response | Description |
|-----------------------------|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+UTEST=3,32,7,5 | +UTEST: 32,7,5,1,1000 OK | The module will transmit for 1 s interval 1 slot burst sequence at TX channel 32 GSM 900 at PCL 5 using training sequence 5 and normal GMSK modulation. |
| AT+UTEST=3,65,8,,2,5000 | +UTEST: 65,8,5,2,5000 OK | The module will transmit for 5 s interval 1 slot burst sequence at TX channel 65 GSM 900 at PCL 8 (gamma 6, 27 dBm) using training sequence 5 and normal 8-PSK modulation. |
| AT+UTEST=3,660,,,,0 | +UTEST: 660,5,5,1,0 OK | The module will transmit continuously 1 slot burst sequence at TX channel 660 DCS 1800 at PCL 5 using training sequence 5 and normal GMSK modulation. |
| AT+UTEST=3,9612,22,,,2000 | +UTEST: 9612,22,5,1,2000 OK | The module will transmit for 2 s interval at TX channel 9612 band B1 at 22 dBm power level using WCDMA modulation. |
| AT+UTEST=3,120399,15,,,3000 | +UTEST: 120399,15,5,1,3000 OK | The module transmits for 3 s interval at TX channel 20399 band FDD 4 at 15 dBm power level using SC-FDMA OFDM modulation 5 MHz bandwidth. |
| AT+UTEST=3,123230,-10,,,0 | +UTEST: 123230,-10,5,1,0 OK | The module continuously transmits at TX channel 23230 band FDD 13 at -10 dBm power level using SC-FDMA OFDM modulation 5 MHz bandwidth. |

Table 7: TX mode test command examples

10.1.7 Digital pins testing description

Defines the commands to perform some verifications on all the digital pins of the u-blox cellular modules.

These pins can be considered as generic digital input / output pins; it is possible to configure one pin as a digital output with "high" logic level and then verify the voltage level present. Conversely, it is possible set a pin as a digital input, externally apply a "high" or "low" logic level and then check if the module is able to correctly measure the voltage level applied.

After the execution of the AT+UTEST=10,5 command, it is possible to externally apply a voltage level to the enabled input pins and / or measure the voltage level on the pins configured as digital input.



These commands are intended for production to check the correct digital pins behavior, detect possible soldering or functional problems and can be executed only in non-signalling mode (otherwise the "+CME ERROR: operation not allowed" or "+CME ERROR: 3" error result code - depending on the [+CMEE](#) AT command setting - is issued without performing any operations).



Do not exceed the values reported in the Generic Digital Interface section of the module data sheet when testing a pin as a digital input pin, since stressing the device above the listed ratings may cause a permanent damage of the module.



SARA-N2

See the SARA-N2 Data Sheet [[158](#)] for the pins levels characteristics.

Configure the CTS pin as "pad disabled" by means of the [+UGPIOC](#) AT command, before using this pin as digital pin test.

10.1.8 Syntax

| Type | Syntax | Response | Example |
|--------------------------------------------|------------------------------------------------|----------|--------------------------------------------|
| Digital pins testing generic syntax | | | |
| Set | AT+UTEST=10,<op_code>,[<bit_padding>]<pin_seq> | OK | AT+UTEST=10,3,"0000001000000300" OK |
| Original configuration restoring | | | |
| 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 |

| Type | Syntax | Response | Example |
|----------------------------------|--------------------------------------|-------------------------------------------|---------------------------------------------|
| Pins configuration | | | |
| Set | AT+UTEST=10,3,<bit_padding><pin_seq> | OK | AT+UTEST=10,3,"00000004200000001000" 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 |
| Read | AT+UTEST? | +UTEST: <mode> OK | +UTEST: 1 OK |
| Test | AT+UTEST=? | +UTEST: (list of supported <mode>s) OK | +UTEST: (0-3) OK |

10.1.9 Defined values

| Parameter | Type | Description |
|--------------------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <op_code> | Number | Test mode setting: <ul style="list-style-type: none"> 0: exits the test interface and restore the pins to the original configuration 2: defines a set of pins that will be tested and initialize these pins to be ready for testing. The original pins configuration is kept for final restore. In the [<bit_padding><pin_seq>] parameter use this notation to represent each module pin with its binary digit: <ul style="list-style-type: none"> 0: the pin will not be tested 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 previously issued. In case a not enabled pin is set as digital input or output, the command does not return an error and the setting is not applied. In the [<bit_padding><pin_seq>] parameter use this notation to represent each module pin with its binary digit: <ul style="list-style-type: none"> 0: the pin will be set as an output 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 previously issued; The command is not mandatory if there are not output pins to configure. In the [<bit_padding><pin_seq>] parameter use this notation to represent each module pin with its binary digit: <ul style="list-style-type: none"> 0: the pin will output a "low" logic level 1: the pin will output a "high" logic level 5: apply the setting change defined with <op_code>= 2 / 3 / 4 and triggers the execution of the digital testing. Digital testing of the pins is possible only after the execution of the AT+UTEST=10,5 command. 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: <ul style="list-style-type: none"> 0: "low" logic digital level measured at the module pin 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: <ul style="list-style-type: none"> SARA-N2 - See the Notes for detailed number description |

10.1.10 Notes

- Consider these steps to construct the [<bit_padding><pin_seq>] sequence:

- o Consider the total number of the module's pins available
 - SARA-N2 - 96 pins
- o When a non-testable pin is selected, the command does not return an error result code but the value is not considered and not applied.
- o The status of the n-th pin will be represented by the corresponding n-th bit; see the <op_code> description for the notation of each mode setting
- o Convert each group of four binary digits into its hexadecimal representation
- An example of the AT commands sequence to test the digital pins is reported in [Table 8](#).

| Command | Response | Description |
|------------------------------------------|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | | Configure the formatting of the error result code by means of +CME AT command |
| AT+COPS=2 | OK | Deregister the module from the network |
| AT+UTEST=1 | OK | The module enters the test mode |
| AT+UTEST=10,2,"000007F400C00 0D83F00" | OK | The command puts the module in Interface initialised state; the command saves the pins status to restore it at the end of the test. Pins enabled for testing: DSR, RI, DCD, DTR, RTS, CTS, GPIO1, GPIO2, GPIO3, GPIO4, I2S1_RXD/GPIO6, I2S1_TXD/GPIO7, GPIO5, I2S1_CLK/GPIO8, I2S1_WA/GPIO9, SPI_SCLK/GPIO10, SPI_MOSI/GPIO11, SPI_MISO/GPIO12, SPI_SRDY/GPIO13, SPI_MRDIY/GPIO14 |
| AT+UTEST=10,3,"0000049400400 0C01800" | OK | Pins configuration: <ul style="list-style-type: none"> o DTR, RTS, GPIO3, GPIO4, I2S1_RXD/GPIO6, GPIO5, I2S1_CLK/GPIO8, SPI_MOSI/GPIO11, SPI_MRDIY/GPIO14 as input o DSR, RI, DCD, CTS, GPIO1, GPIO2, I2S1_TXD/GPIO7, I2S1_WA/GPIO9, SPI_SCLK/GPIO10, SPI_MISO/GPIO12, SPI_SRDY/GPIO13 as output |
| AT+UTEST=10,4,"0000036000800 0182700" | OK | Digital logic value of the output pins: <ul style="list-style-type: none"> o DSR, RI, DCD, CTS, GPIO1, GPIO2, I2S1_TXD/GPIO7, I2S1_WA/GPIO9, SPI_SCLK/GPIO10, SPI_MISO/GPIO12, SPI_SRDY/GPIO13 set to "high". |
| AT+UTEST=10,5 | OK | Configurations made by AT+UTEST=10,2; AT+UTEST=10,3 and AT+UTEST=10,4 are executed. |
| AT+UTEST=10,6 | 000007F400C000D83F00 OK | Logic digital value measured at modules pins: <ul style="list-style-type: none"> o DSR, RI, DCD, DTR, RTS, CTS, GPIO1, GPIO2, GPIO3, GPIO4, I2S1_RXD/GPIO6, I2S1_TXD/GPIO7, GPIO5, I2S1_CLK/GPIO8, I2S1_WA/GPIO9, SPI_SCLK/GPIO10, SPI_MOSI/GPIO11, SPI_MISO/GPIO12, SPI_SRDY/GPIO13, SPI_MRDIY/GPIO14: "high" level detected |
| AT+UTEST=0 | OK | Module exits from the test mode and normal pins configurations is restored. |

Table 8: Digital pins test command examples

The digital pins can be configured as many times as needed by the testing process; AT+UTEST=10,2 command is not needed any more as the DUT is already in Interface initialised state.

10.2 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 |

10.2.1 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.

10.2.2 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 |

10.2.3 Defined values

| Parameter | Type | Description |
|-----------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <mode> | Number | Configures the RING line handling: <ul style="list-style-type: none"> 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) |

10.2.4 Notes

SARA-N2

- <mode>=2, 3 are not supported.

10.3 Debug logging level setting +NLOGLEVEL

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

10.3.1 Description

Sets the logging level. The information text response to read command provides the setting of each logging level in separated lines.

10.3.2 Syntax

| Type | Syntax | Response | Example |
|------|-----------------------------|--------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| Set | AT+NLOGLEVEL=<core>,<level> | OK | AT+NLOGLEVEL="PROTOCOL","ERROR" OK |
| Read | AT+NLOGLEVEL? | [+NLOGLEVEL: <core>,<level> [.]] OK | +NLOGLEVEL: "PROTOCOL","ERROR" +NLOGLEVEL: "SECURITY","NONE" +NLOGLEVEL: "APPLICATION", "WARNING" OK |
| Test | AT+NLOGLEVEL=? | +NLOGLEVEL: (list of supported <core>s), (list of supported <level>s) OK | +NLOGLEVEL: ("PROTOCOL", "APPLICATION","SECURITY"), ("VERBOSE","NORMAL","WARNING", "ERROR","NONE") OK |

10.3.3 Defined values

| Parameter | Type | Description |
|-----------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <level> | String | Required logging level. Allowed strings: <ul style="list-style-type: none"> • VERBOSE • NORMAL (default value) • WARNING • ERROR • NONE |
| <core> | String | Allowed strings: <ul style="list-style-type: none"> • PROTOCOL • SECURITY • APPLICATION |

10.4 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 | No | < 10 s | +CME Error |

10.4.1 Description

Enable the UEs power saving mode (PSM) and configures the corresponding parameters. The command configures the PSM on the UE, 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

See the URCs provided by command [+CEREG](#) for the Active Time value and the extended periodic TAU value that are allocated to the UE by the network in E-UTRAN.

Use the read command to get the assigned values from the network:

- If the power saving mode is enabled (+CPSMS: 1), everything on the device will power down except the real-time clock (RTC) after the expiry of T3324 (Active Time). It will stay powered down until the expiry of T3412 (Extended TAU Timer) or if the Power On line is toggled.
- If the power saving mode is disabled (+CPSMS: 0), the device will not enter Power Save Mode (PSM)

10.4.2 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 |

10.4.3 Defined values

| Parameter | Type | Description |
|------------------------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <mode> | Number | Indication to disable or enable the use of PSM in the UE. Allowed values: <ul style="list-style-type: none"> 0 (default and factory-programmed 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. |
| <Requested_Periodic_RAU> | String | Requested extended periodic RAU (T3312) value to be allocated to the GERAN/UTRAN, one byte in an 8 bit format. For the coding and the value range, see the GPRS Timer 3 IE in 3GPP TS 24.008 [12] |
| <Requested_GPRS_READY_timer> | String | Requested GPRS READY timer (T3314) value to be allocated to the UE in GERAN/UTRAN, one byte in an 8 bit format. For the coding and the value range, see the GPRS Timer 3 IE in 3GPP TS 24.008 [12] |
| <Requested_Periodic_TAU> | String | One byte in an 8 bit format. Requested extended periodic TAU value (T3412) to be allocated to the device 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 the value range, see the GPRS Timer 3 IE in 3GPP TS 24.008 Table 10.5.163a/3GPP TS 24.008 [12]. See also 3GPP TS 23.682 [153] and 3GPP TS 23.401 [154]. <ul style="list-style-type: none"> SARA-N2 - The factory-programmed value is 54 m. The default value is "01100000". |
| <Requested_Active_Time> | String | One byte in an 8 bit format. Requested Active Time value (T3324) to be allocated to the UE. 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 the value range, see the GPRS Timer 2 IE in 3GPP TS 24.008 Table 10.5.163/3GPP TS 24.008 [12]. See also 3GPP TS 23.682 [153], 3GPP TS 23.060 [10] and 3GPP TS 23.401 [154]. <ul style="list-style-type: none"> SARA-N2 - The factory-programmed value is 60 s. The default value is "00000000". |

10.4.4 Notes

- The <Requested_Periodic_RAU> and <Requested_GPRS_READY_timer> parameters are not supported.

10.5 Power saving mode status report +NPSMR

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

10.5.1 Description

Returns the status of MT's power mode. The set command configures the +NPSMR URC. When enabled, the URC is issued at each change in power mode of MT.



The <mode> parameter is issued in the information text response to the read command when +NPSMR URC is enabled.

10.5.2 Syntax

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

10.5.3 Defined values

| Parameter | Type | Description |
|-----------|--------|---------------------------------------------------------------------------------------------------------------------------|
| <n> | Number | Configure the corresponding URC: <ul style="list-style-type: none"> 0 (default value): +NPSMR URC disabled |

| Parameter | Type | Description |
|-----------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <mode> | Number | Indicates the power mode status: <ul style="list-style-type: none"> • 1: +NPSMR URC enabled • 0 (default value): normal mode • 1: power saving mode |

10.6 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 | - | +CME Error |

10.6.1 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.

- 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 256 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.

10.6.2 Syntax

| Type | Syntax | Response | Example |
|------|-------------------------------------------|-------------------------------------------|----------------------|
| Set | AT+NFWUPD=<cmd>[,<sn>,<len>,<data>,<crc>] | OK | AT+NFWUPD=5 OK |
| Test | AT+NFWUPD=? | +NFWUPD: (list of supported <cmd>s) OK | +NFWUPD: (1-5) OK |

10.6.3 Defined values

| Parameter | Type | Description |
|-----------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <cmd> | Number | Firmware package process command: <ul style="list-style-type: none"> • 1: download a FW package segment. The <sn>,<len>,<data>,<crc> parameters are mandatory • 2: package validation • 3: get the package name • 4: get the package version • 5: firmware upgrade |
| <sn> | Number | Sequence number for each package segment, starting with zero |
| <len> | Number | Data length expressed in bytes. The maximum length is 256 bytes. |
| <data> | Number | Data to be transmitted, expressed in hexadecimal format |
| <crc> | Number | CRC8 of the package segment binary data |

10.6.4 Notes

SARA-N2

- <cmd>=3 and 4 are not supported.

11 GPIO

11.1 Introduction

The section describes the AT commands used to configure the GPIO pins provided by u-blox cellular modules.

11.1.1 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 9](#) for an overview of the custom functions supported by u-blox cellular modules.

| <code><gpio_mode></code> | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 18 | 19 | 255 |
|--------------------------------|--------|-------|---------------------------|--------------------|-----------------|------------------|-------------------|--------------------|-------------------|-------------------------|------------------------------------|----------------------------------------|------------------------------------------|----------------------|-------------------------|---------------------------------------|--------------|-----------------|------------------|--------------|
| | Output | Input | Network status indication | GNSS supply enable | GNSS data ready | GNSS RTC sharing | Jamming detection | SIM card detection | Headset detection | GSM Tx burst indication | Module operating status indication | Module functionality status indication | I ² S digital audio interface | SPI serial interface | Master clock generation | UART (DSR, DTR, DCD and RI) interface | Wi-Fi enable | Ring indication | Last gasp enable | Pad disabled |
| SARA-N2 | | | * | | | | | | | | | | | | | | | * | | * |

Table 9: 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.

11.1.2 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.

| <code><gpio_id></code> | Pin name | Pin number | Factory-programmed function | Remarks |
|------------------------------|----------|------------|-----------------------------|---------------------------------------------------------------------------|
| 16 | GPIO1 | 16 | Pad disabled | Reserved for internal use |
| 11 | CTS | 11 | Pad disabled | Pin 11 can be configured for network status indication or ring indication |

Table 10: SARA-N2 series GPIO mapping

See the corresponding module system integration manual for the complete overview of all allowed configurations.

11.1.3 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 Cat NB1: indicates registered state on home network in Cat NB1
- 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 Cat NB1: indicates registered state with visitor Cat NB1 network (roaming in Cat NB1)
- 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



SARA-N2

Only the registered home network Cat NB1 and the registered roaming Cat NB1 are supported.

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.

11.1.3.1 No service (no network coverage or not registered)

- Continuous Output / Low



Figure 1: GPIO pin progress for no service

11.1.3.2 Registered home network 2G

- Cyclic Output / High for 100 ms, Output / Low for 2 s

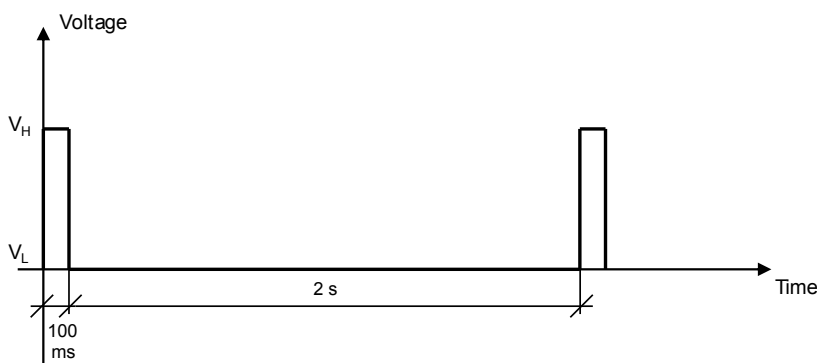


Figure 2: GPIO pin progress for registered home network 2G

11.1.3.3 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

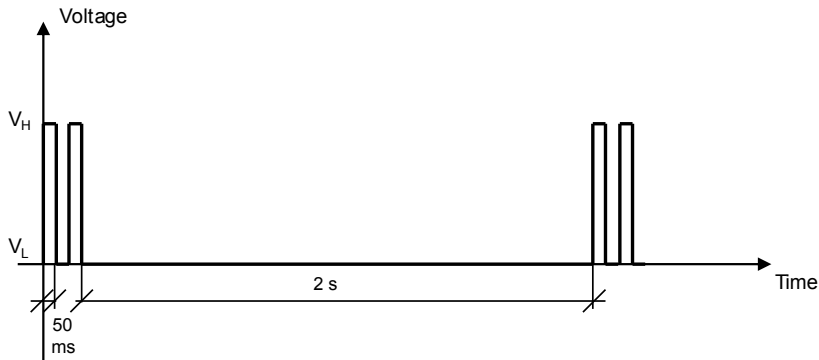


Figure 3: GPIO pin progress for registered home network 3G

11.1.3.4 Registered home network Cat NB1

- Cyclic Output / High for 100 ms, Output / Low for 30 s

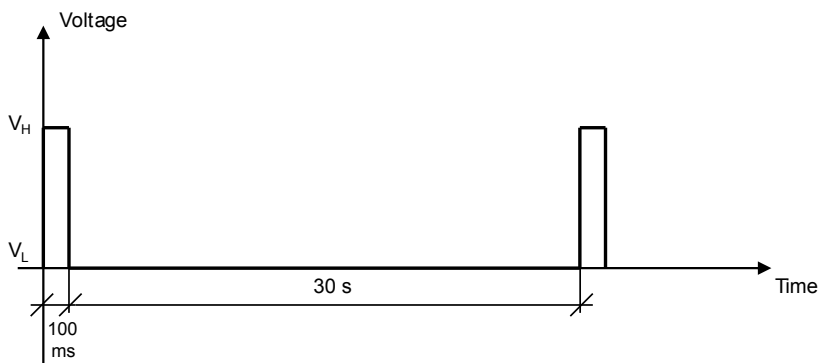


Figure 4: GPIO pin progress for registered home network Cat NB1

11.1.3.5 Registered roaming 2G

- Cyclic Output / High for 100 ms, Output / Low for 100 ms, Output / High for 100 ms, Output / Low for 2 s

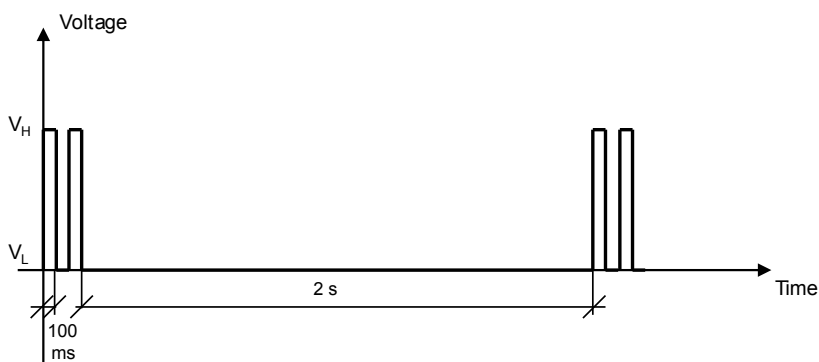


Figure 5: GPIO pin progress for registered roaming 2G

11.1.3.6 Registered roaming 3G

- Cyclic Output / High for 50 ms, Output / Low for 50 ms, Output / High for 50 ms, Output / Low for 100 ms

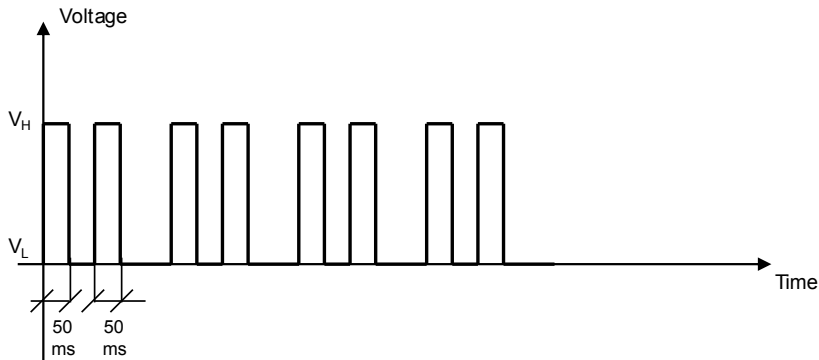


Figure 6: GPIO pin progress for registered roaming 3G

11.1.3.7 Registered roaming Cat NB1

- Cyclic Output / High for 100 ms, Output / Low for 100 ms, Output / High for 100 ms, Output / Low for 30 s

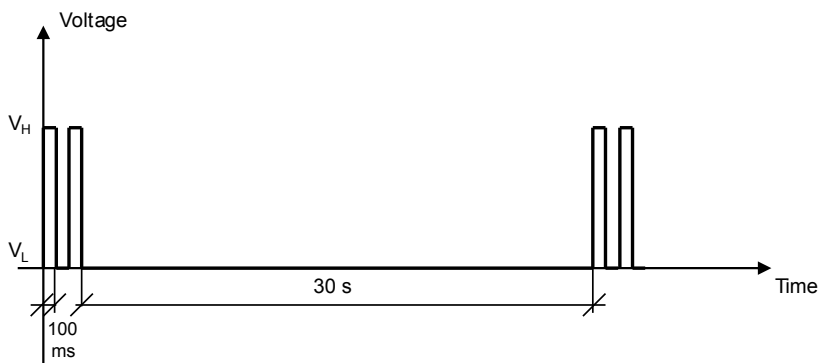


Figure 7: GPIO pin progress for registered roaming Cat NB1

11.1.3.8 Data transmission

- Continuous Output / High

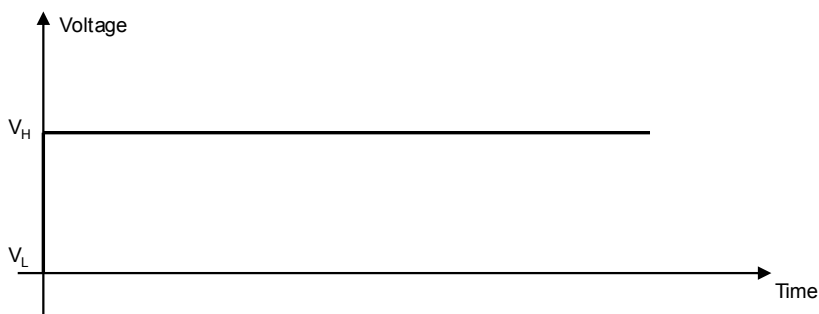


Figure 8: GPIO pin progress for data transmission

11.1.3.9 Data transmission roaming

- Cyclic Output / High for 800 ms, Output / Low for 200 ms

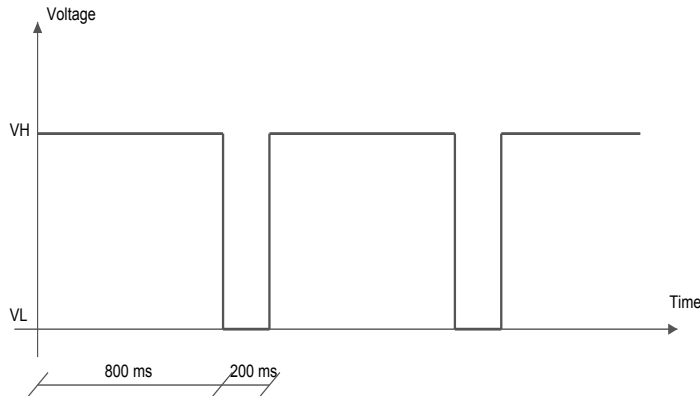


Figure 9: GPIO pin progress for data transmission roaming

11.2 GPIO select configuration command +UGPIOC

| +UGPIOC | | | | | | |
|-------------------|---------------|---------------------|-----------------------|-----------------------|----------------------|------------------------|
| Modules | All products | | | | | |
| Attributes | Syntax | PIN required | Settings saved | Can be aborted | Response time | Error reference |
| | partial | No | <i>NVM</i> | No | < 10 s | +CME Error |

11.2.1 Description

Configures the GPIOs pins as input, output or to handle a custom function. When the GPIOs pins are configured as output pin, it is possible to set the value.

The test command provides the list of the supported GPIOs, the supported functions and the status of all the GPIOs.

ⓘ Not all the GPIO functions can be assigned to each GPIO pin. If the configuration is not allowed, an error result code will be returned (error result code 1502 - "+CME ERROR: Select GPIO mode error"). The following custom functions cannot be simultaneously configured on 2 GPIOs:

- Network status indication
- Ring indication
- GNSS supply enable
- GNSS data ready
- GNSS RTC sharing
- SIM card detection
- Headset detection
- GSM Tx burst indication
- Module operating status indication
- Module functionality status indication
- Last gasp trigger

ⓘ 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](#).

ⓘ SARA-N2
Network status indication and Ring indication are mutually exclusive modes, selecting both simultaneously will return error.

11.2.2 Syntax

| Type | Syntax | Response | Example |
|------|-----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|
| Set | AT+UGPIOC=<gpio_id>,<gpio_mode>[,<gpio_out_val>\<gpio_in_pull>] | OK | AT+UGPIOC=20,0,1 OK |
| Read | AT+UGPIOC? | +UGPIOC: <gpio_id>,<gpio_mode> [<gpio_id>,<gpio_mode> [...]] OK | +UGPIOC: 20,0 21,3 23,255 24,255 51,7 OK |
| Test | AT+UGPIOC=? | +UGPIOC: (list of supported <gpio_id>), (list of supported <gpio_mode>),(list of supported <gpio_out_val>\<gpio_in_ pull>) [<gpio_id1>,<gpio_mode> ... <gpio_idN>,<gpio_mode>] OK | +UGPIOC: (20,21,23,24,51),(0-5,7,9, 255),(0-2) OK |

11.2.3 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: <ul style="list-style-type: none"> • 0: output • 1: input • 2: network status indication • 3: GNSS supply enable • 4: GNSS data ready • 5: GNSS RTC sharing • 7: SIM card detection • 8: headset detection • 9: GSM Tx burst indication • 10: module operating status indication • 11: module functionality status indication • 12: I²S 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 indication • 19: Last gasp enable • 255: pad disabled |
| <gpio_out_val> | Number | GPIO output value (for output function <gpio_mode>=0 only): <ul style="list-style-type: none"> • 0 (default value): low • 1: high |
| <gpio_in_pull> | Number | GPIO input value (for input function <gpio_mode>=1 only): <ul style="list-style-type: none"> • 0 (default value): no resistor activated • 1: pull up resistor active |

| Parameter | Type | Description |
|-----------|------|------------------------------------------------------------------------------|
| | | <ul style="list-style-type: none">2: pull down resistor active |

11.2.4 Notes

SARA-N2

- <gpio_in_pull> and <gpio_out_val> are not supported.
- Only Cat NB1 home/roaming network is supported.

12 Internet protocol transport layer

12.1 Introduction

The maximum number of sockets that can be managed are 7.



The UDP protocol has not any flow control mechanism and packets might be lost in the following scenarios:

- No network signal is available
- Unreliable radio interface (e.g. mobility in GPRS, where cell reselections can lead to data loss, that can be contrasted with the usage of LLC ack reliability QoS parameter)



When both TCP and UDP socket are used at the same time at the maximum throughput (downlink and uplink at the maximum allowed baud rate) it is possible to lose some incoming UDP packets due to internal buffer limitation. A possible workaround is provided as follows:

- If it is possible, adopt an application layer UDP acknowledge system

12.2 IPv4/IPv6 addressing

12.2.1 Introduction

The section describes the IP addressing formats and IP address rules used by TCP/IP UDP/IP enabled applications.

12.2.2 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 11: IPv4 address format examples

12.3 Create socket +NSOCR

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

12.3.1 Description

Creates a socket on the UE. If the port is set, receiving is enabled and **+NSONMI** URCs will appear for any message that is received on that port. Only a socket with a specific protocol and port combination can be created otherwise an error result code is provided.

A maximum of 7 sockets are supported.

12.3.2 Syntax

| Type | Syntax | Response | Example |
|------|------------------------------------------------------------|----------------|----------------------------------------|
| Set | AT+NSOCR=<type>,<protocol>,<listen_port>,<receive_control> | <socket> OK | AT+NSOCR="DGRAM",17,42000,1 1 OK |

12.3.3 Defined values

| Parameter | Type | Description |
|-------------------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <type> | String | Socket type. Supported value is "DGRAM". |
| <protocol> | Number | Standard internet protocol definition. Allowed value: <ul style="list-style-type: none"> 17: UDP |
| <listen_port> | Number | Local port that will be included in sent messages and on which messages will be received. The range goes from 0 to 65535 except for 5683. |
| <receive_control> | Number | Allowed values: <ul style="list-style-type: none"> 0: incoming messages will be ignored 1 (default value): incoming messages will trigger a +NSONMI URC |
| <socket> | Number | Socket identifier to be referenced by the other socket AT commands |

12.3.4 Notes

SARA-N2

- A maximum of 7 sockets are supported.

12.4 SendTo command (UDP only) +NSOST

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

12.4.1 Description

Sends a UDP datagram to the specified host port. It will return the socket identifier where the data was sent on, and the number of bytes of data sent. If the amount of data is larger than the largest datagram that can be sent, the information text response will provide the data quantity successfully sent.

12.4.2 Syntax

| Type | Syntax | Response | Example |
|--------|---------------------------------------------------------------------|------------------------------|-----------------------------------------------------|
| Action | AT+NSOST=<socket>,<remote_ip_address>,<remote_port>,<length>,<data> | <socket>,<sent_length> OK | AT+NSOST=1,"192.158.5.1",1024,2,"07FF" 1,2 OK |

12.4.3 Defined values

| Parameter | Type | Description |
|---------------------|--------|------------------------------------------------------------------------------------------------------------------------------------|
| <socket> | Number | Socket identifier returned by +NSOCR . |
| <remote_ip_address> | String | Remote host IP address of the remote host in IPv4 format. IP addresses can be specified in decimal, octal or hexadecimal notation. |
| <remote_port> | Number | A number in the range 0-65535. Remote port the messages will be received on. |
| <length> | Number | Size of the data to send. The maximum length 512 bytes. |
| <data> | String | Data to be sent in hexadecimal format |
| <sent_length> | Number | Amount of data successfully sent |

12.5 SendTo command with Flags (UDP only) +NSOSTF

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

12.5.1 Description

Sends a UDP datagram to the specified host:port and sets meta-data flags. It will return the socket identifier where the data was sent on, and the number of bytes of data sent. If the amount of data is larger than the largest datagram that can be sent, the information text response will provide the data quantity successfully sent.

12.5.2 Syntax

| Type | Syntax | Response | Example |
|--------|-----------------------------------------------------------------------------|------------------------------|------------------------------------------------------------|
| Action | AT+NSOSTF=<socket>,<remote_ip_address>,<remote_port>,<flag>,<length>,<data> | <socket>,<sent_length> OK | AT+NSOSTF=1,"192.158.5.1",1024,0x100,2,"07FF" 1,2 OK |

12.5.3 Defined values

| Parameter | Type | Description |
|---------------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <socket> | Number | Socket identifier returned by +NSOCR. |
| <remote_ip_address> | String | Remote host IP address of the remote host in IPv4 format. IP addresses can be specified in decimal, octal or hexadecimal format. |
| <remote_port> | Number | Remote port where the messages will be received on, in range 0-65535. |
| <flag> | Number | Specifies the type of message transmission in hexadecimal format. Values of this argument are formed by logically OR'ing zero or more of the following flags: <ul style="list-style-type: none"> 0x000: no flags are set 0x100: exception message. Send message with high priority 0x200: release indicator. Indicate release after next message 0x400: release indicator. Indicate release after next message has been replied to |
| <length> | Number | Data size to send. The maximum length is 512 bytes. |
| <data> | String | Data to be sent in hexadecimal format |
| <sent_length> | Number | Amount of data successfully sent |

12.6 Received message indication +NSONMI

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

12.6.1 Description

Notifies by means of a URC that data has been received on a socket and is ready to be read.

Returns the socket number and number of bytes of data available to read for the first message that is queued. The message received on the same socket will be queued, and it will be issued when the preceding message has been completely read.

12.6.2 Syntax

| Type | Syntax | Response | Example |
|------|--------|---------------------------|--------------|
| URC | | +NSONMI:<socket>,<length> | +NSONMI:1,34 |

12.6.3 Defined values

| Parameter | Type | Description |
|-----------|--------|------------------------------------------------------|
| <socket> | Number | Socket identifier returned by +NSOCR |
| <length> | Number | Number of bytes to read from the specified socket |

12.7 Receive command (UDP only) +NSORF

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

12.7.1 Description

Receives data on a socket. When data arrives a [+NSONMI](#) URC will be issued indicating the socket the message was received on and the amount of data. This command takes a length, which is the maximum amount of data that will be returned. If the requested length is larger than the actual size of the returned data, only the length of returned data is provided, and the remaining length is returned as 0. If the requested length is less than the amount of data returned, only the requested amount of data will be returned, plus an indication of the number of bytes remaining. Once a message has been fully read, a new [+NSONMI](#) URC will be sent if there is another message to process.

12.7.2 Syntax

| Type | Syntax | Response | Example |
|--------|--------------------------------|--------------------------------------------------------------------|---------------------------------------------------------|
| Action | AT+NSORF=<socket>,<req_length> | <socket>,<ip_addr>,<port>,<length>,<data>,<remaining_length> OK | AT+NSORF=1,10 1,"192.158.5.1",1024,5,"hello",0 OK |

12.7.3 Defined values

| Parameter | Type | Description |
|--------------------|--------|------------------------------------------------------------------------|
| <socket> | Number | Socket identifier returned by +NSOCR |
| <req_length> | Number | Maximum amount of data to be returned as a decimal byte length |
| <ip_addr> | String | Remote host IP address |
| <port> | Number | Remote port the messages were sent from. A number in the range 0-65535 |
| <length> | Number | Amount of data returned as a decimal byte length |
| <data> | String | Data received in hexadecimal format |
| <remaining_length> | Number | Amount of data still to be read |

12.8 Close socket +NSOCL

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

12.8.1 Description

Close the specified socket. The pending messages to be read (if present) will be dropped. No further [+NSONMI](#) URCs will be generated. If the socket has already been closed, or was never created, an error result code will be issued.

12.8.2 Syntax

| Type | Syntax | Response | Example |
|------|-------------------|----------|------------------|
| Set | AT+NSOCL=<socket> | OK | AT+NSOCL=1 OK |

12.8.3 Defined values

| Parameter | Type | Description |
|-----------|--------|---------------------------------------------------------------------|
| <socket> | Number | Socket identifier to be referenced by the other socket AT commands. |

13 Ping

13.1 IP network connectivity testing to a remote host +NPING

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

13.1.1 Description

Sends an ICMP packet to the specified host address.

The set command initiates the sending of a PING packet to the specified address. This will either cause a packet to be returned if the remote system is connected and responding to PING packets, or no response will be received. Only a ping attempt is tried. If none of the packets receive a response within the timeout period, an error result code will be raised.

If a response is received, the +NPING URC will be issued. If no response is received the +NPINGERR URC will be issued providing the error cause.

13.1.2 Syntax

| Type | Syntax | Response | Example |
|------|-----------------------------------------------|-----------------------------------------------|-------------------------------|
| Set | AT+NPING=<remote_addr>[,<p_size>[,<timeout>]] | OK | AT+NPING="192.168.1.1" OK |
| URC | | +NPING: <retry_num>,<remote_addr>,<ttl>,<rtt> | +NPING: 1,"192.168.1.1",20,50 |
| URC | | +NPINGERR: <err> | +NPINGERR: 1 |

13.1.3 Defined values

| Parameter | Type | Description |
|---------------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <remote_addr> | String | Address of system sending the message in IPv4 format. IP addresses can be specified in decimal, octal or hexadecimal notation. |
| <p_size> | Number | Size of echo packet payload in range 8-1460 bytes, the default value is 8 bytes. |
| <timeout> | Number | Maximum time to wait for an echo reply response in range 10-60000 ms, the default value is 10 000 ms. |
| <retry_num> | Number | Number of packets sent before a response is received. |
| <ttl> | Number | TTL in the response packet. |
| <rtt> | Number | RTT value, the time elapsed in milliseconds before receiving the echo reply response from the remote host. |
| <err> | Number | Provides some information about the ping request failure: <ul style="list-style-type: none"> • 1: no response from remote host within timeout period • 2: failed to send ping request |

14 Datagram messages

These proprietary commands are used to send messages via MNO NB-IoT platform. Messages wrapped in CoAP (Constrained Application Protocol) packets are transported over UDP sockets. Messages are queued on the module and are sent in order. Messages can be received by either polling the [+NMGR](#) AT command or by turning on the [+NNMI](#) URC.



Constrained Application Protocol is a specialized web transfer protocol for use with constrained nodes and constrained networks in the Internet of Things.



The [+NCDP](#) AT command specifies the MNO NB-IoT platform.

14.1 Get message +NMGR

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

14.1.1 Description

Returns the oldest buffered message and deletes the messages from the buffer. If there are no messages then no information text response will be given.

If new message indications (by means of [+NNMI=1](#) AT command) is set then the received messages will not be available via this AT command.

14.1.2 Syntax

| Type | Syntax | Response | Example |
|--------|---------|-----------------------|-------------------|
| Action | AT+NMGR | <length>,<data> OK | 3, "AA11BB" OK |

14.1.3 Defined values

| Parameter | Type | Description |
|-----------|--------|----------------------------------------------|
| <length> | Number | Number of bytes of the data in range 0-512 |
| <data> | String | Data to be transmitted in hexadecimal format |

14.2 Send message +NMGS

| +NMGS | | | | | | |
|-------------------|---------------|---------------------|-----------------------|-----------------------|----------------------|----------------------------|
| 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

Sends a message from the terminal to the network via the CDP (Connected Device Platform) server.

14.2.2 Syntax

| Type | Syntax | Response | Example |
|------|-------------------------|----------|---------------------------|
| Set | AT+NMGS=<length>,<data> | OK | AT+NMGS=3, "AA11BB" OK |

14.2.3 Defined values

| Parameter | Type | Description |
|-----------|--------|----------------------------------------------|
| <length> | Number | Number of bytes of the data in range 0-512 |
| <data> | String | Data to be transmitted in hexadecimal format |

14.3 New message indications +NNMI

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

14.3.1 Description

Sets or gets whether new message indications are sent. New message indications can be sent when the module receives a downstream message.

If the indications are enabled, all currently buffered messages will be indicated by means of a URC.

14.3.2 Syntax

| Type | Syntax | Response | Example |
|------|----------------------|-----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| Set | AT+NNMI=<indication> | +NNMI: OK OK | AT+NNMI=1 +NNMI: OK OK |
| Read | AT+NNMI? | +NNMI: <indication> OK | +NNMI: 2 OK |
| URC | | <indication>=1 +NNMI: <length>,<data> <indication>=2 +NNMI | <indication>=1 +NNMI: 5,"48656C6C6F" <indication>=2 +NNMI |

14.3.3 Defined values

| Parameter | Type | Description |
|--------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <indication> | Number | Allowed values: <ul style="list-style-type: none"> 0 (default value): indications disabled 1: indications enabled including the received message 2: only the indications are enabled; retrieve the message by means of +NMGR AT command |
| <length> | Number | Number of bytes of the data in range 0-512 |
| <data> | String | Data to be transmitted in hexadecimal format |

14.4 Query received messages +NQMGR

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

14.4.1 Description

Queries the status of the received downstream messages.

Messages are dropped by the module if the host does not read them out of the buffer fast enough. When messages are dropped the oldest messages are dropped first.

14.4.2 Syntax

| Type | Syntax | Response | Example |
|--------|----------|-----------------------------------------------------------------|----------------------------------------|
| Action | AT+NQMGR | BUFFERED=<buffered>,RECEIVED=<received>,DROPPED=<dropped> OK | BUFFERED=3,RECEIVED=34,DROPPED=0 OK |

14.4.3 Defined values

| Parameter | Type | Description |
|------------|--------|-----------------------------------------------------------------------|
| <buffered> | Number | The number of messages waiting to be read in the downstream buffer |
| <received> | Number | Total number of messages received by the module since the module boot |
| <dropped> | Number | Number of messages dropped by the module since the module boot |

14.5 Query sent messages +NQMGs

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

14.5.1 Description

Returns the accumulated status of all the upstream messages sent to the CDP (Connected Device Platform) server since last boot up.

14.5.2 Syntax

| Type | Syntax | Response | Example |
|--------|----------|-------------------------------------------------------|---------------------------------|
| Action | AT+NQMGs | PENDING=<pending>,SENT=<sent>, ERROR=<error> OK | PENDING=3,SENT=34,ERROR=0 OK |

14.5.3 Defined values

| Parameter | Type | Description |
|-----------|--------|---------------------------------------------------------------------------------------------------------|
| <pending> | Number | Number of messages waiting to be sent in the upstream buffer (if a network connection is not available) |
| <sent> | Number | Total number of messages sent by the module since the module power-on |
| <error> | Number | Number of messages not sent due to errors, since the module power-on |

14.6 Send message indications +NSMI

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

14.6.1 Description

Enables and disables indications when an upstream message is sent.

If indications are turned on, the +NSMI URC will be issued when the datagram has been successfully sent and acknowledged by the network.

14.6.2 Syntax

| Type | Syntax | Response | Example |
|------|----------------------|---------------------|-----------------|
| Set | AT+NSMI=<indication> | OK | AT+NSMI=1 OK |
| Read | AT+NSMI? | +NSMI: <indication> | +NSMI: 1 |

| Type | Syntax | Response | Example |
|------|--------|-----------------|---------------|
| | | OK | OK |
| URC | | +NSMI: <status> | +NSMI: "SENT" |

14.6.3 Defined values

| Parameter | Type | Description |
|--------------|--------|---------------------------------------------------------------------------------------------------------------------------|
| <indication> | Number | <ul style="list-style-type: none"> 0 (default value): indications disabled 1: indications enabled |
| <status> | String | Allowed values: <ul style="list-style-type: none"> "SENT" "DISCARDED" |

14.7 Chipset vendor CDP IP address +NCDP

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

14.7.1 Description

Configures the chipset vendor CDP (Connected Device Platform) IP address. The internal network IP address of the CDP server is specific of the intended network configuration.



Connected Device Platform is an entity which is a part of the MNO NB-IoT network infrastructure. It provides the necessary queuing function so that devices in the internet can communicate with IoT entities.

14.7.2 Syntax

| Type | Syntax | Response | Example |
|------|---------------------------------|------------------------------------|-----------------------------------|
| Set | AT+NCDP=<IPv4_address>[,<port>] | OK | AT+NCDP="10.105.7.75",5683 OK |
| Read | AT+NCDP? | +NCDP: <IPv4_address>,<port> OK | +NCDP: "192.168.160.1",5683 OK |

14.7.3 Defined values

| Parameter | Type | Description |
|----------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <IPv4_address> | String | CDP destination IPv4 address. IP addresses can be specified in decimal, octal or hexadecimal notation. |
| <port> | Number | CDP destination port number: <ul style="list-style-type: none"> If <port>= 0 is provided, the default port (5683) will be used. If no port is specified the previously set port will be used. If no port is specified and no port was previously set, the default port will be used. |

14.7.4 Notes

SARA-N2

- Put the MT to the minimum cellular functionality (*AT+CFUN=0*) before issuing this command.
- The changes are effective after the module reboot.

14.8 Message registration status +NMSTATUS

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

14.8.1 Description

Provides the registration status when the module is connected to the CDP (Connected Device Platform) server.

14.8.2 Syntax

| Type | Syntax | Response | Example |
|------|---------------|-------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Read | AT+NMSTATUS? | +NMSTATUS: <registration_status> OK | +NMSTATUS: "REGISTERED" OK |
| Test | AT+NMSTATUS=? | list of supported <registration_status>s> OK | "UNINITIALISED" "MISSING_CONFIG" "INIT_FAILED" "INITIALISED" "REGISTERING" "REREGISTERING" "REGISTERED" "REREGISTERED" "MO_DATA_ENABLED" "NO_UE_IP" "MEMORY_ERROR" "COAP_ERROR" "MSG_SEND_FAILED" "REJECTED_BY_SERVER" "TIMEOUT_AND_RETRYING" "TIMEOUT_AND_FAILED" OK |

14.8.3 Defined values

| Parameter | Type | Description |
|-----------------------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <registration_status> | String | Current registration status. Allowed values: <ul style="list-style-type: none"> • "UNINITIALISED" • "MISSING_CONFIG" • "INIT_FAILED" • "INITIALISED" • "REGISTERING" • "REREGISTERING" • "REGISTERED" • "REREGISTERED" • "SEND_ENABLED" • "NO_UE_IP" • "MEMORY_ERROR" • "COAP_ERROR" • "MSG_SEND_FAILED" • "REJECTED_BY_SERVER" • "TIMEOUT_AND_RETRYING" • "TIMEOUT_AND_FAILED" |

15 Constrained Application Protocol (CoAP)

15.1 Introduction

The Constrained Application Protocol (CoAP) is a datagram-based client/server application protocol for devices on the constrained network (e.g. low overhead, low-power), designed to easily translate to HTTP for simplified integration with the web. CoAP clients can use the GET, PUT, POST and DELETE methods using requests and responses with a CoAP server.

The CoAP defines the application level Quality of Service (QoS), where requests and response messages may be marked as:

- **"Confirmable" (CON):** the messages must be acknowledged by the receiver if successfully received.
- **"Non-confirmable" (NON):** the messages are "fire and forget".

These components can access to the CoAP context:

- **CDP-MNO:** confirmable and non-confirmable messages are supported
- **CoAP-AT:** it can be used to send or receive confirmable messages (by means of `+UCOAPC` command) via CoAP over the NB-IoT platform. Only confirmable messages are supported
- **FOTA:** the Firmware over-the-air (FOTA) component uses the CoAP context to download a FW update package from a dedicated FOTA server. For more details see [FOTA examples](#). Only confirmable messages are supported
- **SELF-REG:** The self-registration component will access to the CoAP context only at the module boot time. After that, the CoAP context shall be available as mutually exclusive between other components. Only confirmable messages are supported

The component can be configured by the `+USELCP` AT command.

The access to the CoAP context will be multiplexed between the FOTA component and the CDP-MNO/CoAP-AT.

Switching the CoAP context is not allowed if it is already acquired by the self-registration component.

The default IP address depends on the server type:

- FOTA server: "52.8.254.248"
- China Telecom (CTCC): "42.99.2.15"
- China Unicom (CUCC): "47.93.238.105"

15.2 CoAP profile configuration +UCOAP

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

15.2.1 Description

Configures, reads and resets the current profile parameters of the CoAP client. A set command for each `<op_code>` parameter must be issued to set each CoAP client profile parameter (CoAP server address, CoAP URI, CoAP PDU option mask).

To store in the NVM the configured CoAP client profile parameters issue the `AT+UCOAP=6,<profile_number>` command where the `<profile_number>` parameter is the profile number.

Up to four profiles can be stored in the NVM and only one can be loaded at a time. The loaded profile will be considered as the current profile and only this one can be stored in the NVM on the requested profile location.

The read command (`AT+UCOAP=7`) returns the parameter settings for all four profiles. If the profile is not defined, then the `" +UCOAP: INVALID PROFILE NUMBER <profile_number> "` will be returned in the information text response to the read command.

15.2.2 Syntax

| Type | Syntax | Response | Example |
|------------------------------------|---------------------------------------------------|------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Generic syntax | | | |
| Set | AT+UCOAP=<op_code>,<param_val>[,<param_val1>] | OK | AT+UCOAP=0,"192.168.10.25","2481" OK |
| Read | AT+UCOAP? | +UCOAP: <op_code>[,<param_val>[,<param_val1>]] [[..]] +UCOAP: <op_code>[,<param_val>[,<param_val1>]] OK | +UCOAP: 0,"192.168.10.25","2481" +UCOAP: 1,"coap://10.17.4.27:3456/ublox/testuri" +UCOAP: 2,"0","1" +UCOAP: 3,"1" +UCOAP: 4,"0" +UCOAP: 5,"2" +UCOAP: 6,"1" OK |
| CoAP server IP address port | | | |
| Set | AT+UCOAP=0,<COAP_server_IP_address>[,<COAP_port>] | OK | AT+UCOAP=0,"192.168.10.25","2481" OK |
| CoAP URI | | | |
| Set | AT+UCOAP=1,<COAP_URI> | OK | AT+UCOAP=1,"coap://10.17.4.27:3456/ublox/testuri" OK |
| CoAP PDU option mask | | | |
| Set | AT+UCOAP=2,<PDU_option>[,<value>] | OK | AT+UCOAP=2,"0",1 OK |
| Current profile number | | | |
| Set | AT+UCOAP=3,<profile_number> | OK | AT+UCOAP=3,"0" OK |
| Current profile valid flag | | | |
| Set | AT+UCOAP=4,<valid_flag> | OK | AT+UCOAP=4,"0" OK |
| Restore profile | | | |
| Set | AT+UCOAP=5,<profile_number> | OK | AT+UCOAP=5,"0" OK |
| Store profile | | | |
| Set | AT+UCOAP=6,<profile_number> | OK | AT+UCOAP=6,"0" OK |
| Read the stored profiles | | | |
| Read | AT+UCOAP=7 | +UCOAP: <param_name>,<param_val> [[..]] +UCOAP: <param_name>,<param_val> OK | AT+UCOAP=7 +UCOAP: INVALID PROFILE NUMBER 0 +UCOAP: INVALID PROFILE NUMBER 1 +UCOAP: "DST_IP_ADDRESS","10.56.9.34" +UCOAP: "PORT",3456 +UCOAP: "URI_STR","coap://10.56.9.34:3456/ublox/testuri" +UCOAP: "OPT_MASK",0 +UCOAP: "PROFILE_NUM",2 +UCOAP: "STATUS_FLAG",1 +UCOAP: INVALID PROFILE NUMBER 3 OK |

| Type | Syntax | Response | Example |
|------|------------|----------------------------------------------|---------------------|
| Test | AT+UCOAP=? | +UCOAP: (list of supported <op_code>s) OK | +UCOAP: (0-6) OK |

15.2.3 Defined values

| Parameter | Type | Description |
|--------------------------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <op_code> | Number | Specific parameter in profile. Allowed values are: <ul style="list-style-type: none"> 0: CoAP server address configuration 1: CoAP URI configuration 2: CoAP PDU option mask configuration 3: current profile number 4: current profile valid 5: restore profile from the NVM 6: store profile to the NVM |
| <COAP_server_IP_address> | String | Remote CoAP server IP address in IPv4 format. For IP address format reference see the IP addressing . |
| <COAP_port> | String | Remote CoAP server port; the default CoAP port is 5683. |
| <COAP_URI> | String | URI of the target resource at server; the maximum supported length of the URI is 200. |
| <PDU_option> | String | PDU option to be added in PDU header. Allowed values are: <ul style="list-style-type: none"> 0: URI_HOST 1: URI_PORT 2: URI_PATH 3: URI_QUERY 4: CONTENT_FORMAT (CONTENT_FORMAT option in the PDU by means of the +UCOAPC AT command) |
| <value> | String | Allowed values are: <ul style="list-style-type: none"> 0 (default value): clear the corresponding option flag 1: set the corresponding option flag |
| <profile_number> | String | Profile number to be used: <ul style="list-style-type: none"> 0: profile 0 1: profile 1 2: profile 2 3: profile 3 |
| <valid_flag> | String | Sets the current profile as valid or invalid: <ul style="list-style-type: none"> 0: invalid profile 1: valid profile |
| <param_name> | String | Verbose description for the specific parameter, provided with their numeric values for each profile. |
| <param_val> | String | Type and supported content depend on the related <op_code> parameter; details are given above. |
| <param_val1> | String | Optional parameter; type and supported content depend on the related <op_code> parameter; details are given above. |

15.2.4 Notes

SARA-N2

- No profiles are defined by factory-programmed setting.

15.3 CoAP command +UCOAPC

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

15.3.1 Description

Triggers the CoAP action according with the <coap_command> parameter. The final result code indicates if sending the command request to the CoAP process was successful or not. The final result of the CoAP command will be returned to the user via the +UCOAPCD URC.

15.3.2 Syntax

| Type | Syntax | Response | Example |
|------|------------------------------------------------|----------------------------------------------------|------------------------|
| Set | AT+UCOAPC=<coap_command>[,<data>,<identifier>] | OK | AT+UCOAPC=1 OK |
| Test | AT+UCOAPC=? | +UCOAPC: (list of supported <coap_command>s) OK | +UCOAPC: (1,4) OK |
| URC | | +UCOAPCD: <data> | +UCOAPCD: "34746E5F31" |

15.3.3 Defined values

| Parameter | Type | Description |
|----------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <coap_command> | Number | CoAP action. Allowed values: <ul style="list-style-type: none"> 1: GET request to the CoAP server; the <data> and <identifier> parameters are not allowed 2: DELETE request to the CoAP server; the <data> and <identifier> parameters are not allowed 3: PUT request to the CoAP server 4: POST request to the CoAP server |
| <data> | String | Hexadecimal data to be placed in command PDU. |
| <identifier> | Number | CoAP Content-Type identifier. Allowed values: <ul style="list-style-type: none"> 0: text / plain 1: application / link format 2: application / xml 3: application / octet stream 4: application / rdf xml 5: application / exi 6: application / json 7: application / cbor |

15.4 CoAP component selection +USELCP

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

15.4.1 Description

Selects the component which can access the CoAP context. A valid IP address shall be set (by means of the +UCOAPS AT command) before selecting the FOTA component.

A valid profile shall be configured and activated (by means of the +UCOAP AT command) before selecting the CoAP-AT component.



It is not possible to set the <comp_code> parameter to 0 or 1 if the <transfer_status> parameter is equal to 2 in the last +UFOTAS URC.

15.4.2 Syntax

| Type | Syntax | Response | Example |
|------|-----------------------|----------------------------|-------------------|
| Set | AT+USELCP=<comp_code> | OK | AT+USELCP=1 OK |
| Read | AT+USELCP? | +USELCP: <comp_code> OK | +USELCP: 1 OK |

15.4.3 Defined values

| Parameter | Type | Description |
|-------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <comp_code> | Number | Indicates the component which can access the CoAP context: <ul style="list-style-type: none"> 0: CDP-MNO (Connected Device Platform) 1: CoAP-AT 2: FOTA (Firmware update Over The Air) 3: SELF-REG. This value is read only and cannot be selected in the set command |

15.5 FOTA server configuration +UCOAPS

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

15.5.1 Description

Configures the IP address and port of the FOTA server and self-registration (specifically for CTCC and CUCC MNO).

The read command returns the IP address and port for all the configured servers. It will return empty if any of the servers are not set.

15.5.2 Syntax

| Type | Syntax | Response | Example |
|------|--------------------------------------------|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Set | AT+UCOAPS=<ser_type>,<ip_address>[,<port>] | OK | AT+UCOAPS=0,"192.168.160.1",5683 OK |
| Read | AT+UCOAPS? | +UCOAPS: <ser_type>,<ip_address>,<port> [[.]] +UCOAPS: <ser_type>,<ip_address>,<port> OK | +UCOAPS: 0,"192.168.160.1",5683 +UCOAPS: 1,"192.168.27.8",5645 +UCOAPS: 2 OK |

15.5.3 Defined values

| Parameter | Type | Description |
|--------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ser_type> | Number | Server type. Allowed values: <ul style="list-style-type: none"> 0: FOTA server 1: self-registration for CTCC 2: self-registration for CUCC |
| <ip_address> | String | Remote server IP address expressed in IPv4 format. For IP address format reference see the IP addressing . |
| <port> | Number | Remote server port; the default CoAP port is 5683 |

15.6 FOTA poll timer configuration +UFOTAPT

| +UFOTAPT | | | | | | |
|----------------|--------------|--------------|----------------|----------------|---------------|-------------------|
| Modules | All products | | | | | |
| Attributes | Syntax | PIN required | Settings saved | Can be aborted | Response time | Error reference |
| | full | No | <i>NVM</i> | No | - | <i>+CME Error</i> |

15.6.1 Description

Configures the poll timer value for the FOTA component. This timer represents the time during which the FOTA engine will remain in the "POLL_TIMER_RUN" state. When the timer expires, the FOTA engine moves to the "POLL_TIMER_EXPIRE" state.

15.6.2 Syntax

| Type | Syntax | Response | Example |
|------|------------------------|----------------------------------------|--------------------|
| Set | AT+UFOTAPT=<timer_res> | OK | AT+UFOTAPT=2 OK |
| Read | AT+UFOTAPT? | +UFOTAPT: <timer_res>,<hrs_left> OK | +UFOTAPT: 1 OK |

15.6.3 Defined values

| Parameter | Type | Description |
|-------------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <timer_res> | Number | Configure the poll timer value, allowed values: <ul style="list-style-type: none"> 0 (factory-programmed value): immediate 1: 1 hour 2: 24 hours (1 day) 3: 168 hours (7 days) 4: 720 hours (30 days) |
| <hrs_left> | Number | Hours left in poll timer expiry |


15.7 Firmware transfer +UCOAPFWT

| +UCOAPFWT | | | | | | |
|----------------|--------------|--------------|----------------|----------------|---------------|-------------------|
| Modules | All products | | | | | |
| Attributes | Syntax | PIN required | Settings saved | Can be aborted | Response time | Error reference |
| | full | No | No | No | - | <i>+CME Error</i> |

15.7.1 Description

Downloads the firmware update package to be used during the FOTA procedure. Issue the command only if the <transfer_status> parameter is 3 in the last *+UFOTAS* URC.

The update process is fault tolerant, even if the power supply is suddenly removed. At the end of a successful installation, the module will be rebooted and the data stored in the NVM are set to the factory-programmed values of the new firmware version.

 Define a CoAP context (by means of the *AT+USELCP=2* command) before issuing this command.

15.7.2 Syntax

| Type | Syntax | Response | Example |
|------|---------------------------|----------|---------------------|
| Set | AT+UCOAPFWT=<block_count> | OK | AT+UCOAPFWT=0 OK |

15.7.3 Defined values

| Parameter | Type | Description |
|---------------|--------|----------------------------------------------------------------------------|
| <block_count> | Number | Indicates the number of blocks to be transferred against each set command: |


| Parameter | Type | Description |
|-----------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | | <ul style="list-style-type: none"> 0: transfer all blocks mentioned in +UFOTAS URC 1-65535: transfer given number of blocks. If given number of blocks are greater than remaining block in +UFOTAS URC, then remaining block count will be transferred |

15.8 FOTA status +UFOTAS

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

15.8.1 Description

Returns the current status of the FOTA process. The action command checks the availability of the firmware update file. The +UFOTAS URC will be issued in either case; if the firmware update package is not available then the state <transfer_status>=0 will be issued again. The +UFOTAS URC is issued at each change of the <transfer_status> parameter value.

 Set the COAP context to FOTA (by setting <comp_code>=2 in the **+USELCP** AT command) before issuing this command.

15.8.2 Syntax


| Type | Syntax | Response | Example |
|--------|------------|-------------------------------------------|-----------------------|
| Action | AT+UFOTAS | OK | OK |
| Read | AT+UFOTAS? | +UFOTAS: <blk_rm>,<transfer_status> OK | +UFOTAS: 1487,1 OK |
| URC | | +UFOTAS: <blk_rm>,<transfer_status> | +UFOTAS: 1487,1 |

15.8.3 Defined values

| Parameter | Type | Description |
|-------------------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <blk_rm> | Number | Status of remaining number of blocks: <ul style="list-style-type: none"> 0: no update is available 1-65535: current block number could be in this range |
| <transfer_status> | Number | FOTA process status: <ul style="list-style-type: none"> 0: no update is available (the POLL timer is running) 1: the POLL timer is expired, the module can query the firmware update 2: transferring <block_count> mentioned in +UCOAPFWT command 3: pending transfer, some blocks left to be transferred and no transfer in progress 4: package validation 5: package installation |

15.8.4 Examples

[Table 12](#) reports an example of an AT commands sequence for the FOTA process.

| Command | Response | Description |
|---------------------------------|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| AT+UCOAPS=0,"52.8.254.248",5683 | OK | Configure the IP address and port for the FOTA server. |
| AT+USELCP=2 | OK | The COAP context is acquired by the FOTA component. |
| AT+UFOTAS? | +UFOTAS: 0,0 OK | The POLL timer is running; a time after which the UE qualifies to query the firmware update to the server. |
| | +UFOTAS: 0,1 |  The +UFOTAS URC will be issued on expiry of that timer. |
| | | The POLL timer has expired; the UE qualifies to query the firmware update to the server. |
| AT+UFOTAS | OK | Issue the action command to check whether a firmware update is available or not. |


| Command | Response | Description |
|---------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | +UFOTAS: 133,3 | The URC notifies that the firmware update package has 133 remaining blocks, and its transfer is pending. |
| AT+UCOAPFWT=0 | OK | Transfer all blocks available in the firmware update package mentioned in the previous URC. |
| | +UFOTAS: 133,2 | The URC notifies that the transfer of 133 blocks of firmware update package has been started.  If the UE reboots in this state, it will resume in transfer pending state(<transfer_status>=3). |
| | +UFOTAS: 0,4 | The URC notifies that the firmware package has downloaded successfully and the validation process is started. |
| | +UFOTAS: 0,5 | The URC notifies that the firmware package validation is completed successfully and the installation process is started. |
| | REBOOTING | An automatic reboot is issued after that the installation process is completed. After the module reboot the UE will resume in <transfer_status>=1 state, so the user needs to query the firmware update as follows. |
| | +UFOTAS: 0,1 | The UE qualifies to query the firmware update. |
| AT+UFOTAS | OK | Issue the action command to check the update package availability. If the UE's current firmware matches with the latest firmware on the server, then the UE will resume in <transfer_status>=0 state. Otherwise the update process will be started again, as the last update was not successful. |
| | +UFOTAS: 0,0 | The POLL timer is running. |

Table 12: FOTA process examples

A Appendix: Error result codes

A.1 Mobile termination error result codes +CME ERROR

| Numeric error 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 |
| 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 |
| 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 |
| 126 | Insufficient resources |
| 132 | Service option not supported |
| 133 | Requested service option not subscribed |
| 134 | Service option temporarily out of order |

| Numeric error code | Description |
|--------------------|---------------------------------------------------|
| 135 | NS-api already used |
| 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 |
| 148 | Unspecified GPRS error |
| 149 | PDP authentication failure |
| 150 | Invalid mobile class |
| 156 | User Busy |
| 159 | Uplink Busy/ Flow Control |
| 254 | Invalid error mapping |
| 255 | Internal error |
| 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 | (U)SIM not inserted |
| 311 | (U)SIM PIN required |
| 312 | PH-(U)SIM PIN required |
| 313 | (U)SIM failure |
| 314 | (U)SIM busy |
| 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 |
| 500 | Unknown error |
| 512 | Required parameter not configured |
| 513 | Module not registered |
| 514 | AT internal error |
| 515 | Active PDP context identifier |
| 516 | Incorrect state for the command |
| 517 | Invalid PDP context identifier |
| 520 | Deactivate the last active PDP context identifier |
| 521 | Undefined PDP context identifier |
| 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 |

| Numeric error code | Description |
|--------------------|--------------------------------------------------------------------|
| 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 |
| 1057 | Bearer capability not authorized |
| 1058 | Bearer capability not presently available |
| 1063 | Service or option not available, unspecified |
| 1065 | Bearer service not implemented |
| 1068 | ACM equal to or greater than ACMmax |
| 1069 | Requested facility not implemented |
| 1070 | Only restricted digital information bearer capability is available |
| 1079 | Service or option not implemented, unspecified |
| 1081 | Invalid transaction identifier value |
| 1087 | User not member of CUG |
| 1088 | Incompatible destination |
| 1091 | Invalid transit network selection |
| 1095 | Semantically incorrect message |
| 1096 | Invalid mandatory information |
| 1097 | Message type non-existent or not implemented |
| 1098 | Message type not compatible with protocol state |
| 1099 | Information element non-existent or not implemented |
| 1100 | Conditional IE error |
| 1101 | Message not compatible with protocol state |
| 1102 | Recovery on timer expiry |
| 1111 | Protocol error, unspecified |
| 1127 | Interworking, unspecified |
| 1279 | Number not allowed |
| 1283 | CCBS possible |
| 1500 | Wrong GPIO identifier |
| 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 SNDCCP failure |

| Numeric error code | Description |
|--------------------|-----------------------------------------------------------------|
| 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 |
| 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 |
| 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 |
| 1700 | GPS GPIO not configured |

| Numeric error code | Description |
|--------------------|------------------------------------------------------|
| 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 |
| 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 |
| 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 |

A.2 Message service error result codes +CMS ERROR

| Numeric error 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 |

| Numeric error code | Description |
|--------------------|----------------------------------------------------------|
| 50 | Requested facility not subscribed |
| 69 | Requested facility not implemented |
| 81 | Invalid short message reference value |
| 95 | Invalid message, unspecified |
| 96 | invalid mandatory information |
| 97 | Message type non-existent or not implemented |
| 98 | Message not compatible with short message protocol state |
| 99 | Information element non-existent or not implemented |
| 111 | Protocol error, unspecified |
| 127 | Interworking, unspecified |
| 128 | Telematic interworking not supported |
| 129 | Short message type 0 not supported |
| 130 | Cannot replace short message |
| 143 | Unspecified TP-PID error |
| 144 | Data coding scheme (alphabet) not supported |
| 145 | Message class not supported |
| 159 | Unspecified TP-DCS error |
| 160 | Command cannot be actioned |
| 161 | Command unsupported |
| 175 | Unspecified TP-Command error |
| 176 | TPDU not supported |
| 192 | SC busy |
| 193 | No SC subscription |
| 194 | SC system failure |
| 195 | Invalid SME address |
| 196 | Destination SME barred |
| 197 | SM Rejected-Duplicate SM |
| 198 | TP-VPF not supported |
| 199 | TP-VP not supported |
| 208 | SIM SMS storage full |
| 209 | No SMS storage capability in SIM |
| 210 | Error in MS |
| 211 | Memory Capacity Exceeded |
| 212 | SIM Application Toolkit Busy |
| 213 | SIM data download error |
| 287 | Network failure unspecified |
| 290 | Network no resource |
| 296 | Radio Resources not Available 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 |
| 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 |

| Numeric error code | Description |
|--------------------|--------------------------------------------------------------------|
| 332 | network timeout |
| 340 | no +CNMA acknowledgement expected |
| 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 too long |
| 531 | MS no Command-Request in Phase 1 |
| 532 | MS Cmd-Req invalid TP-Destination-Address |
| 533 | MS Cmd-Req invalid TP-User-Data-Length |
| 534 | MS Cmd-Req invalid TP-User-Data |
| 535 | MS Cmd-Req invalid TP-Command-Type |
| 536 | MN MNR creation failed |
| 537 | MS CMM creation failed |
| 538 | MS network connection lost |
| 539 | MS pending MO SM transfer |
| 540 | RP-Error OK |
| 541 | RP-Error OK no icon display |
| 542 | SMS-PP Unspecified |
| 543 | SMS rejected By SMS CONTROL |
| 544 | Service Centre Address(SCA) FDN failed |
| 545 | Destination Address(DA) FDN failed |
| 546 | BDN check failed |
| 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 |

| Numeric error code | Description |
|--------------------|---------------------------------------------------------------------------------|
| 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 Registered |
| 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 |
| 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 Procedure 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 |

| Numeric error code | Description |
|--------------------|------------------------------------------------------------------------------------|
| 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 | Layer 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 |
| 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 |

B Appendix: AT Commands List

| AT command | Datagram messages | | | | | | | |
|-------------------------------------------------------------|-------------------|-------|-------|-----------|-------|--------|--------|-------|
| | +NCDP | +NMGR | +NMGs | +NMSTATUS | +NNMI | +NQMGR | +NQMGs | +NSMI |
| SARA N200-02B / N201-02B N210-02B / N211-02X N280-02B | • | • | • | • | • | • | • | • |

| AT command | | General commands | | | | | | | |
|------------|--------------------------------------------------------|------------------|-------|-------|-------|-------|-------|-------|---|
| | | +CCID | +CGMI | +CGMM | +CGMR | +CGSN | +CIMI | +CLAC | / |
| SARA | N200-02B / N201-02B N210-02B / N211-02X N280-02B | • | • | • | • | • | • | • | • |

| AT command | | GPIO interface | |
|------------|--------------------------------------------------------|----------------|--|
| | | +UGPIOC | |
| SARA | N200-02B / N201-02B N210-02B / N211-02X N280-02B | • | |

| AT command | | Internet suite | |
|------------|--------------------------------------------------------|----------------|---|
| | | | |
| SARA | N200-02B / N201-02B N210-02B / N211-02X N280-02B | +NFI/NG | • |

| AT command | | Mobile equipment control and status | | | | | | | | |
|------------|--------------------------------------------------------|-------------------------------------|-------|-------|-------|-------|-------|-----------|------|-----------|
| | | +CCLK | +CEER | +CFUN | +CMEE | +CTZR | +CTZU | +INCONFIG | +NRB | +NUESTATS |
| SARA | N200-02B / N201-02B N210-02B / N211-02X N280-02B | • | • | • | • | • | • | • | • | • |

| AT command | | Network service | | | | | | | | | |
|------------|--------------------------------------------------------|-----------------|---------|-------|--------|------|--------|----------|--------------|------------|-----------|
| | | +CEDRXRDP | +CEDRXS | +COPS | +CSCON | +CSQ | +NBAND | +NEARFCN | +NPOWERCLASS | +NPTWEDRXS | +UMINOCNF |
| SARA | N200-02B / N201-02B N210-02B / N211-02X N280-02B | • | • | • | • | • | • | • | • | • | |

| AT command | | Packet switched data services | | | | | | |
|------------|--------------------------------------------------------|-------------------------------|--------|----------|--------|----------|----------|--------|
| | | +CEREG | +CGACT | +CGAPMRC | +CGATT | +CGDCONT | +CGPADDR | +CIPCA |
| SARA | N200-02B / N201-02B N210-02B / N211-02X N280-02B | • | • | • | • | • | • | |

| AT command | | Security | |
|------------|--------------------------------------------------------|----------|--|
| | | +NFPI | |
| SARA | N200-02B / N201-02B N210-02B / N211-02X N280-02B | • | |

| AT command | | Serial interface | |
|------------|--------------------------------------------------------|------------------|--|
| | | +MATSPEED | |
| SARA | N200-02B / N201-02B N210-02B / N211-02X N280-02B | • | |

| AT command | | Short Messages Service | | | | | | |
|------------|--------------------------------------------------------|------------------------|-------|-------|---------|-------|-------|---------|
| | | +CMGC | +CMGS | +CNMA | +CRTPCP | +CSCA | +CSMS | +CSODCP |
| SARA | N200-02B / N201-02B N210-02B / N211-02X N280-02B | • | • | • | • | • | • | |

| AT command | | System features | | | | | |
|------------|--------------------------------------------------------|-----------------|---------|------------|--------|--------|--------|
| | | +CPSMS | +NFWUPD | +NLOGLEVEL | +NPSMR | +URING | +UTEST |
| SARA | N200-02B / N201-02B N210-02B / N211-02X N280-02B | • | • | • | • | • | • |

| AT command | | Internet protocol transport layer | | | | | |
|------------|--------------------------------------------------------|-----------------------------------|--------|----------|--------|--------|---------|
| | | +NSOCL | +NSOCR | +NSONIMI | +NSORF | +NSOST | +NSOSTF |
| SARA | N200-02B / N201-02B N210-02B / N211-02X N280-02B | • | • | • | • | • | • |

B.1 Parameters stored in profiles

The parameter settings of some commands can be stored in the profiles available in the memory module.



Some AT commands have a unique configuration for all the AT interfaces while for other AT commands it is possible to set a different configuration for each AT interface: the "AT interface configuration sharing" column in the next table provides this information.

Some AT command interfaces have a dynamic activation, which means they are not statically activated at boot time (MUX AT channel is activated when the MUX protocol is established, USB AT channel is activated if/when the USB cable is plugged-in, deactivated when it is removed). Since the activation reloads the AT command profile from NVM for the activated interface, the shared "AT interface configurations" could be overwritten. It is suggested to reconfigure them at the requested value if an AT command interface is dynamically activated.



SARA-N2

The module does not store the AT commands setting in the profiles.

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 |
|-----------------------|--------------------|------------------------------------|----------------------------------------------------------------------------------------------------|
| +COPS | Operator selection | Yes | <ul style="list-style-type: none"> SARA-N2 - The command settings is not persistent |

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 |
|------------------------------|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| +CCLK | Clock | 04/01/01,00:00:00+00 |
| +CGDCONT | PDP context definition | |
| +CPSMS | Power Save Mode | |
| +CTZU | Automatic time zone update | <ul style="list-style-type: none"> SARA-N2 - 1 (automatic time zone via NITZ enabled) |
| +NATSPEED | Configure AT UART baud rate | 9600 b/s (AT UART baud rate), 2 (sample earlier), 1 (1 stop bit) |
| +NCDP | Chipset vendor CDP IP address | |
| +NCONFIG | UE configuration | <ul style="list-style-type: none"> "AUTOCONNECT", "TRUE" "COMBINE_ATTACH", "FALSE" "CELL_RESELECTION", "FALSE" "ENABLE_BIP", "FALSE" |
| +NPOWERCLASS | Power class configuration | <ul style="list-style-type: none"> 5 (power class) |
| +UCOAP | CoAP profile configuration | <ul style="list-style-type: none"> SARA-N2 - all contexts are undefined |
| +UFOTAPT | FOTA poll timer configuration | 0 (poll timer set to immediate) |
| +UGPIOC | GPIO functionality setting | <ul style="list-style-type: none"> SARA-N2 - 255 (CTS) |
| +UMNOCONF | MNO configuration | <ul style="list-style-type: none"> SARA-N2 - 0 (regulatory configuration) |
| +URING | RING line handling | 0 (feature disabled (RING line is only asserted on incoming call and incoming SMS)) |

B.3 Saving AT commands configuration

The following procedure can be used to store the AT commands configuration for the AT commands listed in [Appendix B.2](#):

- SARA-N2 - The module must enter in any of the following mode:
 - Enable the power saving mode (PSM) by means of the [+CPSMS](#) AT command
 - Reboot the module reboot by means of the [+NRB](#) AT command

B.4 Estimated command response time

After having sent a command to a u-blox cellular module, the time to obtain a resulting result code depends on the SIM and the network. It is possible to have an immediate response if the command does not interact with either the network or the SIM.

The following table reports the maximum time to get the result code for the AT commands. The commands are grouped by categories.

| Category | Estimated maximum time to get response | Commands |
|---------------------------|----------------------------------------|------------------------------------------------|
| Set module functionality | Up to 3 min | +CFUN |
| Network commands | Up to 3 min | +CGATT , +COPS |
| SMS acknowledgement to MT | < 150 s | +CNMA |
| SMS | Up to 3 min (<1 s for prompt ">") | +CMGC , +CMGS |
| SIM management | < 10 s | +CSCA |
| PDP context activation | < 150 s | +CGACT |
| PDP context deactivation | < 40 s | +CGACT |
| GPIO commands | < 10 s | +UGPIOC |
| MNO configuration | < 3 min | +UMNOCONF |

C Appendix: Glossary

| | |
|------------------------|-------------------------------------------------------------------------------|
| 2G | 2nd Generation |
| 3G | 3rd Generation |
| 3GPP | 3rd Generation Partnership Project |
| ADC | Analog to Digital Converter |
| AleC | 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 |
| DARF | Downlink Advanced Receiver Performance |
| DCD | Data Carrier Detect |
| DCE | Data Communication Equipment |
| DCM | Data Connection Management |
| DHCP | Dynamic Host Configuration Protocol |
| DNS | Domain Name Server |
| DSR | DSC transponder response |
| DTE, TE | Data Terminal Equipment |
| DTMF | Dual Tone Multi Frequency |
| DTR | Data Terminal Ready |
| DUT | Device Under Test |
| EARFCN | E-UTRAN Absolute Radio Frequency Channel Number |
| eCall | Emergency Call |
| EEP | EEPROM Emulation Parameters |
| EF | Elementary File |
| EF _{CGST} | Elementary File "Closed Subscriber Group Type" |
| EF _{HNB} | Elementary File "Home Node B Number" |
| EF _{PLMNwACT} | Elementary File "User controlled PLMN Selector with Access Technology" |
| eIM | eCall In-band Modem |
| EONS | Enhanced Operator Name from SIM-files EF _{OPL} and EF _{PNN} |
| EPD | Escape Prompt Delay |
| ETSI | European Telecommunications Standards Institute |
| E-UTRAN | Evolved UTRAN |
| FDN | Fixed Dialling Number |

| | |
|------------------|---------------------------------------------------------|
| FOAT | Firmware Over AT |
| FOTA | Firmware Over The Air |
| FS | File System |
| FTP | File Transfer Protocol |
| FW | Firmware |
| FWINSTALL | Firmware Install |
| GAS | Grouping information Alpha String |
| GPIO | General Purpose Input Output |
| GPRS | General Packet Radio Service |
| GPS | Global Positioning System |
| GSM | Global System for Mobile Communications |
| HDLC | High Level Data Link Control |
| HNB | Home Node B |
| HPLMN | Home PLMN |
| HTTP | HyperText Transfer Protocol |
| I | Information |
| I ² C | Inter-Integrated Circuit |
| I ² S | Inter IC Sound or Integrated Interchip Sound |
| ICCID | Integrated Circuit Card ID |
| ICMP | Internet Control Message Protocol |
| ICP | Inter Processor Communication |
| IMEI | International Mobile Equipment Identity |
| IMSI | International Mobile Station Identity |
| InBM | In-Band Modem (generic) |
| IP | Internet Protocol |
| IRA | International Reference Alphabet |
| IRC | Intermediate Result Code |
| ISDN | Integrated Services Digital Network |
| ISP | Internet Service Provider |
| IVS | In-Vehicle System (eCall related) |
| L3 | Layer 3 |
| LCP | Link Control Protocol |
| LF | Line Feed |
| LNS | Linux Network Subsystem |
| M2M | Machine-To-Machine |
| MCC | Mobile Country Code |
| ME | Mobile Equipment |
| MleC | Manually Initiated eCall |
| MMI | Man Machine Interface |
| MN | Mobile Network Software Subsystem |
| MNC | Mobile Network Code |
| MNO | Mobile Network Operator |
| MO | Mobile Originated |
| MS | Mobile Station |
| MSD | Minimum Set of Data (eCall related) |
| MSIN | Mobile Subscriber Identification Number |
| MSISDN | Mobile Systems International Subscriber Identity Number |
| MSPR | Multi-Slot Power Reduction |
| MT | Mobile Terminated |
| MWI | Message Waiting Indication |
| NITZ | Network Identity and Time Zone |
| NVM | Non-Volatile Memory |
| 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 |
| PUK | Personal Unblocking Key |
| QoS | Quality of Service |
| RAM | Random Access Memory |
| RDI | Restricted Digital Information |
| RFU | Reserved for Future Use |
| RNDIS | Remote Network Driver Interface Specification |
| RI | Ring Indicator |
| RTC | Real Time Clock |
| RTP | Real-time Transport Protocol |
| RTS | Request To Send |
| Rx | Receiver |
| SAP | SIM Access Profile |
| SC | Service Centre |
| SI | SIM Application Part Software Subsystem |
| SIP | Session Initiation Protocol |
| SIM | Subscriber Identity Module |
| SMS | Short Message Service |
| SMSC | Short Message Service Center |
| SMTP | Simple Mail Transfer Protocol |
| SoR | Steering of Roaming |
| SDIO | Secure Digital Input Output |
| STA | station |
| SSID | Service Set Identifier |
| TA | Terminal Adaptor |
| TCP | Transfer Control Protocol |
| TE | Terminal Equipment |
| TFT | Traffic Flow Template |
| TP | Transfer layer Protocol |
| Tx | Transmitter |
| TZ | Time Zone |
| UCS2 | Universal Character Set |
| UDI | Unrestricted Digital Information |
| UDP | User Datagram Protocol |
| UI | Unnumbered Information |
| UICC | Universal Integrated Circuit Card |
| UIH | Unnumbered Information with header Check |
| URC | Unsolicited Result Code |
| USIM | UMTS Subscriber Identity Module |
| UTRAN | Universal Terrestrial Radio Access Network |
| UUS1 | User-to-User Signalling Supplementary Service 1 |
| WLAN | Wireless Local Area Network |

Related documents

1. Stevens. TCP/IP Illustrated Volume1 & 2 Addison-Wesley, 1994.
2. 3GPP TS 27.007 - Technical Specification Group Core Network and Terminals; AT command set for User Equipment (UE)
3. 3GPP TS 22.004 - General on supplementary services
4. GSM 02.04 - Digital cellular telecommunication system (Phase 2+); Mobile Stations (MS) features
5. 3GPP TS 22.030 - Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Man-Machine Interface (MMI) of the User Equipment (UE)
6. 3GPP TS 22.090 - Unstructured Supplementary Service Data (USSD); Stage 1
7. 3GPP TS 23.038 - Alphabets and language-specific information
8. 3GPP TS 23.040 - Technical realization of Short Message Service (SMS)
9. 3GPP TS 23.041 - Technical realization of Cell Broadcast Service (CBS)
10. 3GPP TS 23.060 - Technical Specification Group Services and System Aspects; General Packet Radio Service (GPRS); Service description
11. 3GPP TS 24.007 - Mobile radio interface signalling layer 3; General aspects
12. 3GPP TS 24.008 - Mobile radio interface layer 3 specification
13. 3GPP TS 24.011 - Point-to-point (PP) Short Message Service (SMS) support on mobile radio interface
14. GSM 04.12 - Digital cellular telecommunications system (Phase 2+); Short Message Service Cell Broadcast (SMSCB) Support on Mobile Radio Interface.
15. 3GPP TS 22.030 - Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Man-Machine Interface (MMI) of the User Equipment (UE)
16. 3GPP TS 27.005 - Technical Specification Group Terminals; Use of Data Terminal Equipment - Data Circuit terminating Equipment (DTE-DCE) interface for Short Message Services (SMS) and Cell Broadcast Service (CBS)
17. 3GPP TS 27.060 - Technical Specification Group Core Network; Packet Domain; Mobile Station (MS) supporting Packet Switched Services
18. 3GPP TS 51.011 - Digital cellular telecommunications system (Phase 2+); Specification of the Subscriber Identity Module - Mobile Equipment (SIM - ME) interface
19. 3GPP TS 31.102 - Characteristics of the Universal Subscriber Identity Module (USIM) application
20. ITU-T Recommendation V250, 05-99.
21. ITU-T V.25ter - ITU-T V.25 ter Recommendation: Data Communications over the Telephone Network; Serial asynchronous automatic Dialling and control.
22. ITU-T T.32 - ITU-T Recommendation T.32 Asynchronous Facsimile DCE Control - Service Class 2
23. ISO 639 (1988) Code for the representation of names of languages
24. LEON-G1 series Data Sheet, Docu No UBX-13004887
25. LEON-G1 series System Integration Manual, Docu No UBX-13004888
26. ITU-T Recommendation V24, 02-2000. List of definitions for interchange circuits between Data Terminal Equipment (DTE) and Data Connection Equipment (DCE).
27. RFC 791 - Internet Protocol - <http://www.ietf.org/rfc/rfc791.txt>
28. 3GPP TS 05.08 - Radio subsystem link control
29. 3GPP TS 22.087 - User-to-User Signalling (UUS)
30. 3GPP TS 24.008 - Mobile radio interface layer 3 specification
31. 3GPP TS 22.022 - Personalisation of Mobile Equipment (ME)
32. 3GPP TS 22.082 - Call Forwarding (CF) supplementary services
33. 3GPP TS 22.083 - Call Waiting (CW) and Call Holding (HOLD)
34. 3GPP TS 22.081 - Line identification Supplementary Services- Stage 1
35. 3GPP TS 23.081 - Line identification supplementary services- Stage 2
36. 3GPP TS 22.086 - Advice of Charge (AoC) Supplementary Services
37. 3GPP TS 22.024 - Description of Charge Advice Information (CAI)

38. 3GPP TS 22.085 - Closed User Group (CUG) Supplementary Services
39. 3GPP TS 22.096 - Name identification supplementary services
40. 3GPP TS 04.18 - Mobile radio interface layer 3 specification; Radio Resource Control (RRC) protocol
41. GSM 04.60 - Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Mobile Station (MS) - Base Station System (BSS) interface; Radio Link Control / Medium Access Control (RLC/MAC) protocol
42. 3GPP TS 05.02 - Multiplexing and Multiple Access on the Radio Path
43. EVK-G25H Evaluation Kit User Guide, Docu No GSM.G1-EK-09022
44. 3GPP TS 51.014 - Specification of the SIM Application Toolkit for the Subscriber Identity Module - Mobile Equipment (SIM - ME) interface
45. u-blox 5/6 Receiver Description including Protocol Specification, Docu. No GPS-SW-09017
46. 3GPP TS 27.010 V3.4.0 - Terminal Equipment to User Equipment (TE-UE) multiplexer protocol (Release 1999)
47. LEON-G1 Audio Application Note, Docu No GSM.G1-CS-10005
48. EVK-U12 EVK-U13 User Guide, Docu No 3G.G2-EK-10010
49. LISA-U1 / LISA-U2 series System Integration Manual, Docu No UBX-13001118
50. 3GPP TS 22.060 - General Packet Radio Service (GPRS); Service description; Stage 1
51. ETSI TS 102 223 - Smart cards; Card Application Toolkit (CAT)
52. GNSS Implementation Application Note, Docu No UBX-13001849
53. 3GPP TS 25.306 - UE Radio Access capabilities
54. RFC3267 - Real-Time Transport Protocol (RTP) Payload Format and File Storage Format for the Adaptive Multi-Rate (AMR) and Adaptive Multi-Rate Wideband (AMR-WB) Audio Codecs
55. EVK-G20 Evaluation Kit User Guide, Docu No GSM.G1-EK-11002
56. LISA-U1 series Data Sheet, Docu No UBX-13002048
57. RFC 792 Internet Control Message Protocol (<http://tools.ietf.org/html/rfc0792>)
58. 3GPP TS 22.002 - Circuit Bearer Services (BS) supported by a Public Land Mobile Network (PLMN)
59. 3GPP TS 22.067 - enhanced Multi Level Precedence and Pre-emption service (eMLPP); Stage 1
60. LISA-U2 series Data Sheet, Docu No UBX-13001734
61. AT&T: Device Requirements -- Requirements Document -- Document Number 13340 -- Revision 4.6 -- Revision Date 9/2/11
62. 3GPP TS 23.972 - Circuit switched multimedia telephony
63. 3GPP TS 24.615 Communication Waiting (CW) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol Specification
64. 3GPP TS 25.101 - User Equipment (UE) radio transmission and reception (FDD)
65. 3GPP TS 45.005 - Radio transmission and reception
66. Common PCN Handset Specification v4.2
67. SIM Access Profile - Interoperability Specification - Bluetooth Specification V11r00
68. EVK-U20 EVK-U23 User Guide, Docu No UBX-13001794
69. Maxim MAX9860 16-Bit Mono Audio Voice Codec datasheet, 19-4349; Rev 1; 9/09. Available from the Maxim website (<http://datasheets.maxim-ic.com/en/ds/MAX9860.pdf>)
70. 3GPP TS 23.122 - NAS Functions related to Mobile Station (MS) in idle mode
71. ETSI TS 122 101 V8.7.0 (2008-01) Service aspects; Service principles (3GPP TS 22.101 version 8.7.0 Release 8)
72. BS EN 16062:2015 Intelligent transport systems - ESafety - eCall high level application requirements (HLAP) using GSM/UMTS circuit switched networks, April 2015
73. 3GPP TS 26.267 V12.0.0 (2012-12) eCall Data Transfer; In-band modem solution; General description (Release 12)
74. 3GPP TS 51.010-1 Mobile Station (MS) conformance specification; Part 1: Conformance specification
75. RFC 959 File Transfer Protocol (<http://tools.ietf.org/html/rfc959>)
76. RFC 2428 FTP Extensions for IPv6 and NATs (<https://tools.ietf.org/html/rfc2428>)

77. SARA-G3 Audio Application Note, Docu No UBX-13001793
78. LISA-U1 / LISA-U2 Audio Application Note, Docu No UBX-13001835
79. 3GPP TS 23.014 Support of Dual Tone Multi-Frequency (DTMF) signalling V11.0.0 (2012-09)
80. EVK-G35 Evaluation Kit User Guide, Docu No UBX-13001792
81. SARA-G3 Series Data Sheet, Docu No UBX-13000993
82. SARA-G3 / SARA-U2 Series System Integration Manual, Docu No UBX-13000995
83. ETSI TS 127 007 V10.3.0 (2011-04) AT command set for User Equipment (UE) (3GPP TS 27.007 version 10.3.0 Release 10)
84. 3GPP TS 51.010-2 Mobile Station (MS) conformance specification; Part 2: Protocol Implementation Conformance Statement (PICS) proforma specification
85. 3GPP TS 34.121-2 User Equipment (UE) conformance specification; Radio transmission and reception (FDD); Part 2: Implementation Conformance Statement (ICS)
86. u-blox Firmware Update Application Note, Docu No UBX-13001845
87. PCCA standard - Command set extensions for CDPD modems, Revision 2.0, March, 1998
88. 3GPP TS 24.301 Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3
89. 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
90. 3GPP TS 23.221 Architectural requirements
91. 3GPP TS 23.203 Policy and charging control architecture
92. 3GPP TS 31.101 UICC-terminal interface; Physical and logical characteristics
93. ETSI TS 102 221 V8.2.0 (2009-06) Smart Cards; UICC-Terminal interface; Physical and logical characteristics (Release 8)
94. RFC 4291 - IP Version 6 Addressing Architecture (<http://tools.ietf.org/html/rfc4291>)
95. 3GPP TS 25.305 User Equipment (UE) positioning in Universal Terrestrial Radio Access Network (UTRAN); Stage 2
96. 3GPP TS 23.032: Universal Geographical Area Description (GAD)
97. TOBY-L2 series Networking Modes Application Note, Docu No UBX-14000479
98. 3GPP TS 25.331 Radio Resource Control (RRC); Protocol specification
99. 3GPP TS 36.101 Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception
100. Wi-Fi / Cellular Integration Application Note, Docu No UBX-14003264
101. 3GPP TS 24.173 IMS Multimedia telephony communication service and supplementary services; Stage 3
102. 3GPP TS 24.341 Support of SMS over IP networks; Stage 3
103. 3GPP TS 24.229 IP multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3
104. 3GPP TS 36.306 Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio access capabilities
105. 3GPP TS 36.133 Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management
106. 3GPP TS 25.133 Requirements for support of radio resource management (FDD)
107. 3GPP TS 22.071 Location Services (LCS); Service description
108. IEC 61162 Digital interfaces for navigational equipment within a ship
109. 3GPP TS 36.331 Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification (Release 10)
110. 3GPP TS 24.167 3GPP IMS Management Object (MO); Stage 3
111. ITU-T E.212 - Series E: Overall network operation, telephone service, service operation and human factors
112. RFC 793 - Transmission Control Protocol (TCP) Protocol Specification (<https://www.rfc-editor.org/rfc/rfc793.txt>)
113. 3GPP TS 26.201 Speech codec speech processing functions; Adaptive Multi-Rate - Wideband (AMR-WB) speech codec; Frame structure

- 114. 3GPP TS 24.216 Communication Continuity Management Object (MO)
- 115. 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)
- 116. 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)
- 117. 3GPP TS 23.003 Numbering, addressing and identification
- 118. TOBY-L2 series Audio Application Note, Docu No UBX-15015834
- 119. 3GPP TS 31.111 Universal Subscriber Identity Module (USIM) Application Toolkit (USAT)
- 120. RFC 3969 - The Internet Assigned Number Authority (IANA) Uniform Resource Identifier (URI) Parameter Registry for the Session Initiation Protocol (SIP)
- 121. RFC 3261 - SIP: Session Initiation Protocol
- 122. RFC 5341 - The Internet Assigned Number Authority (IANA) tel Uniform Resource Identifier (URI) Parameter Registry
- 123. RFC 3966 - The tel URI for Telephone Numbers
- 124. RFC 2141 - URN Syntax
- 125. RFC 3406 - Uniform Resource Names (URN) Namespace Definition Mechanisms
- 126. RFC 5031 - A Uniform Resource Name (URN) for Emergency and Other Well-Known Services
- 127. 3GPP TS 22.084 MultiParty (MPTY) supplementary service; Stage 1
- 128. 3GPP TS 24.607 Originating Identification Presentation (OIP) and Originating Identification Restriction (OIR) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification
- 129. 3GPP TS 24.608 Terminating Identification Presentation (TIP) and Terminating Identification Restriction (TIR) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification
- 130. 3GPP TS 36.213 Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures
- 131. 3GPP TS 36.212 Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding
- 132. RFC 4715 - The Integrated Services Digital Network (ISDN) Subaddress Encoding Type for tel URI
- 133. End User Test Application Note, Docu No UBX-13001922
- 134. OMA Device Management V1.2.1 (<http://technical.openmobilealliance.org/Technical/technical-information/release-program/current-releases/dm-v1-2-1>)
- 135. RFC 5626 - Managing Client-Initiated Connections in the Session Initiation Protocol (SIP)
- 136. 3GPP TS 24.166 - 3GPP IP Multimedia Subsystem (IMS) conferencing Management Object (MO)
- 137. 3GPP TS 29.061 - Interworking between the Public Land Mobile Network (PLMN) supporting packet based services and Packet Data Networks (PDN)
- 138. 3GPP TS 24.303 - Mobility management based on Dual-Stack Mobile IPv6; Stage 3
- 139. 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
- 140. 3GPP TS 25.367 - Mobility procedures for Home Node B (HNB); Overall description; Stage 2
- 141. 3GPP TS 25.304 - User Equipment (UE) procedures in idle mode and procedures for cell reselection in connected mode
- 142. 3GPP TS 36.304 - Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) procedures in idle mode
- 143. RFC 4867 - RTP Payload Format and File Storage Format for the Adaptive Multi-Rate (AMR) and Adaptive Multi-Rate Wideband (AMR-WB) Audio Codecs
- 144. RFC 4733 - RTP Payload for DTMF Digits, Telephony Tones, and Telephony Signals
- 145. 3GPP2 C.S0015-0 - Short Message Service
- 146. RFC 1518 - An Architecture for IP Address Allocation with CIDR (<https://tools.ietf.org/html/rfc1518>)
- 147. RFC 1519 - Classless Inter-Domain Routing (CIDR): an Address Assignment and Aggregation Strategy (<https://tools.ietf.org/html/rfc1519>)
- 148. 3GPP TS 45.008 - GSM/EDGE Radio Access Network; Radio subsystem link control
- 149. 3GPP TS 25.401 - Universal Mobile Telecommunications System (UMTS); UTRAN Overall Description

- 150.** GSM 04.08 - Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 specification
- 151.** 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
- 152.** 3GPP TS 36.211 - Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation
- 153.** 3GPP TS 23.682 - Architecture enhancements to facilitate communications with packet data networks and applications
- 154.** 3GPP TS 23.401 - General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access
- 155.** GSMA TS.34 - IoT Device Connection Efficiency Guidelines
- 156.** SARA-U2 series Audio Extended Tuning Application Note, Docu No UBX-17012797
- 157.** NB-IoT Application Development Guide, Docu No UBX-16017368
- 158.** SARA-N2 Series Data Sheet, Docu No UBX-15025564



For regular updates to u-blox documentation and to receive product change notifications, register on our homepage.

Revision history

| Revision | Date | Name | Comments |
|----------|-------------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| R01 | 22-Aug-2016 | sfal | Initial release |
| R02 | 23-Dec-2016 | lpah | <p>New commands: +NRB, +NCDP, +NUESTATS, +CSCON, +NBAND, +NEARFCN, +NMGR, +NMGS, +NQMGR, +NQMGS, +NNMI, +NSMI, +NLOGLEVEL, +NSOCR, +NSOCL, +NSOST, +NSONMI, +NSORF, +NPING, +NCONFIG</p> <p>Modified commands: +CGSN, +CIMI, +CMEE, +CFUN, +COPS, +CGDCONT, +CEREG, +CGATT</p> <p>Review the command applicability for these commands: +CGMM, +CGMR, +CGMI, +CGSN, +CIMI, +CLAC, +CFUN, +CMEE, +CSQ, +COPS, +CGDCONT, +CGPADDR, +CEREG, +CGATT</p> |
| R03 | 30-Jan-2017 | lpah | <p>New commands: +NCONFIG</p> <p>Modified commands: +CIMI, +CSCON, +NCDP, +NUESTATS, +NBAND, +COPS, +CGPADDR, +CEREG, +NSOCR, +NSONMI, +NPING, +NMGR, +NMGS, +NQMGR, +NSMI, +NSORF, +NQMGS</p> |
| R04 | 24-Mar-2017 | lpah | <p>Document aligned to FW V100R100C10B655SP2</p> <p>Modified commands: +NUESTATS, +NSOCR, +NSOST, +NPING</p> |
| R05 | 24-Apr-2017 | lpah | <p>Document aligned to FW V100R100C10B656</p> <p>New commands: +NSOSTF</p> <p>Modified commands: AT command settings, +CGSN, +CCLK, +NRB, +CSQ, +NEARFCN, <PDP_addr>, +CGPADDR, +CEREG, +NSOCR, CME error result codes</p> |
| R06 | 06-Jun-2017 | lpah | <p>Extended the document applicability to SARA-N200-02B, SARA-N201-02B, SARA-N210-02B, SARA-N211-02B, SARA-N280-02B</p> <p>New commands: +CPSMS</p> <p>Modified commands: AT command settings, General operation, I, +CCLK, +NUESTATS, +CGDCONT, +URING, +UTEST, Internet protocol transport layer, +NSOCR, +NPING</p> <p>Review the command applicability for these commands: I, +CCID, +CTZU, +UFWUPD, +URING, +UTEST</p> |
| R07 | 27-Jul-2017 | lpah | <p>New commands: +CEDRXS, +CEDRXRDP, +CMGC, +CRTDCP, +CSODCP, +NATSPEED, +NMSTATUS</p> <p>Modified commands: +CGMR, +CFUN, +CTZR, +NUESTATS, +NCONFIG, +COPS, +NEARFCN, +CSMS, +CNMA, +CMGS, +CGDCONT, +CGATT, +CGACT, +CEREG, +CPSMS, +NLOGLEVEL, GPIO introduction, +UGPIOC, +NSOCR, Datagram introduction, +NNMI, +NCDP, Mobile termination error result codes +CME ERROR</p> <p>Review the command applicability for these commands: I, +CCID, +CTZU, +CTZR, +CNMA, +CSCA, +CMGS, +CSMS, +CGACT, +UFWUPD, +URING, +UTEST, +CPSMS, +UGPIOC</p> |
| R08 | 12-Sep-2017 | lpah | <p>New commands: +NPOWERCLASS, +NPTWEDRXS, +CIPCA, +CGAPNRC, +NPSMR</p> <p>Modified commands: +CGSN, +CIMI, +NCONFIG, +NUESTATS, +COPS, +NEARFCN, +NATSPEED, <cid>, <PDP_Type>, +CGACT, GPIO introduction, +NSOCR, +NSOST, +NSOSTF, +NSORF, +NPING, +NMGR, +NMGS, +NSMI, +NCDP</p> |
| R09 | 03-Oct-2017 | lpah | <p>Modified commands: AT command settings, +CMGS, +CMGC, +CGACT, +NSOCR, +NCDP, +NMSTATUS</p> |
| R10 | 26-Jan-2018 | lpah | <p>Extended the document applicability to SARA-N211-02X</p> <p>New commands: +CEER, +NCONFIG, +UMNOCONF, +NPIN, +NFWUPD, +UCOAPS, +UCOAPFWT, +UFOTAPT, +UFOTAS, +USELCP, +UCOAP, +UCOAPC</p> <p>Modified commands: AT command settings, +CCLK, +CMEE, +CSQ, +NBAND, +NEARFCN, +CEDRXS, +NPOWERCLASS, +CSMS, +CNMA, +CMGS, +CSCA, +CMGC, V24 control and V25ter introduction, <APN>, <PDP_addr>, +CGDCONT, +CGACT, +CGPADDR, +CIPCA, +CGAPNRC, Multiple PDP contexts, +UTEST, GPIO introduction, +UGPIOC, +NSOST, +NSOSTF, Mobile termination error result codes +CME ERROR, Saving AT commands configuration</p> <p>Review the command applicability for these commands: +UBANDESEL</p> |
| R11 | 17-Apr-2018 | lpah | <p>Modified commands: Information text responses and result codes, Start up and initialization, +CGSN, +CFUN, +NCONFIG, +COPS, +CSCON, +CEDRXS,</p> |

| Revision | Date | Name | Comments |
|----------|------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | | | +CEDRRDP , +NPTWEDRXS , +CSODCP , PDP contexts and parameter definition , +UTEST , +NPING , +NSMI , +NMSTATUS , +UCOAPC , Parameters stored in profiles |

Contact

For complete contact information, visit us at www.u-blox.com.

u-blox Offices

North, Central and South America

u-blox America, Inc.
Phone: +1 703 483 3180
E-mail: info_us@u-blox.com

Regional Office West Coast:

Phone: +1 408 573 3640
E-mail: info_us@u-blox.com

Technical Support:

Phone: +1 703 483 3185
E-mail: support_us@u-blox.com

Headquarters

Europe, Middle East, Africa

u-blox AG
Phone: +41 44 722 74 44
E-mail: info@u-blox.com
Support: support@u-blox.com

Asia, Australia, Pacific

u-blox Singapore Pte. Ltd.
Phone: +65 6734 3811
E-mail: info_ap@u-blox.com
Support: support_ap@u-blox.com

Regional Office Australia:

Phone: +61 2 8448 2016
E-mail: info_anz@u-blox.com
Support: support_ap@u-blox.com

Regional Office China (Beijing):

Phone: +86 10 68 133 545
E-mail: info_cn@u-blox.com
Support: support_cn@u-blox.com

Regional Office China (Chongqing):

Phone: +86 23 6815 1588
E-mail: info_cn@u-blox.com
Support: support_cn@u-blox.com

Regional Office China (Shanghai):

Phone: +86 21 6090 4832
E-mail: info_cn@u-blox.com
Support: support_cn@u-blox.com

Regional Office China (Shenzhen):

Phone: +86 755 8627 1083
E-mail: info_cn@u-blox.com
Support: support_cn@u-blox.com

Regional Office India:

Phone: +91 80 4050 9200
E-mail: info_in@u-blox.com
Support: support_in@u-blox.com

Regional Office Japan (Osaka):

Phone: +81 6 6941 3660
E-mail: info_jp@u-blox.com
Support: support_jp@u-blox.com

Regional Office Japan (Tokyo):

Phone: +81 3 5775 3850
E-mail: info_jp@u-blox.com
Support: support_jp@u-blox.com

Regional Office Korea:

Phone: +82 2 542 0861
E-mail: info_kr@u-blox.com
Support: support_kr@u-blox.com

Regional Office Taiwan:

Phone: +886 2 2657 1090
E-mail: info_tw@u-blox.com
Support: support_tw@u-blox.com