



# SARA-R4/N4 series

Size-optimized LTE Cat M1 / NB1 / GPRS modules

AT Commands Manual

## Abstract

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

| Document Information          |                                                |             |
|-------------------------------|------------------------------------------------|-------------|
| <b>Title</b>                  | SARA-R4/N4 series                              |             |
| <b>Subtitle</b>               | Size-optimized LTE Cat M1 / NB1 / GPRS modules |             |
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# Preface

## Applicable products

This document applies to the following products:

| Name       | Type number       | Modem version    | Application version | PCN reference |
|------------|-------------------|------------------|---------------------|---------------|
| SARA-R404M | SARA-R404M-00B-00 | K0.0.00.00.07.06 | N.A.                | UBX-17047084  |
| SARA-R410M | SARA-R410M-01B-00 | L0.0.00.00.02.03 | N.A.                | UBX-17051617  |
|            | SARA-R410M-02B-00 | L0.0.00.00.05.06 | A02.00              | UBX-18010263  |
|            | SARA-R410M-52B-00 | L0.0.00.00.06.05 | A02.06              | UBX-18045915  |
| SARA-R412M | SARA-R412M-02B-00 | M0.05.00         | A01.05              | UBX-18050683  |
| SARA-N410  | SARA-N410-02B-00  | L0.0.00.00.07.04 | A02.05              | UBX-18048325  |

## 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
  - 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](http://www.u-blox.com)
- Read the questions and answers on our FAQ database

## Technical Support

### Worldwide Web

Our website ([www.u-blox.com](http://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

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# 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.



### SARA-R4 / SARA-N4

u-blox cellular modules can implement more than one interface between the DTE and the DCE, either virtual interfaces (multiplexer channels) or physical interfaces (UART, USB, SPI, etc., when available). Each interface works as specified by the followings definitions. If not differently stated, all the subsequent descriptions are applicable to each interface. [Appendix B.5](#) describes the different behaviour among the interfaces in reference to the AT command interface.



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

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.

### 1.1.1 Switch from data mode to online command mode

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

- with the escape sequence: for more details see the [S2](#) command description
- via a DTR transition: during data mode, the current DTR state is not important, but only its transition. Furthermore, only the DTR transition from ON to OFF is detected; it can be used to control the switch to online command mode, or to command mode (the data connection is released). For more details see the [Table 6](#) and the [Table 7](#)

To switch back to data mode from online command mode the [O](#) command is used. For more details see also the [&D](#) command.

### 1.1.2 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.

### 1.1.3 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

### 1.1.4 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.

### 1.1.4.1 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.



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

## 1.1.5 Notes

### SARA-R4 / SARA-N4

- The maximum length of the command line is 1024 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 (,)

### 1.1.6 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



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The `V` AT command configures the result code in numeric or verbose format.

The command line termination character can be set with `S3` AT command.

The linefeed character can be set with `S4` AT command.

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 <code>AT+CMEE</code> 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).                              |

| Verbose         | Numeric | Result code type | Description                                                                                                                                                                                                                                                 |
|-----------------|---------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                 |         |                  |  In case of data/fax call, see <a href="#">Circuit 108/2, +++ behaviour for the different &amp;D: summarizing table</a> 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-R4 / SARA-N4

The AT commands can not be aborted, except if explicitly stated in the corresponding AT command description.

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.



The proprietary AT commands supporting the following features implement a different error management and provide different error result codes:

- Firmware update Over AT command and over the air: see the [Appendix A.3](#) and [Appendix A.4](#)
- TCP and UDP connections, FTP and HTTP: see the [Appendix A.5](#), [Appendix A.6](#), [Appendix A.6.1](#), [Appendix A.6.2](#)

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

## 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.

[Appendix B.1](#) lists the complete settings stored in the profiles and the corresponding commands.



#### SARA-R4 / SARA-N4

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

## 1.3 S-parameters

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

```
ATS<parameter_number>?
```

```
ATS<parameter_number>=<value>
```

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

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

| AT command | S Number | Description                                |
|------------|----------|--------------------------------------------|
| S0         | 0        | Automatic answer setting                   |
| S2         | 2        | Escape character setting                   |
| S3         | 3        | Command line termination character setting |
| S4         | 4        | Response formatting character setting      |
| S5         | 5        | Command line editing character setting     |
| S6         | 6        | Pause before blind dialling setting        |
| S7         | 7        | Connection completion timeout setting      |
| S8         | 8        | Command dial modifier time setting         |
| S10        | 10       | Automatic disconnect delay setting         |
| S12        | 12       | Escape prompt delay setting                |



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

## 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.

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

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

#### 2.1.1 Auto-registration

If the **+COPS** <mode> parameter in the profiles or in NVM is left to its factory-programmed value 0 or set to 1, after SIM initialization, all u-blox modules will automatically perform PLMN selection and registration for circuit switched/non EPS services as well as packet switched/EPS services. Auto-registration (sometimes called also "auto-COPS", not to be confused with automatic <mode>=0) will be triggered also at SIM insertion, for modules supporting SIM hot insertion, or at SIM driver recovery, occurring when the communication with the SIM card is re-established by the module after an unrecoverable error, caused e.g. by mechanical vibrations or electrical interference. If no SIM is inserted in the module, the module will anyway select a cell of the cellular network and try to maintain synchronization with it in limited service.

The radio access technology selected by the module at start up is defined by the <PreferredAct> parameter of the **+URAT** command; afterwards the module will reselect the RAT based on the requirements of the cellular standards it complies with and it is not possible to force it to remain in a given RAT unless it is locked on it via **+URAT** or on a specific cell via **+UCELLLOCK** (if supported).

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

#### 2.1.2 Operational restrictions

Operational restrictions may derive from several settings: PIN required, SIM lock, invalidation of the IMEI or SIM credentials by the Mobile Network Operator (MNO) during the registration procedure, FDN enabled. Restrictions to access the network are also applied by the module in any one of these conditions:

- In eCall only state (for all modules supporting the eCall feature)
- In minimum functionality power modes (**+CFUN: 0**, **+CFUN: 4**, **+CFUN: 19**, **+CFUN: 127**), and even if the module is restarted in **+CFUN: 4** or **+CFUN: 19** modes, because they are persistent

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

## 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. **+CREG**) or can be enabled by another command (e.g. the **+CMTI** URC must be enabled by **AT+CNMI** AT command).

### 2.2.5.1 URCs presentation deferring

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

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

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

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

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

| Class                               | AT command to configure the class |
|-------------------------------------|-----------------------------------|
| Reception of a new SMS related URCs | <b>AT+CNMI</b> AT command         |
| +CIEV URCs                          | <b>AT+CMER</b> AT command         |

For the above classes, it is possible to select the presentation strategy in case of AT interface busy according the 3GPP TS 27.007 [2]; the buffering or discarding are the two possible choices (URCs are lost in the latter case). This is done by means of the corresponding AT command (see the AT command listed in the table above). If the URCs are enabled or for the three described classes of URCs, the buffered URCs are sent out only when the AT interface is in idle again; this occurs as soon as:

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



The DTE should wait some time (the recommended value is at least 20 ms) after the reception of an AT command final result code or URC before issuing a new AT command to give the DCE the opportunity to

transmit the buffered URCs. Otherwise the collision of the URCs with the subsequent AT command is still possible.



In case multiple AT interfaces are available, it should be advisable to use one of the different AT interfaces to manage all the user enabled URCs, while use the others ones to send AT commands and receive their responses.

Anyway URCs related to external causes (e.g. RING) are issued on all interfaces.

### 2.2.6 Intermediate Result Code (IRC)

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

## 3 IPC - Inter Processor Communication

### 3.1 Multiplexing mode +CMUX

| +CMUX             |                                                                               |                     |                       |                       |                      |                        |
|-------------------|-------------------------------------------------------------------------------|---------------------|-----------------------|-----------------------|----------------------|------------------------|
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                       |                       |                      |                        |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b> |
|                   | partial                                                                       | No                  | No                    | No                    | -                    | +CME Error             |

#### 3.1.1 Description

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

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

The multiplexer configuration is as follows:

| Channel                                   | Control channel | AT commands / data GNSS tunneling connection | SAP (SIM Access Profile) |
|-------------------------------------------|-----------------|----------------------------------------------|--------------------------|
| SARA-R404M-00B / SARA-R410M-01B           | Channel 0       | Channel 1 - 3                                |                          |
| SARA-R410M-02B / SARA-R410M-52B / SARA-N4 | Channel 0       | Channel 1 - 2                                | Channel 3                |

**Table 2: Multiplexer configuration**

#### 3.1.2 Syntax

| Type | Syntax                                                                            | Response                                                                                                                                                                                                                                                            | Example                                                |
|------|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|
| Set  | AT+CMUX=<mode>[,<subset>[,<port_speed>[,<N1>[,<T1>[,<N2>[,<T2>[,<T3>[,<k>]]]]]]]] | OK                                                                                                                                                                                                                                                                  | AT+CMUX=0,0,,1500,50,3,90<br>OK                        |
| Read | AT+CMUX?                                                                          | +CMUX: <mode>[,<subset>[,<port_speed>[,<N1>[,<T1>[,<N2>[,<T2>[,<T3>[,<k>]]]]]]]<br>OK                                                                                                                                                                               | +CMUX: 0,0,0,1500,253,3,254,0,0<br>OK                  |
| Test | AT+CMUX=?                                                                         | +CMUX: (list of supported <mode>s),(list of supported <subset>s),(list of supported <port_speed>s),(list of supported <N1>s),(list of supported <T1>s),(list of supported <N2>s),(list of supported <T2>s),(list of supported <T3>s),(list of supported <k>s)<br>OK | +CMUX: (0),(0),,(1-1509),(1-255),(0-5),(2-255),,<br>OK |

#### 3.1.3 Defined values

| Parameter    | Type   | Description                                                                                                                                                                                                                                      |
|--------------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <mode>       | Number | Multiplexer transparency mechanism: <ul style="list-style-type: none"> <li>0: basic option</li> </ul>                                                                                                                                            |
| <subset>     | Number | The way in which the multiplexer control channel is set up: <ul style="list-style-type: none"> <li>0 (default value): UIH frames used only</li> <li>1: UI frames used only</li> </ul> See <a href="#">Notes</a> for the parameter applicability. |
| <port_speed> | Number | Transmission rate. The allowed range is 0-7.                                                                                                                                                                                                     |

| Parameter | Type   | Description                                                                                                                                  |
|-----------|--------|----------------------------------------------------------------------------------------------------------------------------------------------|
|           |        | This parameter is ignored and the value 0 is always displayed in case of read command.                                                       |
| <N1>      | Number | Maximum frame size: <ul style="list-style-type: none"> <li>Allowed range is 1-1509.</li> <li>The default value is 31.</li> </ul>             |
| <T1>      | Number | Acknowledgement timer in units of ten milliseconds. The allowed range is 1-255.                                                              |
|           |        | This parameter is ignored and the value 253 is always set.                                                                                   |
| <N2>      | Number | Maximum number of re-transmissions: <ul style="list-style-type: none"> <li>Allowed range is 0-5.</li> <li>The default value is 3.</li> </ul> |
| <T2>      | Number | Response timer for the multiplexer control channel in units of ten milliseconds. The allowed range is 2-255.                                 |
|           |        | This parameter is ignored and the value 254 is always set.                                                                                   |
| <T3>      | Number | Wake up response timer. The allowed range is 0-255.                                                                                          |
|           |        | This parameter is ignored and the value 0 is always displayed in case of the read command.                                                   |
| <k>       | Number | Window size, for advanced operation with Error Recovery options. The allowed range is 0-255.                                                 |
|           |        | This parameter is ignored and the value 0 is always displayed in case of the read command.                                                   |

### 3.1.4 Notes

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

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- <subset> can only assume the value 0.
- <T1>, <T2>, <N2> values are ignored, since the related timers are not implemented.
- The command is only supported on the UART interface. It cannot be used on the USB port.

## 4 General

### 4.1 Manufacturer identification +CGMI

| +CGMI      |                                                                    |              |                |                |               |                            |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|----------------------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                            |
|            | SARA-N4                                                            |              |                |                |               |                            |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference            |
|            | full                                                               | No           | No             | No             | -             | <a href="#">+CME Error</a> |

#### 4.1.1 Description

Text string identifying the manufacturer.

#### 4.1.2 Syntax

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

#### 4.1.3 Defined values

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

### 4.2 Manufacturer identification +GMI

| +GMI       |                                                                    |              |                |                |               |                            |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|----------------------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                            |
|            | SARA-N4                                                            |              |                |                |               |                            |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference            |
|            | full                                                               | No           | No             | No             | -             | <a href="#">+CME Error</a> |

#### 4.2.1 Description

Text string identifying the manufacturer.

#### 4.2.2 Syntax

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

#### 4.2.3 Defined values

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

## 4.3 Model identification +CGMM

| +CGMM             |                                                                               |                     |                       |                       |                      |                            |
|-------------------|-------------------------------------------------------------------------------|---------------------|-----------------------|-----------------------|----------------------|----------------------------|
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                       |                       |                      |                            |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b>     |
|                   | full                                                                          | No                  | No                    | No                    | -                    | <a href="#">+CME Error</a> |

### 4.3.1 Description

Text string identifying the model identification.

### 4.3.2 Syntax

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

### 4.3.3 Defined values

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

## 4.4 Model identification +GMM

| +GMM              |                                                                               |                     |                       |                       |                      |                            |
|-------------------|-------------------------------------------------------------------------------|---------------------|-----------------------|-----------------------|----------------------|----------------------------|
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                       |                       |                      |                            |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b>     |
|                   | full                                                                          | No                  | No                    | No                    | -                    | <a href="#">+CME Error</a> |

### 4.4.1 Description

Text string identifying the model identification.

### 4.4.2 Syntax

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

### 4.4.3 Defined values

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

## 4.5 Firmware version identification +CGMR

| +CGMR             |                                                                               |                     |                       |                       |                      |                            |
|-------------------|-------------------------------------------------------------------------------|---------------------|-----------------------|-----------------------|----------------------|----------------------------|
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                       |                       |                      |                            |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b>     |
|                   | full                                                                          | No                  | No                    | No                    | -                    | <a href="#">+CME Error</a> |

### 4.5.1 Description

Returns the firmware version of the module.

## 4.5.2 Syntax

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

## 4.5.3 Defined values

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

## 4.6 Firmware version identification +GMR

| +GMR       |                                                                               |              |                |                |               |                            |
|------------|-------------------------------------------------------------------------------|--------------|----------------|----------------|---------------|----------------------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |              |                |                |               |                            |
| Attributes | Syntax                                                                        | PIN required | Settings saved | Can be aborted | Response time | Error reference            |
|            | full                                                                          | No           | No             | No             | -             | <a href="#">+CME Error</a> |

### 4.6.1 Description

Returns the firmware version of the module.

### 4.6.2 Syntax

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

### 4.6.3 Defined values

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

## 4.7 IMEI identification +CGSN

| +CGSN      |                                                                               |              |                |                |               |                            |
|------------|-------------------------------------------------------------------------------|--------------|----------------|----------------|---------------|----------------------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |              |                |                |               |                            |
| Attributes | Syntax                                                                        | PIN required | Settings saved | Can be aborted | Response time | Error reference            |
|            | partial                                                                       | No           | No             | No             | -             | <a href="#">+CME Error</a> |

### 4.7.1 Description

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

### 4.7.2 Syntax

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

### 4.7.3 Defined values

| Parameter | Type   | Description                        |
|-----------|--------|------------------------------------|
| <sn>      | String | Serial number, by default the IMEI |

| Parameter | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <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"> <li>0 (default value): International Mobile station Equipment Identity (IMEI)</li> <li>1: International Mobile station Equipment Identity (IMEI)</li> <li>2: International Mobile station Equipment Identity and Software Version number (IMEISV)</li> <li>3: Software Version Number (SVN)</li> <li>255: IMEI (not including the spare digit), the check digit and the SVN</li> </ul> |

#### 4.7.4 Notes

##### SARA-R4 / SARA-N4

- The <snt> parameter is not supported.
- The response to the test command does not provide the information text response.

## 4.8 IMEI identification +GSN

| +GSN       |                                                                               |              |                |                |               |                            |
|------------|-------------------------------------------------------------------------------|--------------|----------------|----------------|---------------|----------------------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |              |                |                |               |                            |
| Attributes | Syntax                                                                        | PIN required | Settings saved | Can be aborted | Response time | Error reference            |
|            | full                                                                          | No           | No             | No             | -             | <a href="#">+CME Error</a> |

#### 4.8.1 Description

The commands handling is the same of [+CGSN](#).

#### 4.8.2 Syntax

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

#### 4.8.3 Defined values

See [+CGSN](#) AT command.

## 4.9 Identification information I

| I          |                                                                               |              |                |                |               |                            |
|------------|-------------------------------------------------------------------------------|--------------|----------------|----------------|---------------|----------------------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |              |                |                |               |                            |
| Attributes | Syntax                                                                        | PIN required | Settings saved | Can be aborted | Response time | Error reference            |
|            | partial                                                                       | No           | No             | No             | -             | <a href="#">+CME Error</a> |

#### 4.9.1 Description

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



The information text response of ATi9 contains the modem version and the application version of the module where applicable; it returns "Undefined" where not applicable.

#### 4.9.2 Syntax

| Type   | Syntax                                 | Response            | Example                        |
|--------|----------------------------------------|---------------------|--------------------------------|
| Action | <b>Ordering code request</b><br>ATi[0] | <type_number><br>OK | ATi0<br>SARA-G350-00S-00<br>OK |



| Type | Syntax                                       | Response                               | Example      |
|------|----------------------------------------------|----------------------------------------|--------------|
|      | <b>Modem and application version request</b> | <modem_version>,<applications_version> | AT!9         |
|      | AT!9                                         | OK                                     | 29.90,A01.00 |
|      |                                              |                                        | OK           |

### 4.9.3 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" |

## 4.10 TE character set configuration +CSCS

|                   |                                                                               |                     |                       |                       |                      |                            |
|-------------------|-------------------------------------------------------------------------------|---------------------|-----------------------|-----------------------|----------------------|----------------------------|
| <b>+CSCS</b>      |                                                                               |                     |                       |                       |                      |                            |
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                       |                       |                      |                            |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b>     |
|                   | full                                                                          | No                  | No                    | No                    | -                    | <a href="#">+CME Error</a> |

### 4.10.1 Description

Selects the TE character set.



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

### 4.10.2 Syntax

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

### 4.10.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <chset>   | String | <ul style="list-style-type: none"> <li>"IRA" (factory-programmed value): International Reference Alphabet (ITU-T T.50)</li> <li>"GSM": GSM default alphabet (3GPP TS 23.038)</li> <li>"PCCP437": PC character set Code Page 437</li> <li>"8859-1": ISO 8859 Latin 1 character set</li> <li>"UCS2": 16-bit universal multiple-octet coded character set (USO/IEC10646); UCS2 character strings are converted to hexadecimal numbers from 0000 to FFFF; e.g. "004100620063" equals three 16-bit characters with decimal values 65, 98 and 99</li> <li>"HEX": character strings consist only of hexadecimal numbers from 00 to FF; e.g. "032FE6" equals three 8-bit characters with decimal values 3, 47 and 230; no conversions to the original MT character set shall be done</li> </ul> |

## 4.11 International mobile subscriber identification +CIMI

| +CIMI      |                                                                    |              |                |                |               |                            |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|----------------------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                            |
|            | SARA-N4                                                            |              |                |                |               |                            |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference            |
|            | full                                                               | Yes          | No             | No             | -             | <a href="#">+CME Error</a> |

### 4.11.1 Description

Request the IMSI (International Mobile Subscriber Identity).

### 4.11.2 Syntax

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

### 4.11.3 Defined values

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

## 4.12 Card identification +CCID

| +CCID      |                                                                    |              |                |                |               |                            |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|----------------------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                            |
|            | SARA-N4                                                            |              |                |                |               |                            |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference            |
|            | full                                                               | No           | No             | No             | -             | <a href="#">+CME Error</a> |

### 4.12.1 Description

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

### 4.12.2 Syntax

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

### 4.12.3 Defined values

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

### 4.12.4 Notes

- The command needs of the SIM to correctly work.

## 4.13 Repeat last command A/

|            |                                                                    |              |                |                |               |                            |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|----------------------------|
| A/         |                                                                    |              |                |                |               |                            |
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                            |
|            | SARA-N4                                                            |              |                |                |               |                            |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference            |
|            | full                                                               | No           | No             | No             | -             | <a href="#">+CME Error</a> |

### 4.13.1 Description

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



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

### 4.13.2 Syntax

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

## 5 Mobile equipment control and status

### 5.1 Module switch off +CPWROFF

| +CPWROFF   |                                                                    |              |                |                |               |                 |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                 |
|            | SARA-N4                                                            |              |                |                |               |                 |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                                                               | No           | No             | No             | < 40 s        | +CME Error      |

#### 5.1.1 Description

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

-  Using this command can result in the following command line being ignored.
-  See the corresponding System Integration Manual for the timing and the electrical details of the module power-off sequence via the +CPWROFF command.

#### 5.1.2 Syntax

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

### 5.2 Set module functionality +CFUN

| +CFUN      |                                                                    |              |                |                |               |                 |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                 |
|            | SARA-N4                                                            |              |                |                |               |                 |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | partial                                                            | No           | No             | No             | Up to 3 min   | +CME Error      |

#### 5.2.1 Description

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

-  SARA-R4 / SARA-N4  
If the syntax +CFUN=15 or +CFUN=16 (resets) or +CFUN=127 is used, the rest of the command line, placed after that will be ignored.
-  SARA-R4 / SARA-N4  
A SW reset via [AT+CFUN=1,1](#) triggers signalling attempts whose number is internally counted by the SW and limited based on mobile network operators' thresholds. The AT&T RPM feature (see also the [+URPM](#) AT command) limits the number of SW resets per hour, and might cause the AT command to return an error result code.

#### 5.2.2 Syntax

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

### 5.2.3 Defined values

| Parameter    | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <fun>        | Number | <p>Selected functionality:</p> <ul style="list-style-type: none"> <li>0: sets the MT to minimum functionality (disable both transmit and receive RF circuits by deactivating both CS and PS services)</li> <li>1 (factory-programmed value): sets the MT to full functionality, e.g. from airplane mode or minimum functionality</li> <li>4: disables both transmit and receive RF circuits by deactivating both CS and PS services and sets the MT into airplane mode. Airplane mode is persistent between power cycles triggered by +CFUN=16 or +CPWROFF (where supported)</li> <li>6: enables the SIM-toolkit interface in dedicated mode and fetching of proactive commands by SIM-APPL from the SIM-card</li> <li>7 or 8: disables the SIM-toolkit interface and fetching of proactive commands by SIM-APPL from the SIM-card</li> <li>9: enables the SIM-toolkit interface in raw mode and fetching of proactive commands by SIM-APPL from the SIM-card</li> <li>15: MT silent reset (with detach from network and saving of NVM parameters), without reset of the SIM card</li> <li>16: MT silent reset (with detach from network and saving of NVM parameters), with reset of the SIM card</li> <li>19: sets the MT to minimum functionality by deactivating CS and PS services and the SIM card</li> <li>127: sets the MT in a deep low power state "HALT" (with detach from the network and saving of the NVM parameters); the only way to wake up the module is a power cycle or a module reset</li> </ul> |
| <rst>        | Number | <p>Reset mode. This parameter can be used only when &lt;fun&gt; is 1, 4 or 19.</p> <ul style="list-style-type: none"> <li>0 (default value): do not reset the MT before setting it to the selected &lt;fun&gt;</li> <li>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 &lt;fun&gt;</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <power_mode> | Number | <ul style="list-style-type: none"> <li>0: MT is switched on with minimum functionality</li> <li>1: MT is switched on</li> <li>4: MT is in "airplane mode"</li> <li>19: MT is in minimum functionality with SIM deactivated</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <STK_mode>   | Number | <ul style="list-style-type: none"> <li>6: the SIM-toolkit interface in dedicated mode and fetching of proactive commands by SIM-APPL from the SIM-card are enabled</li> <li>0, 7 or 8: the SIM-toolkit interface is disabled; fetching of proactive commands by SIM-APPL from the SIM-card is enabled</li> <li>9: the SIM-toolkit interface in raw mode and fetching of proactive commands by SIM-APPL from the SIM-card are enabled</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

### 5.2.4 Notes

#### SARA-R4 / SARA-N4

- <fun>=16, 19 and 127 are not supported.
- <fun>=5 is returned in the information text response to the read command if the device is in Factory Test Mode (FTM).
- <fun>=15 resets the SIM card.
- To reset the module issue the AT+CFUN=15 command.

#### SARA-R404M / SARA-R410M-01B

- <fun>=6, 7, 8 and 9 are not supported.

## 5.3 Indicator control +CIND

| +CIND      |                                                                    |              |                |                |               |                 |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                 |
|            | SARA-N4                                                            |              |                |                |               |                 |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | partial                                                            | No           | No             | No             | -             | +CME Error      |

### 5.3.1 Description

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

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

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

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

### 5.3.2 Syntax

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

### 5.3.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ind>     | Number | Range of corresponding <descr> used to identify the service when an unsolicited indication is provided                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <descr>   | String | Reserved by the norm and their <ind> ranges; it may have the values: <ul style="list-style-type: none"> <li>"battchg": battery charge level (0-5)</li> <li>"signal": signal quality. See mapping in the note below</li> <li>"service": network service availability <ul style="list-style-type: none"> <li>0: not registered to any network</li> <li>1: registered to the network</li> <li>65535: indication not available</li> </ul> </li> <li>"sounder": sounder activity, indicating when the module is generating a sound <ul style="list-style-type: none"> <li>0: no sound</li> <li>1: sound is generated</li> </ul> </li> <li>"message": unread message available in &lt;mem1&gt; storage <ul style="list-style-type: none"> <li>0: no messages</li> <li>1: unread message available</li> </ul> </li> <li>"call": call in progress <ul style="list-style-type: none"> <li>0: no call in progress</li> <li>1: call in progress</li> </ul> </li> <li>"roam": registration on a roaming network <ul style="list-style-type: none"> <li>0: not in roaming or not registered</li> <li>1: roaming</li> <li>65535: indication not available</li> </ul> </li> </ul> |

| Parameter | Type | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           |      | <ul style="list-style-type: none"> <li>"smsfull": indication that an SMS has been rejected with the cause of SMS storage full <ul style="list-style-type: none"> <li>0: SMS storage not full</li> <li>1: SMS storage full</li> </ul> </li> <li>"gprs": PS indication status: <ul style="list-style-type: none"> <li>0: no PS available in the network</li> <li>1: PS available in the network but not registered</li> <li>2: registered to PS</li> <li>65535: indication not available</li> </ul> </li> <li>"callsetup": call set-up: <ul style="list-style-type: none"> <li>0: no call set-up</li> <li>1: incoming call not accepted or rejected</li> <li>2: outgoing call in dialling state</li> <li>3: outgoing call in remote party alerting state</li> </ul> </li> <li>"callheld": call on hold: <ul style="list-style-type: none"> <li>0: no calls on hold</li> <li>1: at least one call on hold</li> </ul> </li> <li>"simind": SIM detection <ul style="list-style-type: none"> <li>0: no SIM detected</li> <li>1: SIM detected</li> <li>2: not available</li> </ul> </li> </ul> |

### 5.3.4 Notes

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

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

## 5.4 Configuration of indicator control +UCIND

| +UCIND     |                                                                            |              |                |                |               |                            |
|------------|----------------------------------------------------------------------------|--------------|----------------|----------------|---------------|----------------------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M SARA-N4 |              |                |                |               |                            |
| Attributes | Syntax                                                                     | PIN required | Settings saved | Can be aborted | Response time | Error reference            |
|            | full                                                                       | No           | No             | No             | -             | <a href="#">+CME Error</a> |

### 5.4.1 Description

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

### 5.4.2 Syntax

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

### 5.4.3 Defined values

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

## 5.5 Mobile termination event reporting +CMER

| +CMER             |                                                                            |                     |                       |                       |                      |                            |
|-------------------|----------------------------------------------------------------------------|---------------------|-----------------------|-----------------------|----------------------|----------------------------|
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M SARA-N4 |                     |                       |                       |                      |                            |
| <b>Attributes</b> | <b>Syntax</b>                                                              | <b>PIN required</b> | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b>     |
|                   | partial                                                                    | No                  | No                    | No                    | -                    | <a href="#">+CME Error</a> |

### 5.5.1 Description

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

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

The command [+UCIND](#) allows enabling or disabling indicators.

### 5.5.2 Syntax

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

### 5.5.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                                                                                                                                                         |
|-----------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <mode>    | Number | <ul style="list-style-type: none"> <li>0 (default value): buffer URCs in the MT</li> <li>1: discard URCs when the V.24 interface is reserved for data; otherwise directly display them on the DTE</li> <li>2: buffer URCs in MT when the V.24 interface is reserved and flush them after reservation; otherwise directly display them on the DTE</li> <li>3: same as 1</li> </ul>   |
| <keyp>    | Number | <ul style="list-style-type: none"> <li>0: no keypad event reporting</li> </ul>                                                                                                                                                                                                                                                                                                      |
| <disp>    | Number | <ul style="list-style-type: none"> <li>0: no display event reporting</li> </ul>                                                                                                                                                                                                                                                                                                     |
| <ind>     | Number | <ul style="list-style-type: none"> <li>0: no indicator event reporting</li> <li>1: indicator event reporting using the +CIEV URC. Only the indicator events which are not caused by <a href="#">+CIND</a> shall be indicated by the MT to the DTE.</li> <li>2: indicator event reporting using the +CIEV URC. All the indicator events shall be directed from MT to DTE.</li> </ul> |



| Parameter | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <bfr>     | Number | <ul style="list-style-type: none"> <li>0: MT buffer of URCs defined within this command is cleared when &lt;mode&gt; 1...3 is entered</li> <li>1: MT buffer of URCs defined within this command is flushed to the DTE when &lt;mode&gt; 1...3 is entered (the OK final result code shall be given before flushing the codes).</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <descr>   | Number | <p>Indicates the indicator order number. The name in the brackets indicates the corresponding &lt;descr&gt; parameter of <b>+CIND</b>; &lt;value&gt; is the new value of indicator:</p> <ul style="list-style-type: none"> <li>1 ("battchg"): &lt;value&gt; provides the battery charge level (0-5)</li> <li>2 ("signal"): &lt;value&gt; provides the signal quality <ul style="list-style-type: none"> <li>0: &lt; -105 dBm</li> <li>1: &lt; -93 dBm</li> <li>2: &lt; -81 dBm</li> <li>3: &lt; -69 dBm</li> <li>4: &lt; - 57 dBm</li> <li>5: &gt;= -57 dBm</li> </ul> </li> <li>3 ("service"): &lt;value&gt; provides the network service availability: <ul style="list-style-type: none"> <li>0: not registered to the network</li> <li>1: registered to the network</li> </ul> </li> <li>4 ("sounder"): &lt;value&gt; provides the sounder activity: <ul style="list-style-type: none"> <li>0: no sound</li> <li>1: sound is generated</li> </ul> </li> <li>5 ("message"): &lt;value&gt; provides the unread message available in &lt;mem1&gt; storage: <ul style="list-style-type: none"> <li>0: no messages</li> <li>1: unread message available</li> </ul> </li> <li>6 ("call"): &lt;value&gt; provides the call in progress: <ul style="list-style-type: none"> <li>0: no call in progress</li> <li>1: call in progress</li> </ul> </li> <li>7 ("roam"): &lt;value&gt; provides the registration on a roaming network: <ul style="list-style-type: none"> <li>0: not in roaming</li> <li>1: roaming</li> </ul> </li> <li>8 ("smsfull"): &lt;value&gt; provides the SMS storage status: <ul style="list-style-type: none"> <li>0: SMS storage not full</li> <li>1: SMS Storage full (an SMS has been rejected with the cause of SMS storage full)</li> </ul> </li> <li>9 ("gprs"): &lt;value&gt; provides the GPRS indication status: <ul style="list-style-type: none"> <li>0: no GPRS available in the network</li> <li>1: GPRS available in the network but not registered</li> <li>2: registered to GPRS</li> <li>65535: PS service indication is not available</li> </ul> </li> <li>10 ("callsetup"): &lt;value&gt; provides the call set-up: <ul style="list-style-type: none"> <li>0: no call set-up</li> <li>1: incoming call not accepted or rejected</li> <li>2: outgoing call in dialing state</li> <li>3: outgoing call in remote party alerting state</li> </ul> </li> <li>11 ("callheld"): &lt;value&gt; provides the call on hold: <ul style="list-style-type: none"> <li>0: no calls on hold</li> <li>1: at least one call on hold</li> </ul> </li> <li>12 ("simind"): &lt;value&gt; provides the SIM detection: <ul style="list-style-type: none"> <li>0: no SIM detected</li> <li>1: SIM detected</li> <li>2: not available</li> </ul> </li> </ul> |

## 5.6 Clock +CCLK

| +CCLK      |                                                                    |              |                |                |               |                 |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                 |
|            | SARA-N4                                                            |              |                |                |               |                 |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | partial                                                            | No           | NVM            | No             | -             | +CME Error      |

### 5.6.1 Description

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

### 5.6.2 Syntax

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

### 5.6.3 Defined values

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

### 5.6.4 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.

## 5.7 Set greeting text +CSGT

| +CSGT      |                |              |                |                |               |                 |
|------------|----------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R410M-52B |              |                |                |               |                 |
|            | SARA-N4        |              |                |                |               |                 |
| Attributes | Syntax         | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | partial        | No           | NVM            | No             | -             | +CME Error      |

### 5.7.1 Description

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



Take care about restrictions related to the baud rate described in the [Autobauding description](#).

### 5.7.2 Syntax

| Type | Syntax                  | Response             | Example                      |
|------|-------------------------|----------------------|------------------------------|
| Set  | AT+CSGT=<mode>[,<text>] | OK                   | AT+CSGT=1,"Hello user"<br>OK |
| Read | AT+CSGT?                | +CSGT: <text>,<mode> | +CSGT: "Hello",0             |

| Type | Syntax    | Response                                            | Example |
|------|-----------|-----------------------------------------------------|---------|
| Test | AT+CSGT=? | OK                                                  | OK      |
|      |           | +CSGT: (list of supported <mode>s), +CSGT: (0-1),49 |         |
|      |           | <lttext>                                            | OK      |
|      |           | OK                                                  |         |

### 5.7.3 Defined values

| Parameter | Type   | Description                                                                                                           |
|-----------|--------|-----------------------------------------------------------------------------------------------------------------------|
| <text>    | String | Greeting text. The factory-programmed value is the empty string.                                                      |
| <mode>    | Number | <ul style="list-style-type: none"> <li>0: turn off the greeting text</li> <li>1: turn on the greeting text</li> </ul> |
| <lttext>  | Number | Maximum length of the <text> parameter.                                                                               |

## 5.8 Automatic time zone update +CTZU

| +CTZU      |                                                                    |              |                |                |               |                 |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B<br>SARA-N4 |              |                |                |               |                 |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                                                               | Yes          | NVM            | No             | -             | +CME Error      |

### 5.8.1 Description

Configures the automatic time zone update via NITZ.



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

### 5.8.2 Syntax

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

### 5.8.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                                                                                                        |
|-----------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <on_off>  | Number | Allowed values (see <a href="#">Notes</a> for the factory-programmed value): <ul style="list-style-type: none"> <li>0: automatic time zone via NITZ disabled</li> <li>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)</li> </ul> |

### 5.8.4 Notes

#### SARA-R4 / SARA-N4

- The factory-programmed value of the <on\_off> parameter is 0.

## 5.9 Report mobile termination error +CMEE

| +CMEE      |                                                                    |              |                |                |               |                            |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|----------------------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                            |
|            | SARA-N4                                                            |              |                |                |               |                            |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference            |
|            | full                                                               | No           | No             | No             | -             | <a href="#">+CME Error</a> |

### 5.9.1 Description

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

### 5.9.2 Syntax

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

### 5.9.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                                                                              |
|-----------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <n>       | Number | <ul style="list-style-type: none"> <li>0: +CME ERROR: &lt;err&gt; result code disabled and ERROR used</li> <li>1: +CME ERROR: &lt;err&gt; result code enabled and numeric &lt;err&gt; values used</li> <li>2: +CME ERROR: &lt;err&gt; result code enabled and verbose &lt;err&gt; values used</li> </ul> |

### 5.9.4 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 |

## 6 Call control

### 6.1 Dial command D

| D          |                                                                    |              |                |                |               |                 |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                 |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                                                               | Yes          | No             | Yes            | Up to 3 min   | +CME Error      |

#### 6.1.1 Description

Lists characters that may be used in a dialling string for making a call (voice, data or fax call) or controlling supplementary services in accordance with 3GPP TS 22.030 [5] and initiates the indicated kind of call. No further commands may follow in the command line in case of data or fax calls.

#### 6.1.2 Syntax

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

#### 6.1.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <number>  | Number | Dial string; the allowed characters are: 1 2 3 4 5 6 7 8 9 0 * # + A B C D , T P ! W @ (see the 3GPP TS 27.007 [2]). The following characters are ignored: , T ! W @.<br> The first occurrence of P is interpreted as pause and separator between the dialling number and the DTMF string. The following occurrences are interpreted only as pause. The use of P as pause has been introduced for AT&T certification. |
| <I>       | String | Set the CLI status; the allowed values are: <ul style="list-style-type: none"> <li>I (ASCII code 49 Hex): CLI presentation restricted</li> <li>i: CLI presentation allowed</li> </ul>  The CLIR supplementary service subscription is overridden for this call.                                                                                                                                                       |
| <G>       | String | Configures the CUG supplementary service for the specific call: <ul style="list-style-type: none"> <li>G: CUG activated</li> <li>g: CUG deactivated</li> </ul> The index and the information parameters used during the call will be the same previously set with <a href="#">+CCUG</a> command.                                                                                                                                                                                                         |

#### 6.1.4 Notes

##### SARA-R404M / SARA-R410M-01B / SARA-R410M-02B / SARA-R410M-52B

- Voice calls are not supported.

## 6.2 Call answer A

|                   |                                                                    |                     |                       |                       |                      |                        |
|-------------------|--------------------------------------------------------------------|---------------------|-----------------------|-----------------------|----------------------|------------------------|
| <b>A</b>          |                                                                    |                     |                       |                       |                      |                        |
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |                     |                       |                       |                      |                        |
| <b>Attributes</b> | <b>Syntax</b>                                                      | <b>PIN required</b> | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b> |
|                   | full                                                               | No                  | No                    | No                    | < 20 s               | +CME Error             |

### 6.2.1 Description

Instructs the DCE to immediately connect to the line and start the answer sequence as specified for the underlying DCE. Any additional command that appears after A on the same command line is ignored. The command is abortable.



SARA-R4

The user is informed that an incoming call is waiting, by the RING IRC.

### 6.2.2 Syntax

| Type   | Syntax | Response | Example |
|--------|--------|----------|---------|
| Action | ATA    | RING     |         |
|        |        | OK       |         |

## 6.3 Hook control H

|                   |                                                                               |                     |                       |                       |                      |                        |
|-------------------|-------------------------------------------------------------------------------|---------------------|-----------------------|-----------------------|----------------------|------------------------|
| <b>H</b>          |                                                                               |                     |                       |                       |                      |                        |
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                       |                       |                      |                        |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b> |
|                   | full                                                                          | No                  | No                    | No                    | < 20 s               | -                      |

### 6.3.1 Description

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



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



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

### 6.3.2 Syntax

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

## 6.4 Automatic answer S0

|                   |                                                                    |                     |                       |                       |                      |                        |
|-------------------|--------------------------------------------------------------------|---------------------|-----------------------|-----------------------|----------------------|------------------------|
| <b>S0</b>         |                                                                    |                     |                       |                       |                      |                        |
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |                     |                       |                       |                      |                        |
| <b>Attributes</b> | <b>Syntax</b>                                                      | <b>PIN required</b> | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b> |
|                   | partial                                                            | No                  | Profile               | No                    | -                    | +CME Error             |

### 6.4.1 Description

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



For an incoming CSD call, if the autoanswering is enabled and the <value> parameter of [&D](#) command is set to 2, the autoanswering only works if the DTR line of the AT interface with activated autoanswering

is set to ON. Otherwise, if DTR is OFF, then the call is rejected. If the <value> parameter of &D command is not set to 2, the DTR state has no impact on autoanswering.

## 6.4.2 Syntax

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

## 6.4.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                                             |
|-----------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <value>   | Number | Value in the range 0-255; the answer to the read command is in "xxx" format. <ul style="list-style-type: none"> <li>0 (factory-programmed value): disables automatic answer mode</li> <li>1-255: enables automatic answering after specified number of rings</li> </ul> |

## 6.4.4 Notes

### SARA-R404M / SARA-R410M-01B / SARA-R410M-02B / SARA-R410M-52B

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

## 7 Network service

### 7.1 Subscriber number +CNUM

| +CNUM      |                                                                    |              |                |                |               |                 |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                 |
|            | SARA-N4                                                            |              |                |                |               |                 |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                                                               | Yes          | No             | No             | < 10 s        | +CME Error      |

#### 7.1.1 Description

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

 MSISDN is read from the SIM.

#### 7.1.2 Syntax

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

#### 7.1.3 Defined values

| Parameter | Type   | Description                                                                                     |
|-----------|--------|-------------------------------------------------------------------------------------------------|
| <alphax>  | String | Associated with <numberx>                                                                       |
| <numberx> | String | Phone number of format specified by <typex>                                                     |
| <typex>   | Number | Type of address, octet in Number format (145 when <numberx> string includes '+', otherwise 129) |

### 7.2 Signal quality +CSQ

| +CSQ       |                                                                    |              |                |                |               |                 |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                 |
|            | SARA-N4                                                            |              |                |                |               |                 |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                                                               | No           | No             | No             | -             | +CME Error      |

#### 7.2.1 Description

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

 SARA-R4 / SARA-N4  
The radio signal strength <signal\_power> will be also used to build and display the indicator "signal" i.e. signal quality in the information text response of +CIND and in the +CIEV URC (see the +CMER command description).

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



## 7.2.2 Syntax

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

## 7.2.3 Defined values

| Parameter      | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <signal_power> | Number | The allowed range is 0-31 and 99. Remapped indication of the following parameters: <ul style="list-style-type: none"> <li>the Received Signal Strength Indication (RSSI) in GSM RAT</li> <li>the Received Signal Code Power (RSCP) in UMTS RAT</li> <li>the Reference Signal Received Power (RSRP) in LTE RAT</li> </ul> When the RF power level of the received signal is the highest possible, the value 31 is reported. When it is not known, not detectable or currently not available, 99 is returned.                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <qual>         | Number | The allowed range is 0-7 and 99. The information provided depends on the selected RAT: <ul style="list-style-type: none"> <li>In 2G RAT CS dedicated and GPRS packet transfer mode indicates the Bit Error Rate (BER) as specified in 3GPP TS 45.008 [148]</li> <li>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 &lt;qual&gt;</li> <li>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 &lt;qual&gt;</li> <li>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 &lt;qual&gt;</li> </ul> See <a href="#">Table 3</a> for the complete parameter mapping |

## 7.2.4 Notes

| <qual> | 2G RAT CS and GPRS          | 2G RAT EGPRS         | UMTS RAT            | LTE RAT             |
|--------|-----------------------------|----------------------|---------------------|---------------------|
| 0      | BER < 0.2%                  | 28 <= MEAN_BEP <= 31 | 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      |
| 99     | Not known or not detectable |                      |                     |                     |

**Table 3: <qual> parameter mapping for each supported RAT**

### SARA-R404M / SARA-R410M / SARA-N4

- Only LTE RAT is supported.
- The <qual> parameter is not supported, and will be always set to 99.

## 7.3 Extended signal quality +CESQ

| +CESQ      |                                                                    |              |                |                |               |                 |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                 |
|            | SARA-N4                                                            |              |                |                |               |                 |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                                                               | No           | No             | No             | -             | +CME Error      |

### 7.3.1 Description

Returns the received signal quality and level:

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



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

### 7.3.2 Syntax

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

### 7.3.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                                                                       |
|-----------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <rxlev>   | Number | Received Signal Strength Indication (RSSI): <ul style="list-style-type: none"> <li>• 0: less than -110 dBm</li> <li>• 1..62: from -110 to -49 dBm with 1 dBm steps</li> <li>• 63: -48 dBm or greater</li> <li>• 99: not known or not detectable</li> </ul>                                        |
| <ber>     | Number | Bit Error Rate (BER): <ul style="list-style-type: none"> <li>• 0..7: as the RXQUAL values described in GSM TS 05.08 [28]</li> <li>• 99: not known or not detectable</li> </ul>                                                                                                                    |
| <rscp>    | Number | Received Signal Code Power (RSCP): <ul style="list-style-type: none"> <li>• 0: -121 dBm or less</li> <li>• 1..95: from -120 dBm to -24 dBm with 1 dBm steps</li> <li>• 96: -25 dBm or greater</li> <li>• 255: not known or not detectable</li> </ul>                                              |
| <ecn0>    | Number | Ratio of received energy per PN chip to the total received power spectral density: <ul style="list-style-type: none"> <li>• 0: -24.5 dB or less</li> <li>• 1..48: from -24 dB to -0.5 dBm with 0.5 dB steps</li> <li>• 49: 0 dB or greater</li> <li>• 255: not known or not detectable</li> </ul> |
| <rsrq>    | Number | Reference Signal Received Quality (RSRQ): <ul style="list-style-type: none"> <li>• 0: -19 dB or less</li> <li>• 1..33: from -19.5 dB to -3.5 dB with 0.5 dB steps</li> <li>• 34: -3 dB or greater</li> </ul>                                                                                      |

| Parameter | Type   | Description                                        |
|-----------|--------|----------------------------------------------------|
| <rsrp>    | Number | • 255: not known or not detectable                 |
|           |        | Reference Signal Received Power (RSRP):            |
|           |        | • 0: -141 dBm or less                              |
|           |        | • 1..96: from -140 dBm to -45 dBm with 1 dBm steps |
|           |        | • 97: -44 dBm or greater                           |
|           |        | • 255: not known or not detectable                 |

## 7.4 Operator selection +COPS

| +COPS             |                                                                               |                     |                         |                       |                             |                            |
|-------------------|-------------------------------------------------------------------------------|---------------------|-------------------------|-----------------------|-----------------------------|----------------------------|
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                         |                       |                             |                            |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b>   | <b>Can be aborted</b> | <b>Response time</b>        | <b>Error reference</b>     |
|                   | partial                                                                       | No                  | <a href="#">Profile</a> | Yes                   | <a href="#">Up to 3 min</a> | <a href="#">+CME Error</a> |

### 7.4.1 Description

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

 In manual PLMN selection mode, if the optional <AcT> parameter is not specified, the modules will select the default access technology with the following priority order: LTE and GSM (not supported technologies will be ignored).

 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? or by verifying the active profile with [AT+V](#) command if supported (parameter <format> is then also visible).

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

- **<mode>=0 and <mode>=1:** the AT command setting is immediately stored in the current activated profile. If the MT is set in automatic selection mode (<mode>= 0), only the mode will be saved. If the MT is set in manual mode (<mode>= 1), also the format (<format>) and operator (<oper>) will be stored in the profile.
- **<mode>=4:** the module starts a manual selection of the specified operator; if this operation is not successful, the module will start an automatic network selection and will remain in automatic mode.

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 manual PLMN selection can fail due to the MNO control on the network selection procedure via EF<sub>CSP</sub> setting; for further details see [+PACSP](#).

 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. Similarly, when notified of a GPRS mobile terminated detach event (e.g. via +CGEV

URC), it is recommended to wait a few seconds before entering AT+COPS=2 in order to let the pending registration procedure (automatically triggered by the module in most cases) successfully end.



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

## 7.4.2 Syntax

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

## 7.4.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <mode>    | Number | Is used to chose whether the network selection is automatically done by the MT or is forced by this command to the operator <oper> given in the format <format>: <ul style="list-style-type: none"> <li>0 (default value and factory-programmed value): automatic (&lt;oper&gt; field is ignored)</li> <li>1: manual</li> <li>2: deregister from network</li> <li>3: set only &lt;format&gt;</li> <li>4: manual/automatic</li> </ul> |
| <format>  | Number | <ul style="list-style-type: none"> <li>0 (factory-programmed value): long alphanumeric &lt;oper&gt;</li> <li>1: short format alphanumeric &lt;oper&gt;</li> <li>2: numeric &lt;oper&gt;</li> </ul>                                                                                                                                                                                                                                   |
| <oper>    | String | Given in format <format> this field may be up to 24 characters long for long alphanumeric format, up to 10 characters for short alphanumeric format and 5 or 6 characters long for numeric format (MCC/MNC codes). The factory-programmed value is FFFF (undefined).                                                                                                                                                                 |
| <stat>    | Number | <ul style="list-style-type: none"> <li>0: unknown</li> <li>1: available</li> <li>2: current</li> <li>3: forbidden</li> </ul>                                                                                                                                                                                                                                                                                                         |
| <AcT>     | Number | Indicates the radio access technology: <ul style="list-style-type: none"> <li>7: LTE</li> <li>8: EC-GSM-IoT (A/Gb mode)</li> <li>9: E-UTRAN (NB-S1 mode)</li> </ul> Allowed values: <ul style="list-style-type: none"> <li>SARA-R404M - 7</li> <li>SARA-R410M-01B / SARA-R410M-02B - 8, 9</li> <li>SARA-R410M-52B - 7, 9</li> <li>SARA-N4 - 9</li> </ul>                                                                             |

## 7.4.4 Notes

### SARA-R4 / SARA-N4

- <format> and <oper> parameters are optional only if the value of <mode> parameter is 0, 2 or 3.
- If the antenna is not connected, then the information text response to the test command is: +COPS: ,, (0-4),(0-2)

## SARA-R410M-01B / SARA-R410M-02B

- <AcT>=8 is used for LTE Cat M1.

## 7.5 Radio Access Technology (RAT) selection +URAT

| +URAT      |                                                                    |              |                |                |               |                 |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                 |
|            | SARA-N4                                                            |              |                |                |               |                 |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | partial                                                            | No           | NVM            | No             | -             | +CME Error      |

### 7.5.1 Description

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

If dual or tri mode is selected, it is also possible to select the preferred RAT, which determines which RAT is selected first (if available). If the preferred RAT is omitted, it will be set by default to the higher RAT available. If tri mode is selected, it is also possible to select the second preferred RAT (if the preferred RAT was also selected). This parameter determines which RAT is selected if the first preferred RAT is not available.

-  Any change in the RAT selection must be done in the detached state issuing the [AT+COPS=2](#) AT 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.
-  In dual mode and tri mode, all the requested Access Stratum protocols are active and Inter-RAT measurements as well as Inter-RAT handovers may be performed (if ordered by the network).

### 7.5.2 Syntax

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

### 7.5.3 Defined values

| Parameter     | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <SelectedAcT> | Number | Indicates the radio access technology and may be: <ul style="list-style-type: none"> <li>• 0: GSM / GPRS / eGPRS (single mode)</li> <li>• 1: GSM / UMTS (dual mode)</li> <li>• 2: UMTS (single mode)</li> <li>• 3: LTE (single mode)</li> <li>• 4: GSM / UMTS / LTE (tri mode)</li> <li>• 5: GSM / LTE (dual mode)</li> <li>• 6: UMTS / LTE (dual mode)</li> <li>• 7: LTE Cat.M1</li> </ul> |

| Parameter         | Type   | Description                                                                                                                                                                                                                                                                           |
|-------------------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                   |        | <ul style="list-style-type: none"> <li>8: LTE Cat.NB1</li> <li>9: GPRS / eGPRS</li> </ul>                                                                                                                                                                                             |
| <PreferredAct>    | Number | Indicates the preferred access technology; it is ignored if dual mode or tri mode are not selected. <ul style="list-style-type: none"> <li>0: GSM / GPRS / eGPRS</li> <li>2: UTRAN</li> <li>3: LTE</li> <li>7: LTE Cat.M1</li> <li>8: LTE Cat.NB1</li> <li>9: GPRS / eGPRS</li> </ul> |
| <2ndPreferredAct> | Number | Indicates the second preferred access technology; it is ignored if tri mode is not selected. <ul style="list-style-type: none"> <li>0: GSM / GPRS / eGPRS</li> <li>2: UTRAN</li> <li>3: LTE</li> <li>7: LTE Cat.M1</li> <li>8: LTE Cat.NB1</li> <li>9: GPRS / eGPRS</li> </ul>        |

## 7.5.4 Notes

- AT&T's EF<sub>RAT</sub> mode contains the RAT mode setting, the RAT mode setting is the mode that the module shall be set to. Thus this setting may override +URAT's <SelectedAcT> and <PreferredAct> loaded at boot time.

### SARA-R404M / SARA-R410M-01B

- <SelectedAcT>=0, 1, 2, 4, 5, 6, 7, 8, 9 are not supported. The factory-programmed value of <SelectedAcT> is 3.

### SARA-R410M-02B / SARA-R410M-52B

- <SelectedAcT> is the first AcT the module will search. In the case a suitable cell can't be found on this AcT, the module will search the <PreferredAct> if defined.
- <PreferredAct> is the next AcT the module will search if no suitable cell can be found on the <SelectedAcT>. In the case a suitable cell can't be found on this AcT, the module will search the <2ndPreferredAct> if defined.
- <SelectedAcT>=0, 1, 2, 3, 4, 5, 6, 9 are not supported. The factory-programmed value of <SelectedAcT> is 7.
- <PreferredAct>=0, 2, 3, 9 are not supported. The factory-programmed value of <PreferredAct> is 8.
- <2ndPreferredAct>=0, 2, 3, 9 are not supported. The factory-programmed value of <PreferredAct> is NULL.

### SARA-N4

- <SelectedAcT>=0, 1, 2, 3, 4, 5, 6, 7, 9 are not supported. The factory-programmed value of <SelectedAcT> is 8.

## 7.6 Network registration status +CREG

| +CREG      |                                          |              |                |                |               |                 |
|------------|------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                 |
|            | SARA-N4                                  |              |                |                |               |                 |
| Attributes | Syntax                                   | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | partial                                  | No           | No             | No             | -             | +CME Error      |

### 7.6.1 Description

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

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

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

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



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



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



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

## 7.6.2 Syntax

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

## 7.6.3 Defined values

| Parameter   | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <n>         | Number | <ul style="list-style-type: none"> <li>0 (default value and factory-programmed value): network registration URC disabled</li> <li>1: network registration URC +CREG: &lt;stat&gt; enabled</li> <li>2: network registration and location information URC +CREG: &lt;stat&gt;[,&lt;lac&gt;,&lt;ci&gt;[,&lt;AcTStatus&gt;]] enabled</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <stat>      | Number | <ul style="list-style-type: none"> <li>0: not registered, the MT is not currently searching a new operator to register to</li> <li>1: registered, home network</li> <li>2: not registered, but the MT is currently searching a new operator to register to</li> <li>3: registration denied</li> <li>4: unknown (e.g. out of GERAN/UTRAN/E-UTRAN coverage)</li> <li>5: registered, roaming</li> <li>6: registered for "SMS only", home network (applicable only when &lt;AcTStatus&gt; indicates E-UTRAN)</li> <li>7: registered for "SMS only", roaming (applicable only when &lt;AcTStatus&gt; indicates E-UTRAN)</li> <li>9: registered for "CSFB not preferred", home network (applicable only when &lt;AcTStatus&gt; indicates E-UTRAN)</li> <li>10: registered for "CSFB not preferred", roaming (applicable only when &lt;AcTStatus&gt; indicates E-UTRAN)</li> </ul> |
| <lac>       | String | Two bytes location area code or tracking area code (if <AcTStatus>=7) in hexadecimal format (e.g. "00C3"). The value FFFF means that the current <lac> value is invalid.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <ci>        | String | From 2 to 4 bytes cell ID in hexadecimal format (e.g. "A13F" or "129080B"). The value FFFFFFFF means that the current <ci> value is invalid.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <AcTStatus> | Number | Indicates the radio access technology <ul style="list-style-type: none"> <li>0: GSM</li> <li>1: GSM COMPACT</li> <li>2: UTRAN</li> <li>3: GSM with EDGE availability</li> <li>4: UTRAN with HSDPA availability</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

| Parameter | Type | Description                                                                                                                                                                                                             |
|-----------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           |      | <ul style="list-style-type: none"> <li>5: UTRAN with HSUPA availability</li> <li>6: UTRAN with HSDPA and HSUPA availability</li> <li>7: E-UTRAN</li> <li>255: the current &lt;AcTStatus&gt; value is invalid</li> </ul> |

## 7.6.4 Notes

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

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

The registration is not started

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

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

- 3: the CS registration failed after a Location Update Reject; possible causes are:
  - Illegal MS
  - Illegal ME
  - IMSI unknown at HLR
  - PLMN not allowed
  - Location area not allowed
  - Roaming not allowed in this location area
  - Network failure
  - Network congestion

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

If the registration type is manual, then no further attempt is made to search for a new PLMN or register with it. If the registration type is automatic, the MS may look for an allowed PLMN if the rejection cause was roaming restriction. In case of illegal MS /ME, there could be possible problems with either the SIM card or with the ME's identity (IMEI): user intervention may be required

- 4: this value, usually transitory, is returned if the registration state does not belong to any of the following:
  - Normal
  - Limited
  - No service
  - Service detached
  - Service disabled

It may be issued after the failure of a registration procedure, before starting a PLMN search, when <stat>=2.

- 5: the MT is registered for circuit-switched services on a VPLMN, in national or international roaming
- 6: in LTE, the MT is registered only for the SMS circuit-switched service on the HPLMN (ore on one of the equivalent HPLMN's)
- 7: in LTE, the MT is registered only for the SMS circuit-switched service on a VPLMN, in national or international roaming



## 7.7 Network selection control +PACSP

| +PACSP            |                                                                    |                     |                       |                       |                      |                        |
|-------------------|--------------------------------------------------------------------|---------------------|-----------------------|-----------------------|----------------------|------------------------|
| <b>Modules</b>    | SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                       |                       |                      |                        |
| <b>Attributes</b> | <b>Syntax</b>                                                      | <b>PIN required</b> | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b> |
|                   | full                                                               | Yes                 | No                    | No                    | -                    | +CME Error             |

### 7.7.1 Description

If the EF<sub>CSP</sub> (Customer Service Profile) is available the +PACSP URC is provided in the following cases:

- SARA-R4 / SARA-N4 - at the module registration
- SARA-R4 / SARA-N4 - whenever the SIM/USIM issues the REFRESH proactive command related to the EF<sub>CSP</sub>

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



The EF<sub>CSP</sub> is available on SIM/USIM cards from AT&T mobile network operator.

### 7.7.2 Syntax

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

### 7.7.3 Defined values

| Parameter   | Type   | Description                                                                                                                                                                                                              |
|-------------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <bit_value> | Number | PLMN mode bit value: <ul style="list-style-type: none"> <li>• 0: automatic network selection is forced (see <a href="#">Notes</a>)</li> <li>• 1: network selection mode unchanged (see <a href="#">Notes</a>)</li> </ul> |

### 7.7.4 Notes

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

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

#### SARA-R4 / SARA-N4

- The read command is not supported.

## 7.8 Channel and network environment description +UCGED

| +UCGED            |                                                     |                     |                       |                       |                      |                        |
|-------------------|-----------------------------------------------------|---------------------|-----------------------|-----------------------|----------------------|------------------------|
| <b>Modules</b>    | SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                       |                       |                      |                        |
| <b>Attributes</b> | <b>Syntax</b>                                       | <b>PIN required</b> | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b> |
|                   | partial                                             | No                  | No                    | No                    | -                    | +CME Error             |

### 7.8.1 Description

Enables the protocol stack and network environment information collection.

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

Table 4 lists the supported <mode> parameter values:

| Channel | <mode>=0 | <mode>=2 | <mode>=3 | <mode>=5 |
|---------|----------|----------|----------|----------|
| SARA-N4 | *        |          |          | *        |
| SARA-R4 | *        |          |          | *        |

Table 4: <mode> parameter applicability

## 7.8.2 Syntax

| Type | Syntax          | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Example                                                                                                                                                                                                                                                                                                  |
|------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Set  | AT+UCGED=<mode> | [+UCGED: <svc><br><arfcn>,<Gmcc>,<Gmnc>,<GcellId>,<BSIC>,<rxlev><br><uarfcn>,<Wband>,<Wmcc>,<Wmnc>,<WcellId>,<Wrrc>,<rssi>,<ecn0_lev><br><earfcn>,<Lband>,<ul_BW>,<dl_BW>,<Lmcc>,<Lmnc>,<tac>,<LcellId>,<P-CID>,<rsrp>,<rsrq>,<Lsinr>,<Lrrc>]<br>OK                                                                                                                                                                                                                                                                                                                                                                                                         | AT+UCGED=2<br>AT+UCGED=3<br>+UCGED: 0<br>65535,fff,fff,0000,ff,99<br>10588,1,222,88,1281d24,255,11,40<br>65535,255,255,255,fff,fff,ffff,0000<br>000,65535,255,255,255,255<br>OK<br>AT+UCGED=5<br>OK                                                                                                      |
| Read | AT+UCGED?       | <mode>= 0:<br>+UCGED: 0<br>OK<br><mode>= 2, <rat>= 2:<br>+UCGED: 2<br>2,<svc>,<MCC>,<MNC><br><arfcn>,<band1900>,<GcellId>,<BSIC>,<Glac>,<Grac>,<rxlev>,<grr>,<t_adv>,<Gspeech_mode><br>OK<br><mode>= 2, <rat>= 3:<br>+UCGED: 2<br>3,<svc>,<MCC>,<MNC><br><uarfcn>,<Wband>,<WcellId>,<Wlac>,<Wrac>,<scrambling_code>,<Wrrc>,<rssi>,<ecn0_lev>,<Wspeech_mode><br>OK<br><mode>= 2, <rat>= 4:<br>+UCGED: 2<br>4,<svc>,<MCC>,<MNC><br><earfcn>,<Lband>,<ul_BW>,<dl_BW>,<tac>,<LcellId>,<P-CID>,<mTmsi>,<mmeGrId>,<mmeCode>,<rsrp>,<rsrq>,<Lsinr>,<Lrrc>,<RI>,<CQI>,<avg_rsrp>,<totalPuschPwr>,<avgPucchPwr>,<drx>,<l2w>,<volte_mode>[,<meas_gap>,<tti_bundling>] | +UCGED: 0<br>OK<br>+UCGED: 2<br>2,4,001,01<br>810,1,0000,01,0000,80,63,255,255,255<br>OK<br>+UCGED: 2<br>3,4,001,01<br>4400,5,00000000,0000,80,9,4,62,42,255<br>OK<br>+UCGED: 2<br>4,0,001,01<br>2525,5,25,50,2b67,69f6bc7,111,0000<br>0000,ffff,ff,67,19,0.00,255,255,255,67,11,255,0,255,255,0,0<br>OK |

| Type | Syntax     | Response                                | Example                    |
|------|------------|-----------------------------------------|----------------------------|
|      |            | OK                                      |                            |
|      |            | <b>&lt;mode&gt;= 2, &lt;rat&gt;= 5:</b> | +UCGED: 2                  |
|      |            | +UCGED: 2                               | 5,1                        |
|      |            | 5,<svc>                                 | OK                         |
|      |            | OK                                      |                            |
|      |            | <b>&lt;mode&gt;= 0:</b>                 | +UCGED: MODE_5_DISABLED    |
|      |            | +UCGED: MODE_5_DISABLED                 | OK                         |
|      |            | OK                                      |                            |
|      |            | <b>&lt;mode&gt;= 5:</b>                 | +RSRP: 162,5110,"-075.00", |
|      |            | +RSRP: <P-CID>,<earfcn>,"<RSRP>,"       | +RSRQ: 162,5110,"-14.20",  |
|      |            | +RSRQ: <P-CID>,<earfcn>,"<RSRQ>,"       | OK                         |
|      |            | OK                                      |                            |
| Test | AT+UCGED=? | +UCGED: (list of supported <mode>s)     | +UCGED: (0,2)              |
|      |            | OK                                      | OK                         |

### 7.8.3 Defined values

| Parameter  | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <mode>     | Number | <ul style="list-style-type: none"> <li>0: reporting disabled</li> <li>2: short form reporting enabled</li> <li>3: retrieve the short form text information report</li> <li>5: RSRP and RSRQ reporting enabled</li> </ul>                                                                                                                                                                                                                                                                                                   |
| <rat>      | Number | Current Radio Access Technology: <ul style="list-style-type: none"> <li>2: 2G</li> <li>3: 3G</li> <li>4: 4G</li> <li>5: unknown. The parameter is set to a 5 until a network information update is not successfully performed through +UCGED=2 or when the MT is set to minimum functionality (<a href="#">+CFUN=4</a>, <a href="#">+CFUN=19</a>).</li> </ul>                                                                                                                                                              |
| <svc>      | Number | Current radio service state: <ul style="list-style-type: none"> <li>0: not known or not detectable</li> <li>1: radio off</li> <li>2: searching</li> <li>3: no service</li> <li>4: registered</li> </ul> The radio service state is updated at each change from a valid network service state (2G, 3G or 4G) to another valid network service state (2G, 3G or 4G). To retrieve the network registration status information refer to <a href="#">+CREG</a> , <a href="#">+CGREG</a> and <a href="#">+CEREG</a> AT commands. |
| <MCC>      | Number | Mobile Country Code; the range is 0-999 (3 digits), FFF if not known or not detectable.                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <MNC>      | Number | Mobile Network Code; the range is 0-999 (1 to 3 digits), FFF if not known or not detectable.                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <arfcn>    | Number | Absolute Radio Frequency Channel Number (ARFCN); the range is 0-1023, 65535 if not known or not detectable.                                                                                                                                                                                                                                                                                                                                                                                                                |
| <band1900> | Number | Indicates whether the given <arfcn> in the range 512-810 is part of band 1900 or not, to avoid ambiguity between bands 1800 and 1900: <ul style="list-style-type: none"> <li>0: the given &lt;arfcn&gt; is not part of band 1900</li> <li>1: the given &lt;arfcn&gt; is part of band 1900</li> </ul>                                                                                                                                                                                                                       |
| <GcellId>  | Number | GERAN Cell Identifier (CI) in hexadecimal format; the range is 0h-FFFFh (2 octets).                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <BSIC>     | Number | Base Station Identity Code (BSIC) of the GERAN cell in hexadecimal format; the range is 0h-3Fh (6 bits), FF if not known or not detectable.                                                                                                                                                                                                                                                                                                                                                                                |
| <Glac>     | Number | Two bytes location area of the GERAN cell in hexadecimal format; FFFF if not known or not detectable.                                                                                                                                                                                                                                                                                                                                                                                                                      |

| Parameter         | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <Grac>            | Number | One byte routing area of the GERAN cell in hexadecimal format; FF if not known or not detectable.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <rxlev>           | Number | GERAN cell Received Signal Strength Indicator (RSSI) index as defined in 3GPP TS 45.008 [28]: <ul style="list-style-type: none"> <li>0: less than -110 dBm</li> <li>1..62: from -110 to -48 dBm with 1 dBm steps</li> <li>63: -48 dBm or greater</li> <li>255: not known or not detectable</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <grr>             | Number | Reserved for future use.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <t_adv>           | Number | Reserved for future use.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <Gspeech_mode>    | Number | Reports the latest obtained value of the GSM speech code. Allowed values: <ul style="list-style-type: none"> <li>0: GSM Enhanced Full Rate (12.2 kb/s)</li> <li>1: GSM Full Rate (13.0 kb/s)</li> <li>2: GSM Half Rate (5.6 kb/s)</li> <li>3..10: AMR NB FR (from 4.75 kb/s to 12.2 kb/s) the value indicates the first codec type chosen from the DUT; see the corresponding value of &lt;Wspeech_mode&gt; parameter for the baud rate mapping</li> <li>3..8: AMR NB HR (from 4.75 kb/s to 7.95 kb/s) the value indicates the first codec type chosen from the DUT; see the corresponding value of &lt;Wspeech_mode&gt; parameter for the baud rate mapping</li> <li>11..13: AMR WB FR (from 6.60 kb/s to 12.65 kb/s) the value indicates the first codec type chosen from the DUT; see the corresponding value of &lt;Wspeech_mode&gt; parameter for the baud rate mapping</li> <li>255: not known or not detectable</li> </ul> <p>See 3GPP TS 26.201 [113] for more details on GSM codecs used during a voice call</p> <p>In case a set of speech codecs is assigned by the network, then the parameter reports the lowest one and this one is not necessary the one used.</p> |
| <uarfcn>          | Number | UTRAN Absolute Radio Frequency Channel Number (UARFCN); the range is 1537-10 838, 65535 if not known or not detectable.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <Wband>           | Number | UTRAN band: <ul style="list-style-type: none"> <li>1: band 1 (2 GHz)</li> <li>2: band 2 (1900 MHz)</li> <li>4: band 4 (2100 MHz)</li> <li>5: band 5 (800 MHz)</li> <li>8: band 8 (900 MHz)</li> <li>255: not known or not detectable</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <Wcellld>         | Number | UTRAN CI (cell identifier) in hexadecimal format; the range is 0h-FFFFFFFh (28 bits), 0000000 if not known or not detectable.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <Wlac>            | Number | Two bytes location area of the UTRAN cell in hexadecimal format; FFFF if not known or not detectable.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <Wrac>            | Number | One byte routing area of the GERAN cell in hexadecimal format; FF if not known or not detectable.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <scrambling_code> | Number | Primary Scrambling Code; range 0-512, 0 if not known or not detectable.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <Wrrc>            | Number | 3G RRC state: <ul style="list-style-type: none"> <li>0: idle</li> <li>1: URA_PCH</li> <li>2: CELL_PCH</li> <li>3: CELL_FACH</li> <li>4: CELL_DCH</li> <li>255: not known or not detectable</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <rssi>            | Number | UTRAN cell Received Signal Strength Indicator as defined in 3GPP TS 25.133 [106]: <ul style="list-style-type: none"> <li>0: less than -100 dBm</li> <li>1..75: from -100 to -25 dBm with 1 dBm steps</li> <li>76: -25 dBm or greater</li> <li>255: not known or not detectable</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <ecn0_lev>        | Number | UTRAN cell Ratio of received energy per PN chip to the total received power spectral density as defined in 3GPP TS 25.133 [106]: <ul style="list-style-type: none"> <li>0: less than -24 dB</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

| Parameter      | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                |        | <ul style="list-style-type: none"> <li>1..48: from -24 dB to 0 dB with 0.5 dB steps</li> <li>49: 0 dB or greater</li> <li>255: not known or not detectable</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <Wspeech_mode> | Number | <p>Reports the latest obtained value of the UMTS speech code. Allowed values:</p> <ul style="list-style-type: none"> <li>3: AMR NB (4.75 kb/s)</li> <li>4: AMR NB (5.15 kb/s)</li> <li>5: AMR NB (5.90 kb/s)</li> <li>6: AMR NB (6.70 kb/s)</li> <li>7: AMR NB (7.40 kb/s)</li> <li>8: AMR NB (7.95 kb/s)</li> <li>9: AMR NB (10.2 kb/s)</li> <li>10: AMR NB (12.2 kb/s)</li> <li>11: AMR WB (6.60 kb/s)</li> <li>12: AMR WB (8.85 kb/s)</li> <li>13: AMR WB (12.65 kb/s)</li> <li>14: AMR WB (14.25 kb/s)</li> <li>15: AMR WB (15.85 kb/s)</li> <li>16: AMR WB (18.25 kb/s)</li> <li>17: AMR WB (19.85 kb/s)</li> <li>18: AMR WB (23.05 kb/s)</li> <li>19: AMR WB (23.85 kb/s)</li> <li>255: not known or not detectable</li> </ul> <p>See 3GPP TS 26.201 [113] for more details on UMTS codecs used during a voice call.</p> <p>In case a set of speech codecs is assigned by the network, then the parameter reports the lowest one and this one is not necessary the one used.</p> |
| <earfcn>       | Number | E-UTRAN Absolute radio frequency channel number; the range is 0-6449, 65535 if not known or not detectable.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <Lband>        | Number | E-UTRAN band (see 3GPP TS 36.101 Table 5.5-1 [99]); the range is 0-44, 255 if not known or not detectable.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <ul_BW>        | Number | Number of Uplink Resource Blocks (see 3GPP TS 36.101 Table 5.6-1 [99]), 255 if not known or not detectable.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <dl_BW>        | Number | Number of Downlink Resource Blocks (see 3GPP TS 36.101 Table 5.6-1 [99]), 255 if not known or not detectable.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <tac>          | Number | E-UTRAN cell Tracking area code in hexadecimal format; the range is 0h-FFFFh (2 octets), FFFF if not known or not detectable.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <LcellId>      | Number | E-UTRAN CI (cell identifier) in hexadecimal format; the range is 0h-FFFFFFh (28 bits), 0000000 if not known or not detectable.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <P-CID>        | Number | E-UTRAN cell Physical Cell ID; the range is 0-503, 65535 if not known or not detectable.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <mTmsi>        | Number | 4 bytes MME Temporary Mobile Subscriber Identity in hexadecimal format; 00000000 if not known or not detectable.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <mmeGrId>      | Number | 2 bytes MME Group Identifier in hexadecimal format; FFFF if not known or not detectable.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <mmeCode>      | Number | 1 byte MME Code in hexadecimal format; FF if not known or not detectable.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <rsrp>         | Number | <p>Reference Signal Received Power (RSRP) as defined in 3GPP TS 36.133 [105]:</p> <ul style="list-style-type: none"> <li>0: less than -140 dBm</li> <li>1..96: from -140 dBm to -44 dBm with 1 dBm steps</li> <li>97: -44 dBm or greater</li> <li>255: not known or not detectable</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <rsrq>         | Number | <p>Reference Signal Received Quality (RSRQ) as defined in 3GPP TS 36.133 [105]:</p> <ul style="list-style-type: none"> <li>0: less than -19.5 dB</li> <li>1..33: from -19.5 dB to -3 dB with 0.5 dB steps</li> <li>34: -3 dB or greater</li> <li>255: not known or not detectable</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <Lsinr>        | Number | E-UTRAN Signal to Interference and Noise ratio in dB. The range goes from -15,88 to 15,88; 255 if not known or not detectable.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <Lrrc>         | Number | <p>4G RRC state:</p> <ul style="list-style-type: none"> <li>0: null</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

| Parameter       | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                 |        | <ul style="list-style-type: none"> <li>1: IDLE</li> <li>2: ATTEMPT TO CONNECT</li> <li>3: CONNECTED</li> <li>4: LEAVING CONNECTED STATE</li> <li>5: ATTEMPT LEAVING E-UTRA</li> <li>6: ATTEMPT ENTERING E-UTRA</li> <li>255: not known or not detectable</li> </ul>                                                                                                                                    |
| <RI>            | Number | Rank Indicator value; 255 if not known or not detectable. It is updated every 480 ms with the value which has been most often reported to the network in the previous 480 ms period. See 3GPP TS 36.213 [130] section 7.2 and 3GPP TS 36.212 [131] section 5.2.2.6 for more details.                                                                                                                   |
| <CQI>           | Number | Channel Quality Indicator value; 255 if not known or not detectable. It is updated every 480 ms with the value which has been most often reported to the network in the previous 480 ms period. See 3GPP TS 36.213 [130] section 7.2 for more details.                                                                                                                                                 |
| <avg_rsrp>      | Number | Average value of last 10th Reference Signal Received Power (RSRP).                                                                                                                                                                                                                                                                                                                                     |
| <totalPuschPwr> | Number | Mobile output power for PUSCH transmission averaged over 480 ms in dBm; 255 if not known or not detectable.                                                                                                                                                                                                                                                                                            |
| <avgPucchPwr>   | Number | Mobile output power for PUCCH transmission averaged over 480 ms in dBm; 255 if not known or not detectable.                                                                                                                                                                                                                                                                                            |
| <drx>           | Number | Discontinuous Reception "drx-Inactivity-Timer" value in ms; 0 if not known or not detectable.                                                                                                                                                                                                                                                                                                          |
| <l2w>           | Number | SIB3 LTE to WCDMA reselection criteria: (threshServingLow)x2 +(q-RxLevMin)x2; 255 if not known or not detectable.                                                                                                                                                                                                                                                                                      |
| <volte_mode>    | Number | Reserved for future use.                                                                                                                                                                                                                                                                                                                                                                               |
| <meas_gap>      | Number | Measurement gap configuration: <ul style="list-style-type: none"> <li>0: disabled</li> <li>40: 40 ms measurement gap repetition period corresponding to the measurement gap pattern ID 0 (see Table 8.1.2.1-1 of 3GPP TS 36.133 [105])</li> <li>80: 80 ms measurement gap repetition period corresponding to the measurement gap pattern ID 1 (see Table 8.1.2.1-1 of 3GPP TS 36.133 [105])</li> </ul> |
| <tti_bundling>  | Number | TTi (Transmission Time interval) bundling status: <ul style="list-style-type: none"> <li>0: off</li> <li>1: on</li> </ul>                                                                                                                                                                                                                                                                              |
| <RSRP>          | String | Reference Signal Received Power (RSRP) as defined in 3GPP TS 36.133 [105] expressed in dBm                                                                                                                                                                                                                                                                                                             |
| <RSRQ>          | String | Reference Signal Received Quality (RSRQ) as defined in 3GPP TS 36.133 [105] expressed in dB                                                                                                                                                                                                                                                                                                            |

## 7.9 Edit Verizon wireless APN table +VZWAPNE

| +VZWAPNE   |            |              |                |                |               |                 |
|------------|------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R404M |              |                |                |               |                 |
| Attributes | Syntax     | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | partial    | No           | NVM            | No             | -             | +CME Error      |

### 7.9.1 Description

Reads and writes the APN table stored in the NVM:

- The set command causes the APN table on the DUT to be overwritten. A set command must be issued for each APN edit.
- The read command queries the APN table that is currently on the DUT, starting from the first entry to the last; it returns each APN entry in a new line.

If the command fails, an error result code is returned. See the 3GPP TS 27.007 [2] subclause 9.2 for <err> values.

## 7.9.2 Syntax

| Type | Syntax                                                               | Response                                                                                                                                                                                             | Example                                                                                                                    |
|------|----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| Set  | AT+VZWAPNE=<wapn>,<apncl>,<apnni>,<apntype>,<apnb>,<apned>,<apntime> | OK                                                                                                                                                                                                   | AT+VZWAPNE=1,1,"VZWIMS",<br>"IPv6","LTE","Enabled",0<br><br>OK                                                             |
| Read | AT+VZWAPNE?                                                          | [+VZWAPNE: <apncl>,<apnni>,<apntype>,<apnb>,<apned>,<apntime> [...]]<br><br>OK                                                                                                                       | +VZWAPNE: 1,"VZWIMS","IPv4v6",<br>"LTE","Enabled",0<br><br>+VZWAPNE: 2,"VZWADMIN",<br>"IPv4v6","LTE","Enabled",0<br><br>OK |
| Test | AT+VZWAPNE=?                                                         | +VZWAPNE: (list of supported <wapn>s),(list of supported <apncl>s),,(range of supported <apntype>s),range of supported <apnb>s,(list of supported <apned>s),(list of supported <apntime>s)<br><br>OK | +VZWAPNE: (0-4),(1-4),,("IPv6",<br>"IPv4v6"),("LTE"),("Enabled",<br>"Disabled"),(0-1023)<br><br>OK                         |

## 7.9.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                                                                                                             |
|-----------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <wapn>    | Number | APN list entry                                                                                                                                                                                                                                                                                                                          |
| <apncl>   | Number | APN class                                                                                                                                                                                                                                                                                                                               |
| <apnni>   | String | Network identifier:<br><ul style="list-style-type: none"> <li>"VZWIMS": Verizon wireless IMS PDN</li> <li>"VZWADMIN": Verizon wireless administrative PDN</li> <li>"VZWINTERNET": Verizon Internet PDN</li> <li>"VZWAPP": Verizon wireless application PDN</li> </ul> The previous strings are predefined but others could be accepted. |
| <apntype> | String | <ul style="list-style-type: none"> <li>"IPv6": IPv6 type</li> <li>"IPv4v6" (factory-programmed value): IPv4 and IPv6 type</li> </ul>                                                                                                                                                                                                    |
| <apnb>    | String | APN bearer:<br><ul style="list-style-type: none"> <li>"LTE" (factory-programmed value): LTE bearer used</li> </ul>                                                                                                                                                                                                                      |
| <apned>   | String | Enable/disable the APN:<br><ul style="list-style-type: none"> <li>"Enabled" (factory-programmed value): APN enabled</li> <li>"Disabled": APN disabled</li> </ul>                                                                                                                                                                        |
| <apntime> | Number | APN inactivity timer value in minutes. The range goes from 0 to 5. Value '0' (factory-programmed value) sets the timer to infinity.                                                                                                                                                                                                     |

## 7.9.4 Notes

| APN class | APN NI      | IP type | APN bearer | Enable flag | WAIT_TIME | Description    |
|-----------|-------------|---------|------------|-------------|-----------|----------------|
| 1         | VZWIMS      | Ipv4v6  | LTE        | Enabled     | 0         | IMS            |
| 2         | VZWADMIN    | Ipv4v6  | LTE        | Enabled     | 0         | Administrative |
| 3         | VZWINTERNET | Ipv4v6  | LTE        | Enabled     | 0         | Internet       |
| 4         | VZWAPP      | Ipv4v6  | LTE        | Enabled     | 0         | Application    |

**Table 5: Factory-programmed APN table setting**

## 7.10 Read RSRP values +VZWRSP

| +VZWRSP    |            |              |                |                |               |                 |
|------------|------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R404M |              |                |                |               |                 |
| Attributes | Syntax     | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full       | No           | No             | No             | -             | +CME Error      |

### 7.10.1 Description

Returns the RSRP (Reference Signal Received Power) values for all LTE cells which the module is measuring.

### 7.10.2 Syntax

| Type | Syntax     | Response                                                                                    | Example                             |
|------|------------|---------------------------------------------------------------------------------------------|-------------------------------------|
| Read | AT+VZWRSP? | +VZWRSP:<br>[<cellID1>,<EARFCN1>,<RSRP1>[,<br><cellID2>,<EARFCN2>,<RSRP2>[,<br>...]]]<br>OK | +VZWRSP:<br>000,2175,"-61.00"<br>OK |

### 7.10.3 Defined values

| Parameter | Type   | Description                                                                      |
|-----------|--------|----------------------------------------------------------------------------------|
| <cellIDn> | Number | nth cell physical cell identifier in "xxx" format. The range goes from 0 to 503. |
| <EARFCNn> | Number | nth cell EARFCN in decimal format. The range goes from 0 to 65535.               |
| <RSRPn>   | String | nth cell RSRP value in dBm/15 kHz where the format is "-XX.XX".                  |

## 7.11 Read RSRQ values +VZWRSRQ

| +VZWRSRQ   |            |              |                |                |               |                 |
|------------|------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R404M |              |                |                |               |                 |
| Attributes | Syntax     | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full       | No           | No             | No             | -             | +CME Error      |

### 7.11.1 Description

Returns the RSRQ (Reference Signal Received Quality) values for all the LTE cells which the module is measuring.

### 7.11.2 Syntax

| Type | Syntax      | Response                                                                                     | Example                              |
|------|-------------|----------------------------------------------------------------------------------------------|--------------------------------------|
| Read | AT+VZWRSRQ? | +VZWRSRQ:<br>[<cellID1>,<EARFCN1>,<RSRQ1>[,<br><cellID2>,<EARFCN2>,<RSRQ2>[,<br>...]]]<br>OK | +VZWRSRQ:<br>000,2175,"-11.00"<br>OK |

### 7.11.3 Defined values

| Parameter | Type   | Description                                                                      |
|-----------|--------|----------------------------------------------------------------------------------|
| <cellID>  | Number | nth cell physical cell identifier in "xxx" format. The range goes from 0 to 503. |
| <EARFCN>  | Number | nth cell EARFCN in decimal format. The range goes from 0 to 65535.               |
| <RSRP>    | String | nth cell RSRP value in dBm/15 kHz where the format is "-XX.XX".                  |



## 7.12 eDRX setting +CEDRXS

| +CEDRXS    |                               |              |                |                |               |                 |
|------------|-------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B |              |                |                |               |                 |
|            | SARA-N4                       |              |                |                |               |                 |
| Attributes | Syntax                        | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                          | Yes          | NVM            | No             | -             | +CME Error      |

### 7.12.1 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.

### 7.12.2 Syntax

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

### 7.12.3 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"> <li>0 (default value): use of eDRX disabled</li> <li>1 (factory-programmed value): use of eDRX enabled</li> <li>2: enable the use of eDRX and enable the URC</li> <li>3: disable the use of eDRX and reset all parameters for eDRX to factory-programmed values</li> </ul> |
| <AcT_type>               | Number | Indicates the type of access technology. Allowed values: <ul style="list-style-type: none"> <li>2: GPRS/eGPRS</li> <li>4: E-UTRAN (WB-S1 mode)</li> <li>5: E-UTRAN (NB-S1 mode)</li> </ul>                                                                                                                                                                                               |
| <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].                                                                                                                                                              |

| Parameter            | Type   | Description                                                                                                                                                                                                                                                                  |
|----------------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <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]. |

## 7.12.4 Notes

### SARA-R4 / SARA-N4

- Only one <AcT\_type> is active at any given time. If the <AcT\_type> parameter is omitted, the module's active <AcT\_type> will be applied.

## 7.13 eDRX read dynamic parameters +CEDRXRDP

| +CEDRXRDP         |               |                                          |                       |                       |                      |                        |
|-------------------|---------------|------------------------------------------|-----------------------|-----------------------|----------------------|------------------------|
| <b>Modules</b>    |               | SARA-R410M-02B SARA-R410M-52B<br>SARA-N4 |                       |                       |                      |                        |
| <b>Attributes</b> | <b>Syntax</b> | <b>PIN required</b>                      | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b> |
|                   | full          | No                                       | No                    | No                    | -                    | +CME Error             |

### 7.13.1 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.

### 7.13.2 Syntax

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

### 7.13.3 Defined values

| Parameter                | Type   | Description                                                                                                                                                                                                                                                                                      |
|--------------------------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <AcT_type>               | Number | Indicates the type of radio access technology. Allowed values: <ul style="list-style-type: none"> <li>0: do not use eDRX</li> <li>1: EC-GSM-IoT (A/Gb mode)</li> <li>2: GSM (A/Gb mode)</li> <li>3: UTRAN (Iu mode)</li> <li>4: E-UTRAN (WB-S1 mode)</li> <li>5: E-UTRAN (NB-S1 mode)</li> </ul> |
| <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].                     |

## 7.14 Set MNO profile +UMNOPROF

| +UMNOPROF  |                                          |              |                |                |               |                 |
|------------|------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                 |
|            | SARA-N4                                  |              |                |                |               |                 |
| Attributes | Syntax                                   | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                                     | Yes          | NVM            | No             | -             | +CME Error      |

### 7.14.1 Description

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



Follow this procedure to properly set up the configuration:

- Deregister the module from the network ([AT+COPS=2](#) or perform a [AT+CFUN=0](#) cycle)
- Issue [AT+UMNOPROF=<MNO>](#)
- Reboot the module ([AT+CFUN=15](#)) in order to apply the new configuration



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



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.

### 7.14.2 Syntax

| Type | Syntax                                  | Response                                     | Example                                                                                                           |
|------|-----------------------------------------|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| Set  | <a href="#">AT+UMNOPROF=&lt;MNO&gt;</a> | OK                                           | <a href="#">AT+UMNOPROF=1</a><br>OK                                                                               |
| Read | <a href="#">AT+UMNOPROF?</a>            | +UMNOPROF: <MNO><br>OK                       | +UMNOPROF: 3<br>OK                                                                                                |
| Test | <a href="#">AT+UMNOPROF=?</a>           | +UMNOPROF: (list of supported <mode>s)<br>OK | +UMNOPROF:<br>0: SW default<br>1: SIM ICCID select<br>2: ATT<br>6: CT<br>4: Telstra<br>5: TMO<br>3: Verizon<br>OK |

### 7.14.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                                    |
|-----------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <MNO>     | Number | Mobile Network Operator (MNO) configuration: <ul style="list-style-type: none"> <li>• 0 (default value): SW default</li> <li>• 1: SIM ICCID select</li> <li>• 2: ATT</li> <li>• 3: Verizon</li> <li>• 4: Telstra</li> <li>• 5: TMO</li> <li>• 6: CT</li> </ul> |

## 7.15 Band selection bitmask +UBANDMASK

| +UBANDMASK |                                          |              |                |                |               |                 |
|------------|------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                 |
|            | SARA-N4                                  |              |                |                |               |                 |
| Attributes | Syntax                                   | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                                     | Yes          | NVM            | No             | -             | +CME Error      |

### 7.15.1 Description

Sets the supported 4G LTE bands for different Radio Access Technologies (RATs). The bands supported are set by means of a bitmask where each bit in an 8 byte integer corresponds to a 4G LTE band.

 Reboot the module (+CFUN=15) to make the setting effective.

 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.

### 7.15.2 Syntax

| Type | Syntax                                     | Response                                                                        | Example                                                         |
|------|--------------------------------------------|---------------------------------------------------------------------------------|-----------------------------------------------------------------|
| Set  | AT+UBANDMASK=<RAT>,<bitmask1>[,<bitmask2>] | OK                                                                              | AT+UBANDMASK=0,2074<br>OK                                       |
| Read | AT+UBANDMASK?                              | +UBANDMASK: <RAT>,<bitmask1>[,<bitmask2>][,<RAT>,<bitmask1>[,<bitmask2>]]<br>OK | +UBANDMASK: 0,168761503,1,168761503<br>OK                       |
| Test | AT+UBANDMASK=?                             | +UBANDMASK: (list of the supported <RAT>s),<bitmask1>,<bitmask2><br>OK          | +UBANDMASK: (0,1),0<br>xxxxxxxxxxxxxxxx,0xxxxxxxxxxxxxxxx<br>OK |

### 7.15.3 Defined values

| Parameter  | Type    | Description                                                                                                                                                                                                                                                              |
|------------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <RAT>      | Integer | Indicates the Radio Access Technology (RAT): <ul style="list-style-type: none"> <li>0: LTE Cat M1</li> <li>1: LTE Cat NB1</li> </ul>                                                                                                                                     |
| <bitmask1> | Integer | Indicated the bandmask for 4G LTE bands 1 through 64. Each bit enables/disables a band: <ul style="list-style-type: none"> <li>Bit 0: band 1</li> <li>Bit 1: band 2</li> <li>Bit 2: band 3</li> <li>Bit 3: band 4</li> <li>..</li> <li>Bit 63: band 64</li> </ul>        |
| <bitmask2> | Integer | Indicated the bandmask for 4G LTE bands 65 through 128. Each bit enables/disables a band: <ul style="list-style-type: none"> <li>Bit 0: band 65</li> <li>Bit 1: band 66</li> <li>Bit 2: band 67</li> <li>Bit 3: band 68</li> <li>..</li> <li>Bit 63: band 128</li> </ul> |

## 8 Security

### 8.1 Enter PIN +CPIN

| +CPIN      |                                                                    |              |                |                |               |                 |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                 |
|            | SARA-N4                                                            |              |                |                |               |                 |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                                                               | No           | No             | No             | < 10 s        | +CME Error      |

#### 8.1.1 Description

Enter PIN. If no PIN request is pending, the corresponding error code is returned. If a wrong PIN is given three times, the PUK must be inserted in place of the PIN, followed by the <newpin> which replaces the old pin in the SIM.

#### 8.1.2 Syntax

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

#### 8.1.3 Defined values

| Parameter       | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <pin>, <newpin> | String | 4-to-8 characters long string of decimal digits.<br><br>If only PIN is required, <newpin> is not to be entered.<br><br>If PUK is required, <pin> must be the PUK and <newpin>, the new PIN code, must be entered as well.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <code>          | String | <ul style="list-style-type: none"> <li>READY: MT is not pending for any password</li> <li>SIM PIN: MT is waiting SIM PIN to be given</li> <li>SIM PUK: MT is waiting SIM PUK to be given</li> <li>SIM PIN2: MT is waiting SIM PIN2 to be given</li> <li>SIM PUK2: MT is waiting SIM PUK2 to be given</li> <li>PH-NET PIN: MT is waiting network personalization password to be given</li> <li>PH-NETSUB PIN: MT is waiting network subset personalization password to be given</li> <li>PH-SP PIN: MT is waiting service provider personalization password to be given</li> <li>PH-CORP PIN: MT is waiting corporate personalization password to be given</li> <li>PH-SIM PIN: MT is waiting phone to SIM/UICC card password to be given</li> </ul> |

#### 8.1.4 Notes

- The command needs the SIM module to work correctly
- If PIN is not inserted the following situation can occur:  
AT+CMEE=2  
OK  
AT+COPS=0  
+CME ERROR: SIM PIN required  
AT+CMEE=0  
OK

AT+COPS=0

ERROR

- To change the PIN the user must use the AT+CPWD="SC",<old\_pin>,<new\_pin> command (see [Chapter 8.3](#) for details).

Example:

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

## 8.2 Facility lock +CLCK

| +CLCK             |                                                                    |                     |                       |                       |                      |                        |
|-------------------|--------------------------------------------------------------------|---------------------|-----------------------|-----------------------|----------------------|------------------------|
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |                     |                       |                       |                      |                        |
|                   | SARA-N4                                                            |                     |                       |                       |                      |                        |
| <b>Attributes</b> | <b>Syntax</b>                                                      | <b>PIN required</b> | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b> |
|                   | full                                                               | Yes                 | No                    | Yes                   | Up to 3 min          | +CME Error             |

### 8.2.1 Description

Locks, unlocks or interrogates an MT or a network facility <fac>. A password is normally needed to do such actions. When querying the status of a network service (<mode>=2) the information text response for "not active" case (<status>=0) is returned only if the service is not active for any <class>. Instead when querying the status of a network service (<mode>=2) asking for a specific <class>, the DUT sends a generic request. The command can be aborted if network facilities are set or interrogated.



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



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

### 8.2.2 Syntax

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

### 8.2.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <fac>     | String | Facility values: <ul style="list-style-type: none"> <li>"SC": SIM (PIN enabled/disabled)</li> <li>"PN": Network Personalisation (see the 3GPP TS 22.022 [31])</li> <li>"PU": network sUbset Personalisation (see the 3GPP TS 22.022 [31])</li> <li>"PP": service Provider Personalisation (see the 3GPP TS 22.022 [31])</li> <li>"PC": Corporate Personalisation (see the 3GPP TS 22.022 [31])</li> <li>"PS": SIM/USIM Personalisation (see the 3GPP TS 22.022 [31])</li> <li>"FD": SIM fixed dialling phonebook feature</li> <li>"AO": BAR (Bar All Outgoing Calls)</li> <li>"OI": BOIC (Bar Outgoing International Calls)</li> <li>"OX": BOIC-exHC(Bar Outgoing International Calls except to Home Country)</li> </ul> |

| Parameter | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           |        | <ul style="list-style-type: none"> <li>"AI": BAIC (Bar All Incoming Calls)</li> <li>"IR": BIC-Roam (Bar Incoming Calls when Roaming outside the home country)</li> <li>"AB": All Barring services (applicable only for &lt;mode&gt;=0)</li> <li>"AG": All outGoing barring services (applicable only for &lt;mode&gt;=0)</li> <li>"AC": All inComing barring services (applicable only for &lt;mode&gt;=0)</li> <li>"CS": CNTRL (lock CoNTRoL surface (e.g. phone keyboard)) (see the 3GPP TS 27.007 [2])</li> <li>"PF": Lock Phone to the very First inserted SIM/UICC card (see the 3GPP TS 27.007 [2])</li> <li>"NT": Barr incoming calls from numbers Not stored to TA memory (see the 3GPP TS 27.007 [2])</li> <li>"NM": Barr incoming calls from numbers Not stored to MT memory (see 3GPP TS 27.007 [2])</li> <li>"NS": Barr incoming calls from numbers Not stored to SIM/UICC memory (see the 3GPP TS 27.007 [2])</li> <li>"NA": Barr incoming calls from numbers Not stored in any memory (see the 3GPP TS 27.007 [2])</li> </ul> |
| <mode>    | Number | <ul style="list-style-type: none"> <li>0: unlock</li> <li>1: lock</li> <li>2: query status</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <status>  | Number | <ul style="list-style-type: none"> <li>0: not active</li> <li>1: active</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <passwd>  | String | Shall be the same as password specified for the facility from the MT user interface or with the <b>+CPWD</b> command                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <class>   | Number | Sum of numbers each representing a class of information. The default value is 7 (voice + data + fax): <ul style="list-style-type: none"> <li>1: voice</li> <li>2: data</li> <li>4: FAX</li> <li>8: short message service</li> <li>16: data circuit sync</li> <li>32: data circuit async</li> <li>64: dedicated packet access</li> <li>128: dedicated PAD access</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

## 8.3 Change password +CPWD

| +CPWD      |                                                                    |              |                |                |               |                 |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                 |
|            | SARA-N4                                                            |              |                |                |               |                 |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                                                               | Yes          | No             | Yes            | Up to 3 min   | +CME Error      |

### 8.3.1 Description

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

### 8.3.2 Syntax

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

### 8.3.3 Defined values

| Parameter   | Type   | Description                                                                       |
|-------------|--------|-----------------------------------------------------------------------------------|
| <fac>       | String | "P2" SIM PIN2; see the <a href="#">+CLCK</a> command description for other values |
| <oldpwd>    | String | Old password                                                                      |
| <newpwd>    | String | New password                                                                      |
| <pwdlength> | Number | Length of password (digits)                                                       |

### 8.3.4 Notes

- If the PIN is blocked, an error result code will be provided when attempting to change the PIN code if the PIN check is disabled through [AT+CLCK](#) command.



## 9 Short Messages Service

### 9.1 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](#).

#### 9.1.1 Class 0 SMS

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

- SARA-R4 / SARA-N4 - not stored.

#### 9.1.2 <index> parameter range

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

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

- SARA-R4 / SARA-N4
  - o Values between 0 and 23: SMS stored in ME.
  - o Values between 0 and n: SMS stored in SIM (n depends on SIM card used).

**BM** (Broadcast Message):

- SARA-R4 / SARA-N4 - Broadcast Message storage is not supported.

**SR** (Status Report)

- SARA-R4 / SARA-N4 - Status Report storage is not supported.

#### 9.1.3 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.

## 9.2 Select message service +CSMS

| +CSMS             |                                                                    |                     |                       |                       |                      |                        |
|-------------------|--------------------------------------------------------------------|---------------------|-----------------------|-----------------------|----------------------|------------------------|
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |                     |                       |                       |                      |                        |
|                   | SARA-N4                                                            |                     |                       |                       |                      |                        |
| <b>Attributes</b> | <b>Syntax</b>                                                      | <b>PIN required</b> | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b> |
|                   | full                                                               | Yes                 | No                    | No                    | -                    | +CMS Error             |

### 9.2.1 Description

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

## 9.2.2 Syntax

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

## 9.2.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                                                                                                                                                        |
|-----------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <service> | Number | <ul style="list-style-type: none"> <li>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</li> <li>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+</li> </ul> |
| <mt>      | Number | Mobile terminated messages: <ul style="list-style-type: none"> <li>0: not supported</li> <li>1: supported</li> </ul>                                                                                                                                                                                                                                                               |
| <mo>      | Number | Mobile originated messages: <ul style="list-style-type: none"> <li>0: not supported</li> <li>1: supported</li> </ul>                                                                                                                                                                                                                                                               |
| <bm>      | Number | Broadcast messages: <ul style="list-style-type: none"> <li>0: not supported</li> <li>1: supported</li> </ul>                                                                                                                                                                                                                                                                       |

## 9.2.4 Notes

### SARA-R4 / SARA-N4

- Set <service> to 1 to acknowledge an incoming message (either SMS or Status Report) with **+CNMA** AT command.
- If <service> is changed from 1 to 0 and one or more parameters of the **+CNMI** command are in phase 2+, switch the **+CNMI** parameters to phase 2 specific values before entering phase 2.

## 9.3 Preferred message storage +CPMS

| +CPMS      |                                                                               |              |                |                |               |                 |
|------------|-------------------------------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |              |                |                |               |                 |
| Attributes | Syntax                                                                        | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | partial                                                                       | Yes          | NVM            | No             | Up to 3 min   | +CMS Error      |

### 9.3.1 Description

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



See the test command for the supported memory types for each memory storage.

### 9.3.2 Syntax

| Type | Syntax                           | Response                                                          | Example                                        |
|------|----------------------------------|-------------------------------------------------------------------|------------------------------------------------|
| Set  | AT+CPMS=<mem1>[,<mem2>[,<mem3>]] | AT+CPMS: <used1>,<total1>,<used2>,<total2>,<used3>,<total3><br>OK | AT+CPMS="BM","SM","SM"<br>+CPMS: 0,5,0,50,0,50 |

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

### 9.3.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                                                                                                                                                              |
|-----------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <mem1>    | String | Memory used to read and delete messages. The supported values may vary: <ul style="list-style-type: none"> <li>"ME": ME message storage</li> <li>"SM": (U)SIM message storage</li> <li>"MT" (factory-programmed value): "ME"+"SM", "ME" preferred</li> <li>"BM": Broadcast Message storage</li> <li>"SR": Status Report storage</li> </ul> The default value is the currently set value. |
| <mem2>    | String | Memory used to write and send SMS. The supported values may vary: <ul style="list-style-type: none"> <li>"ME": ME message storage</li> <li>"SM": (U)SIM message storage</li> <li>"MT" (factory-programmed value): "ME"+"SM", "ME" preferred</li> </ul> The default value is the currently set value.                                                                                     |
| <mem3>    | String | Memory preferred to store the received SMS. The supported values may vary: <ul style="list-style-type: none"> <li>"ME": ME message storage</li> <li>"SM": (U)SIM message storage</li> <li>"MT" (factory-programmed value): "ME"+"SM", "ME" preferred</li> </ul> The default value is the currently set value.                                                                            |
| <used1>   | Number | Number of used message locations in <mem1>                                                                                                                                                                                                                                                                                                                                               |
| <total1>  | Number | Total number of message locations in <mem1>                                                                                                                                                                                                                                                                                                                                              |
| <used2>   | Number | Number of used message locations in <mem2>                                                                                                                                                                                                                                                                                                                                               |
| <total2>  | Number | Total number of message locations in <mem2>                                                                                                                                                                                                                                                                                                                                              |
| <used3>   | Number | Number of used message locations in <mem3>                                                                                                                                                                                                                                                                                                                                               |
| <total3>  | Number | Total number of message locations in <mem3>                                                                                                                                                                                                                                                                                                                                              |

### 9.3.4 Notes

#### SARA-R4 / SARA-N4

- "MT" message storage is not supported.
- The factory-programmed value is "ME", "ME" and "ME".

## 9.4 Preferred message format +CMGF

| +CMGF      |                                                                            |              |                         |                |               |                            |
|------------|----------------------------------------------------------------------------|--------------|-------------------------|----------------|---------------|----------------------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M SARA-N4 |              |                         |                |               |                            |
| Attributes | Syntax                                                                     | PIN required | Settings saved          | Can be aborted | Response time | Error reference            |
|            | full                                                                       | Yes          | <a href="#">Profile</a> | No             | -             | <a href="#">+CMS Error</a> |

### 9.4.1 Description

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

## 9.4.2 Syntax

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

## 9.4.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                                 |
|-----------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <mode>    | Number | Indicates the format of messages used with send, list, read and write commands and URCs resulting from receiving SMSes messages: <ul style="list-style-type: none"> <li>0 (default and factory-programmed value): PDU mode</li> <li>1: text mode</li> </ul> |

## 9.5 Save settings +CSAS

| +CSAS      |                                                                               |              |                     |                |               |                            |
|------------|-------------------------------------------------------------------------------|--------------|---------------------|----------------|---------------|----------------------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |              |                     |                |               |                            |
| Attributes | Syntax                                                                        | PIN required | Settings saved      | Can be aborted | Response time | Error reference            |
|            | full                                                                          | No           | <a href="#">NVM</a> | No             | -             | <a href="#">+CMS Error</a> |

### 9.5.1 Description

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

### 9.5.2 Syntax

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

### 9.5.3 Defined values

| Parameter | Type   | Description                                                                                               |
|-----------|--------|-----------------------------------------------------------------------------------------------------------|
| <profile> | Number | Specific SMS profile index where to store the active message settings. The factory-programmed value is 0. |

## 9.6 Restore settings +CRES

| +CRES      |                                                                    |              |                |                |               |                 |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                 |
|            | SARA-N4                                                            |              |                |                |               |                 |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                                                               | Yes          | No             | No             | < 10 s        | +CMS Error      |

### 9.6.1 Description

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

### 9.6.2 Syntax

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

### 9.6.3 Defined values

| Parameter | Type   | Description                                                                |
|-----------|--------|----------------------------------------------------------------------------|
| <profile> | Number | Specific SMS profile index from where to read the message service settings |

## 9.7 New message indication +CNMI

| +CNMI      |                                                                    |              |                |                |               |                 |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                 |
|            | SARA-N4                                                            |              |                |                |               |                 |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | partial                                                            | Yes          | Profile        | No             | -             | +CMS Error      |

### 9.7.1 Description

Selects the procedure to indicate the reception of a new SMS in case of the MT is active (the DTR signal is ON). If the MT is inactive (the DTR signal is OFF), the message reception should be done as specified in 3GPP TS 23.038 [7].

The +UCMT URC notifies the SMS-DELIVER status for 3GPP2 Mobile Terminated SMSes; it is equivalent to +CMT but valid only for 3GPP2 SMS (i.e. 3GPP2 SMS over IMS received on Verizon MNO).

### 9.7.2 Syntax

| Type | Syntax                                        | Response                                                                                                                                              | Example                                        |
|------|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|
| Set  | AT+CNMI=[<mode>[,<mt>[,<bm>[,<ds>[,<bfr>]]]]] | OK                                                                                                                                                    | AT+CNMI=1,1<br>OK                              |
| Read | AT+CNMI?                                      | +CNMI: <mode>,<mt>,<bm>,<ds>,<bfr><br>OK                                                                                                              | +CNMI: 0,0,0,0,0<br>OK                         |
| Test | AT+CNMI=?                                     | +CNMI: (list of supported <mode>s), (list of supported <mt>s), (list of supported <bm>s), (list of supported <ds>s), (list of supported <bfr>s)<br>OK | +CNMI: (0-2),(0-3),(0-3),(0-2),(0-1)<br>OK     |
| URC  |                                               | +CMTI: <mem>,<index>                                                                                                                                  | +CMTI: "SM",5                                  |
| URC  |                                               | Text mode (+CMGF=1):                                                                                                                                  | +CMT: "+393475234652",,"14/11/21, 11:58:23+01" |

| Type | Syntax | Response                                                                                                                                                                                      | Example                                                                         |
|------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
|      |        | +CMT: <oa>,<[alpha]>,<scts>,<[tooa]>,<fo>,<pid>,<dc>,<sca>,<tosca>,<length><CR><LF><data>                                                                                                     | Hello world                                                                     |
|      |        | <b>PDU mode (+CMGF=0):</b><br>+CMT: <length><CR><LF><pdu>                                                                                                                                     |                                                                                 |
| URC  |        | <b>Text mode (+CMGF=1):</b><br>+UCMT: <message_id>,<oa>,<scts>,<[priority]>,<[privacy]>,<[callback_number]>,<[encoding]>,<[status]>,<[num_sms]>,<[part]>,<[reference]>,<length><CR><LF><text> | +UCMT: 1,+1231241241,"18:02:28+08" ,,,2,,,,,6<br>Hello!                         |
|      |        | <b>PDU mode (+CMGF=0):</b><br>+UCMT: <pdu_length><CR><LF><pdu>                                                                                                                                |                                                                                 |
| URC  |        | +CBMI: <mem>,<index>                                                                                                                                                                          | +CBMI: "BM",48                                                                  |
| URC  |        | <b>Text mode (+CMGF=1):</b><br>+CBM: <sn>,<mid>,<dc>,<page>,<pages><CR><LF><data>                                                                                                             | +CBM: 271,1025,1,1,1<br>The quick brown fox jumps over the lazy dog 0123456789  |
|      |        | <b>PDU mode (+CMGF=0):</b><br>+CBM: <length><CR><LF><pdu>                                                                                                                                     |                                                                                 |
| URC  |        | +CDSI: <mem>,<index>                                                                                                                                                                          | +CDSI: "MT",2                                                                   |
| URC  |        | <b>Text mode (+CMGF=1):</b><br>+CDS: <fo>,<mr>,<[ra]>,<[tora]>,<scts>,<dt>,<st>                                                                                                               | +CDS: 6,202,"+393492323583",145,"14/07/25,13:07:16+02","14/07/25,16:35:44+02",0 |
|      |        | <b>PDU mode (+CMGF=0):</b><br>+CDS: <length><CR><LF><pdu>                                                                                                                                     |                                                                                 |

### 9.7.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-----------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <mode>    | Number | Controls the processing of URCs specified within this command: <ul style="list-style-type: none"> <li>0 (default value): buffer URCs in the MT; if the MT buffer is full, the oldest indication may be discarded and replaced with the new received indications (ring buffer)</li> <li>1 (factory-programmed value): discard indication and reject new received message URCs when MT-DTE link is reserved; otherwise forward them directly to the DTE</li> <li>2: buffer URCs in the MT when the serial link is busy (e.g. data-transfer); otherwise forward them directly to the DTE</li> <li>3: forward URCs directly to the TE. TA-TE link specific inband technique used to embed result codes and data when MT is in on-line data mode</li> </ul>                                                                                                                                                                                                                                                                                                                                       |
| <mt>      | Number | Specifies the rules for managing the received SMS according the message's Data Coding Scheme (DCS): <ul style="list-style-type: none"> <li>0 (default and factory-programmed value): No SMS-DELIVER indications are routed to the TE</li> <li>1: if SMS-DELIVER is stored in the MT, indication of the memory location is routed to the DTE using the +CMTI URC</li> <li>2: SMS-DELIVER (except class 2 SMS) are routed directly to the DTE (but not saved in the module file system or SIM memory) using the +CMT URC. If MT has its own display device then class 0 SMS and SMS in the message waiting indication group (discard message) may be copied to both MT display and to DTE. In this case MT shall send the acknowledgement to the network. Class 2 SMSs and messages in the message waiting indication group (storage message) result in indication as defined in &lt;mt&gt;=1</li> <li>3: Class 3 SMS-DELIVERs are routed directly to DTE using URCs defined in &lt;mt&gt;=2. Messages of other data coding schemes result in indication as defined in &lt;mt&gt;=1</li> </ul> |
| <bm>      | Number | Specifies the rules for managing the received Cell Broadcast messages (CBM): <ul style="list-style-type: none"> <li>0 (default and factory-programmed value): no CBM indications to the DTE</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

| Parameter | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           |        | <ul style="list-style-type: none"> <li>1: if the CBM is stored in the MT, an indication of the used memory location is routed to DTE using the +CBMI URC</li> <li>2: new CBMs are routed directly to the DTE using the +CBM URC</li> <li>3: class 3 CBMs are routed directly to DTE using URCs defined in &lt;bm&gt;=2. If CBM storage is supported, messages of other classes result in indication as defined in &lt;bm&gt;=1</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <ds>      | Number | Specifies the rules for managing the Status Report messages: <ul style="list-style-type: none"> <li>0 (default and factory-programmed value): no SMS-STATUS-REPORTs are routed to the DTE</li> <li>1: SMS-STATUS-REPORTs are routed to the DTE using the +CDS URC</li> <li>2: if SMS-STATUS-REPORT is stored in the MT, the indication of the memory location is routed to the DTE using the +CDSI URC</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <bfr>     | Number | Controls the buffering of URCs: <ul style="list-style-type: none"> <li>0 (default and factory-programmed value): MT buffer of URCs defined within this command is flushed to the DTE when &lt;mode&gt; 1...3 is entered (OK final result code shall be given before flushing the codes).</li> <li>1: MT buffer of URCs defined within this command is cleared when &lt;mode&gt; 1...3 is entered</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <mem>     | String | Same as defined in <a href="#">+CPMS Defined Values</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <index>   | Number | Storage position                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <length>  | Number | Two meanings: <ul style="list-style-type: none"> <li>in text mode: number of characters</li> <li>in PDU mode: PDU's length in octets without the Service Center's address. In example: 039121430100038166F6000004E374F80D: this is a PDU with Service Center's number +1234, that generates the address 03912143 (4 octets). Thus in this case &lt;length&gt;=13.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <pdu>     | String | Protocol data unit: each 8-bit octet is presented as two IRA character long hexadecimal numbers, e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <oa>      | String | Originator address                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <scts>    | String | Service center time stamp in time-string format, see the <dt>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <data>    | String | In the case of SMS: 3GPP TS 23.040 [8] TP-User-Data in text mode responses; format: <ul style="list-style-type: none"> <li>if &lt;dc&gt; indicates that 3GPP TS 23.038 [7] GSM 7 bit default alphabet is used and &lt;fo&gt; indicates that 3GPP TS 23.040 [8] TP-User-Data-Header-Indication is not set:               <ul style="list-style-type: none"> <li>if TE character set other than "HEX" (see the <a href="#">+CSCS</a> command in 3GPP TS 27.007 [2]): ME/TA converts GSM alphabet into current TE character set according to rules of Annex A</li> <li>if TE character set is "HEX": ME/TA converts each 7-bit character of GSM 7 bit default alphabet into two IRA character long hexadecimal number (e.g. character Æ (GSM 7 bit default alphabet 28) is presented as 1C (IRA 49 and 67))</li> </ul> </li> <li>if &lt;dc&gt; indicates that 8-bit or UCS2 data coding scheme is used, or &lt;fo&gt; indicates that 3GPP TS 23.040 [8] TP-User-Data-Header-Indication is set: ME/TA converts each 8-bit octet into two IRA character long hexadecimal number (e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65))</li> </ul> In the case of CBS: 3GPP TS 23.041 [9] CBM Content of Message in text mode responses; format: <ul style="list-style-type: none"> <li>if &lt;dc&gt; indicates that 3GPP TS 23.038 [7] GSM 7 bit default alphabet is used:               <ul style="list-style-type: none"> <li>if TE character set other than "HEX" (see the <a href="#">+CSCS</a> in 3GPP TS 27.007 [2]): ME/TA converts GSM alphabet into current TE character set according to rules of Annex A</li> <li>if TE character set is "HEX": ME/TA converts each 7-bit character of the GSM 7 bit default alphabet into two IRA character long hexadecimal number</li> </ul> </li> <li>if &lt;dc&gt; indicates that 8-bit or UCS2 data coding scheme is used: ME/TA converts each 8-bit octet into two IRA character long hexadecimal number</li> </ul> |
| <sn>      | Number | CBM serial number                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <mid>     | Number | CBM message identifier                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <dc>      | Number | Data Coding Scheme                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <page>    | Number | CBM Page Parameter bits 4-7 in integer format as described in 3GPP TS 23.041 [9]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <pages>   | Number | CBM Page Parameter bits 0-3 in integer format as described in 3GPP TS 23.041 [9]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

| Parameter         | Type   | Description                                                                                                                                            |
|-------------------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| <fo>              | Number | First octet of the SMS TPDU (see 3GPP TS 23.040 [8])                                                                                                   |
| <mr>              | Number | Message reference                                                                                                                                      |
| <ra>              | String | Recipient address field                                                                                                                                |
| <tora>            | Number | Type of address of <ra> - octet                                                                                                                        |
| <dt>              | String | Discharge time in format "yy/MM/dd,hh:mm:ss+zz"; the time zone is expressed in steps of 15 minutes. The range goes from -48 to +56                     |
| <st>              | Number | Status of a SMS STATUS-REPORT                                                                                                                          |
| <message_id>      | Number | Message-ID of the 3GPP2 SMS                                                                                                                            |
| <priority>        | Number | 3GPP2 priority: <ul style="list-style-type: none"> <li>0: normal</li> <li>1: interactive</li> <li>2: urgent</li> <li>3: emergency</li> </ul>           |
| <privacy>         | Number | 3GPP2 privacy: <ul style="list-style-type: none"> <li>0: not restricted</li> <li>1: restrictive</li> <li>2: confidential</li> <li>3: secret</li> </ul> |
| <callback_number> | String | Callback number                                                                                                                                        |
| <encoding>        | Number | Text encoding: <ul style="list-style-type: none"> <li>2: ASCII7</li> <li>3: IA5</li> <li>4: UCS2</li> <li>8: ISO 8859-1</li> <li>9: GSM7</li> </ul>    |
| <num_sms>         | Number | Total number of SMS                                                                                                                                    |
| <part>            | Number | Fragment part number                                                                                                                                   |
| <reference>       | Number | 3GPP2 reference ID                                                                                                                                     |

### 9.7.4 Notes

- The incoming SMS/CBM URC indications will be displayed only on the AT interface where the last +CNMI command was set. As a general rule, the command should be issued by the DTE:
  - After start-up
  - After using the Z and &F command (which reset the command configuration)
  - Whenever the incoming SMS URCs indications are requested on a different AT interface
- <mode> = 3 is not supported.

## 9.8 Read message +CMGR

| +CMGR      |                                                                            |              |                |                |               |                 |
|------------|----------------------------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M SARA-N4 |              |                |                |               |                 |
| Attributes | Syntax                                                                     | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                                                                       | Yes          | No             | No             | <10 s         | +CMS Error      |

### 9.8.1 Description

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



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



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



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



## 9.8.2 Syntax

| Type | Syntax                                         | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Example                                                                                                                                                                                                    |
|------|------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Set  | <b>Text mode (+CMGF=1):</b><br>AT+CMGR=<index> | <b>SMS-DELIVER</b><br>+CMGR: <stat>,<oa>,[<alpha>],<br><scts>[,<tooa>,<fo>,<pid>,<dc>],<br><sca>,<tosca>,<length><br><data><br>OK<br><b>SMS-SUBMIT</b><br>+CMGR: <stat>,<da>,[<alpha>],<br><toda>,<fo>,<pid>,<dc>,[<vp>],<br><sca>,<tosca>,<length><br><data><br>OK<br><b>SMS-STATUS-report</b><br>+CMGR: <stat>,<fo>,<mr>,[<ra>],<br>[<tora>],<scts>,<dt>,<st><br>OK<br><b>SMS-COMMAND</b><br>+CMGR: <stat>,<fo>,<ct>[,<pid>],<br>[<mn>],[<da>],[<toda>],<length><br>[<cdata>]]<br>OK<br><b>CBM storage</b><br>+CMGR: <stat>,<sn>,<mid>,<dc>,<page>,<pages><br><data><br>OK | AT+CMGR=303<br>+CMGR: "REC READ",<br>"+393488535999",,"07/04/05,18:0<br>2:28+08",145,4,0,0,"+393492000<br>466",145,93<br>You have a missed called. Free<br>information provided by your<br>operator.<br>OK |
|      | <b>PDU mode (+CMGF=0):</b><br>AT+CMGR=<index>  | +CMGR: <stat>,[<alpha>],<length><br><pdu><br>OK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | AT+CMGR=1<br>+CMGR: 1,,40<br>0791934329002000040<br>C9193230982661400008070<br>328045218018D4F29CFE0<br>6B5CBF379F87C4EBF41E4340<br>82E7FDBC3<br>OK                                                        |
| Test | AT+CMGR=?                                      | OK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                            |

## 9.8.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                                                                                                          |
|-----------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <index>   | Number | Storage position                                                                                                                                                                                                                                                                                                                     |
| <stat>    | Number | <ul style="list-style-type: none"> <li>0: in PDU mode or "REC UNREAD" in text mode: received unread SMS</li> <li>1: in PDU mode or "REC READ" in text mode: received read SMS</li> <li>2: in PDU mode or "STO UNSENT" in text mode: stored unsent SMS</li> <li>3: in PDU mode or "STO SENT" in text mode: stored sent SMS</li> </ul> |
| <oa>      | String | Originator address                                                                                                                                                                                                                                                                                                                   |
| <alpha>   | String | Alphanumeric representation of <da> or <oa> corresponding to the entry found in the phonebook 3GPP TS 24.008 [12]. The parameter is not managed.                                                                                                                                                                                     |
| <scts>    | String | Service center time stamp in time-string format, see <dt>                                                                                                                                                                                                                                                                            |
| <tooa>    | Number | Type of address of <oa> - octet                                                                                                                                                                                                                                                                                                      |
| <fo>      | Number | First octet of the SMS TPDU (see 3GPP TS 23.040 [8])                                                                                                                                                                                                                                                                                 |
| <pid>     | Number | TP-Protocol-Identifier (default 0); see the 3GPP TS 23.040 [8]                                                                                                                                                                                                                                                                       |
| <dc>      | Number | Data Coding Scheme                                                                                                                                                                                                                                                                                                                   |
| <sca>     | String | Service center address field                                                                                                                                                                                                                                                                                                         |

| Parameter  | Type                                                              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
|------------|-------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-----------------------|----------|-------------------------------------------------------------------|------------|----------------------------------------|------------|-----------------------|------------|------------------------|
| <tosca>    | Number                                                            | Type of address of <sca> - octet in Number format (for more details see the 3GPP TS 24.008 [12]); default 145 when string includes '+', otherwise default 129                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| <length>   | Number                                                            | Two meanings: <ul style="list-style-type: none"><li>in text mode: number of characters</li><li>in PDU mode: PDU's length in octets without the Service Center's address. In example 039121430100038166F6000004E374F80D: this is a PDU with Service Center's number +1234, that generates the address 03912143 (4 octets). Thus in this case &lt;length&gt; = 13.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| <data>     | String                                                            | <p>In the case of SMS: 3GPP TS 23.040 [8] TP-User-Data in text mode responses; format:</p> <ul style="list-style-type: none"><li>if &lt;dcs&gt; indicates that 3GPP TS 23.038 [7] GSM 7 bit default alphabet is used and &lt;fo&gt; indicates that 3GPP TS 23.040 [8] TP-User-Data-Header-Indication is not set:<ul style="list-style-type: none"><li>if TE character set other than "HEX" (see +CSCS command description): ME/TA converts GSM alphabet into current TE character set according to rules of Annex A</li><li>if TE character set is "HEX": ME/TA converts each 7-bit character of GSM 7 bit default alphabet into two IRA character long hexadecimal number (e.g. character Æ (GSM 7 bit default alphabet 28) is presented as 1C (IRA 49 and 67))</li></ul></li><li>if &lt;dcs&gt; indicates that 8-bit or UCS2 data coding scheme is used, or &lt;fo&gt; indicates that 3GPP TS 23.040 [8] TP-User-Data-Header-Indication is set: ME/TA converts each 8-bit octet into two IRA character long hexadecimal number (e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65))</li></ul> <p>In the case of CBS: 3GPP TS 23.041 [9] CBM Content of Message in text mode responses; format:</p> <ul style="list-style-type: none"><li>if &lt;dcs&gt; indicates that 3GPP TS 23.038 [7] GSM 7 bit default alphabet is used:<ul style="list-style-type: none"><li>if TE character set other than "HEX" (see +CSCS command description): ME/TA converts GSM alphabet into current TE character set according to rules of Annex A</li><li>if TE character set is "HEX": ME/TA converts each 7-bit character of the GSM 7 bit default alphabet into two IRA character long hexadecimal number</li></ul></li><li>if &lt;dcs&gt; indicates that 8-bit or UCS2 data coding scheme is used: ME/TA converts each 8-bit octet into two IRA character long hexadecimal number</li></ul> |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| <da>       | String                                                            | Destination address                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| <toda>     | Number                                                            | Type of address of <da> - octet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| <vp>       | Number                                                            | <p>Format depending of the &lt;fo&gt; setting:</p> <ul style="list-style-type: none"><li>Relative format: validity period starting from when the SMS is received by the SMSC, in range 0-255 (default value 167); for more details see the 3GPP TS 23.040 [8]</li></ul> <table><tr><td>&lt;vp&gt;</td><td>Validity period value</td></tr><tr><td>0 to 143</td><td>(TP-VP + 1) x 5 minutes (i.e. 5 minutes intervals up to 12 hours)</td></tr><tr><td>144 to 167</td><td>12 hours + ((TP-VP -143) x 30 minutes)</td></tr><tr><td>168 to 196</td><td>(TP-VP - 166) x 1 day</td></tr><tr><td>197 to 255</td><td>(TP-VP - 192) x 1 week</td></tr></table> <ul style="list-style-type: none"><li>Absolute format: absolute time of the validity period termination in string format ("yy/MM/dd,hh:mm:ss+zz") (see the 3GPP TS 23.040 [8]); the time zone is expressed in steps of 15 minutes. The range goes from -48 to +56</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <vp> | Validity period value | 0 to 143 | (TP-VP + 1) x 5 minutes (i.e. 5 minutes intervals up to 12 hours) | 144 to 167 | 12 hours + ((TP-VP -143) x 30 minutes) | 168 to 196 | (TP-VP - 166) x 1 day | 197 to 255 | (TP-VP - 192) x 1 week |
| <vp>       | Validity period value                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| 0 to 143   | (TP-VP + 1) x 5 minutes (i.e. 5 minutes intervals up to 12 hours) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| 144 to 167 | 12 hours + ((TP-VP -143) x 30 minutes)                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| 168 to 196 | (TP-VP - 166) x 1 day                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| 197 to 255 | (TP-VP - 192) x 1 week                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| <mr>       | Number                                                            | Message reference                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| <ra>       | String                                                            | Recipient address field                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| <tora>     | Number                                                            | Type of address of <ra> - octet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| <dt>       | String                                                            | Discharge time in format "yy/MM/dd,hh:mm:ss+zz"; the time zone is expressed in steps of 15 minutes. The range goes from -48 to +56                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| <st>       | Number                                                            | Status of an SMS STATUS-REPORT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| <ct>       | Number                                                            | TP-Command-Type (default 0)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| <mn>       | Number                                                            | See the 3GPP TS 23.040 [8] TP-Message-Number in integer format                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| <cdata>    | String                                                            | TP-Command-Data in text mode responses                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| <sn>       | Number                                                            | CBM serial number                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| <mid>      | Number                                                            | CBM message identifier                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| <page>     | Number                                                            | 3GPP TS 23.041 [9] CBM Page Parameter bits 4-7 in integer format                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |

| Parameter | Type   | Description                                                                                                                                                                               |
|-----------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <pages>   | Number | 3GPP TS 23.041 [9] CBM Page Parameter bits 0-3 in integer format                                                                                                                          |
| <pdu>     | String | Protocol data unit: each 8-bit octet is presented as two IRA character long hexadecimal numbers, e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65) |

## 9.9 New message acknowledgement to MT +CNMA

| +CNMA             |                                                                               |                     |                       |                       |                      |                        |
|-------------------|-------------------------------------------------------------------------------|---------------------|-----------------------|-----------------------|----------------------|------------------------|
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                       |                       |                      |                        |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b> |
|                   | full                                                                          | Yes                 | No                    | No                    | < 150 s              | +CMS Error             |

### 9.9.1 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.

### 9.9.2 Syntax

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

### 9.9.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                                                                                                                             |
|-----------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <n>       | Number | <ul style="list-style-type: none"> <li>0: the command operates similarly as defined for the text mode</li> <li>1: sends RP-ACK (or buffered result code received correctly)</li> <li>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))</li> </ul> |
| <length>  | Number | PDU's length in octets without the Service Center's address                                                                                                                                                                                                                                                                                             |

## 9.10 List message +CMGL

| +CMGL      |                                                                    |              |                |                |                                                |                 |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|------------------------------------------------|-----------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |                                                |                 |
|            | SARA-N4                                                            |              |                |                |                                                |                 |
| 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      |

### 9.10.1 Description

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

### 9.10.2 Syntax

| Type | Syntax                                          | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Example                                                                                                                                                             |
|------|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Set  | <b>Text mode (+CMGF=1):</b><br>AT+CMGL[=<stat>] | <b>Command successful and SMS-DELIVERs:</b><br>+CMGL: <index>,<stat>,<oa>,<br>[<alpha>],[<scts>],[<tooa>,<br><length>]<br><data><br>[+CMGL: <index>,<stat>,<oa>,<br>[<alpha>],[<scts>],[<tooa>,<br><length>]<data>[...]]<br>OK<br><b>Command successful and SMS-SUBMITs:</b><br>+CMGL: <index>,<stat>,<da>,<br>[<alpha>],[<toda>,<length>]<br><data><br>[+CMGL: <index>,<stat>,<da>,[<alpha>],[<toda>,<length>]<data>[...]]<br>OK<br><b>Command successful and SMS-STATUS-REPORTs:</b><br>+CMGL: <index>,<stat>,<fo>,<mr>,<br>[<ra>],[<tora>],[<scts>,<dt>,<st><br>[+CMGL: <index>,<stat>,<fo>,<mr>,<br>[<ra>],[<tora>],[<scts>,<dt>,<st><br>[...]]<br>OK<br><b>Command successful and SMS-COMMANDs:</b><br>+CMGL: <index>,<stat>,<fo>,<ct><br>[+CMGL: <index>,<stat>,<fo>,<ct>[...]]<br>OK<br><b>Command successful and CBM storage:</b><br>+CMGL: <index>,<stat>,<sn>,<mid>,<page>,<pages><data><br>[+CMGL: <index>,<stat>,<sn>,<mid>,<page>,<pages>,<data>[...]]<br>OK | AT+CMGL<br><br>+CMGL: 303,"REC READ","+393401234999",,"08/08/06,10:01:38+08"<br><br>You have a missed called. Free information provided by your operator.<br><br>OK |
|      | <b>PDU mode (+CMGF=0):</b>                      | <b>Command successful:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | AT+CMGL=1                                                                                                                                                           |

| Type | Syntax           | Response                                                                                                                         | Example                                                                                                                                                                           |
|------|------------------|----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      | AT+CMGL[=<stat>] | +CMGL: <index>,<stat>,<alpha>],<br><length><br><br><pdu><br><br>[+CMGL: <index>,<stat>,<alpha>],<br><length>]<br><br><pdu> [...] | +CMGL: 305,1,,57 079193432900<br>1185440ED0D637396C7EBBCB0<br>000909092708024802A050<br>003000303DEA0584CE60<br>205D974791994769BDF3A90<br>DB759687E9F534FD0DA2C9603419<br><br>OK |
| Test | AT+CMGL=?        | +CMGL: (list of supported <stat>s)<br><br>OK                                                                                     | +CMGL: ("REC UNREAD","REC<br>READ","STO UNSENT","STO SENT",<br>"ALL")<br><br>OK                                                                                                   |

### 9.10.3 Defined values

| Parameter | Type             | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <stat>    | Number or String | Number type in PDU mode (default value: 4), or string type in text mode (default value: "ALL"); indicates the status of message in memory: <ul style="list-style-type: none"> <li>0: in PDU mode or "REC UNREAD" in text mode: received unread SMS messages</li> <li>1: in PDU mode or "REC READ" in text mode: received read SMS messages</li> <li>2: in PDU mode or "STO UNSENT" in text mode: stored unsent SMS messages</li> <li>3: in PDU mode or "STO SENT" in text mode: stored sent SMS messages</li> <li>4: in PDU mode or "ALL" in text mode: all SMS messages</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <index>   | Number           | Storage position                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <oa>      | String           | Originator address                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <alpha>   | String           | Alphanumeric representation of <da> or <oa> corresponding to the entry found in the phonebook 3GPP TS 24.008 [12]. The parameter is not managed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <scts>    | String           | Service center time stamp in time-string format; see the <dt> parameter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <tooa>    | Number           | Type of address of <oa> - octet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <length>  | Number           | Two meanings: <ul style="list-style-type: none"> <li>in text mode: number of characters</li> <li>in PDU mode: PDU's length in octets without the Service Center's address. In example 039121430100038166F6000004E374F80D: this is a PDU with Service Center's number +1234, that generates the address 03912143 (4 octets). Thus in this case &lt;length&gt; = 13.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <data>    | String           | This is the TP-User-Data in text mode; the decoding depends on the DCS (Data Coding Scheme) and the FO (First Octet) of the SMS header 3GPP TS 23.040 [8]; format: <ul style="list-style-type: none"> <li>if DCS indicates that 3GPP TS 23.038 [7] GSM 7 bit default alphabet is used and FO indicates that 3GPP TS 23.040 [8] TP-User-Data-Header-Indication is not set: <ul style="list-style-type: none"> <li>if TE character set other than "HEX" (see the +CSCS AT command description): ME/TA converts GSM alphabet into current TE character set according to rules of Annex A</li> <li>if TE character set is "HEX": ME/TA converts each 7-bit character of GSM 7 bit default alphabet into two IRA character long hexadecimal number (e.g. character Æ (GSM 7 bit default alphabet 28) is presented as 1C (IRA 49 and 67))</li> </ul> </li> <li>if DCS indicates that 8-bit or UCS2 data coding scheme is used, or FO indicates that 3GPP TS 23.040 [8] TP-User-Data-Header-Indication is set: ME/TA converts each 8-bit octet into two IRA character long hexadecimal number (e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65))</li> </ul> In the case of CBS: 3GPP TS 23.041 [9] CBM Content of Message in text mode responses; format: <ul style="list-style-type: none"> <li>if DCS indicates that 3GPP TS 23.038 [7] GSM 7 bit default alphabet is used: <ul style="list-style-type: none"> <li>if TE character set other than "HEX" (see the +CSCS AT command description): ME/TA converts GSM alphabet into current TE character set according to rules of Annex A</li> <li>if TE character set is "HEX": ME/TA converts each 7-bit character of the GSM 7 bit default alphabet into two IRA character long hexadecimal number</li> </ul> </li> <li>if DCS indicates that 8-bit or UCS2 data coding scheme is used: ME/TA converts each 8-bit octet into two IRA character long hexadecimal number</li> </ul> |
| <da>      | String           | Destination address                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <toda>    | Number           | Type of address of <da> - octet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

| Parameter | Type   | Description                                                                                                                                                                               |
|-----------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <fo>      | Number | First octet of the SMS TPDU (see 3GPP TS 23.040 [8])                                                                                                                                      |
| <mr>      | Number | Message reference                                                                                                                                                                         |
| <ra>      | String | Recipient address field                                                                                                                                                                   |
| <tora>    | Number | Type of address of <ra> - octet                                                                                                                                                           |
| <dt>      | String | Discharge time in format "yy/MM/dd,hh:mm:ss+zz"; the time zone is expressed in steps of 15 minutes. The range goes from -48 to +56                                                        |
| <st>      | Number | Status of an SMS STATUS-REPORT                                                                                                                                                            |
| <ct>      | Number | TP-Command-Type (default 0)                                                                                                                                                               |
| <sn>      | Number | CBM serial number                                                                                                                                                                         |
| <mid>     | Number | CBM message identifier                                                                                                                                                                    |
| <page>    | Number | 3GPP TS 23.041 [9] CBM Page Parameter bits 4-7 in integer format                                                                                                                          |
| <pages>   | Number | 3GPP TS 23.041 [9] CBM Page Parameter bits 0-3 in integer format                                                                                                                          |
| <pdu>     | String | Protocol data unit: each 8-bit octet is presented as two IRA character long hexadecimal numbers, e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65) |
| <dc>      | Number | Data Coding Scheme                                                                                                                                                                        |

## 9.11 Send message +CMGS

| +CMGS      |                                                                               |              |                |                |                                                |                 |
|------------|-------------------------------------------------------------------------------|--------------|----------------|----------------|------------------------------------------------|-----------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |              |                |                |                                                |                 |
| 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      |

### 9.11.1 Description

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



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

### 9.11.2 Syntax

| Type | Syntax                                                                                    | Response                     | Example                                                                              |
|------|-------------------------------------------------------------------------------------------|------------------------------|--------------------------------------------------------------------------------------|
| Set  | <b>Text mode (+CMGF=1):</b><br>AT+CMGS=<da>[,<toda>]<CR><br>> text is entered<Ctrl-Z/ESC> | +CMGS: <mr><br>OK            | AT+CMGS="0171112233"<CR><br>> This is the text<Ctrl-Z><br>+CMGS: 2<br>OK             |
|      | <b>PDU mode (+CMGF=0):</b><br>AT+CMGS=<length><CR><br>> PDU is given<Ctrl-Z/ESC>          | +CMGS: <mr>[,<ackpdu>]<br>OK | AT+CMGS=13<CR><br>> 039121430100038166F600000<br>4E374F80D<Ctrl-Z><br>+CMGS: 2<br>OK |
| Test | AT+CMGS=?                                                                                 | OK                           |                                                                                      |

### 9.11.3 Defined values

| Parameter | Type   | Description                     |
|-----------|--------|---------------------------------|
| <da>      | String | Destination address             |
| <toda>    | Number | Type of address of <da> - octet |
| <text>    | String | SMS String                      |

| Parameter | Type   | Description                                                                                                                                                                                                                                                                                                                                                            |
|-----------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <mr>      | Number | Message reference                                                                                                                                                                                                                                                                                                                                                      |
| <length>  | Number | Two meanings: <ul style="list-style-type: none"> <li>in text mode: number of characters</li> <li>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 &lt;length&gt;=13.</li> </ul> |
| <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                                                                                                                                                                                                                                                          |

### 9.11.4 Notes

#### SARA-R4 / SARA-N4

- The <ackpdu> parameter is not supported.

## 9.12 Write message to memory +CMGW

| +CMGW      |                                                                    |              |                |                |               |                 |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                 |
|            | SARA-N4                                                            |              |                |                |               |                 |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                                                               | Yes          | No             | No             | <10 s         | +CMS Error      |

### 9.12.1 Description

Stores a message (SMS-DELIVER or SMS-SUBMIT) to memory storage <mem2> and returns the memory location <index> of the stored message. <Ctrl-Z> indicates that the SMS shall be stored, while <ESC> indicates aborting of the edited SMS.



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

### 9.12.2 Syntax

| Type | Syntax                                                                                                     | Response             | Example                                                                                |
|------|------------------------------------------------------------------------------------------------------------|----------------------|----------------------------------------------------------------------------------------|
| Set  | <b>Text mode (+CMGF=1):</b><br>AT+CMGW[=<oa/da>[,<tooa/toda>[,<stat>]]]<CR><br>text is entered<Ctrl-Z/ESC> | +CMGW: <index><br>OK | AT+CMGW="091137880"<CR><br>> This is the text<Ctrl-Z><br>+CMGW: 303<br>OK              |
|      | <b>PDU mode (+CMGF=0):</b><br>AT+CMGW=<length>[,<stat>]<CR><br>PDU is given<Ctrl-Z/ESC>                    | +CMGW: <index><br>OK | AT+CMGW=13<CR><br>> 039121430100038166F600000<br>4E374F80D<Ctrl-Z><br>+CMGW: 303<br>OK |
| Test | AT+CMGW=?                                                                                                  | OK                   |                                                                                        |

### 9.12.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                                        |
|-----------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <da>      | String | TP-Destination-Address Address-Value field (see the 3GPP TS 23.040 [8]); BCD numbers (or GSM 7 bit default alphabet characters) are converted to characters of the currently selected TE character set (see the +CSCS AT command); type of address given by <toda> |
| <oa>      | String | TP-Originating-Address Address-Value field (see the 3GPP TS 23.040 [8]); BCD numbers (or GSM 7 bit default alphabet characters) are converted to characters                                                                                                        |

| Parameter | Type             | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           |                  | of the currently selected TE character set (see the <a href="#">+CSCS</a> AT command); type of address given by <tooa>                                                                                                                                                                                                                                                                                                                                                                                                     |
| <tooa>    | Number           | TP-Originating-Address Type-of-Address octet (see the 3GPP TS 24.011 [13]); see the <toda> parameter for the default value                                                                                                                                                                                                                                                                                                                                                                                                 |
| <toda>    | Number           | TP-Destination-Address Type-of-Address octet (see the 3GPP TS 24.011 [13]); when the first character of <da> is + (IRA 43) the default value is 145, otherwise it is 129)                                                                                                                                                                                                                                                                                                                                                  |
| <stat>    | Number or String | Number type in PDU mode (default value: 2), or string type in text mode (default value: "STO UNSENT"); it indicates the message status in memory: <ul style="list-style-type: none"> <li>0: in PDU mode or "REC UNREAD" in text mode: received unread SMS messages</li> <li>1: in PDU mode or "REC READ" in text mode: received read SMS messages</li> <li>2: in PDU mode or "STO UNSENT" in text mode: stored unsent SMS messages</li> <li>3: in PDU mode or "STO SENT" in text mode: stored sent SMS messages</li> </ul> |
| <text>    | String           | SMS string                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <index>   | Number           | Storage position                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <length>  | Number           | The parameter meaning depends on the message format: <ul style="list-style-type: none"> <li>In text mode: number of characters</li> <li>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 &lt;length&gt;=13.</li> </ul>                                                                                                              |
| <PDU>     | String           | Protocol Data Unit: each 8-bit octet of the PDU must be written as two IRA character long hexadecimal numbers, e.g. an octet with integer value 42 must be written as two characters 2A (IRA 50 and 65)                                                                                                                                                                                                                                                                                                                    |

## 9.13 Send message from storage +CMSS

| +CMSS      |                                                                    |              |                |                |               |                 |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                 |
|            | SARA-N4                                                            |              |                |                |               |                 |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                                                               | Yes          | No             | No             | Up to 3 min   | +CMS Error      |

### 9.13.1 Description

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

### 9.13.2 Syntax

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

### 9.13.3 Defined values

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



## 9.14 Set text mode parameters +CSMP

| +CSMP             |                                                                               |                     |                       |                       |                      |                        |
|-------------------|-------------------------------------------------------------------------------|---------------------|-----------------------|-----------------------|----------------------|------------------------|
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                       |                       |                      |                        |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b> |
|                   | full                                                                          | Yes                 | No                    | No                    | < 10 s               | +CMS Error             |

### 9.14.1 Description

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

### 9.14.2 Syntax

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

### 9.14.3 Defined values

| Parameter  | Type                                                              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |       |       |        |   |   |                             |   |   |                                          |   |   |          |   |   |                                          |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
|------------|-------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------|--------|---|---|-----------------------------|---|---|------------------------------------------|---|---|----------|---|---|------------------------------------------|------|-----------------------|----------|-------------------------------------------------------------------|------------|----------------------------------------|------------|-----------------------|------------|------------------------|
| <fo>       | Number                                                            | First octet of the SMS TPDU (see 3GPP TS 23.040 [8])                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |       |       |        |   |   |                             |   |   |                                          |   |   |          |   |   |                                          |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| <vp>       | Number                                                            | Format depending on the values of the bit3/bit4 of the <fo> (SMS-SUBMIT case): <table><tr><th>bit 3</th><th>bit 4</th><th>Format</th></tr><tr><td>0</td><td>0</td><td>Validity period not present</td></tr><tr><td>0</td><td>1</td><td>Validity period present, relative format</td></tr><tr><td>1</td><td>0</td><td>Reserved</td></tr><tr><td>1</td><td>1</td><td>Validity period present, absolute format</td></tr></table> <ul style="list-style-type: none"><li>Relative format: validity period, counted from when the SMS-SUBMIT is received by the SMSC, in range 0-255 (the default value is 167); for more details see the 3GPP TS 23.040 [8]<table><tr><th>&lt;vp&gt;</th><th>Validity period value</th></tr><tr><td>0 to 143</td><td>(TP-VP + 1) x 5 minutes (i.e. 5 minutes intervals up to 12 hours)</td></tr><tr><td>144 to 167</td><td>12 hours + ((TP-VP -143) x 30 minutes)</td></tr><tr><td>168 to 196</td><td>(TP-VP - 166) x 1 day</td></tr><tr><td>197 to 255</td><td>(TP-VP - 192) x 1 week</td></tr></table></li><li>Absolute format: absolute time of the validity period termination in string format ("yy/MM/dd,hh:mm:ss+zz") (see the 3GPP TS 23.040 [8]); the time zone is expressed in steps of 15 minutes. The range goes from -48 to +56</li></ul> | bit 3 | bit 4 | Format | 0 | 0 | Validity period not present | 0 | 1 | Validity period present, relative format | 1 | 0 | Reserved | 1 | 1 | Validity period present, absolute format | <vp> | Validity period value | 0 to 143 | (TP-VP + 1) x 5 minutes (i.e. 5 minutes intervals up to 12 hours) | 144 to 167 | 12 hours + ((TP-VP -143) x 30 minutes) | 168 to 196 | (TP-VP - 166) x 1 day | 197 to 255 | (TP-VP - 192) x 1 week |
| bit 3      | bit 4                                                             | Format                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |       |       |        |   |   |                             |   |   |                                          |   |   |          |   |   |                                          |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| 0          | 0                                                                 | Validity period not present                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |       |       |        |   |   |                             |   |   |                                          |   |   |          |   |   |                                          |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| 0          | 1                                                                 | Validity period present, relative format                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |       |       |        |   |   |                             |   |   |                                          |   |   |          |   |   |                                          |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| 1          | 0                                                                 | Reserved                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |       |       |        |   |   |                             |   |   |                                          |   |   |          |   |   |                                          |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| 1          | 1                                                                 | Validity period present, absolute format                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |       |       |        |   |   |                             |   |   |                                          |   |   |          |   |   |                                          |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| <vp>       | Validity period value                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |       |       |        |   |   |                             |   |   |                                          |   |   |          |   |   |                                          |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| 0 to 143   | (TP-VP + 1) x 5 minutes (i.e. 5 minutes intervals up to 12 hours) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |       |       |        |   |   |                             |   |   |                                          |   |   |          |   |   |                                          |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| 144 to 167 | 12 hours + ((TP-VP -143) x 30 minutes)                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |       |       |        |   |   |                             |   |   |                                          |   |   |          |   |   |                                          |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| 168 to 196 | (TP-VP - 166) x 1 day                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |       |       |        |   |   |                             |   |   |                                          |   |   |          |   |   |                                          |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| 197 to 255 | (TP-VP - 192) x 1 week                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |       |       |        |   |   |                             |   |   |                                          |   |   |          |   |   |                                          |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| <pid>      | Number                                                            | TP-Protocol-Identifier (default value: 0); see the 3GPP TS 23.040 [8]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |       |       |        |   |   |                             |   |   |                                          |   |   |          |   |   |                                          |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| <dc>       | Number                                                            | Data Coding Scheme. The default value is 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |       |       |        |   |   |                             |   |   |                                          |   |   |          |   |   |                                          |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |

## 9.15 Delete message +CMGD

| +CMGD      |                                                                    |              |                |                |               |                 |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                 |
|            | SARA-N4                                                            |              |                |                |               |                 |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | partial                                                            | Yes          | No             | No             | < 55 s        | +CMS Error      |

### 9.15.1 Description

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

-  When deleting a message from an empty location, the module returns the "OK" final result code.
-  If the <index> value is out of range (it depends on [AT+CPMS](#) command setting), then the "+CMS ERROR: invalid memory index" error result code is returned.

### 9.15.2 Syntax

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

### 9.15.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <index>   | Number | Storage position                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <flag>    | Number | Deletion flag. If present, and different from 0, the <index> parameter is ignored: <ul style="list-style-type: none"> <li>0 (default value): delete the message specified in &lt;index&gt;</li> <li>1: delete all the read messages from the preferred message storage, leaving unread messages and stored mobile originated messages (whether sent or not) untouched</li> <li>2: delete all the read messages from the preferred message storage and sent mobile originated messages, leaving unread messages and unsent mobile originated messages untouched</li> <li>3: delete all the read messages from the preferred message storage, sent and unsent mobile originated messages leaving unread messages untouched</li> <li>4: delete all the messages from the preferred message storage including unread messages</li> </ul> |

## 9.16 Service center address +CSCA

| +CSCA      |                                                                    |              |                |                |               |                 |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                 |
|            | SARA-N4                                                            |              |                |                |               |                 |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                                                               | Yes          | No             | No             | < 10 s        | +CMS Error      |

### 9.16.1 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.

-  SARA-R4 / SARA-N4  
This command sets the service center value both in the RAM (this value is actually the SMSC address used) and in the SIM card. Through the read command the value of current service center stored in the

RAM is displayed. At the power on, the MT reads the SMSC address in the SIM card and the same value is set in RAM.

## 9.16.2 Syntax

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

## 9.16.3 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 |

## 9.17 Read concatenated message +UCMGR

| +UCMGR     |                                                     |              |                |                |               |                 |
|------------|-----------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |              |                |                |               |                 |
| Attributes | Syntax                                              | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                                                | Yes          | No             | No             | <10 s         | +CMS Error      |

### 9.17.1 Description

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

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

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

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

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

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

### 9.17.2 Syntax

| Type | Syntax           | Response                                                                                                                                                                                                                                                 | Example                                                                                                                                                                                                                                                                                                           |
|------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Set  | AT+UCMGR=<index> | <b>SMS-DELIVER</b><br>+UCMGR: <stat>,<oa>,[<alpha>],<br><scts>[,<tooa>,<fo>,<pid>,<dcsc>,<sca>,<tosca>,<length>][,<seq>,<max>,<iei>,<ref>]<br><br><data><br>OK<br><b>SMS-SUBMIT</b><br>+UCMGR: <stat>,<da>,[<alpha>]<br>[<toda>,<fo>,<pid>,<dcsc>,<vp>], | AT+UCMGR=1<br><br>+UCMGR: "REC READ",<br>"+393488535999",,"07/04/05,18:0<br>2:28+08",145,4,0,0,"+393492000<br>466",145,153,1,2,0,127<br><br>u-blox reserves all rights to this<br>document and the information<br>contained herein. Reproduction, use<br>or disclosure to third parties without<br>express permis |

| Type | Syntax     | Response                                                                                                                                    | Example |
|------|------------|---------------------------------------------------------------------------------------------------------------------------------------------|---------|
|      |            | <code>&lt;sca&gt;,&lt;tosca&gt;,&lt;length&gt;][,&lt;seq&gt;,&lt;max&gt;,&lt;iei&gt;,&lt;ref&gt;]</code><br><code>&lt;data&gt;</code><br>OK | OK      |
|      |            | <b>SMS-STATUS-report</b><br>+UCMGR:<stat>,<fo>,<mr>,<ra>,<tora><scts><dt>,<st><br>OK                                                        |         |
|      |            | <b>SMS-COMMAND</b><br>+UCMGR: <stat>,<fo>,<ct>,<pid>,<mn>,<da>,<toda>,<length>,<cdata>]]<br>OK                                              |         |
|      |            | <b>CBM storage</b><br>+UCMGR: <stat>,<sn>,<mid>,<dcs>,<page>,<pages><br><code>&lt;data&gt;</code><br>OK                                     |         |
| Test | AT+UCMGR=? | OK                                                                                                                                          |         |

### 9.17.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <index>   | Number | Storage position                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <stat>    | String | Indicates the status of message in memory: <ul style="list-style-type: none"> <li>"REC UNREAD": received unread SMS</li> <li>"REC READ": received read SMS</li> <li>"STO UNSENT": stored unsent SMS</li> <li>"STO SENT": stored sent SMS</li> </ul>                                                                                                                                                                                                                                                                                                               |
| <oa>      | String | Originator address                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <alpha>   | String | Alphanumeric representation of <da> or <oa> corresponding to the entry found in the phonebook 3GPP TS 24.008 [12]. The parameter is not managed.                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <scts>    | String | Service center time stamp in time-string format, refer to <dt>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <tooa>    | Number | Type of address of <oa> - octet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <fo>      | Number | First octet of the SMS TPDU (see 3GPP TS 23.040 [8])                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <pid>     | Number | TP-Protocol-Identifier (default 0); see 3GPP TS 23.040 [8]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <dcs>     | Number | Data Coding Scheme                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <sca>     | String | Service center address field                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <tosca>   | Number | Type of address of <sca> - octet in Number format (for more details see 3GPP TS 24.008 [12]); default 145 when string includes '+', otherwise default 129                                                                                                                                                                                                                                                                                                                                                                                                         |
| <length>  | Number | Number of characters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <seq>     | Number | Sequence number of the current short message (1-255)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <max>     | Number | Maximum number of short messages in the concatenated short message (1-255)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <iei>     | Number | Information Element Identifier, the possible values are the following: <ul style="list-style-type: none"> <li>0: Concatenated short messages, 8-bit reference number</li> <li>8: Concatenated short messages, 16-bit reference number</li> </ul>                                                                                                                                                                                                                                                                                                                  |
| <ref>     | Number | Concatenated short message reference number: <ul style="list-style-type: none"> <li>0-255: concatenated short messages, 8-bit reference number case</li> <li>0-65535: concatenated short messages, 16-bit reference number case</li> </ul>                                                                                                                                                                                                                                                                                                                        |
| <data>    | String | In the case of SMS: 3GPP TS 23.040 [8] TP-User-Data in text mode responses; format: <ul style="list-style-type: none"> <li>if &lt;dcs&gt; indicates that 3GPP TS 23.038 [7] GSM 7 bit default alphabet is used and &lt;fo&gt; indicates that 3GPP TS 23.040 [8] TP-User-Data-Header-Indication is not set: <ul style="list-style-type: none"> <li>if TE character set other than "HEX" (see the +CSCS AT command description): ME/TA converts GSM alphabet into current TE character set according to rules of 3GPP TS 27.005 [16] Annex A</li> </ul> </li> </ul> |

| Parameter  | Type                                                              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
|------------|-------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-----------------------|----------|-------------------------------------------------------------------|------------|----------------------------------------|------------|-----------------------|------------|------------------------|
|            |                                                                   | <ul style="list-style-type: none"><li>if TE character set is "HEX": ME/TA converts each 7-bit character of GSM 7 bit default alphabet into two IRA character long hexadecimal number (e.g. character Æ (GSM 7 bit default alphabet 28) is presented as 1C (IRA 49 and 67))</li><li>if &lt;dc&gt; indicates that 8-bit or UCS2 data coding scheme is used, or &lt;fo&gt; indicates that 3GPP TS 23.040 [8] TP-User-Data-Header-Indication is set: ME/TA converts each 8-bit octet into two IRA character long hexadecimal number (e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65))</li></ul> <p>In the case of CBS: 3GPP TS 23.041 [9] CBM Content of Message in text mode responses; format:</p> <ul style="list-style-type: none"><li>if &lt;dc&gt; indicates that 3GPP TS 23.038 [7] GSM 7 bit default alphabet is used:<ul style="list-style-type: none"><li>if TE character set other than "HEX" (see the +CSCS AT command description): ME/TA converts GSM alphabet into current TE character set according to rules of 3GPP TS 27.005 [16] Annex A</li><li>if TE character set is "HEX": ME/TA converts each 7-bit character of the GSM 7 bit default alphabet into two IRA character long hexadecimal number</li></ul></li><li>if &lt;dc&gt; indicates that 8-bit or UCS2 data coding scheme is used: ME/TA converts each 8-bit octet into two IRA character long hexadecimal number</li></ul> |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| <da>       | String                                                            | Destination address                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| <tda>      | Number                                                            | Type of address of <da> - octet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| <vp>       | Number                                                            | Format depending of the <fo> setting: <ul style="list-style-type: none"><li>Relative format: validity period starting from when the SMS is received by the SMSC, in range 0-255 (default value 167); for more details see 3GPP TS 23.040 [8]<table><tr><td>&lt;vp&gt;</td><td>Validity period value</td></tr><tr><td>0 to 143</td><td>(TP-VP + 1) x 5 minutes (i.e. 5 minutes intervals up to 12 hours)</td></tr><tr><td>144 to 167</td><td>12 hours + ((TP-VP -143) x 30 minutes)</td></tr><tr><td>168 to 196</td><td>(TP-VP - 166) x 1 day</td></tr><tr><td>197 to 255</td><td>(TP-VP - 192) x 1 week</td></tr></table></li><li>Absolute format: absolute time of the validity period termination in string format ("yy/MM/dd,hh:mm:ss+zz") (refer to 3GPP TS 23.040 [8]); the time zone is expressed in steps of 15 minutes. The range goes from -48 to +56</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <vp> | Validity period value | 0 to 143 | (TP-VP + 1) x 5 minutes (i.e. 5 minutes intervals up to 12 hours) | 144 to 167 | 12 hours + ((TP-VP -143) x 30 minutes) | 168 to 196 | (TP-VP - 166) x 1 day | 197 to 255 | (TP-VP - 192) x 1 week |
| <vp>       | Validity period value                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| 0 to 143   | (TP-VP + 1) x 5 minutes (i.e. 5 minutes intervals up to 12 hours) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| 144 to 167 | 12 hours + ((TP-VP -143) x 30 minutes)                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| 168 to 196 | (TP-VP - 166) x 1 day                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| 197 to 255 | (TP-VP - 192) x 1 week                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| <mr>       | Number                                                            | Message reference                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| <ra>       | String                                                            | Recipient address field                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| <tora>     | Number                                                            | Type of address of <ra> - octet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| <scts>     | String                                                            | Service center time stamp in time-string format, refer to <dt>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| <dt>       | String                                                            | Discharge time in format "yy/MM/dd,hh:mm:ss+zz"; the time zone is expressed in steps of 15 minutes. The range goes from -48 to +56                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| <st>       | Number                                                            | Status of an SMS STATUS-REPORT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| <ct>       | Number                                                            | TP-Command-Type (default 0)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| <mn>       | Number                                                            | 3GPP TS 23.040 [8] TP-Message-Number in integer format                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| <mid>      | Number                                                            | CBM message identifier                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| <cdata>    | String                                                            | TP-Command-Data in text mode responses                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| <sn>       | Number                                                            | CBM serial number                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| <page>     | Number                                                            | 3GPP TS 23.041 [9] CBM page parameter bits 4-7 in integer format                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |
| <pages>    | Number                                                            | 3GPP TS 23.041 [9] CBM page parameter bits 0-3 in integer format                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |      |                       |          |                                                                   |            |                                        |            |                       |            |                        |

## 9.18 List concatenated message +UCMGL

| +UCMGL     |                                                     |              |                |                |                                                |                 |
|------------|-----------------------------------------------------|--------------|----------------|----------------|------------------------------------------------|-----------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |              |                |                |                                                |                 |
| 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      |

### 9.18.1 Description

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

- SMS-DELIVER: the parameters <tooa>, <length> shall be displayed only if +CSDH=1 is set.
- SMS-SUBMIT: the parameters <toda>, <length> shall be displayed only if +CSDH=1 is set.

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

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

### 9.18.2 Syntax

| Type | Syntax            | Response                                                                                                                                                                                                                                                              | Example                                                                                                                                                                                                                                                                                                                                                                                                          |
|------|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Set  | AT+UCMGL[=<stat>] | <b>SMS-DELIVERs:</b><br>+UCMGL: <index>,<stat>,<oa>,<br>[<alpha>],[<scts>],[<tooa>,<br><length>],[<seq>,<max>,<iei>,<br><ref>]<br><data><br>[+UCMGL: <index>,<stat>,<oa>,<br>[<alpha>],[<scts>],[<tooa>,<br><length>],[<seq>,<max>,<iei>,<br><ref>]<data>[...]]<br>OK | AT+UCMGL<br>+UCMGL: 304,"REC READ","+39340<br>1234999","08/08/06,10:01:38+08",<br>145,152,1,2,8,32767<br>u-blox reserves all rights to this<br>document and the information<br>contained herein. Reproduction, use<br>or disclosure to third parties without<br>express permi<br>+UCMGL: 305,"REC READ","+39340<br>1234999","08/08/06,10:01:40+08",<br>145,29,2,2,8,32767<br>ssion is strictly prohibited.<br>OK |
|      |                   | <b>SMS-SUBMITs:</b><br>+UCMGL: <index>,<stat>,<da>,<br>[<alpha>],[<toda>,<length>],[<br><seq>,<max>,<iei>,<ref>]<br><data><br>[+UCMGL: <index>,<stat>,<da>,<br>[<alpha>],[<toda>,<length>],[<seq>,<br><max>,<iei>,<ref>]<data>[...]]<br>OK                            |                                                                                                                                                                                                                                                                                                                                                                                                                  |
|      |                   | <b>SMS-STATUS-REPORTs:</b><br>+UCMGL: <index>,<stat>,<fo>,<br><mr>,[<ra>],[<tora>],[<scts>,<dt>,<br><st><br>[+UCMGL: <index>,<stat>,<fo>,<br><mr>,[<ra>],[<tora>],[<scts>,<dt>,<br><st> [...]]<br>OK                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                  |
|      |                   | <b>SMS-COMMANDs:</b><br>+UCMGL: <index>,<stat>,<fo>,<ct><br>[+UCMGL: <index>,<stat>,<fo>,<br><ct>[...]]                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                  |

| Type | Syntax     | Response                                                                                                                                              | Example                                                                |
|------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|
|      |            | OK<br><b>CBM storage:</b><br>+UCMGL: <index>,<stat>,<sn>,<mid>,<page>,<pages><data><br>[+UCMGL: <index>,<stat>,<sn>,<mid>,<page>,<pages>,<data>[...]] |                                                                        |
| Test | AT+UCMGL=? | OK<br>+UCMGL: (list of supported <stat>s)<br>OK                                                                                                       | +UCMGL: ("REC UNREAD","REC READ","STO UNSENT","STO SENT","ALL ")<br>OK |

### 9.18.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <stat>    | String | Indicates the status of message in memory: <ul style="list-style-type: none"> <li>"REC UNREAD": received unread SMS messages</li> <li>"REC READ": received read SMS messages</li> <li>"STO UNSENT": stored unsent SMS messages</li> <li>"STO SENT": stored sent SMS messages</li> <li>"ALL": all SMS messages (default value)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <index>   | Number | Storage position                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <oa>      | String | Originator address                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <alpha>   | String | Alphanumeric representation of <da> or <oa> corresponding to the entry found in the phonebook 3GPP TS 24.008 [12]. The parameter is not managed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <scts>    | String | Service center time stamp in time-string format; refer to <dt>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <tooa>    | Number | Type of address of <oa> - octet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <length>  | Number | Number of characters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <seq>     | Number | Sequence number of the current short message (1-255)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <max>     | Number | Maximum number of short messages in the concatenated short message (1-255)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <iei>     | Number | Information Element Identifier, the possible values are the following: <ul style="list-style-type: none"> <li>0: concatenated short messages, 8-bit reference number</li> <li>8: concatenated short messages, 16-bit reference number</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <ref>     | Number | Concatenated short message reference number: <ul style="list-style-type: none"> <li>0-255: concatenated short messages, 8-bit reference number case</li> <li>0-65535: concatenated short messages, 16-bit reference number case</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <data>    | String | In the case of SMS: 3GPP TS 23.040 [8] TP-User-Data in text mode responses; format: <ul style="list-style-type: none"> <li>if &lt;dc&gt; indicates that 3GPP TS 23.038 [7] GSM 7 bit default alphabet is used and &lt;fo&gt; indicates that 3GPP TS 23.040 [8] TP-User-Data-Header-Indication is not set: <ul style="list-style-type: none"> <li>if TE character set other than "HEX" (see the +CSCS AT command description): ME/TA converts GSM alphabet into current TE character set according to rules of 3GPP TS 27.005 Annex A [16]</li> <li>if TE character set is "HEX": ME/TA converts each 7-bit character of GSM 7 bit default alphabet into two IRA character long hexadecimal number (e.g. character Æ (GSM 7 bit default alphabet 28) is presented as 1C (IRA 49 and 67))</li> </ul> </li> <li>if &lt;dc&gt; indicates that 8-bit or UCS2 data coding scheme is used, or &lt;fo&gt; indicates that 3GPP TS 23.040 [8] TP-User-Data-Header-Indication is set: ME/TA converts each 8-bit octet into two IRA character long hexadecimal number (e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65))</li> </ul> In the case of CBS: 3GPP TS 23.041 [9] CBM Content of Message in text mode responses; format: <ul style="list-style-type: none"> <li>if &lt;dc&gt; indicates that 3GPP TS 23.038 [7] GSM 7 bit default alphabet is used: <ul style="list-style-type: none"> <li>if TE character set other than "HEX" (see the +CSCS AT command description): ME/TA converts GSM alphabet into current TE character set according to rules of 3GPP TS 27.005 [16] Annex A</li> </ul> </li> <li>if TE character set is "HEX": ME/TA converts each 7-bit character of the GSM 7 bit default alphabet into two IRA character long hexadecimal number</li> </ul> |

| Parameter | Type   | Description                                                                                                                                     |
|-----------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------|
|           |        | if <dc> indicates that 8-bit or UCS2 data coding scheme is used: ME/TA converts each 8-bit octet into two IRA character long hexadecimal number |
| <da>      | String | Destination address                                                                                                                             |
| <tda>     | Number | Type of address of <da> - octet                                                                                                                 |
| <fo>      | Number | First octet of the SMS TPDU (see 3GPP TS 23.040 [8])                                                                                            |
| <mr>      | Number | Message reference                                                                                                                               |
| <ra>      | String | Recipient address field                                                                                                                         |
| <tora>    | Number | Type of address of <ra> - octet                                                                                                                 |
| <dt>      | String | Discharge time in format "yy/MM/dd,hh:mm:ss+zz"; the time zone is expressed in steps of 15 minutes. The range goes from -48 to +56              |
| <st>      | Number | Status of an SMS STATUS-REPORT                                                                                                                  |
| <ct>      | Number | TP-Command-Type (default 0)                                                                                                                     |
| <sn>      | Number | CBM serial number                                                                                                                               |
| <mid>     | Number | CBM message identifier                                                                                                                          |
| <page>    | Number | 3GPP TS 23.041 [9] CBM Page Parameter bits 4-7 in integer format                                                                                |
| <pages>   | Number | 3GPP TS 23.041 [9] CBM Page Parameter bits 0-3 in integer format                                                                                |
| <dc>      | Number | Data Coding Scheme                                                                                                                              |

## 9.19 Send concatenated message +UCMGS

| +UCMGS     |                               |              |                |                |                                                |                 |
|------------|-------------------------------|--------------|----------------|----------------|------------------------------------------------|-----------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B |              |                |                |                                                |                 |
|            | SARA-N4                       |              |                |                |                                                |                 |
| 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      |

### 9.19.1 Description

Sends one segment of a concatenated message from a DTE to the network (SMS-SUBMIT). The message reference value <mr> is returned to the DTE for a successful message delivery. <Ctrl-Z> indicates that the SMS shall be sent, while <ESC> indicates aborting of the edited SMS.



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



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

### 9.19.2 Syntax

| Type | Syntax                                                                           | Response           | Example                                                                                                                                                                                                                                                                                                                                                       |
|------|----------------------------------------------------------------------------------|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Set  | AT+UCMGS=<da>,[<tda>],<seq>,<max>,<iei>,<ref><CR><br>text is entered<Ctrl-Z/ESC> | +UCMGS: <mr><br>OK | AT+UCMGS="0171112233",,1,2,0,127<CR><br><br>> u-blox reserves all rights to this document and the information contained herein. Reproduction, use or disclosure to third parties without express permis<Ctrl-Z><br><br>+UCMGS:2<br><br>OK<br><br>AT+UCMGS="0171112233",,2,2,0,127<CR><br><br>> sion is strictly prohibited.<Ctrl-Z><br><br>+UCMGS:3<br><br>OK |
| Test | AT+UCMGS=?                                                                       | OK                 |                                                                                                                                                                                                                                                                                                                                                               |



### 9.19.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                      |
|-----------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <da>      | String | Destination address                                                                                                                                                                                                                              |
| <tda>     | Number | Type of address of <da> - octet                                                                                                                                                                                                                  |
| <seq>     | Number | Sequence number of the current short message (1-255)                                                                                                                                                                                             |
| <max>     | Number | Maximum number of short messages in the concatenated short message (1-255)                                                                                                                                                                       |
| <iei>     | Number | Information Element Identifier, the possible values are the following: <ul style="list-style-type: none"> <li>0: Concatenated short messages, 8-bit reference number</li> <li>8: Concatenated short messages, 16-bit reference number</li> </ul> |
| <ref>     | Number | Concatenated short message reference number: <ul style="list-style-type: none"> <li>0-255: Concatenated short messages, 8-bit reference number case</li> <li>0-65535: Concatenated short messages, 16-bit reference number case</li> </ul>       |
| <text>    | String | SMS String                                                                                                                                                                                                                                       |
| <mr>      | Number | Message reference                                                                                                                                                                                                                                |

## 9.20 Write concatenated message to memory +UCMGW

| +UCMGW     |                                                     |              |                |                |               |                 |
|------------|-----------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |              |                |                |               |                 |
| Attributes | Syntax                                              | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                                                | Yes          | No             | No             | < 10 s        | +CMS Error      |

### 9.20.1 Description

Stores one segment of a concatenated message (SMS-DELIVER or SMS-SUBMIT) to memory storage <mem2> and returns the memory location <index> of the stored message. <Ctrl-Z> indicates that the SMS shall be stored, while <ESC> indicates aborting of the edited SMS.



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



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

### 9.20.2 Syntax

| Type | Syntax                                                                                                    | Response              | Example                                                                                                                                                                                                                                                                                                                                                       |
|------|-----------------------------------------------------------------------------------------------------------|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Set  | AT+UCMGW=[<oa/da>],[<tooa/toda>],[<stat>],[<seq>,<max>,<iei>,<ref><CR><br><br>text is entered<Ctrl-Z/ESC> | +UCMGW: <index><br>OK | AT+UCMGW="091137880",,,1,2,8,32767<CR><br><br>> u-blox reserves all rights to this document and the information contained herein. Reproduction, use or disclosure to third parties without express permi<Ctrl-Z><br><br>+UCMGW:302<br>OK<br><br>AT+UCMGW="091137880",,,2,2,8,32767<CR><br><br>> ssion is strictly prohibited.<Ctrl-Z><br><br>+UCMGW:303<br>OK |
| Test | AT+UCMGW=?                                                                                                | OK                    |                                                                                                                                                                                                                                                                                                                                                               |

### 9.20.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                                                                               |
|-----------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <da>      | String | 3GPP TS 23.040 [8] TP-Destination-Address Address-Value field in string format; BCD numbers (or GSM 7 bit default alphabet characters) are converted to characters of the currently selected TE character set (refer command +CSCS in 3GPP TS 27.007 [2]); type of address given by <toa>                 |
| <oa>      | String | 3GPP TS 23.040 [8] TP-Originating-Address Address-Value field in string format; BCD numbers (or GSM 7 bit default alphabet characters) are converted to characters of the currently selected TE character set (refer command +CSCS chapter <a href="#">Chapter 4.10</a> ); type of address given by <toa> |
| <toa>     | Number | 3GPP TS 24.011 [13] TP-Originating-Address Type-of-Address octet in integer format (default refer <toa>)                                                                                                                                                                                                  |
| <toa>     | Number | 3GPP TS 24.011 [13] TP-Destination-Address Type-of-Address octet in integer format (when first character of <da> is + (IRA 43) default is 145, otherwise default is 129)                                                                                                                                  |
| <stat>    | String | Indicates the status of message in memory: <ul style="list-style-type: none"> <li>"REC UNREAD": received unread SMS messages</li> <li>"REC READ": received read SMS messages</li> <li>"STO UNSENT": stored unsent SMS messages</li> <li>"STO SENT": stored sent SMS messages (default value)</li> </ul>   |
| <seq>     | Number | Sequence number of the current short message (1-255)                                                                                                                                                                                                                                                      |
| <max>     | Number | Maximum number of short messages in the concatenated short message (1-255)                                                                                                                                                                                                                                |
| <iei>     | Number | Information Element Identifier, the possible values are the following: <ul style="list-style-type: none"> <li>0: Concatenated short messages, 8-bit reference number</li> <li>8: Concatenated short messages, 16-bit reference number</li> </ul>                                                          |
| <ref>     | Number | Concatenated short message reference number: <ul style="list-style-type: none"> <li>0-255: Concatenated short messages, 8-bit reference number case</li> <li>0-65535: Concatenated short messages, 16-bit reference number case</li> </ul>                                                                |
| <text>    | String | SMS String                                                                                                                                                                                                                                                                                                |
| <index>   | Number | Storage position                                                                                                                                                                                                                                                                                          |

## 9.21 More messages to send +CMMS

| +CMMS             |                                                                               |                     |                       |                       |                      |                            |
|-------------------|-------------------------------------------------------------------------------|---------------------|-----------------------|-----------------------|----------------------|----------------------------|
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                       |                       |                      |                            |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b>     |
|                   | full                                                                          | Yes                 | No                    | No                    | -                    | <a href="#">+CMS Error</a> |

### 9.21.1 Description

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

### 9.21.2 Syntax

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

### 9.21.3 Defined values

| Parameter | Type   | Description                                                                   |
|-----------|--------|-------------------------------------------------------------------------------|
| <mode>    | Number | <ul style="list-style-type: none"> <li>0 (default value): disabled</li> </ul> |

| Parameter | Type | Description                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           |      | <ul style="list-style-type: none"> <li>1: keep enabled until the time between the response of the latest message send command (such as <b>+CMGS</b>) and the next send command exceeds 5 s, then close the link and switch &lt;mode&gt; automatically back to 0</li> <li>2: keep permanently enabled. The link is closed after each send sequence, but &lt;mode&gt; is not switched back to 0</li> </ul> |

## 9.22 Sending of originating data via the control plane +CSODCP

| +CSODCP    |         |              |                |                |               |                            |
|------------|---------|--------------|----------------|----------------|---------------|----------------------------|
| Modules    | SARA-N4 |              |                |                |               |                            |
| Attributes | Syntax  | PIN required | Settings saved | Can be aborted | Response time | Error reference            |
|            | full    | No           | No             | No             | -             | <a href="#">+CME Error</a> |

### 9.22.1 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

### 9.22.2 Syntax

| Type | Syntax                                                                 | Response                                                                                                                                                        | Example                                   |
|------|------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|
| Set  | AT+CSODCP=<cid>,<cpdata_length>,<cpdata>[,<RAI>[,<type_of_user_data>]] | OK                                                                                                                                                              | AT+CSODCP=1,3,"AA11BB"<br>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)<br>OK | +CSODCP: (0-10),(512),(0,1,2),(0,1)<br>OK |

### 9.22.3 Defined values

| Parameter           | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <cid>               | Number | See <a href="#">&lt;cid&gt;</a>                                                                                                                                                                                                                                                                                                                                                              |
| <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"> <li>0 (default value): no information available</li> <li>1: data exchange completed with the transmission of the ESM DATA TRANSPORT message.</li> <li>2: data exchange completed with the receipt of the ESM DATA TRANSPORT message.</li> </ul> |
| <type_of_user_data> | Number | Indicates the type of user data: <ul style="list-style-type: none"> <li>0 (default value): regular data</li> <li>1: exception data</li> </ul>                                                                                                                                                                                                                                                |

## 9.23 Terminating data reporting via control plane +CRTDCP

| +CRTDCP    |         |              |                |                |               |                            |
|------------|---------|--------------|----------------|----------------|---------------|----------------------------|
| Modules    | SARA-N4 |              |                |                |               |                            |
| Attributes | Syntax  | PIN required | Settings saved | Can be aborted | Response time | Error reference            |
|            | full    | No           | No             | No             | -             | <a href="#">+CME Error</a> |

### 9.23.1 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.

### 9.23.2 Syntax

| Type | Syntax                | Response                                                                                                                                         | Example                           |
|------|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| Set  | AT+CRTDCP=<reporting> | OK                                                                                                                                               | AT+CRTDCP=1<br>OK                 |
| Read | AT+CRTDCP?            | +CRTDCP: <reporting><br>OK                                                                                                                       | +CRTDCP: 1<br>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>)<br>OK | +CRTDCP: (0-1),(0-10),(512)<br>OK |
| URC  |                       | +CRTDCP: <cid>,<cpdata_length>,<cpdata><br>+CRTDCP: 0,2,"ab"                                                                                     |                                   |

### 9.23.3 Defined values

| Parameter       | Type   | Description                                                                                                                                       |
|-----------------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| <reporting>     | Number | <ul style="list-style-type: none"> <li>0 (default value): reporting disabled</li> <li>1: reporting enabled by means of the URC +CRTDCP</li> </ul> |
| <cid>           | Number | See <a href="#">&lt;cid&gt;</a>                                                                                                                   |
| <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 <a href="#">[88]</a> subclause 9.9.4.24)                                                      |

## 10 V24 control and V25ter

### 10.1 Introduction

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

### 10.2 Circuit 109 behavior &C

| &C                |                                                                               |                     |                         |                       |                      |                            |
|-------------------|-------------------------------------------------------------------------------|---------------------|-------------------------|-----------------------|----------------------|----------------------------|
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                         |                       |                      |                            |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b>   | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b>     |
|                   | full                                                                          | No                  | <a href="#">Profile</a> | No                    | -                    | <a href="#">+CME Error</a> |

#### 10.2.1 Description

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

#### 10.2.2 Syntax

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

#### 10.2.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                                                                                        |
|-----------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <value>   | Number | Indicates the behavior of circuit 109 <ul style="list-style-type: none"> <li>0: DCE always presents ON condition on circuit 109</li> <li>1 (default value and factory-programmed value): circuit 109 changes in accordance with the Carrier detect status; ON if the Carrier is detected, OFF otherwise</li> </ul> |

#### 10.2.4 Notes

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

## 10.3 Circuit 108/2 behavior &D

| &D                |                                                                               |                     |                         |                       |                      |                            |
|-------------------|-------------------------------------------------------------------------------|---------------------|-------------------------|-----------------------|----------------------|----------------------------|
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                         |                       |                      |                            |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b>   | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b>     |
|                   | full                                                                          | No                  | <a href="#">Profile</a> | No                    | -                    | <a href="#">+CME Error</a> |

#### 10.3.1 Description

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

#### 10.3.2 Syntax

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

### 10.3.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <value>   | Number | <ul style="list-style-type: none"> <li>0: the DCE ignores circuit 108/2</li> <li>1 (default value and factory-programmed value): upon an ON-to-OFF transition of circuit 108/2, the DCE enters online command state and issues an OK result code</li> <li>2: upon an ON-to-OFF transition of circuit 108/2, the DCE performs an orderly cleardown of the call. The automatic answer is disabled while circuit 108/2 remains OFF</li> </ul> |

### 10.3.4 ~+++ behavior in PSD &D



SARA-R4 / SARA-N4

The ~+++ behavior in PSD &D is not supported.

- A special meaning of the &D value is provided for the ~+++ sequence during a PSD data transfer with PPP L2 protocol (this is outside the V25ter specification scope). The ~+++ causes context deactivation during a PSD data transfer session for the AT&D0 and AT&D2 value (the +++ return to on-line command mode is provided for each &D value during a CSD data call)
- A different implementation for the ~+++ is done with the &D1 value: the PSD data transfer is escaped and system returns in the on-line command state. The ATO command is used to resume the PSD data transfer session
- During the on-line command mode different AT commands can be sent but data calls in PSD on-line command mode cannot be granted (activate the AT+CRC=1 mode to identify the kind of call and reject data incoming calls if PSD is in the on-line command mode)



For more details see the ITU-T Recommendation V250 [20], ITU-T V.25ter Recommendation [21] and ITU-T V.32 Recommendation [22].



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

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

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

Table 6: CSD data mode

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

Table 7: PSD data mode

### 10.3.6 Notes

- The ON/OFF DTR transition in direct link forces the DCE into command mode. In case of AT&D0 the DTR transition is ignored, also in direct link.
- The escape sequence for the PSD data mode with a L2 protocol different from the PPP is not ~+++, and it could be not supported. See the [#unique\\_385/unique\\_385\\_Connect\\_42\\_t1](#) for more information.

## 10.4 DSR override &S

| &S                |                                                                               |                     |                         |                       |                      |                            |
|-------------------|-------------------------------------------------------------------------------|---------------------|-------------------------|-----------------------|----------------------|----------------------------|
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                         |                       |                      |                            |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b>   | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b>     |
|                   | full                                                                          | No                  | <a href="#">Profile</a> | No                    | -                    | <a href="#">+CME Error</a> |

### 10.4.1 Description

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

### 10.4.2 Syntax

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

### 10.4.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                           |
|-----------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <value>   | Number | <ul style="list-style-type: none"> <li>0: sets the DSR line to ON</li> <li>1 (default value and factory-programmed value): sets the DSR line to ON in data mode and to OFF in command mode</li> </ul> |

### 10.4.4 Notes

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

## 10.5 Flow control &K

| &K                |                                      |                     |                         |                       |                      |                            |
|-------------------|--------------------------------------|---------------------|-------------------------|-----------------------|----------------------|----------------------------|
| <b>Modules</b>    | SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                         |                       |                      |                            |
| <b>Attributes</b> | <b>Syntax</b>                        | <b>PIN required</b> | <b>Settings saved</b>   | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b>     |
|                   | full                                 | No                  | <a href="#">Profile</a> | No                    | -                    | <a href="#">+CME Error</a> |

### 10.5.1 Description

Controls the flow control mechanism. The following settings are allowed:

- No flow control
- HW flow control also referred with RTS / CTS flow control
- SW flow control also referred with XON / XOFF flow control

### 10.5.2 Syntax

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

### 10.5.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                                                                                             |
|-----------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <value>   | Number | <ul style="list-style-type: none"> <li>0: disable DTE flow control</li> <li>3 (default and factory-programmed value): enable the RTS/CTS DTE flow control</li> <li>4: enable the XON/XOFF DTE flow control</li> <li>5: enable the XON/XOFF DTE flow control</li> <li>6: enable the XON/XOFF DTE flow control</li> </ul> |

### 10.5.4 Notes

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

- Set the <value> parameter of AT&K command to 0 (flow control disabled) or 4, 5 or 6 (software flow control) when the RTS and CTS lines are not physically connected.
- The software flow control (XON/XOFF) setting is not allowed on the USB interfaces, on the SPI interface and on a multiplexer channel. See the [Multiple AT command interfaces](#) for all the behavior differences in respect to the supported interfaces.
- The SW flow control (XON/XOFF) activation is only allowed in case of the text transmission: the binary data cannot be transmitted because it may contain the special flow control characters (XON/XOFF).
- When the software flow control (XON/XOFF) is used, the DC1 (XON, 0x11) and DC3 (XOFF, 0x13) characters are reserved and therefore filtered (e.g. in SMS text mode these two characters can not be input). Since the DTE-DCE communication relies on the correct reception of DC1/DC3 characters, the UART power saving should be disabled on the module when the SW flow control is used. If the UART power saving is active, the DC1/DC3 characters could be used to wake up the module's UART, and therefore lost. In case a DC3 character (XOFF) is correctly received by module's UART and some data is waiting to be transmitted, the module is forced to stay awake until a subsequent DC1 character (XON) is received.

#### SARA-R4 / SARA-N4

- The SW flow control is not supported (<value>=4, 5 and 6 are not allowed).

### 10.5.5 SW flow control enhancement for PSD data transfer with PPP L2 protocol



The software flow control enhancement is only supported on the UART interface.



SARA-R4 / SARA-N4

The SW flow control enhancement is not supported.

The standard implementation of the UART XON/XOFF flow control is limited to DTE-DCE communications where the ASCII non-printable control characters are not transferred. This is an important limitation, since it is not possible to use it in case of the generic binary data transfer. An extension to a PPP L2 protocol data transfer has been done by exploiting the PPP octet stuffing procedure.

#### PPP Octet-stuffed framing and transparency

The PPP protocol implements an escape mechanism specified to allow control data such as XON/XOFF to be transparently transmitted over the link, and to remove spurious control data which may be injected into the link by intervening hardware and software.

The control escape octet is defined as binary 01111101 (hexadecimal 0x7d), most significant bit first. As a minimum, sending implementations must escape the flag sequence and control escape octets.

After Frame Check Sequence (FCS) computation, the transmitter examines the entire frame between the two flag sequences. Each flag sequence, control escape octet, and any octet which is flagged in the sending Async-Control - Character-Map (ACCM), is replaced by a two octet sequence consisting of the control escape octet followed by the original octet exclusive-or'd with hexadecimal 0x20.

The receiving implementations must correctly process all the control escape sequences. On the reception, prior to FCS computation, each octet with value less than hexadecimal 0x20 is checked. If it is flagged in the receiving ACCM, it is simply removed (it may have been inserted by intervening data communications equipment). Each control escape octet is also removed, and the following octet is exclusive-or'd with hexadecimal 0x20, unless it is the flag sequence (which aborts a frame).

#### ACCM negotiation for XON/XOFF chars during PPP LCP negotiation

The ACCM is negotiated in a LCP (Link Control Protocol, part of PPP protocol) configuration request. In particular the LCP Option 02 is used.

This option is described in the RFC 1662 and has the following format.

| 02 | 06 | Async Control Character Map |

This configuration option provides a method to negotiate the use of control character transparency on asynchronous links.

The module by default would start in any case requesting an ACCM sets to 0x00000000, which is incompatible with XON/XOFF flow control.



To overcome this situation, the ACCM negotiation handler should combine the value received in a Configure-Nak via a logical bitwise OR operation with the last configure-request value it sent. This result should then be sent in the next Configure-Request message. If a configure-request is received whose bit mask includes cleared bits for characters that the local implementation knows to be problematic (perhaps by way of an administrative option or some kind of hardware information), then it should send a Configure-Nak with the prior value modified to have these bits set.

#### Application to XON/XOFF flow control implementation in the module

The flow control characters DC1 and DC3 appears at arbitrary locations in the data stream received by the module. The module with software flow control active during a PPP session, discards these characters after modifying the flow control state (stopping or starting its own transmit process) and does not include them in any part of the received data or CRC calculation; in the transmitted data the module escapes the XON/XOFF characters if they appear in the transmitted PPP frame. They are transmitted on the link as follows:

0x11 is encoded as 0x7d, 0x31. (XON)

0x13 is encoded as 0x7d, 0x33. (XOFF)

PPP ACCM negotiation in the module firmware is implemented in the following way:

- If the XON/XOFF flow control is active on the UART when the PPP is invoked, the requested ACCM is 0x000A0000
- If the XON/XOFF flow control is not active on the UART when the PPP is invoked, the requested ACCM is 0x00000000

As soon as the LCP configuration phase is completed, the IPCP protocol (the network control protocol for establishing and configuring Internet Protocol over a Point-to-Point Protocol link) can start; from this point forward the negotiated ACCM are applied.

If SW flow control is enabled on the module, but the DTE requests a wrong ACCM setting (ACCM differs than 0x0A0000) the SW flow control is anyway effective during the data mode, that is the 0x11 and 0x13 is detected during data mode even if the ACCM is not properly set by the DTE during LCP configuration.

## 10.6 DTE-DCE character framing +ICF

| +ICF              |                                                                               |                     |                         |                       |                      |                            |
|-------------------|-------------------------------------------------------------------------------|---------------------|-------------------------|-----------------------|----------------------|----------------------------|
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                         |                       |                      |                            |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b>   | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b>     |
|                   | partial                                                                       | No                  | <a href="#">Profile</a> | No                    | -                    | <a href="#">+CME Error</a> |

### 10.6.1 Description

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



The following restrictions must be reminded:

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

### 10.6.2 Syntax

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

### 10.6.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                      |
|-----------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <format>  | Number | <ul style="list-style-type: none"> <li>0: auto detect</li> <li>1: 8 data 2 stop</li> <li>2: 8 data 1 parity 1 stop</li> <li>3: 8 data 1 stop</li> <li>4: 7 data 2 stops</li> <li>5: 7 bit, 1 parity, 1 stop</li> <li>6: 7 bit, 1 stop</li> </ul> |
| <parity>  | Number | <ul style="list-style-type: none"> <li>0: odd</li> <li>1: even</li> </ul>                                                                                                                                                                        |

### 10.6.4 Notes

#### SARA-R4

- Automatic frame recognition is not supported (<format> cannot be set to 0).
- The only supported values are <format> = 3 and <parity> = 1.

## 10.7 DTE-DCE local flow control +IFC

| +IFC              |                                      |                     |                         |                       |                      |                            |
|-------------------|--------------------------------------|---------------------|-------------------------|-----------------------|----------------------|----------------------------|
| <b>Modules</b>    | SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                         |                       |                      |                            |
| <b>Attributes</b> | <b>Syntax</b>                        | <b>PIN required</b> | <b>Settings saved</b>   | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b>     |
|                   | full                                 | No                  | <a href="#">Profile</a> | No                    | -                    | <a href="#">+CME Error</a> |

### 10.7.1 Description

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

The SW flow control (XON/XOFF) activation is only allowed in case of the text transmission: the binary data cannot be transmitted because it may contain the special flow control characters (XON/XOFF). For the SW flow control enhancement, allowing its usage during a PSD call with PPP L2 protocol, see [SW flow control enhancement for PSD data transfer with PPP L2 protocol](#) in the [AT&K](#) command description.

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

Since the DTE-DCE communication relies on the correct reception of DC1/DC3 characters, the UART power saving should be disabled on the module when SW flow control is used. If the UART power saving is active, the DC1/DC3 characters could be used to wake up the module's UART, and therefore lost. In case a DC3 character (XOFF) is correctly received by module's UART and some data is waiting to be transmitted, the module is forced to stay awake until a subsequent DC1 character (XON) is received.



The software flow control (XON/XOFF) setting is not allowed on the USB interfaces, on the SPI interface and on a multiplexer channel. See the [Multiple AT command interfaces](#) for all the behavior differences in respect to the supported interfaces.

### 10.7.2 Syntax

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

### 10.7.3 Defined values

| Parameter    | Type   | Description                                                                                                                                                                      |
|--------------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <DCE_by_DTE> | Number | <ul style="list-style-type: none"> <li>0: none</li> <li>1: DC1/DC3 on circuit 103 (XON/XOFF)</li> <li>2 (default and the factory-programmed value): circuit 105 (RTS)</li> </ul> |
| <DTE_by_DCE> | Number | <ul style="list-style-type: none"> <li>0: none</li> <li>1: DC1/DC3 on circuit 104 (XON/XOFF)</li> <li>2 (default and the factory-programmed value): circuit 106 (CTS)</li> </ul> |

### 10.7.4 Notes

- <DCE\_by\_DTE> and <DTE\_by\_DCE> parameters must be provided with the same value in pairs (only (0, 0), (1,1) and (2,2) are allowed. The other combinations are not allowed and the "+CME ERROR: operation not allowed" error result code is returned).

#### SARA-R4 / SARA-N4

- The SW flow control is not supported (<DCE\_by\_DTE> and <DTE\_by\_DCE> cannot be set to 1).

## 10.8 Set flow control \Q

| \Q                |                                                                               |                     |                       |                       |                      |                        |
|-------------------|-------------------------------------------------------------------------------|---------------------|-----------------------|-----------------------|----------------------|------------------------|
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                       |                       |                      |                        |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b> |
|                   | full                                                                          | No                  | No                    | No                    | -                    | +CME Error             |

### 10.8.1 Description

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

The SW flow control (XON/XOFF) activation is only allowed in case of the text transmission: the binary data cannot be transmitted because it may contain the special flow control characters (XON/XOFF). For the SW flow control enhancement, allowing its usage during a PSD call with PPP L2 protocol, see the [SW flow control enhancement for PSD data transfer with PPP L2 protocol](#) in the [AT&K](#) command description.

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

Since the DTE-DCE communication relies on the correct reception of DC1/DC3 characters, the UART power saving should be disabled on the module when SW flow control is used. If the UART power saving is active, the DC1/DC3 characters could be used to wake up the module's UART, and therefore lost. In case a DC3 character (XOFF) is correctly received by module's UART and some data is waiting to be transmitted, the module is forced to stay awake until a subsequent DC1 character (XON) is received.



The software flow control (XON/XOFF) setting is not allowed on the USB interfaces, on the SPI interface and on a multiplexer channel. See the [Multiple AT command interfaces](#) for all the behavior differences in respect to the supported interfaces.

### 10.8.2 Syntax

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

### 10.8.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                |
|-----------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <value>   | Number | <ul style="list-style-type: none"> <li>0: no flow control</li> <li>1: DC1/DC3 on circuit 103 and 104 (XON/XOFF)</li> <li>3 (default value): DCE_by_DTE on circuit 105 (RTS) and DTE_by_DCE on circuit 106 (CTS)</li> </ul> |

## 10.9 UART data rate configuration +IPR

| +IPR              |                                                                               |                     |                         |                       |                      |                            |
|-------------------|-------------------------------------------------------------------------------|---------------------|-------------------------|-----------------------|----------------------|----------------------------|
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                         |                       |                      |                            |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b>   | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b>     |
|                   | partial                                                                       | No                  | <a href="#">Profile</a> | No                    | -                    | <a href="#">+CME Error</a> |

### 10.9.1 Description

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

When supported, the autobauding feature allows baud rate recognition by the DCE when it operates in command mode.



The command settings are ignored when the AT command interface runs either on the USB or on the SPI interface. The DCE sends the "OK" final result code but the command will have no effect.

### 10.9.2 Syntax

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

### 10.9.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                    |
|-----------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <rate>    | Number | Baud rate <ul style="list-style-type: none"> <li>0 (factory-programmed value): autobauding</li> <li>1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 (default value), 230400, 460800, 921600, 3000000, 3250000, 6000000, 6500000</li> </ul> |

### 10.9.4 Notes

- On the UART AT interface, after the reception of the "OK" result code for the +IPR command, the DTE shall wait for at least 100 ms before issuing a new AT command; this is to guarantee a proper baud rate reconfiguration.

#### SARA-R4 / SARA-N4

- Automatic baud rate detection is not implemented (<rate>=0 is not supported).
- The factory-programmed value for <rate> is 115200.
- This command is not supported in the multiplexer mode. See the [+CMUX](#) AT command for more details.

#### SARA-R404M / SARA-R410M-01B / SARA-R410M-02B

- Valid baud rates <rate>= 9600, 19200, 38400, 57600, 115200.

#### SARA-R410M-52B / SARA-N4

- Valid baud rates <rate>= 9600, 19200, 38400, 57600, 115200, 230400, 460800.

## 10.10 Return to on-line data state O

|                   |                                                                               |                     |                       |                       |                      |                        |
|-------------------|-------------------------------------------------------------------------------|---------------------|-----------------------|-----------------------|----------------------|------------------------|
| <b>O</b>          |                                                                               |                     |                       |                       |                      |                        |
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                       |                       |                      |                        |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b> |
|                   | full                                                                          | Yes                 | No                    | No                    | -                    | +CME Error             |

### 10.10.1 Description

Causes the DCE to return to online data state and issue a CONNECT or CONNECT <text> (based on ATX command) intermediate result code on DTE. It is the complementary command to the escape sequence, or to the other actions (DTR ON to OFF transition, see table in [Chapter 10.3.5](#)) that cause the DCE to switch from online data state to online command state.

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

### 10.10.2 Syntax

| Type   | Syntax | Response   | Example        |
|--------|--------|------------|----------------|
| Action | ATO    | <response> | ATO<br>CONNECT |

### 10.10.3 Defined values

| Parameter  | Type   | Description                                                                                                            |
|------------|--------|------------------------------------------------------------------------------------------------------------------------|
| <response> | String | <ul style="list-style-type: none"> <li>CONNECT</li> <li>NO CARRIER: the online data state cannot be resumed</li> </ul> |

### 10.10.4 Notes

- The command provides an error result code ("CME ERROR: operation not allowed" if +CME is set to 2) in the following cases:
  - The DCE is not in online command state
  - It is issued on a DCE different from the one in online command state
- In case of PSD call, any data from the network (downlink data) received by the DCE during the on-line command state is discarded. This means that after the O command and on-line data state resume, any possible data loss has to be recovered by upper layer protocols (e.g. TCP).

## 10.11 Escape character S2

|                   |                                                                               |                     |                       |                       |                      |                        |
|-------------------|-------------------------------------------------------------------------------|---------------------|-----------------------|-----------------------|----------------------|------------------------|
| <b>S2</b>         |                                                                               |                     |                       |                       |                      |                        |
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                       |                       |                      |                        |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b> |
|                   | partial                                                                       | No                  | Profile               | No                    | -                    | +CME Error             |

### 10.11.1 Description

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

### 10.11.2 Syntax

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

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

### 10.11.3 Defined values

| Parameter | Type   | Description                                                                                                                        |
|-----------|--------|------------------------------------------------------------------------------------------------------------------------------------|
| <value>   | Number | Range 1 to 255. The answer to the read command is in "xxx" format. The default and the factory-programmed value is 43 (ASCII '+'). |

### 10.11.4 Notes

#### SARA-R4 / SARA-N4

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

| Data call command | L2 protocol | Description                          | ATS2 behavior                                                                                                                                                                                            |
|-------------------|-------------|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ATD*99***1#       | PPP         | PSD call: dial up                    | Escape sequence detection is only done for ~+++. ATS2 is not effective.<br><br>There is not a timing constraint (see the <a href="#">S12</a> AT command) for ~++++ (++ + is encapsulated in a PPP frame) |
| ATD1234           |             | CSD call                             | The command is effective if issued in both command and online command mode                                                                                                                               |
| AT+USODL=0        |             | PSD call: Direct Link mode           | The command is effective                                                                                                                                                                                 |
| AT+USOWR=0,32     |             | PSD call:AT socket (not transparent) | Break detection is not supported                                                                                                                                                                         |

Table 8: ATS2 handling for different data call scenarios

#### SARA-R4 / SARA-N4

- The command has no effect.

## 10.12 Command line termination character S3

| S3         |                                                                    |              |                         |                |               |                            |
|------------|--------------------------------------------------------------------|--------------|-------------------------|----------------|---------------|----------------------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                         |                |               |                            |
|            | SARA-N4                                                            |              |                         |                |               |                            |
| Attributes | Syntax                                                             | PIN required | Settings saved          | Can be aborted | Response time | Error reference            |
|            | partial                                                            | No           | <a href="#">Profile</a> | No             | -             | <a href="#">+CME Error</a> |

### 10.12.1 Description

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

### 10.12.2 Syntax

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

### 10.12.3 Defined values

| Parameter | Type   | Description                                                                                                                                                    |
|-----------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <value>   | Number | Range 0 to 127. The answer to the read command is in "xxx" format. The default and the factory-programmed value is 13 (ASCII carriage return (CR, IRA5 0/13)). |

## 10.13 Response formatting character S4

### S4

|                   |                                                                               |                     |                         |                       |                      |                            |
|-------------------|-------------------------------------------------------------------------------|---------------------|-------------------------|-----------------------|----------------------|----------------------------|
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                         |                       |                      |                            |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b>   | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b>     |
|                   | partial                                                                       | No                  | <a href="#">Profile</a> | No                    | -                    | <a href="#">+CME Error</a> |

### 10.13.1 Description

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

### 10.13.2 Syntax

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

### 10.13.3 Defined values

| Parameter | Type   | Description                                                                                                                                        |
|-----------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| <value>   | Number | Range 0 to 127. The answer to the read command is in "xxx" format. The default and the factory-programmed value is 10 (line feed (LF, IRA5 0/10)). |

## 10.14 Command line editing character S5

### S5

|                   |                                                                               |                     |                         |                       |                      |                            |
|-------------------|-------------------------------------------------------------------------------|---------------------|-------------------------|-----------------------|----------------------|----------------------------|
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                         |                       |                      |                            |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b>   | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b>     |
|                   | partial                                                                       | No                  | <a href="#">Profile</a> | No                    | -                    | <a href="#">+CME Error</a> |

### 10.14.1 Description

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

### 10.14.2 Syntax

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

### 10.14.3 Defined values

| Parameter | Type   | Description                                                                                                                                            |
|-----------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| <value>   | Number | Range 0 to 127. The answer to the read command is in "xxx" format. The default and the factory-programmed value is 8 (ASCII backspace (BS, IRA5 0/8)). |

## 10.15 Pause before blind dialling S6

### S6

|                   |                                                                               |                     |                       |                       |                      |                            |
|-------------------|-------------------------------------------------------------------------------|---------------------|-----------------------|-----------------------|----------------------|----------------------------|
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                       |                       |                      |                            |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b>     |
|                   | partial                                                                       | No                  | No                    | No                    | -                    | <a href="#">+CME Error</a> |

### 10.15.1 Description

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

### 10.15.2 Syntax

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

### 10.15.3 Defined values

| Parameter | Type   | Description                                                                                |
|-----------|--------|--------------------------------------------------------------------------------------------|
| <value>   | Number | Range 2 - 10. The answer to the read command is in "xxx" format. The default value is 2 s. |

## 10.16 Connection completion timeout S7

### S7

|                   |                                                                               |                     |                         |                       |                      |                            |
|-------------------|-------------------------------------------------------------------------------|---------------------|-------------------------|-----------------------|----------------------|----------------------------|
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                         |                       |                      |                            |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b>   | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b>     |
|                   | partial                                                                       | No                  | <a href="#">Profile</a> | No                    | -                    | <a href="#">+CME Error</a> |

### 10.16.1 Description

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

### 10.16.2 Syntax

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

### 10.16.3 Defined values

| Parameter | Type   | Description                                                                                                             |
|-----------|--------|-------------------------------------------------------------------------------------------------------------------------|
| <value>   | Number | Range 1 - 255. The answer to the read command is in "xxx" format. The default and the factory-programmed value is 60 s. |



## 10.17 Command dial modifier time S8

### S8

|                   |                                                                               |                     |                       |                       |                      |                            |
|-------------------|-------------------------------------------------------------------------------|---------------------|-----------------------|-----------------------|----------------------|----------------------------|
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                       |                       |                      |                            |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b>     |
|                   | partial                                                                       | No                  | No                    | No                    | -                    | <a href="#">+CME Error</a> |

### 10.17.1 Description

Specifies the amount of time, in seconds, that the DCE shall pause during dialling, when a ',' (comma) dial modifier is encountered in a dial string.



The command has no effect.

### 10.17.2 Syntax

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

### 10.17.3 Defined values

| Parameter | Type   | Description                                                                               |
|-----------|--------|-------------------------------------------------------------------------------------------|
| <value>   | Number | Range 0 - 255. The answer to the read command is in "xxx" format. The default value is 2. |

## 10.18 Automatic disconnect delay S10

### S10

|                   |                                                                               |                     |                       |                       |                      |                            |
|-------------------|-------------------------------------------------------------------------------|---------------------|-----------------------|-----------------------|----------------------|----------------------------|
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                       |                       |                      |                            |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b>     |
|                   | partial                                                                       | No                  | No                    | No                    | -                    | <a href="#">+CME Error</a> |

### 10.18.1 Description

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

### 10.18.2 Syntax

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

### 10.18.3 Defined values

| Parameter | Type   | Description               |
|-----------|--------|---------------------------|
| <value>   | Number | Range 1 - 254. Default: 1 |

### 10.18.4 Notes

#### SARA-R4 / SARA-N4

- The command has no effect.

## 10.19 Escape prompt delay (EPD) S12

### S12

|                   |                                                                               |                     |                       |                       |                      |                            |
|-------------------|-------------------------------------------------------------------------------|---------------------|-----------------------|-----------------------|----------------------|----------------------------|
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                       |                       |                      |                            |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b>     |
|                   | partial                                                                       | No                  | No                    | No                    | -                    | <a href="#">+CME Error</a> |

### 10.19.1 Description

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

Furthermore, the timeout is:

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

### 10.19.2 Syntax

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

### 10.19.3 Defined values

| Parameter | Type   | Description                                                                                     |
|-----------|--------|-------------------------------------------------------------------------------------------------|
| <value>   | Number | Range 0 - 255. The answer to the read command is in "xxx" format. The default value is 50 (1 s) |

## 10.20 Command echo E

### E

|                   |                                                                               |                     |                         |                       |                      |                            |
|-------------------|-------------------------------------------------------------------------------|---------------------|-------------------------|-----------------------|----------------------|----------------------------|
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                         |                       |                      |                            |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b>   | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b>     |
|                   | full                                                                          | No                  | <a href="#">Profile</a> | No                    | -                    | <a href="#">+CME Error</a> |

### 10.20.1 Description

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

### 10.20.2 Syntax

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

### 10.20.3 Defined values

| Parameter | Type   | Description                                                                                                                      |
|-----------|--------|----------------------------------------------------------------------------------------------------------------------------------|
| <value>   | Number | <ul style="list-style-type: none"> <li>• 0: echo off</li> <li>• 1 (default and the factory-programmed value): echo on</li> </ul> |

## 10.21 Result code suppression Q

### Q

|                   |                                                                               |                     |                         |                       |                      |                            |
|-------------------|-------------------------------------------------------------------------------|---------------------|-------------------------|-----------------------|----------------------|----------------------------|
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                         |                       |                      |                            |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b>   | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b>     |
|                   | full                                                                          | No                  | <a href="#">Profile</a> | No                    | -                    | <a href="#">+CME Error</a> |

### 10.21.1 Description

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

### 10.21.2 Syntax

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

### 10.21.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                            |
|-----------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <value>   | Number | <ul style="list-style-type: none"> <li>0 (default and the factory-programmed value): DCE transmits result codes</li> <li>1: Result codes are suppressed and not transmitted</li> </ul> |

## 10.22 DCE response format V

### V

|                   |                                                                               |                     |                         |                       |                      |                            |
|-------------------|-------------------------------------------------------------------------------|---------------------|-------------------------|-----------------------|----------------------|----------------------------|
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                         |                       |                      |                            |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b>   | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b>     |
|                   | full                                                                          | No                  | <a href="#">Profile</a> | No                    | -                    | <a href="#">+CME Error</a> |

### 10.22.1 Description

Control the contents of the header and trailer transmitted with result codes and information text responses. It also determines whether the result code is transmitted in a numeric form or an alphabetic (or verbose) form. The information text response is not affected by this setting. See [Information text responses and result codes](#) for description of the result code formats.

### 10.22.2 Syntax

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

### 10.22.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                         |
|-----------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <value>   | Number | <ul style="list-style-type: none"> <li>0: DCE transmits limited headers, trailers and numeric text</li> <li>1 (default and the factory-programmed value): DCE transmits full headers, trailers and verbose response text</li> </ul> |

## 10.23 Result code selection and call progress monitoring control X

|                   |                                                                               |                     |                         |                       |                      |                            |
|-------------------|-------------------------------------------------------------------------------|---------------------|-------------------------|-----------------------|----------------------|----------------------------|
| <b>X</b>          |                                                                               |                     |                         |                       |                      |                            |
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                         |                       |                      |                            |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b>   | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b>     |
|                   | full                                                                          | No                  | <a href="#">Profile</a> | No                    | -                    | <a href="#">+CME Error</a> |

### 10.23.1 Description

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

### 10.23.2 Syntax

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

### 10.23.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                                      |
|-----------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <value>   | Number | <ul style="list-style-type: none"> <li>0: CONNECT result code is given upon entering online data state;</li> <li>1-4: CONNECT &lt;speed&gt; result code is given upon entering online data state; (4 is the default and the factory-programmed value)</li> </ul> |
| <speed>   | Number | Transfer speed for CSD calls configured via the CBST command                                                                                                                                                                                                     |

## 10.24 Reset to default configuration Z

|                   |                                                                               |                     |                       |                       |                      |                            |
|-------------------|-------------------------------------------------------------------------------|---------------------|-----------------------|-----------------------|----------------------|----------------------------|
| <b>Z</b>          |                                                                               |                     |                       |                       |                      |                            |
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                       |                       |                      |                            |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b>     |
|                   | full                                                                          | No                  | No                    | No                    | -                    | <a href="#">+CME Error</a> |

### 10.24.1 Description

Resets the DCE configuration into a known state; the reset includes the loading of the settings stored in the profile identified by the <value> parameter, into the current profile, and the application of the settings.

When the command is issued, any CSD call in progress is released. In case of success, the result code is issued using the format configuration ([Q](#), [V](#), [S3](#), [S4](#) commands) loaded from the requested profile. The other DCE settings are applied after the result code has been sent.

For more details on the settings stored in the profiles, see the [Appendix B.1](#).

### 10.24.2 Syntax

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

### 10.24.3 Defined values

| Parameter | Type   | Description                                                                    |
|-----------|--------|--------------------------------------------------------------------------------|
| <value>   | Number | Profile index, possible values 0-1; optional parameter, the default value is 0 |

## 10.25 Set to factory defined configuration &F

| &F                |                                                                               |                     |                       |                       |                      |                        |
|-------------------|-------------------------------------------------------------------------------|---------------------|-----------------------|-----------------------|----------------------|------------------------|
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                       |                       |                      |                        |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b> |
|                   | full                                                                          | No                  | No                    | No                    | -                    | +CME Error             |

### 10.25.1 Description

Resets the current profile to factory-defined defaults. Other NVM settings, not included in the profiles, are not affected.

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

For more details on the settings stored in the profiles, refer to [Appendix B.1](#).

### 10.25.2 Syntax

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

### 10.25.3 Defined values

| Parameter | Type   | Description    |
|-----------|--------|----------------|
| <value>   | Number | Only 0 allowed |

## 10.26 Display current configuration &V

| &V                |                                                                               |                     |                       |                       |                      |                        |
|-------------------|-------------------------------------------------------------------------------|---------------------|-----------------------|-----------------------|----------------------|------------------------|
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                       |                       |                      |                        |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b> |
|                   | full                                                                          | No                  | No                    | No                    | -                    | +CME Error             |

### 10.26.1 Description

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



Since not all configuration items are listed with this command, see the example below for the list of the displayed configuration items. [Appendix B.1](#) provides the complete list of the configuration items stored in the profiles.



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

### 10.26.2 Syntax

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

| Type | Syntax | Response | Example                                                                                                                                                                                                                                                                                                                                                                                                      |
|------|--------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      |        |          | 00, +CRC:000, +IPR:0, +COPS:0,0,<br>FFFF, +ICF:3,1, +UPSV: 0, +CMGF:0<br>, +CNMI:1,0,0,0,0, +USTS: 0<br><br>STORED PROFILE 1: &C1, &D1, &S1,<br>&K3, E1, Q0, V1, X4, S00:000, S0<br>2:043, S03:013, S04:010, S05:00<br>8, S07:060, +CBST:007, 000, 001,<br>+CRLP:061, 061, 048, 006, +CR:0<br>00, +CRC:000, +IPR:0, +COPS:0,0,<br>FFFF, +ICF:3,1, +UPSV: 0, +CMGF:0<br>, +CNMI:1,0,0,0,0, +USTS: 0<br><br>OK |

### 10.26.3 Notes

#### SARA-R4 / SARA-N4

- Only the ACTIVE PROFILE is available. The device does not support STORED PROFILE 0 or STORED PROFILE 1

# 11 SIM management

## 11.1 Generic SIM access +CSIM

| +CSIM      |                                          |              |                |                |               |                 |
|------------|------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                 |
|            | SARA-N4                                  |              |                |                |               |                 |
| Attributes | Syntax                                   | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                                     | Yes          | No             | No             | -             | +CME Error      |

### 11.1.1 Description

Allows direct control of the SIM by a distant application on the TE. This command transparently transmits the <command> to the SIM via the MT. The <response> is returned in the same manner to the TE.

 The command needs the SIM module to work correctly.

 It is recommended to wait some seconds after boot (or reset) before using the command.

### 11.1.2 Syntax

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

### 11.1.3 Defined values

| Parameter  | Type   | Description                                                                                           |
|------------|--------|-------------------------------------------------------------------------------------------------------|
| <length>   | Number | Length of the characters sent to the TE in <command> or <response> parameters                         |
| <command>  | String | Command passed on by MT to SIM in hex format; see the 3GPP TS 51.011 [18] and ETSI TS 102 221 [93]    |
| <response> | String | Response to the command passed on by the SIM to the MT (3GPP TS 51.011 [18] and ETSI TS 102 221 [93]) |

## 11.2 Read the SIM language +CLAN

| +CLAN      |                                          |              |                |                |               |                 |
|------------|------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                 |
|            | SARA-N4                                  |              |                |                |               |                 |
| Attributes | Syntax                                   | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                                     | No           | No             | No             | -             | +CME Error      |

### 11.2.1 Description

Reads the language from the SIM.

 The read syntax will display the most preferred language from the preferred language list in EF<sub>ELP</sub> (2F05) file. If the EF<sub>ELP</sub> file does not exist, the preferred language is read from EF<sub>LP</sub> (6F05) file. This file content is decoded according to the CB (cell broadcast) data coding scheme (dcs), and the according language is displayed in the response string. If this byte does not result in a valid language according to the CB dcs, then it is printed in the response string in hexadecimal representation.

### 11.2.2 Syntax

| Type | Syntax   | Response      | Example     |
|------|----------|---------------|-------------|
| Read | AT+CLAN? | +CLAN: <code> | +CLAN: "en" |

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

### 11.2.3 Defined values

| Parameter | Type   | Description                                                                                                                                 |
|-----------|--------|---------------------------------------------------------------------------------------------------------------------------------------------|
| <code>    | String | It is a two-letter abbreviation of the language. The language codes, as defined in ISO 639, consists of two characters, e.g. "en", "it" etc |

## 11.3 SIM states reporting +USIMSTAT

| +USIMSTAT      |                                                     |              |                |                |               |                 |
|----------------|-----------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| <b>Modules</b> | SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |              |                |                |               |                 |
| Attributes     | Syntax                                              | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|                | partial                                             | No           | NVM            | No             | -             | +CME Error      |

### 11.3.1 Description

Configures the +UUSIMSTAT URC presentation. Based on the configuration, the URC is able to report the SIM card initialization status, the phonebook initialization status and the REFRESH proactive command execution result.



If <state> 9 and 10 are reported, update all SIM card related parameters cached in the DTE's application (e.g. the IMSI retrieved with +CIMI command).

### 11.3.2 Syntax

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

### 11.3.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <mode>    | Number | Bitmask representing which indications the +UUSIMSTAT URC is allowed to report.<br>See <a href="#">Table 9</a> for the meaning of each bit. The factory-programmed value is 0.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <state>   | Number | <ul style="list-style-type: none"> <li>0: SIM card not present</li> <li>1: PIN needed</li> <li>2: PIN blocked</li> <li>3: PUK blocked</li> <li>4: (U)SIM not operational</li> <li>5: (U)SIM in restricted use (FDN or BDN active)</li> <li>6: (U)SIM operational (registration may be initiated)</li> <li>7: SIM phonebook ready to be used (when the SIM application is active)</li> <li>8: USIM phonebook ready to be used (when the USIM application is active)</li> <li>9: (U)SIM toolkit REFRESH proactive command successfully concluded</li> <li>10: (U)SIM toolkit REFRESH proactive command unsuccessfully concluded</li> <li>11: PPP connection active, (U)SIM toolkit REFRESH proactive command delayed till PPP deactivation</li> <li>12: voice call active, (U)SIM toolkit REFRESH proactive command delayed till call release</li> </ul> |



| Parameter | Type | Description                                                                                                                               |
|-----------|------|-------------------------------------------------------------------------------------------------------------------------------------------|
|           |      | <ul style="list-style-type: none"> <li>13: CSD call active, (U)SIM toolkit REFRESH proactive command delayed till call release</li> </ul> |

### 11.3.4 Notes

- <state>=9 and 10 will not be reported when dedicated (+CFUN=6) or raw (+CFUN=9) mode is active.
- Table 9 provides the meaning of each bit with the corresponding state:

| Bit | States reported                                                                                                |
|-----|----------------------------------------------------------------------------------------------------------------|
| 0   | Reports the (U)SIM initialization status (<state>'s from 0 to 6 may be reported)                               |
| 1   | Reports the (U)SIM phonebook initialization status (<state>'s from 7 to 8 may be reported)                     |
| 2   | Reports the (U)SIM toolkit REFRESH proactive command execution result (<state>'s from 9 to 13 may be reported) |

**Table 9: <mode> bitmask meaning**

#### SARA-R4 / SARA-N4

- Only <mode>=4 is supported and is its factory programmed value. See the +UCUSATA AT command to disable +USIMSTAT URCs.
- <state>=11, 12 and 13 are not reported.

## 12 SIM toolkit

### 12.1 Introduction

SIM Application Toolkit (STK) is the 3GPP standard feature that allows the Subscriber Identity Module (SIM) to handle the DCE, also by giving commands such as displaying menus and/or asking for user input, and control its access to the network.

Once the SIM toolkit interface has been enabled via [AT+CFUN](#) command, the DTE is notified SIM toolkit commands and events and can interact with the SIM through appropriate STK AT commands.

SIM toolkit processing supports two modes: dedicated and raw. In dedicated mode, the DTE is notified of STK commands and events after decoding; in raw mode the DTE receives the raw data as received from the SIM. Only one mode can be enabled and function at a time.

For more details on the command description and parameters, see 3GPP TS 51.014 [\[44\]](#).

-  The setup menu fetched from the SIM card may vary with the terminal profile supported by the MT, which is affected by the capabilities of the module itself (e.g. speech): this implies that different u-blox modules may display different setup menus with the same SIM card.
-  The commands in this section properly work only if the SIM toolkit interface has been activated by the DTE. Otherwise the SIM toolkit processing will be blocked.
-  If an AT command related to the dedicated mode is used when the raw mode is enabled (and vice versa), an error result code ("CME ERROR: operation not allowed" if [+CMEE](#) is set to 2) is returned.

The STK commands related to the Bearer Independent Protocol, i.e. Open Channel, Close Channel, Receive Data, Send Data, Get Channel Status and the events Data Available and Channel Status, are autonomously managed by the device without the intervention from the TE, unless the dedicated mode is active and the Open Channel command requires the user intervention (see ETSI TS 102 223 [\[51\]](#)).

### 12.2 Bearer Independent Protocol status indication +UBIP

| +UBIP      |                                                     |              |                     |                |               |                            |
|------------|-----------------------------------------------------|--------------|---------------------|----------------|---------------|----------------------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |              |                     |                |               |                            |
| Attributes | Syntax                                              | PIN required | Settings saved      | Can be aborted | Response time | Error reference            |
|            | full                                                | No           | <a href="#">NVM</a> | No             | -             | <a href="#">+CME Error</a> |

#### 12.2.1 Description

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

#### 12.2.2 Syntax

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

#### 12.2.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                  |
|-----------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <mode>    | Number | Indicates whether the +UUBIP URC is enabled or not: <ul style="list-style-type: none"> <li>0 (factory-programmed value): BIP status indication disabled</li> <li>1: BIP status indication enabled</li> </ul> |

| Parameter | Type   | Description                                                                                                                                                                                                                                                                                                                             |
|-----------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           |        | <ul style="list-style-type: none"> <li>2: OPEN CHANNEL, CLOSE CHANNEL and CHANNEL STATUS EVENT status indications enabled</li> </ul>                                                                                                                                                                                                    |
| <ev_cmd>  | Number | Indicates the event download's tag or proactive command's tag. Allowed values: <ul style="list-style-type: none"> <li>10: Channel status event</li> <li>64: Open channel proactive command</li> <li>65: Close channel proactive command</li> <li>66: Receive data proactive command</li> <li>67: Send data proactive command</li> </ul> |
| <val>     | Number | Indicates the channel status (in case of the event download channel status) or result in case of a proactive command (see ETSI TS 102 223 [51])                                                                                                                                                                                         |

## 12.3 Read the USAT profile +CUSATR

| +CUSATR        |                                                     |              |                |                |               |                 |
|----------------|-----------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| <b>Modules</b> | SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |              |                |                |               |                 |
| Attributes     | Syntax                                              | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|                | full                                                | Yes          | No             | No             | -             | +CME Error      |

### 12.3.1 Description

Reads the USAT terminal profile for the given profile storage. If the <profile\_storage> parameter is omitted in the set command, the information text response will return the profile for all the supported profile storage values.

### 12.3.2 Syntax

| Type | Syntax                        | Response                                                 | Example                                                                                                         |
|------|-------------------------------|----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| Set  | AT+CUSATR[=<profile_storage>] | +CUSATR: <profile_storage>,<br><profile><br>OK           | AT+CUSATR=1<br><br>+CUSATR: 1,"F31FE84A119C00<br>878C00001FE060000043C000000<br>00040004000000000008"<br><br>OK |
| Test | AT+CUSATR=?                   | +CUSATR: (list of supported<br><profile_storage>s)<br>OK | +CUSATR: (0-5)<br>OK                                                                                            |

### 12.3.3 Defined values

| Parameter         | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <profile_storage> | Number | Allowed values: <ul style="list-style-type: none"> <li>0: the TE profile that can be set with the +CUSATW AT command</li> <li>1: the MT profile that can be set with the +CUSATW AT command</li> <li>2: MT default profile that reflects the inherent, default supported facilities of the MT</li> <li>3: UICC profile that reflects the currently active UICC profile that was sent to the UICC in the last TERMINAL PROFILE command</li> <li>4: UICC EF<sub>UST</sub>. It represents the elementary file that indicates services available in the USIM</li> <li>5: list of MT only facilities (facilities that are not allowed to be assigned to the TE, see 3GPP TS 31.111 [119])</li> </ul> |
| <profile>         | String | The profile in hexadecimal character format describing the supported facilities of the referenced <profile_storage> as specified for the Terminal Profile in 3GPP TS 31.111 [119] or for the related EF in 3GPP TS 31.102 [19].                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

## 12.4 Write the USAT profile +CUSATW

| +CUSATW    |                                          |              |                |                |               |                 |
|------------|------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                 |
|            | SARA-N4                                  |              |                |                |               |                 |
| Attributes | Syntax                                   | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                                     | Yes          | NVM            | No             | -             | +CME Error      |

### 12.4.1 Description

Writes a USAT terminal profile to the profile storage location. If the profile storage parameter is omitted in the set command, it resets the profiles for all the supported profile storage values to factory-programmed setting. If only the profile parameter is omitted, it will reset the given profile storage to factory-programmed setting. Upon an attempt to store or reset a profile that conflicts with an already stored profile or the list of MT only facilities, the operation fails and the profile referred to by the command parameter <profile\_storage> remains unchanged. The MT will provide an error result code.

### 12.4.2 Syntax

| Type | Syntax                                     | Response                                              | Example                                                                                                  |
|------|--------------------------------------------|-------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| Set  | AT+CUSATW[=<profile_storage>[, <profile>]] | OK                                                    | AT+CUSATW=1,"F31FE84A119C00878C00001FE060000043C0000000040004000000000008"<br>OK<br>+CUSATW: (0,1)<br>OK |
| Test | AT+CUSATW=?                                | +CUSATW: (list of supported <profile_storage>s)<br>OK |                                                                                                          |

### 12.4.3 Defined values

| Parameter         | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <profile_storage> | Number | Allowed values: <ul style="list-style-type: none"> <li>0: TE. It refers to the profile storage for the facilities supported by the TE. The default value is a blank profile with all bits set to zero. This value is applicable both in the execution command and in the information text response.</li> <li>1: MT. It refers to the profile storage for the facilities to be supported by the MT, which can be a subset of the default MT facilities. The TE can choose to register a subset of the MT default profile, typically omitting facilities also supported by the TE profile. The default value is the MT default profile. This value is applicable both in the execution command and in the information text response.</li> </ul> |
| <profile>         | String | The profile in hexadecimal character format describing the supported facilities of the referenced <profile_storage> as specified for the Terminal Profile in 3GPP TS 31.111 [119] or for the related EF in 3GPP TS 31.102 [19].                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## 12.5 Enable USAT terminal URCs +UCUSATA

| +UCUSATA   |                                          |              |                |                |               |                 |
|------------|------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                 |
|            | SARA-N4                                  |              |                |                |               |                 |
| Attributes | Syntax                                   | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                                     | No           | NVM            | No             | -             | +CME Error      |

### 12.5.1 Description

Enables the USAT terminal URCs to the TE for USAT proactive commands sent from the UICC to the MT.

### 12.5.2 Syntax

| Type | Syntax                  | Response | Example            |
|------|-------------------------|----------|--------------------|
| Set  | AT+UCUSATA=<active_URC> | OK       | AT+UCUSATA=0<br>OK |

| Type | Syntax       | Response                                             | Example               |
|------|--------------|------------------------------------------------------|-----------------------|
| Read | AT+UCUSATA?  | +UCUSATA: <active_URC><br>OK                         | +UCUSATA: 0<br>OK     |
| Test | AT+UCUSATA=? | +UCUSATA: (list of supported<br><active_URC>s)<br>OK | +UCUSATA: (0-7)<br>OK |
| URC  |              | +CUSATP: <proactive_command>                         |                       |
| URC  |              | +CUSATEND                                            |                       |

### 12.5.3 Defined values

| Parameter           | Type   | Description                                                                                                                                    |
|---------------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------|
| <active_URC>        | Number | Bitmask representing which URCs are activated.<br>See <a href="#">Table 10</a> for the meaning of each bit. The factory-programmed value is 0. |
| <proactive_command> | String | Command in hexadecimal character format. Proactive command as defined in 3GPP TS 31.111 [119], consisting of the full BER-TLV data object.     |

### 12.5.4 Notes

- The MT issues the +CUSATP URC to forward to the TE proactive commands issued by the UICC.
- The MT issues the +CUSATEND URC when the UICC indicates that the proactive command session is terminated.
- [Table 10](#) provides the meaning of each bit with the corresponding state:

| Bit | States reported           |
|-----|---------------------------|
| 0   | Enable the +CUSATEND URC  |
| 1   | Enable the +CUSATP URC    |
| 2   | Enable the +UUSIMSTAT URC |

**Table 10: <mode> bitmask meaning**

## 13 Packet switched data services

### 13.1 PDP contexts and parameter definition

#### 13.1.1 Primary and secondary PDP contexts

A PDP context can be either **primary** or **secondary**. In LTE, PS data connections are referred to as EPS bearers: EPS bearers are conceptually equivalent to the legacy PDP contexts, which are often referred to for sake of simplicity. Similarly to a PDP context, the EPS bearer can be a default (primary) or dedicated (secondary) one. The initial EPS bearer established during LTE attach procedure is actually a default EPS bearer. A secondary PDP context uses the same IP address of a primary PDP context (the usual PDP context activated e.g. via dial-up). The Traffic Flow Filters for such secondary contexts shall be specified according to 3GPP TS 23.060 [10].

The typical usage of the secondary PDP contexts is in VoIP calls, where RTP (speech) packets are conveyed on one PDP context (e.g. the primary one) with a given QoS (e.g. low reliability) whereas SIP signalling is routed on a different PDP context (e.g. the secondary one, with the same IP address but different port numbers) with a more reliable QoS.

A Traffic Flow Template (i.e. a filter based on port number, specifying relative flow precedence) shall be configured for the secondary context to instruct the GGSN to route down-link packets onto different QoS flows towards the TE.

| PDP context type | Activation procedure                                                                                                                                                                                                                                                                                                                                                                                             |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Primary          | Used to establish a logical connection through the network from the UE to the GGSN with a specifically negotiated Quality of Service (QoS).<br><br>The UE initiates the PDP context activation: it changes the session management state to active, creates the PDP context, obtains the IP address and reserves radio resources. After the activation, the UE is able to send IP packets over the air interface. |
| Secondary        | Used to establish a second PDP context with the same IP address and the same APN as the primary PDP context.<br><br>The two contexts may have different QoS profiles, which makes the feature useful for applications that have different QoS requirements (e.g. IP multimedia); QoS is applied based on port number addressing.                                                                                 |

On all other modules, at most 2 secondary PDP contexts may be associated to a primary PDP context and at most 2 secondary PDP contexts can be activated, since the maximum number of PDP contexts, both normal and secondary, is always 3.

SARA-R4 / SARA-N4  
The secondary PDP contexts are not supported.

#### 13.1.2 Multiple PDP contexts

Two PDP context types are defined:

- "external" PDP context: IP packets are built by the DTE, the MT's IP instance runs the IP relay function only;
- "internal" PDP context: the PDP context (relying on the MT's embedded TCP/IP stack) is configured, established and handled via the data connection management AT commands.

Multiple PDP contexts are supported. The DTE can access these PDP contexts either alternatively through the physical serial interface, or simultaneously through the virtual serial ports of the multiplexer (multiplexing mode MUX), with the following constraints:

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

SARA-R4 / SARA-N4  
Multiple PDP contexts and internal PDP contexts are not supported.

### 13.1.3 Parameter definition

#### 13.1.3.1 <APN>

The Access Point Name (APN) is a string parameter, which is a logical name, valid in the current PLMN's domain, used to select the 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).



SARA-R4 / SARA-N4

An optional special code placed at the beginning of <APN> indicates the type of authentication handling between the module and the network and may be:

- CHAP: challenge handshake authentication protocol
- PAP: personal authentication protocol
- NOAUTH: authentication protocol not used
- code omitted: authentication protocol not used

An example for the usage of <APN> is:

```
AT+CGDCONT=1,"IP","CHAP:internet.t-dl.de"
```

The information text response to the +CGDCONT read command does not include the PAP: and CHAP: prefixes in the APN string.

#### 13.1.3.2 <cid>

PDP context identifier. A numeric parameter specifying a particular PDP context definition. This parameter is valid only locally on the interface DTE-MT.

The maximum number of definable and active PDP contexts depend(s) on the product version:<sup>1</sup>

| Product           | Max number of definable PDP contexts | Max number of active PDP contexts |
|-------------------|--------------------------------------|-----------------------------------|
| SARA-R4 / SARA-N4 | 8                                    | 8                                 |

#### 13.1.3.3 <PDP\_addr>

String parameter identifying the MT in the IP-address space applicable to the PDP service. If the value is null or omitted (dynamic IP addressing), then a value may be provided by the DTE during the PDP startup procedure or, failing that, a dynamic address will be requested via DHCP. It can be read with the command [AT+CGPADDR](#) or [AT+CGDCONT](#) read command.

To request a static IP address, a fixed IP address shall be specified for the <PDP\_addr> 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"
- IPv6: "ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd"

#### 13.1.3.4 <PDP\_type>

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

- "IP" (default value): Internet Protocol (IETF STD 5)
- "NONIP": Non 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-R404M / SARA-R410M-01B / SARA-R410M-02B  
<PDP\_type>="NONIP" is not supported.

<sup>1</sup> The maximum number of active PDP contexts may be limited by the MNO

## 13.2 PPP LCP handshake behaviour

When a data call is initiated by means of **D\*** AT command, the module switches to PPP mode just after the CONNECT intermediate result code. The first step of the PPP procedure is the LCP handshake, in this phase the behaviour of 2G products differs from 3G products and 4G products.



Entering OnLine Command Mode (OLCM) during LCP handshake phase is strongly discouraged because the handshake procedure could be broken and should be restarted from the beginning.

## 13.3 PDP context definition +CGDCONT

| +CGDCONT   |                                                                    |              |                |                |               |                 |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                 |
|            | SARA-N4                                                            |              |                |                |               |                 |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | partial                                                            | Yes          | NVM            | No             | -             | +CME Error      |

### 13.3.1 Description

Defines the connection parameters for a PDP context, identified by the local context identification parameter <cid>. If the command is used only with parameter <cid>, the corresponding PDP context becomes undefined.

Each context is permanently stored so that its definition is persistent over power cycles.

The command is used to set up the PDP context parameters for an external context, i.e. a data connection using the external IP stack (e.g. Windows dial up) and PPP link over the serial interface.

Usage of static i.e. user defined IP address is possible in UTRAN and GERAN but not in EUTRAN; to prevent inconsistent addressing methods across various RATs, static IP addressing is not recommended for LTE modules: 3GPP TS 23.060 [10] Rel.8 and later releases specify that a UE with EUTRAN/UTRAN/GERAN capabilities shall not include a static PDP address in PDP context activation requests.

### 13.3.2 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                                                                                                                                                                                                                 | <b>IPv4 example</b><br>AT+CGDCONT=1,"IP","APN_name",<br>"1.2.3.4",0,0<br>OK<br><b>IPv4v6 example</b><br>AT+CGDCONT=1,"IPV4V6","APN","0<br>.0.0.0 0.0.0.0.0.0.0.0.0.0.0.0.0.0.0<br>",0,0<br>OK<br><b>IPv6 example</b><br>AT+CGDCONT=1,"IPV6","APN","0.0.0<br>.0.0.0.0.0.0.0.0.0.0.0.0.0",0,0<br>OK |
| Read | AT+CGDCONT?                                                                                                                                                             | +CGDCONT: <cid>,<PDP_type>,<APN>,<PDP_addr>,<d_comp>,<h_comp>,<IPv4AddrAlloc>,<emergency_indication>,<P-CSCF_discovery>,<IM_CN_Signalling_Flag_Ind>,<NSLPI>]]                                                      | +CGDCONT: 1,"IP","web.omnitel.it",<br>"91.80.140.199",0,0<br>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 | +CGDCONT: (1-3),"IP",,(0-2),(0-4)<br>OK                                                                                                                                                                                                                                                           |



| Type | Syntax | Response                                                                                                   | Example |
|------|--------|------------------------------------------------------------------------------------------------------------|---------|
|      |        | <P-CSCF_discovery>s),(list of supported <IM_CN_Signalling_Flag_Ind>s),(list of supported <NSLPI>s))]<br>OK |         |

### 13.3.3 Defined values

| Parameter                   | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <cid>                       | Number | See <a href="#">&lt;cid&gt;</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <PDP_type>                  | String | See <a href="#">&lt;PDP_type&gt;</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <APN>                       | String | See <a href="#">&lt;APN&gt;</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <PDP_addr>                  | Number | See <a href="#">&lt;PDP_addr&gt;</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <d_comp>                    | Number | PDP data compression; it can have the values: <ul style="list-style-type: none"> <li>0 (default value): off</li> <li>1: on (predefined compression type i.e. V.42bis data compression)</li> <li>2: V.42bis data compression</li> </ul>                                                                                                                                                                                                                                                                                                                                 |
| <h_comp>                    | Number | PDP header compression; it can have the values: <ul style="list-style-type: none"> <li>0 (default value): off</li> <li>1: on (predefined compression type, i.e. RFC1144)</li> <li>2: RFC1144</li> <li>3: RFC2507</li> <li>4: RFC3095</li> </ul>  <h_comp>: the available head-compressions are dependent on configuration of the stack (configured via features in the stack)                                                                                                        |
| <IPv4AddrAlloc>             | Number | Controls how the MT/TA requests to get the IPv4 address information: <ul style="list-style-type: none"> <li>0 (default value): IPv4 Address Allocation through NAS Signalling</li> <li>1: IPv4 Address Allocated through DHCP</li> </ul>                                                                                                                                                                                                                                                                                                                               |
| <emergency_indication>      | Number | Indicates whether the PDP context is for emergency bearer services or not: <ul style="list-style-type: none"> <li>0 (default value): PDP context is not for emergency bearer services</li> <li>1: PDP context is for emergency bearer services</li> </ul>                                                                                                                                                                                                                                                                                                              |
| <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"> <li>0 (default value): preference of P-CSCF address discovery not influenced by <a href="#">+CGDCONT</a></li> <li>1: preference of P-CSCF address discovery through NAS Signalling</li> <li>2: preference of P-CSCF address discovery through DHCP</li> </ul>                                                                                                                                                            |
| <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"> <li>0: PDP context is not for IM CN subsystem-related signalling only</li> <li>1: PDP context is for IM CN subsystem-related signalling only</li> </ul>                                                                                                                                                                                                                                                                                        |
| <NSLPI>                     | Number | Indicates the NAS signalling priority requested for the corresponding PDP context: <ul style="list-style-type: none"> <li>0 (default value): indicates that the PDP context has to be activated with the value for the low priority indicator configured in the MT.</li> <li>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".</li> </ul> The MT utilises the NSLPI information provided as specified in 3GPP TS 24.301 [88] and 3GPP TS 24.008 [12]. |

### 13.3.4 Notes

#### Additional examples:

| Command                      | Response                              | Description                                                                                             |
|------------------------------|---------------------------------------|---------------------------------------------------------------------------------------------------------|
| AT+CGDCONT=?                 | +CGDCONT: (1-3),"IP",,(0),(0-1)<br>OK | Configure the error result code format by means of the <a href="#">+CMEE</a> AT command<br>Test command |
| AT+CGDCONT=4,"IP","internet" | +CME ERROR: operation not allowed     | Define out of range PDP contexts                                                                        |

| Command                              | Response                                                                                                                                     | Description                      |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| 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<br>+CGDCONT: 1,"IP","STATREAL","0.0.0.0",0,0<br>+CGDCONT: 3,"IP","tim.ibox.it","0.0.0.0",0,0<br>OK | Read command                     |

#### SARA-R4 / SARA-N4

- When registering in LTE, the initial default EPS bearer is mapped to <cid>= 1.
- If not specified by the set command, the following values are assumed:
  - <cid>: 1
  - <PDP\_addr>: "0.0.0.0"
- <d\_comp>=1, 2 are not supported.
- The command setting are stored in the NVM at the module switch off.
- The module automatically accepts Mobile Terminated PDP contexts/EPS bearers.
- The <NSLPI> parameter is not supported.
- <P-CSCF\_discovery>=2 is not supported.

#### SARA-R4 / SARA-N4

- <h\_comp>= 1, 2, 3 and 4 are not supported.
- If <PDP\_addr> is not assigned or set to all zeros and <PDP\_type>="IPV4V6", the read command will only return the all zeros IPV6 address.

#### SARA-R404M

- The settings of the initial default EPS bearer mapped to <cid>= 1 must have a blank APN.

## 13.4 Packet switched data configuration +UPSD

| +UPSD      |                                                                               |              |                |                |               |                 |
|------------|-------------------------------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |              |                |                |               |                 |
| Attributes | Syntax                                                                        | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | partial                                                                       | No           | NVM            | No             | -             | +CME Error      |

### 13.4.1 Description

Sets or reads all the parameters in a specific packet switched data (PSD) profile. The command is used to set up the PDP context parameters for an internal context, i.e. a data connection using the internal IP stack and related AT commands for sockets.

To set all the parameters of the PSD profile a set command for each parameter needs to be issued.



In the read command, if only the first parameter is issued, the module returns all the parameters of the given PSD profile, and lists them in separated lines.

### 13.4.2 Syntax

| Type | Syntax                                       | Response                                          | Example                                            |
|------|----------------------------------------------|---------------------------------------------------|----------------------------------------------------|
| Set  | AT+UPSD=<profile_id>,<param_tag>,<param_val> | OK                                                | AT+UPSD=0,1,"apn.provider.com"<br>OK               |
| Read | AT+UPSD=<profile_id>,<param_tag>             | +UPSD: <profile_id>,<param_tag>,<param_val><br>OK | AT+UPSD=0,1<br>+UPSD: 0,1,"apn.provider.com"<br>OK |

| Type | Syntax               | Response                                                                                                                    | Example                                                                                                                                   |
|------|----------------------|-----------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
|      | AT+UPSD=<profile_id> | +UPSD: <profile_id>,0,<param_val><br>><br>+UPSD: <profile_id>,1,<param_val1>...<br>+UPSD: <profile_id>,x,<param_valx><br>OK | AT+UPSD=0<br>+UPSD: 0,0,0<br>+UPSD: 0,1,"apn.provider.com"<br>+UPSD: 0,2,"username"<br>+UPSD: 0,4,"0.0.0.0"<br>...<br>+UPSD: 0,19,0<br>OK |

### 13.4.3 Defined values

| Parameter    | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <profile_id> | Number | PSD profile identifier, in range 0-6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <param_tag>  | Number | <ul style="list-style-type: none"> <li>0: Protocol type; the allowed values of &lt;param_val&gt; parameter are <ul style="list-style-type: none"> <li>0 (factory-programmed value): IPv4</li> <li>1: IPv6</li> <li>2: IPv4v6 with IPv4 preferred for internal sockets</li> <li>3: IPv4v6 with IPv6 preferred for internal sockets</li> </ul> </li> <li>1: APN - &lt;param_val&gt; defines the APN text string, e.g. "apn.provider.com"; the maximum length is 99. The factory-programmed value is an empty string.</li> <li>2: username - &lt;param_val&gt; is the user name text string for the authentication phase. The factory-programmed value is an empty string.</li> <li>3: password - &lt;param_val&gt; is the password text string for the authentication phase. Note: the AT+UPSD read command with &lt;param_tag&gt; = 3 is not allowed and the read all command does not display it</li> <li>4: DNS1 - &lt;param_val&gt; is the text string of the primary DNS address. IPv4 DNS addresses are specified in dotted decimal notation form (i.e. four numbers in range 0-255 separated by periods, e.g. "xxx.yyy.zzz.www"). IPv6 DNS addresses are specified in standard IPv6 notation form (2001:DB8:: address compression is allowed). The factory-programmed value is "0.0.0.0".</li> <li>5: DNS2 - &lt;param_val&gt; is the text string of the secondary DNS address. IPv4 DNS addresses are specified in dotted decimal notation form (i.e. four numbers in range 0-255 separated by periods, e.g. "xxx.yyy.zzz.www"). IPv6 DNS addresses are specified in standard IPv6 notation form (2001:DB8:: address compression is allowed). The factory-programmed value is "0.0.0.0".</li> <li>6: authentication - the &lt;param_val&gt; parameter selects the authentication type: <ul style="list-style-type: none"> <li>0 (factory-programmed value): none</li> <li>1: PAP</li> <li>2: CHAP</li> <li>3: automatic selection of authentication type (none/CHAP/PAP)</li> </ul> </li> <li>7: IP address - &lt;param_val&gt; is the text string of the static IP address given by the ISP in dotted decimal notation form (i.e. four numbers in range 0-255 separated by periods, e.g. "xxx.yyy.zzz.www"). The factory-programmed value is "0.0.0.0". Note: IP address set as "0.0.0.0" means dynamic IP address assigned during PDP context activation</li> <li>8: data compression - the &lt;param_val&gt; parameter refers to the default parameter named &lt;d_comp&gt; and selects the data compression type: <ul style="list-style-type: none"> <li>0 (factory-programmed value): off</li> <li>1: predefined, i.e. V.42bis</li> <li>2: V.42bis</li> </ul> </li> <li>9: header compression - the &lt;param_val&gt; parameter refers to the default parameter named &lt;h_comp&gt; and selects the header compression type: <ul style="list-style-type: none"> <li>0 (factory-programmed value): off</li> <li>1: predefined, i.e. RFC1144</li> <li>2: RFC1144</li> <li>3: RFC2507</li> <li>4: RFC3095</li> </ul> </li> <li>10: QoS precedence - the &lt;param_val&gt; parameter selects the precedence class:</li> </ul> |

| Parameter | Type | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           |      | <ul style="list-style-type: none"> <li>o 0 (factory-programmed value): subscribed</li> <li>o 1: high</li> <li>o 2: normal</li> <li>o 3: low</li> <li>• 11: QoS delay - the &lt;param_val&gt; parameter selects the delay class: <ul style="list-style-type: none"> <li>o 0 (factory-programmed value): subscribed</li> <li>o 1: class 1</li> <li>o 2: class 2</li> <li>o 3: class 3</li> <li>o 4: best effort</li> </ul> </li> <li>• 12: QoS reliability - the &lt;param_val&gt; parameter selects the reliability class: <ul style="list-style-type: none"> <li>o 0 (factory-programmed value): subscribed</li> <li>o 1: class 1 (Interpreted as class 2)</li> <li>o 2: class 2 (GTP Unack, LLC Ack and Protected, RLC Ack)</li> <li>o 3: class 3 (GTP Unack, LLC Unack and Protected, RLC Ack)</li> <li>o 4: class 4 (GTP Unack, LLC Unack and Protected, RLC Unack)</li> <li>o 5: class 5 (GTP Unack, LLC Unack and Unprotected, RLC Unack)</li> <li>o 6: class 6 (Interpreted as class 3)</li> </ul> </li> <li>• 13: QoS peak rate - the &lt;param_val&gt; parameter selects the peak throughput in range 0-9. The factory-programmed value is 0.</li> <li>• 14: QoS mean rate - the &lt;param_val&gt; parameter selects the mean throughput in range 0-18, 31. The factory-programmed value is 0.</li> <li>• 15: minimum QoS precedence - the &lt;param_val&gt; parameter selects the acceptable value for the precedence class: <ul style="list-style-type: none"> <li>o 0 (factory-programmed value): subscribed</li> <li>o 1: high</li> <li>o 2: normal</li> <li>o 3: low</li> </ul> </li> <li>• 16: minimum QoS delay - the &lt;param_val&gt; parameter selects the acceptable value for the delay class: <ul style="list-style-type: none"> <li>o 0 (factory-programmed value): subscribed</li> <li>o 1: class 1</li> <li>o 2: class 2</li> <li>o 3: class 3</li> <li>o 4: best effort</li> </ul> </li> <li>• 17: minimum QoS reliability - the &lt;param_val&gt; parameter selects the minimum acceptable value for the reliability class: <ul style="list-style-type: none"> <li>o 0 (factory-programmed value): subscribed</li> <li>o 1: class 1 (Interpreted as class 2)</li> <li>o 2: class 2 (GTP Unack, LLC Ack and Protected, RLC Ack)</li> <li>o 3: class 3 (GTP Unack, LLC Unack and Protected, RLC Ack)</li> <li>o 4: class 4 (GTP Unack, LLC Unack and Protected, RLC Unack)</li> <li>o 5: class 5 (GTP Unack, LLC Unack and Unprotected, RLC Unack)</li> <li>o 6: class 6 (Interpreted as class 3)</li> </ul> </li> <li>• 18: minimum QoS peak rate - the &lt;param_val&gt; parameter selects the acceptable value for the peak throughput in range 0-9. The factory-programmed value is 0.</li> <li>• 19: minimum QoS mean rate - the &lt;param_val&gt; parameter selects the acceptable value for the mean throughput in range 0-18, 31. The factory-programmed value is 0.</li> <li>• 20: 3G QoS delivery order - the &lt;param_val&gt; parameter selects the acceptable value for the delivery order: <ul style="list-style-type: none"> <li>o 0 (factory-programmed value): subscribed</li> <li>o 1: enable</li> <li>o 2: disable</li> </ul> </li> <li>• 21: 3G QoS erroneous SDU delivery - the &lt;param_val&gt; parameter selects the acceptable value for the erroneous SDU delivery: <ul style="list-style-type: none"> <li>o 0 (factory-programmed value): subscribed</li> <li>o 1: no detection</li> <li>o 2: enable</li> <li>o 3: disable</li> </ul> </li> </ul> |

| Parameter | Type | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           |      | <ul style="list-style-type: none"> <li>22: 3G QoS extended guaranteed downlink bit rate - &lt;param_val&gt; is the value for the extended guaranteed downlink bit rate in kb/s. The factory-programmed value is 0.</li> <li>23: 3G QoS extended maximum downlink bit rate - &lt;param_val&gt; is the value for the extended maximum downlink bit rate in kb/s. The factory-programmed value is 0.</li> <li>24: 3G QoS guaranteed downlink bit rate - &lt;param_val&gt; is the value for the guaranteed downlink bit rate in kb/s. The factory-programmed value is 0.</li> <li>25: 3G QoS guaranteed uplink bit rate - &lt;param_val&gt; is the value for the guaranteed uplink bit rate in kb/s. The factory-programmed value is 0.</li> <li>26: 3G QoS maximum downlink bit rate - &lt;param_val&gt; is the value for the maximum downlink bit rate in kb/s. The factory-programmed value is 0.</li> <li>27: 3G QoS maximum uplink bit rate - &lt;param_val&gt; is the value for the maximum uplink bit rate in kb/s. The factory-programmed value is 0.</li> <li>28: 3G QoS maximum SDU size - &lt;param_val&gt; is the value for the maximum SDU size in octets. The factory-programmed value is 0.</li> <li>29: 3G QoS residual bit error rate - &lt;param_val&gt; selects the acceptable value for the residual bit error rate: <ul style="list-style-type: none"> <li>0 (factory-programmed value): subscribed</li> <li>1: 5E2</li> <li>2: 1E2</li> <li>3: 5E3</li> <li>4: 4E3</li> <li>5: 1E3</li> <li>6: 1E4</li> <li>7: 1E5</li> <li>8: 1E6</li> <li>9: 6E8</li> </ul> </li> <li>30: 3G QoS SDU error ratio - &lt;param_val&gt; selects the acceptable value for the SDU error ratio: <ul style="list-style-type: none"> <li>0 (factory-programmed value): subscribed</li> <li>1: 1E2</li> <li>2: 7E3</li> <li>3: 1E3</li> <li>4: 1E4</li> <li>5: 1E5</li> <li>6: 1E6</li> <li>7: 1E1</li> </ul> </li> <li>31: 3G QoS signalling indicator - &lt;param_val&gt; selects the acceptable value for the signalling indicator: <ul style="list-style-type: none"> <li>0 (factory-programmed value): subscribed</li> <li>1: signalling indicator 1</li> </ul> </li> <li>32: 3G QoS source statistics descriptor - &lt;param_val&gt; selects the acceptable value for the source statistics descriptor: <ul style="list-style-type: none"> <li>0 (factory-programmed value): subscribed</li> <li>1: source statistics descriptor 1</li> </ul> </li> <li>33: 3G QoS traffic class - &lt;param_val&gt; selects the acceptable value for the traffic class: <ul style="list-style-type: none"> <li>0 (factory-programmed value): subscribed</li> <li>1: conversational</li> <li>2: streaming</li> <li>3: interactive</li> <li>4: background</li> </ul> </li> <li>34: 3G QoS traffic priority - &lt;param_val&gt; selects the acceptable value for the traffic priority: <ul style="list-style-type: none"> <li>0 (factory-programmed value): subscribed</li> <li>1: priority 1</li> <li>2: priority 2</li> <li>3: priority 3</li> </ul> </li> <li>35: 3G QoS transfer delay - &lt;param_val&gt; is the value for the transfer delay in milliseconds. The factory-programmed value is 0.</li> </ul> |

| Parameter | Type | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           |      | <ul style="list-style-type: none"> <li>36: 3G minimum QoS delivery order - &lt;param_val&gt; selects the acceptable value for the delivery order: <ul style="list-style-type: none"> <li>0 (factory-programmed value): subscribed</li> <li>1: enable</li> <li>2: disable</li> </ul> </li> <li>37: 3G minimum QoS erroneous SDU delivery - &lt;param_val&gt; selects the acceptable value for the erroneous SDU delivery: <ul style="list-style-type: none"> <li>0 (factory-programmed value): subscribed</li> <li>1: no detection</li> <li>2: enable</li> <li>3: disable</li> </ul> </li> <li>38: 3G minimum QoS extended guaranteed downlink bit rate - &lt;param_val&gt; is the value for the extended guaranteed downlink bit rate in kb/s. The factory-programmed value is 0.</li> <li>39: 3G minimum QoS extended maximum downlink bit rate - &lt;param_val&gt; is the value for the extended maximum downlink bit rate in kb/s. The factory-programmed value is 0.</li> <li>40: 3G minimum QoS guaranteed downlink bit rate - &lt;param_val&gt; is the value for the guaranteed downlink bit rate in kb/s. The factory-programmed value is 0.</li> <li>41: 3G minimum QoS guaranteed uplink bit rate - &lt;param_val&gt; is the value for the guaranteed uplink bit rate in kb/s. The factory-programmed value is 0.</li> <li>42: 3G minimum QoS maximum downlink bit rate - &lt;param_val&gt; is the value for the maximum downlink bit rate in kb/s. The factory-programmed value is 0.</li> <li>43: 3G minimum QoS maximum uplink bit rate - &lt;param_val&gt; is the value for the maximum uplink bit rate in kb/s. The factory-programmed value is 0.</li> <li>44: 3G minimum QoS maximum SDU size - &lt;param_val&gt; is the value for the maximum SDU size in octets. The factory-programmed value is 0.</li> <li>45: 3G minimum QoS residual bit error rate - &lt;param_val&gt; selects the acceptable value for the residual bit error rate: <ul style="list-style-type: none"> <li>0 (factory-programmed value): subscribed</li> <li>1: 5E2</li> <li>2: 1E2</li> <li>3: 5E3</li> <li>4: 4E3</li> <li>5: 1E3</li> <li>6: 1E4</li> <li>7: 1E5</li> <li>8: 1E6</li> <li>9: 6E8</li> </ul> </li> <li>46: 3G minimum QoS SDU error ratio - &lt;param_val&gt; selects the acceptable value for the SDU error ratio: <ul style="list-style-type: none"> <li>0 (factory-programmed value): subscribed</li> <li>1: 1E2</li> <li>2: 7E3</li> <li>3: 1E3</li> <li>4: 1E4</li> <li>5: 1E5</li> <li>6: 1E6</li> <li>7: 1E1</li> </ul> </li> <li>47: 3G minimum QoS signalling indicator - &lt;param_val&gt; selects the acceptable value for the signalling indicator: <ul style="list-style-type: none"> <li>0 (factory-programmed value): subscribed</li> <li>1: signalling indicator 1</li> </ul> </li> <li>48: 3G minimum QoS source statistics descriptor - &lt;param_val&gt; selects the acceptable value for the source statistics descriptor: <ul style="list-style-type: none"> <li>0 (factory-programmed value): subscribed</li> <li>1: source statistics descriptor 1</li> </ul> </li> <li>49: 3G minimum QoS traffic class - &lt;param_val&gt; selects the acceptable value for the traffic class: <ul style="list-style-type: none"> <li>0 (factory-programmed value): subscribed</li> </ul> </li> </ul> |

| Parameter | Type | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           |      | <ul style="list-style-type: none"> <li>o 1: conversational</li> <li>o 2: streaming</li> <li>o 3: interactive</li> <li>o 4: background</li> <li>• 50: 3G minimum QoS traffic priority - &lt;param_val&gt; selects the acceptable value for the traffic priority: <ul style="list-style-type: none"> <li>o 0 (factory-programmed value): subscribed</li> <li>o 1: priority 1</li> <li>o 2: priority 2</li> <li>o 3: priority 3</li> </ul> </li> <li>• 51: 3G Minimum QoS transfer delay - &lt;param_val&gt; is the value for the transfer delay in milliseconds. The factory-programmed value is 0.</li> <li>• 100: map the +UPSD profile to the specified &lt;cid&gt; in the +CGDCONT table. <ul style="list-style-type: none"> <li>o 1: map the current profile to &lt;cid&gt; 1</li> <li>o 2: map the current profile to &lt;cid&gt; 2</li> <li>o 3: map the current profile to &lt;cid&gt; 3</li> <li>o 4: map the current profile to &lt;cid&gt; 4</li> <li>o 5: map the current profile to &lt;cid&gt; 5</li> <li>o 6: map the current profile to &lt;cid&gt; 6</li> <li>o 7: map the current profile to &lt;cid&gt; 7</li> <li>o 8 (factory-programmed value): map the current profile to &lt;cid&gt; 8</li> </ul> </li> </ul> |

#### 13.4.4 Notes

- For the description of the QoS parameters, see 3GPP TS 22.060 [50] and 3GPP TS 23.060 [10].
- The maximum length of <param\_val> if <param\_tag> is equal to 2 or 3 is 64.

#### SARA-R4 / SARA-N4

- The only supported <profile\_id> is 0.
- The only supported <param\_tag> is 0 (IP type).

### 13.5 GPRS attach or detach +CGATT

| +CGATT     |                                                                    |              |                |                |               |                 |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                 |
|            | SARA-N4                                                            |              |                |                |               |                 |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                                                               | Yes          | No             | Yes            | Up to 3 min   | +CME Error      |

#### 13.5.1 Description

Register (attach) the MT to, or deregister (detach) the MT from the GPRS service. After this command the MT remains in AT command mode. If the MT is already in the requested state (attached or detached), the command is ignored and OK 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.



##### SARA-R4

If MT is configured in class "B" (see the +CGCLASS AT command) and the GSM registration has not yet been performed, AT+CGATT=1 triggers both GSM and GPRS registration. If the command is aborted before the PS registration has ended, the CS registration is completed and the MT goes into class "CC".



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

### 13.5.2 Syntax

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

### 13.5.3 Defined values

| Parameter | Type   | Description                                                                                                                                |
|-----------|--------|--------------------------------------------------------------------------------------------------------------------------------------------|
| <state>   | Number | Indicates the state of GPRS attachment: <ul style="list-style-type: none"> <li>0: detached</li> <li>1 (default value): attached</li> </ul> |

## 13.6 PDP context activate or deactivate +CGACT

| +CGACT     |                                                                               |              |                |                |                               |                 |
|------------|-------------------------------------------------------------------------------|--------------|----------------|----------------|-------------------------------|-----------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |              |                |                |                               |                 |
| Attributes | Syntax                                                                        | PIN required | Settings saved | Can be aborted | Response time                 | Error reference |
|            | full                                                                          | Yes          | No             | Yes            | Up to 40-150 s<br>(see below) | +CME Error      |

### 13.6.1 Description

Activates or deactivates the specified PDP context. After the command, the MT remains in AT command mode. If any context is already in the requested state, the state for the context remains unchanged. If the required action cannot succeed, an error result code is returned. If the MT is not GPRS attached when the activation of a PDP context is required, the MT first performs a GPRS attach and then attempts to activate the specified context.

The maximum expected response time is different whenever the activation or the deactivation of a PDP context is performed (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.

### 13.6.2 Syntax

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

### 13.6.3 Defined values

| Parameter | Type   | Description                                    |
|-----------|--------|------------------------------------------------|
| <status>  | Number | Indicates the state of PDP context activation: |



| Parameter | Type   | Description                                                                            |
|-----------|--------|----------------------------------------------------------------------------------------|
|           |        | <ul style="list-style-type: none"> <li>0: deactivated</li> <li>1: activated</li> </ul> |
| <cid>     | Number | See <a href="#">&lt;cid&gt;</a> .                                                      |

### 13.6.4 Notes

#### SARA-R4 / SARA-N4

- If <cid> is not defined, the command activates or deactivates all the defined PDP contexts.

### 13.6.5 Examples

Examples of usage of [+CGDCONT](#), [+CGACT](#), [+CGPADDR](#) command:

| Command sent by the DTE             | DCE response                                                                                                                                                              | Description                          |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| AT+CMEE=2                           | OK                                                                                                                                                                        | Set the verbose error result codes   |
| AT+COPS=0                           | OK                                                                                                                                                                        |                                      |
| AT+COPS?                            | +COPS: 0,0,"vodafone IT"<br>OK                                                                                                                                            |                                      |
| AT+CGDCONT=1,"IP","web.omnitel.it"  | OK                                                                                                                                                                        | Define several PDP contexts          |
| AT+CGDCONT=3,"IP","internet"        | OK                                                                                                                                                                        |                                      |
| AT+CGDCONT=2,"IP","mms.vodafone.it" | OK                                                                                                                                                                        |                                      |
| AT+CGDCONT?                         | +CGDCONT: 1,"IP","web.omnitel.it","0.0.0.0",0,0<br>+CGDCONT: 3,"IP","internet","0.0.0.0",0,0<br>+CGDCONT: 2,"IP","mms.vodafone.it","0.0.0.0",0,0<br>OK                    | Read PDP contexts                    |
| AT+CGACT=1,1                        | OK                                                                                                                                                                        | Activate the PDP context 1           |
| AT+CGPADDR=1                        | +CGPADDR: 1, "91.80.104.82"<br>OK                                                                                                                                         | Show address of the PDP context 1    |
| AT+CGPADDR=2                        | +CGPADDR: 2, "0.0.0.0"<br>OK                                                                                                                                              | Show the address of PDP context 2    |
| AT+CGPADDR=3                        | +CGPADDR: 3, "0.0.0.0"<br>OK                                                                                                                                              | Show the address of PDP context 3    |
| AT+CGDCONT?                         | +CGDCONT: 1,"IP","web.omnitel.it","91.80.104.82",0,0<br>+CGDCONT: 3,"IP","internet","0.0.0.0",0,0<br>+CGDCONT: 2,"IP","mms.vodafone.it","0.0.0.0",0,0<br>OK               |                                      |
| AT+CGACT=0,1                        | OK                                                                                                                                                                        | Deactivate the PDP context 1         |
| AT+CGDCONT?                         | +CGDCONT: 1,"IP","web.omnitel.it","0.0.0.0",0,0<br>+CGDCONT: 3,"IP","internet","0.0.0.0",0,0<br>+CGDCONT: 2,"IP","mms.vodafone.it","0.0.0.0",0,0<br>OK                    |                                      |
| AT+CGACT=1                          | OK                                                                                                                                                                        | Activate all of defined PDP contexts |
| AT+CGDCONT?                         | +CGDCONT: 1,"IP","web.omnitel.it","91.80.101.207",0,0<br>+CGDCONT: 3,"IP","internet","83.225.114.136",0,0<br>+CGDCONT: 2,"IP","mms.vodafone.it","10.159.135.60",0,0<br>OK |                                      |
| AT+CGPADDR=1                        | +CGPADDR: 1, "91.80.101.207"<br>OK                                                                                                                                        | Show the address of PDP context 1    |

| Command sent by the DTE | DCE response                                                                                                                                                              | Description                            |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|
| AT+CGPADDR=2            | +CGPADDR: 2, "10.159.135.60"<br>OK                                                                                                                                        | Show the address of PDP context 2      |
| AT+CGACT=0              | OK                                                                                                                                                                        | Deactivate all of defined PDP contexts |
| AT+CGPADDR=2            | +CGPADDR: 2, "0.0.0.0"<br>OK                                                                                                                                              | Show the address of PDP context 2      |
| AT+CGPADDR=3            | +CGPADDR: 3, "0.0.0.0"<br>OK                                                                                                                                              | Show the address of PDP context 3      |
| AT+CGDCONT?             | +CGDCONT: 1,"IP","web.omnitel.it","0.0.0.0",0,0<br>+CGDCONT: 3,"IP","internet","0.0.0.0",0,0<br>+CGDCONT: 2,"IP","mms.vodafone.it","0.0.0.0",0,0<br>OK                    |                                        |
| AT+CGACT=1,2            | OK                                                                                                                                                                        | Activate the PDP context 2             |
| AT+CGDCONT?             | +CGDCONT: 1,"IP","web.omnitel.it","0.0.0.0",0,0<br>+CGDCONT: 3,"IP","internet","0.0.0.0",0,0<br>+CGDCONT: 2,"IP","mms.vodafone.it","10.153.123.229",0,0<br>OK             |                                        |
| AT+CGACT=1,3            | OK                                                                                                                                                                        | Activate PDP context 3                 |
| AT+CGDCONT?             | +CGDCONT: 1,"IP","web.omnitel.it","0.0.0.0",0,0<br>+CGDCONT: 3,"IP","internet","83.225.171.77",0,0<br>+CGDCONT: 2,"IP","mms.vodafone.it","10.153.123.229",0,0<br>OK       |                                        |
| AT+CGACT=1,1            | OK                                                                                                                                                                        | Activate the PDP context 1             |
| AT+CGDCONT?             | +CGDCONT: 1,"IP","web.omnitel.it","91.80.175.163",0,0<br>+CGDCONT: 3,"IP","internet","83.225.171.77",0,0<br>+CGDCONT: 2,"IP","mms.vodafone.it","10.153.123.229",0,0<br>OK |                                        |
| AT+CGACT=0              | OK                                                                                                                                                                        | Deactivate all of defined PDP contexts |
| AT+CGDCONT?             | +CGDCONT: 1,"IP","web.omnitel.it","0.0.0.0",0,0<br>+CGDCONT: 3,"IP","internet","0.0.0.0",0,0<br>+CGDCONT: 2,"IP","mms.vodafone.it","0.0.0.0",0,0<br>OK                    |                                        |

## 13.7 Enter PPP state/GPRS dial-up D\*

| D*         |                                                                    |              |                |                |               |                 |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                 |
|            | SARA-N4                                                            |              |                |                |               |                 |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                                                               | Yes          | No             | No             | Up to 3 min   | +CME Error      |

### 13.7.1 Description

The V.24 dial command "D", similar to the command with the syntax [AT+CGDATA="PPP",<cid>](#), causes the MT to perform the necessary actions to establish the communication between the DTE and the external PDP network through the PPP protocol. This can include performing a PS attach and, if the PPP server on the DTE side starts communication, PDP context activation on the specified PDP context identifier (if not already requested by means of [+CGATT](#) and [+CGACT](#) commands).

If the command is accepted and the preliminary PS procedures have succeeded, the "CONNECT" intermediate result code is returned, the MT enters the V.25ter online data state and the PPP L2 protocol between the MT and the DTE is started.



The data session is terminated by one of the following events:

- sending ~+++.
- via a DTR transition from ON to OFF.
- sending an LCP Terminate Request.

If used with <cid>= 100, this command can enable the local dial-up, that establishes a PPP communication between the DTE and the module through a serial interface (UART, MUX, or CDC-ACM). In this case an active PDP context is not needed since the DTE is assigned a private IP address.

### 13.7.2 Local dial-up

The local dial-up feature is enabled by performing a dial-up on <cid>= 100. It establishes a PPP communication between the DTE and the module through a serial interface (UART, MUX, or CDC-ACM). An IP link is created by assigning private IP addresses to the endpoints. An active PDP context is not needed. The IP traffic is automatically routed by the module, thus allowing the DTE to communicate with:

- the internet through an active PDP context (at least one PDP context/EPS bearer is needed for the IP connectivity). By default, the first PDP context activated is used to convey the data;
- a device connected to the Virtual Ethernet over USB (RNDIS/CDC-ECM);
- devices (STA) connected to the Wi-Fi access point (AP) of the cellular module (see [Wi-Fi section](#)).

The feature has been studied to work in router mode.

In general no defined / no active context is required to use local dial-up. The local dial-up is in any case able to communicate with the interfaces connected to the module IP stack, as for example RNDIS and Wi-Fi interfaces.

The local dial-up feature does not support the OnLine Command Mode (OLCM). Furthermore the DTR ON to OFF transition and the ~+++ cannot be used to terminate the local dial-up (the procedure described in [~+++ behavior in PSD & D](#) is not applicable).

The PIN insertion is not mandatory for the local dial-up feature.

### 13.7.3 Syntax

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

### 13.7.4 Defined values

| Parameter           | Type   | Description                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <dialing_type_char> | String | Optional (legacy) "T" or "P" character indicating the tone dialing or pulse dialing respectively                                                                                                                                                                                                                                                                                 |
| <dialing_number>    | Number | List all the supported values                                                                                                                                                                                                                                                                                                                                                    |
| <address>           | -      | Ignored                                                                                                                                                                                                                                                                                                                                                                          |
| <L2P>               | String | Layer 2 protocol to be used between the DTE and MT; allowed values: <ul style="list-style-type: none"> <li>• "PPP" (default value)</li> <li>• "M-HEX"</li> <li>• "M-RAW_IP"</li> <li>• "M-OPT-PPP"</li> </ul>  The application on the remote side must support the selected protocol as well. |
| <cid>               | Number | See <a href="#">&lt;cid&gt;</a>                                                                                                                                                                                                                                                                                                                                                  |

### 13.7.5 Notes

- Dial up with PAP/CHAP authentication is not supported on an already active PDP context that was activated without authentication.
- The context identifier <cid> is mapped to 1 if not specified.
- The GPRS dial-up command maps to AT+CGDATA="PPP",<cid>.

- If FDN is enabled and FDN check for PS data call is supported by the module, to perform a GPRS dial-up one of the following entries must be stored in the FDN phonebook: \*99#, \*99\*#, \*99\*\*# or \*99\*\*\*#.

#### SARA-R4 / SARA-N4

- The local dial-up feature is not supported.

## 13.8 Show PDP address +CGPADDR

| +CGPADDR          |                                                                               |                     |                       |                       |                      |                            |
|-------------------|-------------------------------------------------------------------------------|---------------------|-----------------------|-----------------------|----------------------|----------------------------|
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                       |                       |                      |                            |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b>     |
|                   | full                                                                          | Yes                 | No                    | No                    | -                    | <a href="#">+CME Error</a> |

### 13.8.1 Description

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

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

### 13.8.2 Syntax

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

### 13.8.3 Defined values

| Parameter  | Type   | Description                          |
|------------|--------|--------------------------------------|
| <cid>      | Number | See <a href="#">&lt;cid&gt;</a>      |
| <PDP_addr> | Number | See <a href="#">&lt;PDP_addr&gt;</a> |

## 13.9 GPRS event reporting +CGEREP

| +CGEREP           |                                                     |                     |                       |                       |                      |                            |
|-------------------|-----------------------------------------------------|---------------------|-----------------------|-----------------------|----------------------|----------------------------|
| <b>Modules</b>    | SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                       |                       |                      |                            |
| <b>Attributes</b> | <b>Syntax</b>                                       | <b>PIN required</b> | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b>     |
|                   | partial                                             | Yes                 | No                    | No                    | -                    | <a href="#">+CME Error</a> |

### 13.9.1 Description

Configures sending of URCs from MT to the DTE, in case of certain events occurring during GPRS signalling between the MT and the network.

### 13.9.2 Syntax

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

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

### 13.9.3 Defined values

| Parameter   | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <mode>      | Number | Controls the processing of URCs specified within this command. Allowed values: <ul style="list-style-type: none"> <li>0 (default value): buffer URCs in the MT; if the buffer is full the oldest ones will be discarded</li> <li>1: discard URCs when V.24 link is reserved (online); otherwise forward them directly to the DTE</li> <li>2: buffer URCs in the MT when link reserved (online) and flush them to the DTE when the link becomes available; otherwise forward them directly to the DTE</li> </ul> |
| <bfr>       | Number | Controls the effect on buffered codes when <mode> 1 or 2 is entered. Allowed values: <ul style="list-style-type: none"> <li>0 (default value): MT buffer of URCs defined within this command is cleared when &lt;mode&gt; 1 or 2 is entered</li> <li>1: MT buffer of URCs defined within this command is flushed to the DTE when &lt;mode&gt; 1 or 2 is entered (OK is given before flushing the codes)</li> </ul>                                                                                              |
| <cid>       | Number | See <cid>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <reason>    | Number | Indicates whether the reason why the context activation request for PDP type IPv4v6 was not granted: <ul style="list-style-type: none"> <li>0: IPv4 only allowed</li> <li>1: IPv6 only allowed</li> <li>2: single address bearers only allowed</li> <li>3: single address bearers only allowed and MT initiated context activation for a second address type bearer was not successful</li> </ul>                                                                                                               |
| <cid_other> | Number | Indicates whether the context identifier allocated by MT for an MT initiated context of a second address type                                                                                                                                                                                                                                                                                                                                                                                                   |
| <p_cid>     | Number | Numeric parameter that identifies the particular PDP context definition, specified using +CGDCONT, to which a secondary PDP context definition will be associated using +CGDSCONT.                                                                                                                                                                                                                                                                                                                              |

| Parameter       | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                 |        | This parameter is only locally valid on the interface TE-MT.                                                                                                                                                                                                                                                                                                                                                                |
| <event_type>    | Number | Indicates whether the event is informational or whether the TE has to acknowledge it: <ul style="list-style-type: none"> <li>0: informational event</li> <li>1: information request: acknowledgement required</li> </ul>                                                                                                                                                                                                    |
| <change_reason> | Number | Indicates what kind of change occurred: <ul style="list-style-type: none"> <li>1: TFT only changed</li> <li>2: QoS only changed</li> <li>3: both TFT and QoS changed</li> </ul>                                                                                                                                                                                                                                             |
| <PDP_type>      | Number | See <a href="#">&lt;PDP_type&gt;</a>                                                                                                                                                                                                                                                                                                                                                                                        |
| <PDP_addr>      | Number | See <a href="#">&lt;PDP_addr&gt;</a>                                                                                                                                                                                                                                                                                                                                                                                        |
| <class>         | String | GPRS mobile class. Allowed values: <ul style="list-style-type: none"> <li>"A": class A mode of operation (A/Gb mode), or CS/PS mode of operation (lu mode) (highest mode of operation)</li> <li>"B": class B (circuit-switched and packet-switched data alternatively supported)</li> <li>"CG": class C (one service only) in GPRS mode</li> <li>"CC": class C (one service only) in circuit-switched (GSM) mode</li> </ul> |

### 13.9.4 Explanation of URCs

| URC                                                                | Remarks                                                                                                           |
|--------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| +CGEV: ME PDN ACT <cid>[,<reason>[,<cid_other>]]                   | The MT has activated a primary context.                                                                           |
| +CGEV: ME ACT <p_cid>,<cid>,<event_type>                           | The network has responded to a MT initiated secondary context activation.                                         |
| +CGEV: ME PDN DEACT <cid>                                          | The MT has forced a primary context deactivation.                                                                 |
| +CGEV: ME DEACT <PDP_type>,<PDP_addr>[,<cid>]                      | The MT has forced a context deactivation.                                                                         |
| +CGEV: ME DEACT,<p_cid>,<cid>,0                                    | The UE has forced a secondary context deactivation.                                                               |
| +CGEV: ME DEACT <p_cid>,<cid>,<event_type>                         | The MT has forced a secondary context deactivation.                                                               |
| +CGEV: ME MODIFY <cid>,<change_reason>,<event_type>                | The MT has forced a context modification.                                                                         |
| +CGEV: ME DETACH                                                   | The mobile station has forced a GPRS detach                                                                       |
| +CGEV: ME CLASS <class>                                            | The mobile station has forced a change of MT class; the highest available class is reported                       |
| +CGEV: NW PDN ACT <cid>[,<reason>]                                 | The network has activated a primary context.                                                                      |
| +CGEV: NW ACT <p_cid>,<cid>,<event_type>                           | The network has forced a secondary context deactivation.                                                          |
| +CGEV: NW PDN DEACT <cid>                                          | The network has forced a primary context deactivation.                                                            |
| +CGEV: NW DEACT,<p_cid>,<cid>,0                                    | The network has forced a secondary context deactivation.                                                          |
| +CGEV: NW DEACT <p_cid>,<cid>,<event_type>                         | The network has forced a secondary context deactivation.                                                          |
| +CGEV: NW DEACT <PDP_type>,<PDP_addr>[,<cid>]                      | The network has forced a context deactivation.                                                                    |
| +CGEV: NW MODIFY <cid>,<change_reason>,<event_type>                | The network has forced a context modification.                                                                    |
| +CGEV: NW DETACH                                                   | The network has forced a GPRS detach                                                                              |
| +CGEV: NW CLASS <class>                                            | The network has forced a change of MT class (e.g. due to service detach); the highest available class is reported |
| +CGEV: VZW_SUBS_ACTION_NORMAL (0) - No restriction to data traffic | No restriction to data traffic. The URC is provided only on Verizon network.                                      |

## 13.10 GPRS network registration status +CGREG

| +CGREG     |                                          |              |                |                |               |                            |
|------------|------------------------------------------|--------------|----------------|----------------|---------------|----------------------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                            |
|            | SARA-N4                                  |              |                |                |               |                            |
| Attributes | Syntax                                   | PIN required | Settings saved | Can be aborted | Response time | Error reference            |
|            | partial                                  | No           | No             | No             | -             | <a href="#">+CME Error</a> |

### 13.10.1 Description

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

- +CGREG: <stat> if <n>=1 and there is a change in the GPRS network registration status in GERAN/UTRAN
- +CGREG: <stat>[,<lac>,<ci>[,<AcT>,<rac>]] if <n>=2 and there is a change of the network cell in GERAN/UTRAN

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

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



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



If the GPRS MT also supports circuit mode services in GERAN/UTRAN and/or EPS services in E-UTRAN, the +CREG / +CEREG commands return the registration status and location information for those services.

### 13.10.2 Syntax

| Type | Syntax         | Response                                                                                                           | Example                                                       |
|------|----------------|--------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|
| Set  | AT+CGREG=[<n>] | OK                                                                                                                 | AT+CGREG=1<br>OK                                              |
| Read | AT+CGREG?      | If <n>=0 or 1:<br>+CGREG: <n>,<stat><br>OK<br>If <n>=2:<br>+CGREG: <n>,<stat>[,<lac>,<ci>[,<br><AcT>,<rac>]]<br>OK | +CGREG: 0,4<br>OK<br>+CGREG: 2,1,"61EF","7D58A3",2,"14"<br>OK |
| Test | AT+CGREG=?     | +CGREG: (list of supported <n>s)<br>OK                                                                             | +CGREG: (0-2)<br>OK                                           |
| URC  |                | If <n>=1:<br>+CGREG: <stat><br>If <n>=2:<br>+CGREG: <stat>[,<lac>,<ci>[,<AcT>,<rac>]]                              | +CGREG: 1<br>+CGREG: 1,"4E54","44A5"                          |

### 13.10.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <n>       | Number | <ul style="list-style-type: none"> <li>• 0 (default value and factory-programmed value): network registration URC disabled</li> <li>• 1: network registration URC enabled</li> <li>• 2: network registration and location information URC enabled</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                      |
| <stat>    | Number | <ul style="list-style-type: none"> <li>• 0: not registered, the MT is not currently searching an operator to register to</li> <li>• 1: registered, home network</li> <li>• 2: not registered, but MT is currently searching a new operator to register to</li> <li>• 3: registration denied</li> <li>• 4: unknown (e.g. out of GERAN/UTRAN coverage)</li> <li>• 5: registered, roaming</li> <li>• 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) (applicable only when &lt;AcT&gt; indicates 2,4,5,6)</li> </ul> |
| <lac>     | String | Two bytes location area in hexadecimal format; it is optionally provided in the URC and in the response to the read command if <n>=2. The value FFFF means that the current <lac> value is invalid.                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <ci>      | String | From 2 to 4 bytes cell ID in hexadecimal format; it is optionally provided in the URC and in the response to the read command if <n>=2. The value FFFFFFFF means that the current <ci> value is invalid.                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <AcT>     | Number | Indicates the radio access technology:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

| Parameter | Type   | Description                                                                                                                                                                                                                                                                                                                              |
|-----------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           |        | <ul style="list-style-type: none"> <li>0: GSM</li> <li>1: GSM COMPACT</li> <li>2: UTRAN</li> <li>3: GSM with EDGE availability</li> <li>4: UTRAN with HSDPA availability</li> <li>5: UTRAN with HSUPA availability</li> <li>6: UTRAN with HSDPA and HSUPA availability</li> <li>255: the current &lt;AcT&gt; value is invalid</li> </ul> |
| <rac>     | String | One byte routing area in hexadecimal format                                                                                                                                                                                                                                                                                              |

### 13.10.4 Notes

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

## 13.11 Manual deactivation of a PDP context H

|                   |                                                                               |                     |                       |                       |                      |                        |
|-------------------|-------------------------------------------------------------------------------|---------------------|-----------------------|-----------------------|----------------------|------------------------|
| <b>H</b>          |                                                                               |                     |                       |                       |                      |                        |
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                       |                       |                      |                        |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b> |
|                   | full                                                                          | No                  | No                    | No                    | < 20 s               | -                      |

### 13.11.1 Description

This command H (On-hook) deactivates a pending PDP context with PPP L2 protocol in online command mode. The MT responds with OK. See [Chapter 6.3](#) for a detailed description.



In GPRS online command mode, entered by typing the escape sequence "+++" or "~+++" (see [Chapter 10.3.4](#)), the ATH command is needed to terminate the connection. Alternatively, in data transfer mode, DTE originated DTR toggling or PPP disconnection may be used.

### 13.11.2 Syntax

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

## 13.12 UE modes of operation for EPS +CEMODE

|                   |                                                     |                     |                       |                       |                      |                        |
|-------------------|-----------------------------------------------------|---------------------|-----------------------|-----------------------|----------------------|------------------------|
| <b>+CEMODE</b>    |                                                     |                     |                       |                       |                      |                        |
| <b>Modules</b>    | SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                       |                       |                      |                        |
| <b>Attributes</b> | <b>Syntax</b>                                       | <b>PIN required</b> | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b> |
|                   | full                                                | No                  | NVM                   | No                    | -                    | +CME Error             |

### 13.12.1 Description

Sets the MT to operate according to the specified mode of operation for EPS, see 3GPP TS 24.301 [88]. If the requested operation mode is not supported, an error result code is returned.



u-blox cellular modules are certified according to all the capabilities and options stated in the Protocol Implementation Conformance Statement document (PICS) of the module. The PICS, according to 3GPP TS 51.010-2 [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.



### 13.12.2 Syntax

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

### 13.12.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <mode>    | Number | Mode configuration: <ul style="list-style-type: none"> <li>0: PS mode 2 of operation. The UE registers only to EPS services, and the UE's usage setting is "data centric"</li> <li>1 (default and factory-programmed value for voice capable devices): CS/PS mode 1 of operation. The UE registers to both EPS and non-EPS services, and the UE's usage setting is "voice centric"</li> <li>2 (default and factory-programmed value for voice not-capable devices): CS/PS mode 2 of operation. The UE registers to both EPS and non-EPS services, and the UE's usage setting is "data centric"</li> <li>3: PS mode 1 of operation. The UE registers only to EPS services, and the UE's usage setting is "voice centric"</li> </ul> |

### 13.12.4 Notes

- A UE set to "Data centric" does not disable the E-UTRAN capability if voice services cannot be obtained. Upon receiving combined EPS/IMSI attach accept or combined TA/LA Update accept with "SMS-only" indication, a data centric UE stays in the current RAT and is not allowed to use CSFB. Upon receiving combined EPS/IMSI attach accept or combined TA/LA Update accept with "CSFB Not Preferred" indication, a data centric UE stays in the current RAT and is allowed to use CSFB.
- A UE set to "Voice centric" shall always try to ensure that Voice service is possible. A CSFB and an IMS/CS-voice capable UE set to "Voice centric" unable to obtain voice service in E-UTRAN (e.g. CSFB and IMS voice are not supported or the configured preferences on how to handle voice services prevent usage of any available voice services), shall disable the E-UTRAN capability, which results in re-selecting GERAN or UTRAN. The E-UTRAN capability is re-enabled by the UE under the conditions described in 3GPP TS 24.301 [88].
- If +CEMODE is set to EPS-only (<mode>=0 or <mode>=3) the **+CGCLASS** command setting is automatically updated to class "CG".

#### SARA-R4 / SARA-N4

- The set command is not supported. The operation mode for EPS is network operator specific and handled via the **+UMNOPROF** command.

## 13.13 EPS network registration status +CEREG

| +CEREG            |                                                                               |                     |                       |                       |                      |                        |
|-------------------|-------------------------------------------------------------------------------|---------------------|-----------------------|-----------------------|----------------------|------------------------|
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                       |                       |                      |                        |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b> |
|                   | full                                                                          | No                  | No                    | No                    | -                    | <b>+CME Error</b>      |

### 13.13.1 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.



#### SARA-R4 / SARA-N4

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

### 13.13.2 Syntax

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

### 13.13.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-----------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <n>       | Number | Mode configuration: <ul style="list-style-type: none"> <li>• 0 (default value): network registration URC disabled</li> <li>• 1: network registration URC +CEREG: &lt;stat&gt; enabled</li> <li>• 2: network registration and location information URC +CEREG: &lt;stat&gt;[,&lt;tac&gt;],[&lt;ci&gt;],[&lt;AcT&gt;]] enabled</li> <li>• 3: network registration, location information and EMM cause value information URC +CEREG: &lt;stat&gt;[,&lt;tac&gt;],[&lt;ci&gt;],[&lt;AcT&gt;],[&lt;cause_type&gt;,&lt;reject_cause&gt;]] enabled</li> <li>• 4: PSM, network registration and location information information URC +CEREG: &lt;stat&gt;[,&lt;tac&gt;],[&lt;ci&gt;],[&lt;AcT&gt;][,&lt;Active-Time&gt;],[&lt;Periodic-TAU&gt;]]]] enabled</li> <li>• 5: PSM, network registration, location information and EMM cause value information URC +CEREG: &lt;stat&gt;[,&lt;tac&gt;],[&lt;ci&gt;],[&lt;AcT&gt;][,&lt;cause_type&gt;],[&lt;reject_cause&gt;][,&lt;Active-Time&gt;],[&lt;Periodic-TAU&gt;]]]] enabled</li> </ul> |
| <stat>    | Number | EPS registration status: <ul style="list-style-type: none"> <li>• 0: not registered, the MT is not currently searching an operator to register to</li> <li>• 1: registered, home network</li> <li>• 2: not registered, but the MT is currently trying to attach or searching an operator to register to</li> <li>• 3: registration denied</li> <li>• 4: unknown (e.g. out of E-UTRAN coverage)</li> <li>• 5: registered, roaming</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

| Parameter      | Type   | Description                                                                                                                                                                                                                                                                                                                  |
|----------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                |        | <ul style="list-style-type: none"> <li>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)</li> </ul>                                                                            |
| <ta>           | String | Two bytes tracking area code in hexadecimal format                                                                                                                                                                                                                                                                           |
| <ci>           | String | Four bytes E-UTRAN cell-id in hexadecimal format                                                                                                                                                                                                                                                                             |
| <AcT>          | Number | Access technology of the serving cell: <ul style="list-style-type: none"> <li>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)</li> <li>8: E-UTRAN EC-GSM-IoT (A/Gb mode)</li> <li>9: E-UTRAN Cat NB1</li> </ul> |
| <cause_type>   | Number | <reject_cause> type: <ul style="list-style-type: none"> <li>0: indicates that &lt;reject_cause&gt; contains an EMM cause value, see 3GPP TS 24.301 [88] Annex A</li> <li>1: indicates that &lt;reject_cause&gt; contains a manufacture-specific cause</li> </ul>                                                             |
| <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]                                                                                                                       |

### 13.13.4 Notes

#### SARA-R4 / SARA-N4

- <ta>, <ci> and <AcT> should be ignored when the module is not registered.

#### SARA-R404M / SARA-R410M-01B / SARA-R410M-02B

- <n>= 4 and 5 are not supported.

#### SARA-R410M-01B / SARA-R410M-02B

- <AcT>=8 reports LTE Cat M1.

## 13.14 Delete non-active PDP contexts +CGDEL

| +CGDEL     |                                                                            |              |                |                |               |                 |
|------------|----------------------------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M SARA-N4 |              |                |                |               |                 |
| Attributes | Syntax                                                                     | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                                                                       | No           | No             | No             | -             | +CME Error      |

### 13.14.1 Description

Removes the indicated PDP context and removes all the associated data related to the indicated PDP contexts that are not activated. The AT command does not delete or remove the information for activated PDP contexts. The removed PDP context is listed by the +CGDEL: <cid> IRC.

If the <cid> parameter points to a primary PDP context, the PDP context will be deleted together with all the linked secondary PDP contexts if none of the PDP contexts are activated.

If the <cid> parameter points to a secondary PDP context, the PDP context will be deleted if it is not activated.



If the parameter <cid> is omitted, all the primary PDP contexts that are not activated or that have any activated secondary PDP contexts will be removed and all secondary PDP contexts that are not activated will be removed. The associated data of all the deleted PDP contexts will be removed, and the removed PDP context are listed by the +CGDEL: <cid>[,<cid>,...]] IRC.



The command removes the associated PDP context data that can be set by the AT commands +CGDCONT, +CGDSCONT, +CGTFT, +CGEQREQ, +CGEQMIN and +CGEQOS. For an attempt to delete PDP context(s) which would violate these rules, an error result code is returned.

### 13.14.2 Syntax

| Type | Syntax           | Response                          | Example                       |
|------|------------------|-----------------------------------|-------------------------------|
| Set  | AT+CGDEL=[<cid>] | +CGDEL: <cid>[,<cid>[,...]]<br>OK | AT+CGDEL=2<br>+CGDEL: 2<br>OK |
| Test | AT+CGDEL=?       | OK                                | OK                            |

### 13.14.3 Defined values

| Parameter | Type   | Description                     |
|-----------|--------|---------------------------------|
| <cid>     | Number | See <a href="#">&lt;cid&gt;</a> |

## 13.15 Configure the authentication parameters of a PDP/EPS bearer +UAUTHREQ

| +UAUTHREQ  |                                                     |              |                     |                |               |                            |
|------------|-----------------------------------------------------|--------------|---------------------|----------------|---------------|----------------------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |              |                     |                |               |                            |
| Attributes | Syntax                                              | PIN required | Settings saved      | Can be aborted | Response time | Error reference            |
|            | partial                                             | Yes          | <a href="#">NVM</a> | No             | -             | <a href="#">+CME Error</a> |

### 13.15.1 Description

Configures the authentication parameters of a defined PDP/EPS bearer. The authentication parameters will be sent during the context activation phase as a protocol configuration options (PCO) information element.

When <auth\_type>=3 is set, [+CGACT=1,<cid>](#) may trigger at most 3 PDP context activation requests for <cid> to the protocol stack. The first request for <cid> is done with no authentication. If the PDP context activation fails, a second attempt is triggered with PAP authentication. If the second PDP context activation fails, a third attempt is triggered with CHAP authentication. These 3 PDP context activation requests are not to be confused with the effective number of request PDP context activations sent to the network (see the 3GPP TS 24.008 [12]).



The command returns an error result code if the input <cid> is already active or not yet defined.

### 13.15.2 Syntax

| Type | Syntax                                              | Response                                                                        | Example                             |
|------|-----------------------------------------------------|---------------------------------------------------------------------------------|-------------------------------------|
| Set  | AT+UAUTHREQ=<cid>,<auth_type>,<username>,<password> | OK                                                                              | AT+UAUTHREQ=1,1,"user","pass"<br>OK |
| Test | AT+UAUTHREQ=?                                       | +UAUTHREQ: (list of supported <cid>s),(list of supported <auth_type>s)[,]<br>OK | +UAUTHREQ: (1-8),(0-2),,<br>OK      |

### 13.15.3 Defined values

| Parameter   | Type   | Description                                                                                                                                                                                                                  |
|-------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <cid>       | Number | See <a href="#">&lt;cid&gt;</a> .                                                                                                                                                                                            |
| <auth_type> | Number | Configure the authentication. Allowed values: <ul style="list-style-type: none"> <li>0: no authentication</li> <li>1: PAP</li> <li>2: CHAP</li> <li>3: automatic selection of authentication type (none/CHAP/PAP)</li> </ul> |
| <username>  | String | Username. The default value is an empty string: <ul style="list-style-type: none"> <li>SARA-R4 / SARA-N4 - The maximum length is 64.</li> </ul>                                                                              |
| <password>  | String | Password. The default value is an empty string: <ul style="list-style-type: none"> <li>SARA-R4 / SARA-N4 - The maximum length is 64.</li> </ul>                                                                              |

### 13.15.4 Notes

- In a PPP dial-up scenario, the authentication parameters set by the +UAUTHREQ command are overwritten whenever the host provides a new setting via the PPP authentication protocol (PAP or CHAP).
- The <username> and <password> parameters must be set to an empty string if the authentication type is not set (<auth\_type>=0).

#### SARA-R4 / SARA-N4

- <auth\_type>=3 is not supported.

## 13.16 PDP IP configuration when roaming +UDCONF=75

| +UDCONF=75 |                                                     |              |                |                |               |                 |
|------------|-----------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |              |                |                |               |                 |
| Attributes | Syntax                                              | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                                                | Yes          | NVM            | No             | -             | +CME Error      |

### 13.16.1 Description

Configures the PDP IP when roaming. When set, the PDP IP can be limited to IPv4, IPv6, or IPv4v6 when roaming on a network.

 The configuration will be effective at the next power on.

 Only one PDP profile can be set using this command.

### 13.16.2 Syntax

| Type | Syntax                           | Response                              | Example                               |
|------|----------------------------------|---------------------------------------|---------------------------------------|
| Set  | AT+UDCONF=75,<cid>,<PDP_IP_conf> | OK                                    | AT+UDCONF=75,1,0<br>OK                |
| Read | AT+UDCONF=75                     | +UDCONF: 75,<cid>,<PDP_IP_conf><br>OK | AT+UDCONF=75<br>+UDCONF: 75,1,0<br>OK |

### 13.16.3 Defined values

| Parameter     | Type   | Description                                                                                                                                          |
|---------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| <cid>         | Number | See <cid>.                                                                                                                                           |
| <PDP_IP_conf> | Number | PDP IP configuration when roaming: <ul style="list-style-type: none"> <li>• 0: IP</li> <li>• 1: IPv6</li> <li>• 2: IPv4v6</li> </ul> See <PDP_type>. |

### 13.16.4 Notes

#### SARA-R4 / SARA-N4

- Set the <PDP\_IP\_conf> parameter before to read it.

## 13.17 Enable/Disable data when roaming +UDCONF=76

| +UDCONF=76 |                                          |              |                |                |               |                 |
|------------|------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                 |
|            | SARA-N4                                  |              |                |                |               |                 |
| Attributes | Syntax                                   | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                                     | Yes          | NVM            | No             | -             | +CME Error      |

### 13.17.1 Description

Configures the PDP to enable or disable when roaming. When set to disabled, the PDP will not be able to send data when roaming on a network.

 The configuration will be effective at the next power on.

 Only one PDP profile can be set using this command.

### 13.17.2 Syntax

| Type | Syntax                         | Response                            | Example                               |
|------|--------------------------------|-------------------------------------|---------------------------------------|
| Set  | AT+UDCONF=76,<cid>,<Data_Flag> | OK                                  | AT+UDCONF=76,1,0<br>OK                |
| Read | AT+UDCONF=76                   | +UDCONF: 76,<cid>,<Data_Flag><br>OK | AT+UDCONF=76<br>+UDCONF: 76,1,0<br>OK |

### 13.17.3 Defined values

| Parameter   | Type   | Description                                                                                                                                                                |
|-------------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <cid>       | Number | See <a href="#">&lt;cid&gt;</a> .                                                                                                                                          |
| <Data_Flag> | Number | PDP data configuration when roaming: <ul style="list-style-type: none"> <li>0 (default value): data enabled when roaming</li> <li>1: data disabled when roaming</li> </ul> |

### 13.17.4 Notes

#### SARA-R4 / SARA-N4

- Set the <Data\_Flag> parameter before to read it.

## 14 System features

### 14.1 Firmware installation +UFWINSTALL

| +UFWINSTALL |                                                                    |              |                |                |               |                                  |
|-------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|----------------------------------|
| Modules     | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                                  |
|             | SARA-N4                                                            |              |                |                |               |                                  |
| Attributes  | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference                  |
|             | full                                                               | No           | No             | No             | -             | <a href="#">FW Install Error</a> |

#### 14.1.1 Description

Triggers the FW installation procedure, starting from the file (update binary file) stored in the module file system. It could be used as a part of implementation of the FOTA procedure. The command causes a SW system reset with network deregistration.

During the update process, the device cannot be used to make calls, even emergency calls. The update process is fault tolerant, even if the battery is suddenly removed.

At the end of a successful installation, the main firmware software boots up, NVM and profiles data are set to the factory-programmed values of the new firmware version and the SIM is reset (the PIN will be required if enabled).

-  SARA-R4 / SARA-N4  
Refer to the specific firmware update release notes for information concerning NVM after installing the firmware.
-  Once the command has been sent correctly, the FW resets and at the next boot-up, the FW install will start.
-  In case of power loss during the install phase, at the next module wake-up a fault is detected and the module remains in Firmware Install Mode until the end of the procedure (install terminated).

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

#### 14.1.2 Syntax

| Type | Syntax          | Response | Example             |
|------|-----------------|----------|---------------------|
| Set  | AT+UFWINSTALL   | OK       | AT+UFWINSTALL<br>OK |
| Test | AT+UFWINSTALL=? | OK       | OK                  |

#### 14.1.3 Notes

##### SARA-R4 / SARA-N4

- After the command is issued, the module reboots and starts the install process which can take up to 20 minutes long. No result codes are issued on the terminal during this phase and both UART and USB interfaces are unavailable for the communication. At the end of the update process the module reboots again with the new firmware installed.
- Store the update file on the device; the procedure for storing is up to the user (+UFTPC, +UFWUPD or +UDWNFILE).

## 14.2 Firmware update Over AT (FOAT) +UFWUPD

| +UFWUPD           |                                                                               |                     |                       |                       |                      |                            |
|-------------------|-------------------------------------------------------------------------------|---------------------|-----------------------|-----------------------|----------------------|----------------------------|
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                       |                       |                      |                            |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b>     |
|                   | partial                                                                       | No                  | No                    | No                    | -                    | <a href="#">FOAT Error</a> |

### 14.2.1 Description

Triggers the firmware update using the Xmodem or Xmodem-1k protocol.

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

-  The errors (data corruption, data loss, etc.) during the Update phase are internally handled by the Xmodem protocol itself; for more details about the error result codes, see [FOAT error result codes](#).
-  If no data comes to the module after having issued the AT+UFWUPD command, up to ten NACK are sent and then Firmware Update Mode is dropped out coming back to normal mode; the FW is unchanged and still useable (ERROR1).
-  For more details, see the u-blox Firmware Update Application Note [\[86\]](#).

### 14.2.2 Description

Making use of the file triggers the firmware download using the Xmodem or Xmodem-1k protocols.

-  In case of power loss during the download, at the next module wake-up the module remains in Firmware Download Mode expecting that the download restarts from the beginning.

### 14.2.3 Syntax

| Type | Syntax               | Response                                                                                                  | Example                                                                                                                      |
|------|----------------------|-----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| Set  | AT+UFWUPD=<filetype> | +UFWUPD: ONGOING<br><br>CCC<NACK><NACK><NACK><br><NACK><NACK><NACK><NACK><br><NACK><NACK><NACK><br><br>OK | AT+UFWUPD=3<br><br>+UFWUPD: ONGOING<br><br>CCC<NACK><NACK><NACK><br><NACK><NACK><NACK><NACK><br><NACK><NACK><NACK><br><br>OK |
| Test | AT+UFWUPD=?          | +UFWUPD: (list of supported<br><filetype>s)<br><br>OK                                                     | +UFWUPD: (3)<br><br>OK                                                                                                       |

### 14.2.4 Defined values

| Parameter  | Type   | Description                                                                               |
|------------|--------|-------------------------------------------------------------------------------------------|
| <filetype> | Number | Download type: <ul style="list-style-type: none"> <li>3: firmware image update</li> </ul> |

### 14.2.5 Notes

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- Status updates on the file transfer via CCC or <NACK><NACK><NACK> are not sent to the terminal.



## 14.3 Antenna detection +UANTR

| +UANTR     |                                                                    |              |                |                |               |                 |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                 |
|            | SARA-N4                                                            |              |                |                |               |                 |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                                                               | No           | No             | No             | -             | +CME Error      |

### 14.3.1 Description

Measures the DC component of load of the cellular antenna (the GPS antenna is RFU). The antenna load is expressed in kOhm.

### 14.3.2 Syntax

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

### 14.3.3 Defined values

| Parameter      | Type   | Description                                                                                                                                                                                                                                                                                                                                                                           |
|----------------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <antenna_id>   | Number | Antenna identifier (optional parameter) <ul style="list-style-type: none"> <li>0 (default value): cellular antenna</li> <li>1: GPS antenna (RFU)</li> </ul>                                                                                                                                                                                                                           |
| <antenna_load> | Number | Measured value in kOhm of the antenna load with a resolution of 1 kOhm. The range goes from -1 to 53 (only integer values can be assumed), where: <ul style="list-style-type: none"> <li>-1: open circuit</li> <li>0: short circuit</li> <li>1: 1 kOhm (minimum limit of the measurement range)</li> <li>...</li> <li>53: 53 kOhm (maximum limit of the measurement range)</li> </ul> |

### 14.3.4 Notes

- The load resistor values below the minimum limit of 1 kOhm are identified as short circuit (<antenna\_load>=0), while values above the maximum limit of 53 kOhm are identified as open circuit (<antenna\_load>=-1).
- The reported value could differ from the real resistance value of the diagnostic resistor mounted inside the antenna assembly due to antenna cable length, antenna cable capacity and the measurement method.

## 14.4 Power saving control (Power SaVing) +UPSV

| +UPSV      |                |              |                |                |               |                 |
|------------|----------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R410M-52B |              |                |                |               |                 |
|            | SARA-N4        |              |                |                |               |                 |
| Attributes | Syntax         | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | partial        | No           | Profile        | No             | -             | +CME Error      |

### 14.4.1 Description

Sets the UART power saving configuration, but it has a global effect on the module power saving configuration:

- If the power saving is enabled (+UPSV: 4), the UART interface is disabled after 6 s of inactivity and the module enters the idle mode automatically whenever possible

- If the power saving is disabled (+UPSV: 0), the UART interface is always enabled and the module does not enter the idle mode

### 14.4.2 Syntax

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

### 14.4.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                  |
|-----------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <mode>    | Number | Power saving configuration. Allowed values: <ul style="list-style-type: none"> <li>• 0 (default and factory-programmed value): power saving disabled</li> <li>• 4: power saving is controlled by the UART <b>TX</b> line activity</li> </ul> |

### 14.4.4 Notes

- For a detailed explanation of modules' operating modes, modules and interfaces behavior in reference to the +UPSV command setting, see the corresponding system integration manual.

## 14.5 End user test +UTEST

| +UTEST            |                                                                               |                     |                       |                       |                      |                            |
|-------------------|-------------------------------------------------------------------------------|---------------------|-----------------------|-----------------------|----------------------|----------------------------|
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                       |                       |                      |                            |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b>     |
|                   | full                                                                          | No                  | No                    | No                    | -                    | <a href="#">+CME Error</a> |

### 14.5.1 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.

### 14.5.2 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):

- 2G transmission of a GSM burst sequence on the desired channel and power level (only one time slot configuration is available)
- 2G transmission of an 8-PSK modulation burst sequence on the desired channel and power level (only one time slot configuration is available)
- 3G transmission of a WCDMA signal on the desired channel and power level
- 4G transmission of an LTE SC-FDMA OFDM signal (5 MHz bandwidth) in the desired channel in the FDD band and power level

- 4G transmission of LTE SC-FDMA OFDM signal (5 MHz bandwidth) in the desired channel in TDD band and power level
- Receiving signal detection and RF level measurement on the desired 2G, 3G or 4G (LTE) channel
- Receiving signal detection at diversity or secondary antenna input and RF level measurement on the desired 2G, 3G or 4G (LTE) channel

 The command only accepts the parameter set supported by the specific module version. When an unsupported parameter is issued, an error result code will be provided ("CME ERROR: operation not supported" or "CME ERROR: 4" depending on the [+CMEE](#) AT command setting).

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

- The module only accepts +UTEST commands

 SARA-R4 / SARA-N4  
The module also accepts some non-signaling related commands. Although it is recommended that only +UTEST commands are used.

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: operation not allowed" or "CME ERROR: 3" depending on the [+CMEE](#) AT command setting)

 The module must not be registered with the network before entering the non-signalling mode, otherwise an error result code ("CME ERROR: operation not allowed" or "CME ERROR: 3" depending on the [+CMEE](#) AT command setting) is provided.

 The [+CMEE](#) 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

When the module returns the normal mode, the network registration status stored in the profile will be restored.

 See the End User Test Application Note [\[133\]](#) for further test command examples.

### 14.5.3 Syntax

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

### 14.5.4 Defined values

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

| Parameter       | Type   | Description                                                               |
|-----------------|--------|---------------------------------------------------------------------------|
| <par1>..<<par5> | Number | Parameters needed for RX and TX test mode as reported in the table below. |

### 14.5.5 Notes

- Check the corresponding module data sheet for the list of supported bands and Radio Access Technologies (RAT).
- RX mode setting (<mode>=2)**

| Parameter | Description | Range      | Default | Notes                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------|-------------|------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <par1>    | Channel     | 0 ÷ 165535 | 32      | <p>RX channel 2G RAT: for 850, 900, 1800 bands the value corresponds to ARFCN while for 1900 band an offset of 32768 is added.</p> <ul style="list-style-type: none"> <li>[0-124]: GSM 900 MHz</li> <li>[128-251]: GSM 850 MHz</li> <li>[512-885]: DCS 1800 MHz</li> <li>[975-1023]: EGSM 900 MHz</li> <li>[33280-33578]: PCS 1900 MHz (corresponding to ARFCN 512-810 range in band 1900)</li> </ul> |

RX channel 3G RAT: the value corresponds to UARFCN except for band 19 where an offset of 20000 is added, additional channels available in some 3G bands are not supported.

- [1537-1738]: band 4 (1700 MHz)
- [2937-3088]: band 8 (900 MHz)
- [4357-4458]: band 5 (850 MHz)
- [4387-4413]: band 6 (800 MHz)
- [20712-20763]: band 19 (800 MHz)
- [9662-9938]: band 2 (1900 MHz)
- [10562-10838]: band 1 (2100 MHz)
- [10050-10125]: TD-SCDMA band 34 (2000 MHz)
- [9400-9600]: TD-SCDMA band 39 (1900 MHz)

RX channel 4G RAT: the value corresponds to EARFCN with an offset of 100000.

| <par1> range      | LTE band | EARFCN range    |
|-------------------|----------|-----------------|
| [100000-100599]   | FDD 1    | [0 - 599]       |
| [100600-101199]   | FDD 2    | [600 - 1199]    |
| [101200-101949]   | FDD 3    | [1200 - 1949]   |
| [101950-102399]   | FDD 4    | [1950 - 2399]   |
| [102400-102649]   | FDD 5    | [2400 - 2649]   |
| [102650-102749]   | FDD 6    | [2650 - 2749]   |
| [102750-103449]   | FDD 7    | [2750 - 3449]   |
| [103450-103799]   | FDD 8    | [3450 - 3799]   |
| [103800-104149]   | FDD 9    | [3800 - 4149]   |
| [105010-105179]   | FDD 12   | [5010 - 5179]   |
| [105180-105279]   | FDD 13   | [5180 - 5279]   |
| [105730-105849]   | FDD 17   | [5730 - 5849]   |
| [106000-106149]   | FDD 19   | [6000 - 6149]   |
| [106150-106449]   | FDD 20   | [6150 - 6449]   |
| [108040 - 108689] | FDD 25   | [8040 - 8689]   |
| [108690 - 109039] | FDD 26   | [8690 - 9039]   |
| [109210-109659]   | FDD 28   | [9210 - 9659]   |
| [109660-109769]   | FDD 29   | [9660 - 9769]   |
| [136200-136349]   | TDD 34   | [36200 - 36349] |
| [137750-138249]   | TDD 38   | [37750 - 38249] |
| [138250-138649]   | TDD 39   | [38250 - 38649] |
| [138650-139649]   | TDD 40   | [38650 - 39649] |

| Parameter | Description | Range | Default | Notes                                                                                                                                                                                    |
|-----------|-------------|-------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           |             |       |         | <div> <div>&lt;par1&gt; range</div> <div>[139650-141589]</div> </div> <div> <div>LTE band</div> <div>TDD 41</div> </div> <div> <div>EARFCN range</div> <div>[39650 - 41589]</div> </div> |

**Table 11: <par1> parameter range**


The "+CME ERROR: operation not supported" or "+CME ERROR: 4" error result code will be provided in these cases (depending on the +CMEE AT command setting):

- 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

|        |                                     |            |      |                                                                                                                                                                                                                                                                                                                                              |
|--------|-------------------------------------|------------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <par2> | Time                                | 1 ÷ 600000 | 1000 | Time interval for RX test expressed in ms                                                                                                                                                                                                                                                                                                    |
| <par3> | Antenna diversity                   | 0 ÷ 1      | 0    | Receiver path: <ul style="list-style-type: none"> <li>o 0: main / primary antenna</li> <li>o 1: diversity / secondary antenna</li> </ul> The parameter is available only if supported, otherwise an error result code will be provided (" +CME ERROR: operation not supported" or "+CME ERROR: 4" depending on the +CMEE AT command setting) |
| <min>  | Minimum antenna RF level estimation | -100 ÷ -20 |      | Expressed in dBm, for 2G RAT <div>            SARA-R4 / SARA-N4<br/>           The range goes from -75 to -20.         </div>                                                                                                                               |
| <avg>  | Average antenna RF level estimation | -100 ÷ -20 |      | Expressed in dBm, for 2G RAT <div>            SARA-R4 / SARA-N4<br/>           The range goes from -75 to -20.         </div>                                                                                                                             |
| <max>  | Maximum antenna RF level estimation | -100 ÷ -20 |      | Expressed in dBm, for 2G RAT <div>            SARA-R4 / SARA-N4<br/>           The range goes from -75 to -20.         </div>                                                                                                                             |

#### • TX mode setting (<mode>=3)

| Parameter | Description | Range      | Default | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------|-------------|------------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <par1>    | Tx channel  | 0 ÷ 165535 | 32      | TX channel 2G RAT: for 850, 900, 1800 bands the value corresponds to ARFCN while for 1900 band an offset of 32768 is added. <ul style="list-style-type: none"> <li>o [0-124]: GSM 900 MHz</li> <li>o [128-251]: GSM 850 MHz</li> <li>o [512-885]: DCS 1800 MHz</li> <li>o [975-1023]: EGSM 900 MHz</li> <li>o [33280-33578]: PCS 1900 MHz (corresponding to ARFCN 512-810 range in band 1900)</li> </ul> TX channel 3G RAT: the value corresponds to UARFCN except for the band 19 where an offset of 20000 is added, additional channels available in some 3G bands are not supported. <ul style="list-style-type: none"> <li>o [1312-1513]: band 4 (1700 MHz)</li> <li>o [2712-2863]: band 8 (900 MHz)</li> <li>o [4132-4233]: band 5 (850 MHz)</li> <li>o [4162-4188]: band 6 (800 MHz)</li> <li>o [20312-20363]: band 19 (800 MHz)</li> <li>o [9262-9538]: band 2 (1900 MHz)</li> <li>o [9612-9888]: band 1 (2100 MHz)</li> <li>o [10050-10125]: TD-SCDMA band 34 (2000 MHz)</li> <li>o [9400-9600]: TD-SCDMA band 39 (1900 MHz)</li> </ul> TX channel 4G RAT: the value corresponds to EARFCN with an offset of 100000. |

| Parameter | Description | Range | Default | Notes                                    |
|-----------|-------------|-------|---------|------------------------------------------|
|           |             |       |         | <b>&lt;par1&gt; range</b>                |
|           |             |       |         | <b>LTE band</b>                          |
|           |             |       |         | <b>EARFCN range</b>                      |
|           |             |       |         | [118000-118599] FDD 1 [18000 - 18599]    |
|           |             |       |         | [118600-119199] FDD 2 [18600 - 19199]    |
|           |             |       |         | [119200-119949] FDD 3 [19200 - 19949]    |
|           |             |       |         | [119950-120399] FDD 4 [19950 - 20399]    |
|           |             |       |         | [120400-120649] FDD 5 [20400 - 20649]    |
|           |             |       |         | [120650-120749] FDD 6 [20650 - 20749]    |
|           |             |       |         | [120750-121449] FDD 7 [20750 - 21449]    |
|           |             |       |         | [121450-121799] FDD 8 [21450 - 21799]    |
|           |             |       |         | [121800-122149] FDD 9 [21800 - 22149]    |
|           |             |       |         | [123010-123179] FDD 12 [23010 - 23179]   |
|           |             |       |         | [123180-123279] FDD 13 [23180 - 23279]   |
|           |             |       |         | [123730-123849] TDD 17 [23730 - 23849]   |
|           |             |       |         | [124000-124149] FDD 19 [24000 - 24149]   |
|           |             |       |         | [124150-124449] FDD 20 [24150 - 24449]   |
|           |             |       |         | [126040 - 126689] FDD 25 [26040 - 26689] |
|           |             |       |         | [126690 - 127039] FDD 26 [26690 - 27039] |
|           |             |       |         | [127210-127659] FDD 28 [27210 - 27659]   |
|           |             |       |         | [136200-136349] TDD 34 [36200 - 36349]   |
|           |             |       |         | [137750-138249] TDD 38 [37750 - 38249]   |
|           |             |       |         | [138250-138649] TDD 39 [38250 - 38649]   |
|           |             |       |         | [138650-139649] TDD 40 [38650 - 39649]   |
|           |             |       |         | [139650-141589] TDD 41 [39650 - 41589]   |

**Table 12: <par1> parameter range**


The "+CME ERROR: operation not supported" or "+CME ERROR: 4" error result code will be provided in these cases (depending on the +CMEE AT command setting):

- 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



Avoid channels that would put the TX waveform outside the band due to SC-FDMA modulation bandwidth.

|        |                     |          |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------|---------------------|----------|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <par2> | Power control level | -56 ÷ 24 | 5 | <p>For 2G RAT: PCL (power control level). The allowed values depend on the related &lt;par1&gt; value: lower numbers means higher power level.</p> <ul style="list-style-type: none"> <li>o [0-19]: GSM 850 and 900, if &lt;par2&gt; is less than 5 the handling is the same for &lt;par2&gt;=5</li> <li>o [0-15]: DCS 1800 and PCS 1900</li> </ul> <p>In case &lt;par4&gt; is set to 2 (8-PSK modulation) the range is as below. Other values are valid but behave as the indicated level:</p> <ul style="list-style-type: none"> <li>o [0-19]: GSM 850 and 900 if &lt;par2&gt; is less than 8 the handling is the same for &lt;par2&gt;=8</li> <li>o [0-15]: DCS 1800 and PCS 1900; if &lt;par2&gt; is less than 2 the handling is the same for &lt;par2&gt;=2</li> </ul> <p>For 3G RAT: absolute output power [dBm]</p> <ul style="list-style-type: none"> <li>o [-56 ÷ 24] for all the bands</li> </ul> <p>For 4G RAT: absolute output power [dBm]</p> <ul style="list-style-type: none"> <li>o [-40 ÷ 24] for all the bands</li> </ul> <p>Only the values indicated in the above ranges are valid, otherwise an error result code will be provided</p> |
|--------|---------------------|----------|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| Parameter | Description       | Range      | Default | Notes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------|-------------------|------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           |                   |            |         | ("+CME ERROR: operation not supported" or "+CME ERROR: 4" depending on the +CMEE AT command setting).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <par3>    | Training sequence | 0 ÷ 7      | 5       | Training sequence to be used (to be changed only in case of link with network simulator, else use default)<br> In 3G / 4G RAT the values is unused.                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <par4>    | Modulation mode   | 1 ÷ 2      | 1       | Modulation mode:<br>o 1: GMSK normal modulation including the training sequence<br>o 2: 8-PSK normal modulation including the training sequence<br> In 3G / 4G RAT the parameter is ignored.<br> LTE SC-FDMA OFDM modulation (5 MHz bandwidth), FDD, is automatically set using for <par1> an EARFCN value.<br> The LTE Cat.M1 SC-FDMA OFDM modulation (1.4 MHz bandwidth), FDD, is automatically set using an EARFCN value for the <par1> parameter. |
| <par5>    | Time              | 0 ÷ 600000 | 1000    | Time interval for TX test expressed in ms<br>o 0: burst sequence is continuously transmitted. In this case the command will immediately return the information text response. The command line will be immediately available for any +UTEST command. Provide AT+UTEST=1 command to stop the burst sequence transmission, any other +UTEST commands can be set and the current sequence transmission is stopped.                                                                                                                                                                                                                                                                                          |

## 14.5.6 SARA-R4 Examples



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

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

| Command              | Response                                | Description                                                                                                             |
|----------------------|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| AT+UTEST=2,105230,,1 | +UTEST: 105230,1000,1,-72,-71,-70<br>OK | The module measures the antenna RX level at RX channel 5230 band FDD 13 for 1 s interval on the secondary antenna path. |

**Table 13: RX mode test command examples**

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

**Table 14: TX mode test command examples**

### 14.5.7 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 +CME 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-R4 / SARA-N4

See the End User Test Application Note [133] and the corresponding module data sheet for the list of pins available for testing and their levels characteristics and further test command examples.

### 14.5.8 Syntax

| Type                                | Syntax | Response | Example |
|-------------------------------------|--------|----------|---------|
| Digital pins testing generic syntax |        |          |         |



| Type                                    | Syntax                                          | Response                                  | Example                                     |
|-----------------------------------------|-------------------------------------------------|-------------------------------------------|---------------------------------------------|
| Set                                     | AT+UTEST=10,<op_code>[,<bit_padding>]<pin_seq>] | OK                                        | AT+UTEST=10,3,"0000001000000300"<br>OK      |
| <b>Original configuration restoring</b> |                                                 |                                           |                                             |
| Set                                     | AT+UTEST=10,0                                   | OK                                        | AT+UTEST=10,0<br>OK                         |
| <b>Pins set definition</b>              |                                                 |                                           |                                             |
| Set                                     | AT+UTEST=10,2,<bit_padding>]<pin_seq>]          | OK                                        | AT+UTEST=10,2,"0000000C300000003000"<br>OK  |
| <b>Pins configuration</b>               |                                                 |                                           |                                             |
| Set                                     | AT+UTEST=10,3,<bit_padding>]<pin_seq>]          | OK                                        | AT+UTEST=10,3,"00000004200000001000"<br>OK  |
| <b>Output pins definition</b>           |                                                 |                                           |                                             |
| Set                                     | AT+UTEST=10,4,<bit_padding>]<pin_seq>]          | OK                                        | AT+UTEST=10,4,"00000000100000002000"<br>OK  |
| <b>Digital testing execution</b>        |                                                 |                                           |                                             |
| Set                                     | AT+UTEST=10,5                                   | OK                                        | AT+UTEST=10,5<br>OK                         |
| <b>Digital value measurement</b>        |                                                 |                                           |                                             |
| Set                                     | AT+UTEST=10,6                                   | <bit_padding>]<pin_seq><br>OK             | AT+UTEST=10,6<br>00000004100000003000<br>OK |
| Read                                    | AT+UTEST?                                       | +UTEST: <mode><br>OK                      | +UTEST: 1<br>OK                             |
| Test                                    | AT+UTEST=?                                      | +UTEST: (list of supported <mode>s)<br>OK | +UTEST: (0-3)<br>OK                         |

### 14.5.9 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <op_code> | Number | <p>Test mode setting:</p> <ul style="list-style-type: none"> <li>0: exits the test interface and restore the pins to the original configuration</li> <li>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 [&lt;bit_padding&gt;]&lt;pin_seq&gt; parameter use this notation to represent each module pin with its binary digit: <ul style="list-style-type: none"> <li>0: the pin will not be tested</li> <li>1: the pin will be tested (as digital input or output)</li> </ul> </li> <li>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. <p>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 [&lt;bit_padding&gt;]&lt;pin_seq&gt; parameter use this notation to represent each module pin with its binary digit:</p> <ul style="list-style-type: none"> <li>0: the pin will be set as an output</li> <li>1: the pin will be set as an input</li> </ul> </li> <li>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 [&lt;bit_padding&gt;]&lt;pin_seq&gt; parameter use this notation to represent each module pin with its binary digit: <ul style="list-style-type: none"> <li>0: the pin will output a "low" logic level</li> <li>1: the pin will output a "high" logic level</li> </ul> </li> </ul> |

| Parameter                | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                          |        | <ul style="list-style-type: none"> <li>5: apply the setting change defined with &lt;op_code&gt;= 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.</li> <li>6: returns the logic value of pins under testing (both input and output); in the [&lt;bit_padding&gt;]&lt;pin_seq&gt; parameter use this notation to represent each module pin with its binary digit: <ul style="list-style-type: none"> <li>0: "low" logic digital level measured at the module pin</li> <li>1: "high" logic digital level measured at the module pin</li> </ul> </li> </ul> |
| [<bit_padding>]<pin_seq> | Number | Sequence of hexadecimal digits containing the pin information and the action to execute: <ul style="list-style-type: none"> <li>SARA-R4 / SARA-N4 - See the <a href="#">Notes</a> and End User Test Application Note <a href="#">[133]</a> for detailed number description</li> </ul>                                                                                                                                                                                                                                                                                                                                                                               |

### 14.5.10 Notes

- Consider these steps to construct the [<bit\_padding>]<pin\_seq> sequence:
  - Consider the total number of the module's pins available
    - SARA-R4 / SARA-N4 - 64 pins
  - 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.
  - The status of the n-th pin will be represented by the corresponding n-th bit; see the <op\_code> description for the notation of each mode setting
  - Convert each group of four binary digits into its hexadecimal representation
-  SARA-R4 / SARA-N4  
See the End User Test Application Note [\[133\]](#) for the list of pins available for testing.
- An example of the AT commands sequence to test the digital pins is reported in [Table 15](#).

| Command                              | Response                   | Description                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------------------------|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                      |                            | Configure the formatting of the error result code by means of +CMEE 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,"000007F400C000D83F00" | OK                         | The command puts the module in Interface initialised state; the command saves the pins status to restore it at the end of the test.<br><br>Pins enabled for testing: DSR, RI, DCD, DTR, RTS, CTS, GPIO1, GPIO2, GPIO3, GPIO4, I2S1_RXD/GPIO6, I2S1_TXD/GPIO7, GPIO5, I2S1_CLK/GPIO8, I2S1_WA/GPIO9, SPI_SCLK/GPIO10, SPI_MOSI/GPIO11, SPI_MISO/GPIO12, SPI_SRDY/GPIO13, SPI_MRDY/GPIO14 |
| AT+UTEST=10,3,"00000494004000C01800" | OK                         | Pins configuration: <ul style="list-style-type: none"> <li>DTR, RTS, GPIO3, GPIO4, I2S1_RXD/GPIO6, GPIO5, I2S1_CLK/GPIO8, SPI_MOSI/GPIO11, SPI_MRDY/GPIO14 as input</li> <li>DSR, RI, DCD, CTS, GPIO1, GPIO2, I2S1_TXD/GPIO7, I2S1_WA/GPIO9, SPI_SCLK/GPIO10, SPI_MISO/GPIO12, SPI_SRDY/GPIO13 as output</li> </ul>                                                                     |
| AT+UTEST=10,4,"00000360008000182700" | OK                         | Digital logic value of the output pins: <ul style="list-style-type: none"> <li>DSR, RI, DCD, CTS, GPIO1, GPIO2, I2S1_TXD/GPIO7, I2S1_WA/GPIO9, SPI_SCLK/GPIO10, SPI_MISO/GPIO12, SPI_SRDY/GPIO13 set to "high".</li> </ul>                                                                                                                                                              |
| 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<br>OK | Logic digital value measured at modules pins: <ul style="list-style-type: none"> <li>DSR, RI, DCD, DTR, RTS, CTS, GPIO1, GPIO2, GPIO3, GPIO4, I2S1_RXD/GPIO6, I2S1_TXD/GPIO7, GPIO5, I2S1_CLK/GPIO8, I2S1_WA/GPIO9, SPI_SCLK/GPIO10, SPI_MOSI/GPIO11, SPI_MISO/GPIO12, SPI_SRDY/GPIO13, SPI_MRDY/GPIO14: "high" level detected</li> </ul>                                               |

| Command    | Response | Description                                                                 |
|------------|----------|-----------------------------------------------------------------------------|
| AT+UTEST=0 | OK       | Module exits from the test mode and normal pins configurations is restored. |

**Table 15: 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.

## 14.6 Internal temperature monitor +UTEMP

| +UTEMP     |                |              |                |                |               |                            |
|------------|----------------|--------------|----------------|----------------|---------------|----------------------------|
| Modules    | SARA-R410M-52B |              |                |                |               |                            |
|            | SARA-N4        |              |                |                |               |                            |
| Attributes | Syntax         | PIN required | Settings saved | Can be aborted | Response time | Error reference            |
|            | partial        | No           | No             | No             | -             | <a href="#">+CME Error</a> |

### 14.6.1 Description

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

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

- SARA-R4 / SARA-N4 - The AT command returns the value measured by the temperature sensor on the **Die**.

### 14.6.2 Syntax

| Type | Syntax          | Response                                 | Example             |
|------|-----------------|------------------------------------------|---------------------|
| Set  | AT+UTEMP=<unit> | OK                                       | AT+UTEMP=0<br>OK    |
| Read | AT+UTEMP?       | +UTEMP: <die_temp><br>OK                 | +UTEMP: 310<br>OK   |
| Test | AT+UTEMP=?      | +UTEMP: (list of supported <unit>)<br>OK | +UTEMP: (0-1)<br>OK |

### 14.6.3 Defined values

| Parameter  | Type   | Description                                                                                                                                                                                                                                                                                            |
|------------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <unit>     | Number | Select the measurement unit for value representation: <ul style="list-style-type: none"> <li>0: values in tenth of Celsius degrees returned</li> <li>1: values in tenth of Fahrenheit degrees returned</li> </ul>                                                                                      |
| <die_temp> | Number | Fetched value of Die temperature of the selected measurement unit; the allowed range depends on the measurement unit: <ul style="list-style-type: none"> <li>Celsius degrees: [-40; 140]</li> <li>Fahrenheit degrees: [-40; 284]</li> <li>655355: no valid temperature measure is available</li> </ul> |

## 14.7 Power Saving Mode Setting +CPSMS

| +CPSMS     |                                                                    |              |                     |                |               |                            |
|------------|--------------------------------------------------------------------|--------------|---------------------|----------------|---------------|----------------------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                     |                |               |                            |
|            | SARA-N4                                                            |              |                     |                |               |                            |
| Attributes | Syntax                                                             | PIN required | Settings saved      | Can be aborted | Response time | Error reference            |
|            | partial                                                            | Yes          | <a href="#">NVM</a> | No             | < 10 s        | <a href="#">+CME Error</a> |

### 14.7.1 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)



SARA-R4

The URCs provided by the **+CEREG** AT commands for the Active Time value and the extended periodic TAU value are not supported.



SARA-R4

The read command will return the requested values. See the **+UCPSMS** AT command to get the values assigned from the network.

## 14.7.2 Syntax

| Type | Syntax                                                                                                                                           | Response                                                                                                                                                                                                                             | Example                                                                        |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| Set  | AT+CPSMS=[<mode>[,<br><Requested_Periodic_RAU>[,<br><Requested_GPRS_READY_timer>[,<br><Requested_Periodic_TAU>[,<br><Requested_Active_Time>]]]]] | OK                                                                                                                                                                                                                                   | AT+CPSMS=1,,,"01000011","01000011"<br>OK                                       |
| Read | AT+CPSMS?                                                                                                                                        | +CPSMS: <mode>,[<Requested_Periodic_RAU>],[<Requested_GPRS_READY_timer>],[<Requested_Periodic_TAU>],[<Requested_Active_Time>]<br>OK                                                                                                  | +CPSMS: 1,,,"01000011","01000011"<br>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)<br>OK | +CPSMS: (0,1,2),,,"00000000"-<br>"11111111"),("00000000"-<br>"11111111")<br>OK |

## 14.7.3 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"> <li>• 0 (default and factory-programmed value): disable the use of PSM</li> <li>• 1: enable the use of PSM</li> <li>• 2: disable the use of PSM and reset all parameters for PSM to factory-programmed values.</li> </ul>   |
| <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 |

| Parameter               | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                         |        | 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"> <li>SARA-R4 - The factory-programmed value is 150 s. The default value is "01100000".</li> </ul>                                                                                                                                                                                                                                                                                                                       |
| <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"> <li>SARA-R4 - The factory-programmed value is 6 s. The default value is "00000000".</li> </ul>                                                                                                                                                                                                                                                                                                                         |

## 14.7.4 Notes

- The <Requested\_Periodic\_RAU> and <Requested\_GPRS\_READY\_timer> parameters are not supported.

### SARA-R4

- <mode>= 2 is not supported.
- Reboot the module after enabling the Power Save Mode in order to enter the PSM state.
- The PSM mode cannot be enabled with a PIN enabled UICC card.

## 14.8 Power Saving Mode Assigned Values +UCPSMS

| +UCPSMS    |                                                                    |              |                |                |               |                 |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |              |                |                |               |                 |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                                                               | Yes          | No             | No             | -             | +CME Error      |

### 14.8.1 Description

Reads the UEs power saving mode (PSM) parameters assigned by the network. The command returns the state of 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

To be noticed that

- Power saving mode enabled (+UCPSMS: 1): everything on the device is powered down except for 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.
- Power saving mode disabled (+UCPSMS: 0): the device will not enter the Power Save Mode (PSM).

### 14.8.2 Syntax

| Type | Syntax     | Response                                                                                                                             | Example                                      |
|------|------------|--------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
| Read | AT+UCPSMS? | +UCPSMS: <mode>,[<Assigned_Periodic_RAU>],[<Assigned_GPRS_READY_timer>],[<Assigned_Periodic_TAU>],[<Assigned_Active_Time>]<br><br>OK | +UCPSMS: 1,,,"01000011","01000011"<br><br>OK |

### 14.8.3 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"> <li>0: use of PSM disabled</li> <li>1: use of PSM enabled</li> </ul> |

| Parameter                   | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <Assigned_Periodic_RAU>     | String | Assigned extended periodic RAU (T3312) value 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]                                                                                                                                                                                                                                                                      |
| <Assigned_GPRS_READY_timer> | String | Assigned GPRS READY timer (T3314) value 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]                                                                                                                                                                                                                                                                     |
| <Assigned_Periodic_TAU>     | String | One byte in an 8 bit format. Assigned extended periodic TAU value (T3412) allocated to the device in E-UTRAN. The Assigned extended periodic TAU value is coded as one byte (octet 3) of the GPRS Timer 3 information element coded as bit format (e.g. "01000111" equals 70 hours). For the coding and the value range, see the GPRS Timer 3 IE in 3GPP TS 24.008 Table 10.5.163a/3GPP TS 24.008 [12]. See also 3GPP TS 23.682 [153] and 3GPP TS 23.401 [154]. |
| <Assigned_Active_Time>      | String | One byte in an 8 bit format. Assigned Active Time value (T3324) allocated to the UE. The Assigned Active Time value is coded as one byte (octet 3) of the GPRS Timer 2 information element coded as bit format (e.g. "00100100" equals 4 minutes). For the coding and the value range, see the GPRS Timer 2 IE in 3GPP TS 24.008 Table 10.5.163/3GPP TS 24.008 [12]. See also 3GPP TS 23.682 [153], 3GPP TS 23.060 [10] and 3GPP TS 23.401 [154].               |

#### 14.8.4 Notes

##### SARA-R4 / SARA-N4

- <Assigned\_Periodic\_RAU> and <Assigned\_GPRS\_READY\_timer> are not supported.

## 14.9 Set LWM2M FOTA URCs +ULWM2MSTAT

| +ULWM2MSTAT |                                                                    |              |                |                |               |                 |
|-------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules     | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                 |
|             | SARA-N4                                                            |              |                |                |               |                 |
| Attributes  | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|             | full                                                               | Yes          | NVM            | No             | -             | -               |

### 14.9.1 Description

Allows enabling or disabling of LWM2M FOTA status URCs.

### 14.9.2 Syntax

| Type | Syntax             | Response                                           | Example                  |
|------|--------------------|----------------------------------------------------|--------------------------|
| Set  | AT+ULWM2MSTAT=<n>  | OK                                                 | AT+ULWM2MSTAT=1<br>OK    |
| Read | AT+ULWM2MSTAT?     | +ULWM2MSTAT: <n><br>OK                             | +ULWM2MSTAT: 1<br>OK     |
| Test | AT+ULWM2MSTAT=?<n> | +ULWM2MSTAT: (list of supported <n>s)<br>OK        | +ULWM2MSTAT: (0,1)<br>OK |
| URC  |                    | +ULWM2MSTAT: <stat>,<percent><br>+ULWM2MSTAT: 1,99 |                          |

### 14.9.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                       |
|-----------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <n>       | Number | Mode configuration: <ul style="list-style-type: none"> <li>• 0: LWM2M FOTA status URC disabled</li> <li>• 1 (default value): LWM2M FOTA status +ULWM2MSTAT URC enabled</li> </ul> |
| <stat>    | Number | LWM2M FOTA status: <ul style="list-style-type: none"> <li>• 1: FOTA download in progress</li> <li>• 2: FOTA download complete</li> </ul>                                          |
| <percent> | Number | Percentage of FOTA download completed                                                                                                                                             |

## 14.10 Cancel LWM2M FOTA Download +ULWM2M=0

| +ULWM2M=0  |                                                                    |              |                |                |               |                 |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                 |
|            | SARA-N4                                                            |              |                |                |               |                 |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                                                               | Yes          | No             | No             | -             | -               |

### 14.10.1 Description

When a LWM2M session is in progress and the firmware is being download to the device, the download can be canceled by issuing this command. To make use of this command, URCs for LWM2M FOTA sessions must be enabled. See [+ULWM2MSTAT](#) for details on enabling LWM2M URCs.

### 14.10.2 Syntax

| Type | Syntax      | Response | Example           |
|------|-------------|----------|-------------------|
| Set  | AT+ULWM2M=0 | OK       | AT+ULWM2M=0<br>OK |

## 14.11 uFOTA configuration +UFOTACONF

| +UFOTACONF |                |              |                |                |               |                 |
|------------|----------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R410M-52B |              |                |                |               |                 |
|            | SARA-N4        |              |                |                |               |                 |
| Attributes | Syntax         | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full           | No           | NVM            | No             | -             | +CME Error      |

### 14.11.1 Description

Configures the uFOTA registration and timer for periodic connections to the uFOTA server.

### 14.11.2 Syntax

| Type                             | Syntax                        | Response                                                                   | Example                                   |
|----------------------------------|-------------------------------|----------------------------------------------------------------------------|-------------------------------------------|
| <b>Generic syntax</b>            |                               |                                                                            |                                           |
| Set                              | AT+UFOTACONF=<mode>,<param>   | OK                                                                         | AT+UFOTACONF=2,604800<br>OK               |
| <b>uFOTA registration</b>        |                               |                                                                            |                                           |
| Set                              | AT+UFOTACONF=1,<registration> | OK                                                                         | AT+UFOTACONF=1,1<br>OK                    |
| <b>uFOTA periodic connection</b> |                               |                                                                            |                                           |
| Set                              | AT+UFOTACONF=2,<timer>        | OK                                                                         | AT+UFOTACONF=2,604800<br>OK               |
| Read                             | AT+UFOTACONF=<mode>           | +UFOTACONF: <mode>,<param><br>OK                                           | +UFOTACONF: 1,1<br>OK                     |
| Test                             | AT+UFOTACONF=?                | +UFOTACONF: (list of supported <mode>s),(list of supported <param>s)<br>OK | +UFOTACONF: (1-2),(-1,1-4294967295)<br>OK |

### 14.11.3 Defined values

| Parameter      | Type   | Description                                                                                                                                                                              |
|----------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <mode>         | Number | uFOTA parameter to be configured: <ul style="list-style-type: none"> <li>1: module registration to uFOTA server</li> <li>2: timer for periodic connection to the uFOTA server</li> </ul> |
| <registration> | Number | uFOTA registration:                                                                                                                                                                      |

| Parameter | Type            | Description                                                                                                                                                                                                                                                                                          |
|-----------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           |                 | <ul style="list-style-type: none"> <li>0: module registration to uFOTA server disabled</li> <li>1 (factory-programmed and default value): module registration to uFOTA server enabled</li> </ul>                                                                                                     |
| <timer>   | Number          | Timer for periodic connection to the uFOTA server (in seconds); the factory-programmed and default value is 604800 (7 days): <ul style="list-style-type: none"> <li>-1: never periodically connected to the uFOTA server</li> <li>1-4294967295: range in seconds for periodic connections</li> </ul> |
| <param>   | Number / String | Type and supported content depend on the related <op_code> parameter; details are given above                                                                                                                                                                                                        |

### 14.11.4 Notes

#### SARA-R410M-52B / SARA-N4

- <mode> = 1 is not supported. Disable the uFOTA registration by means of <mode> = 2 and <timer> = -1.

## 14.12 Last gasp configuration +ULGASP

| +ULGASP    |                |              |                |                |               |                 |
|------------|----------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R410M-52B |              |                |                |               |                 |
|            | SARA-N4        |              |                |                |               |                 |
| Attributes | Syntax         | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | partial        | No           | NVM            | No             | < 10 s        | +CME Error      |

### 14.12.1 Description

The command enables/disables and configures the last gasp feature. The application is automatically triggered by a properly configured GPIO (see [GPIO Introduction](#)). The feature supports the sending of a predefined last notification in case of power outage, just before the power goes off. It is assumed that the cellular module is registered to the network when the alarm is triggered; however the command just configures the feature so it is possible to issue it also if PIN is not inserted. It is possible to enable/disable the +UULGASP URC in order to be notified about the operation result.

 This AT command must be issued after a proper configuration of the GPIO has been performed via the +UGPIOC command. Otherwise, if +UGPIOC is issued after +ULGASP, the Last Gasp will work only after a reboot.

 The parameters will be set to the values stored in the NVM in case they are omitted in the set command.

### 14.12.2 Syntax

| Type | Syntax                                                                                                                                      | Response                                                                                                                                                                                                                                                                                    | Example                                                              |
|------|---------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|
| Set  | AT+ULGASP=<GPIO_mode>,<text>,<msg_format>,<profile_id>,<IP_protocol>,<IP_addr:PORT>,[<method>],[<urc_enable>],[<nv_upd_freq>],[<tx_count>]] | OK                                                                                                                                                                                                                                                                                          | AT+ULGASP=0,"Power_loss",0,,1,17,"192.168.100.20:8080"<br>OK         |
| Read | AT+ULGASP?                                                                                                                                  | +ULGASP: <GPIO_mode>,<text>,<msg_format>,<profile_ID>,<IP_protocol>,<IP_addr:PORT>,<method>,<urc_enable>,<nv_upd_freq>,<tx_count><br>OK                                                                                                                                                     | +ULGASP: 0,"Power_loss",0,,1,17,"192.168.100.20:8080",1,,1,0,1<br>OK |
| Test | AT+ULGASP=?                                                                                                                                 | +ULGASP: (list of supported <GPIO_mode>'s),(list of supported <msg_format>'s),(list of supported <profile_id>'s),(list of supported <IP_protocol>'s),(list of supported <method>'s),(list of supported <urc_enable>'s),(list of supported <nv_upd_freq>'s),(list of supported <tx_count>'s) | +ULGASP: (0-2),(0-1),(1),(17),(1),(0-1),(0-3600),(1-10)<br>OK        |



| Type | Syntax | Response                    | Example       |
|------|--------|-----------------------------|---------------|
|      |        | OK                          |               |
| URC  |        | +UULGASP: <result>,<bearer> | +UULGASP: 0,1 |

### 14.12.3 Defined values

| Parameter      | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <GPIO_mode>    | Number | Select the interrupt trigger. Allowed values: <ul style="list-style-type: none"> <li>0 (factory-programmed value): trigger disabled; the following arguments will be ignored.</li> <li>1: falling edge</li> <li>2: rising edge</li> </ul>                                                                                                                                                                                                                                                                                                   |
| <text>         | String | The string that will be sent upon GPIO movement. Text or binary format can be selected with the <msg_format> parameter. When text format is selected, a maximum of 256 ASCII chars is allowed. When the binary format is selected, a maximum of 512 chars (0-9,A-F) is allowed. Every 8-bit octet of the message must be written as two IRA character long hexadecimal numbers, e.g. an octet with integer value 42 (i.e. 0x2A) must be written as a string of two characters "2A" (IRA 50 and 65). Factory-programmed value: empty string. |
| <msg_format>   | Number | Format of the <text> parameter. Allowed values: <ul style="list-style-type: none"> <li>0 (factory-programmed value): text</li> <li>1: binary</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                     |
| <profile_id>   | Number | PSD profile identifier. Only the value 1 is allowed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <IP_protocol>  | Number | IP protocol used for socket connection. Allowed values: <ul style="list-style-type: none"> <li>17: UDP</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <IP_addr:PORT> | String | IPv4 or IPv6 server address with the socket port. Factory-programmed value: empty string.                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <method>       | Number | Notification method, it is the way the application send out the <text message>. Allowed values: <ul style="list-style-type: none"> <li>1: use IP (TCP or UDP) connection</li> </ul>                                                                                                                                                                                                                                                                                                                                                         |
| <urc_enable>   | Number | Flag determining if the URC is to be issued or not. Allowed values: <ul style="list-style-type: none"> <li>0: disabled</li> <li>1 (factory-programmed value): enabled</li> </ul>                                                                                                                                                                                                                                                                                                                                                            |
| <result>       | Number | Operation result. Allowed values: <ul style="list-style-type: none"> <li>0: success</li> <li>1: generic fail</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <bearer>       | Number | Notification used bearer. Allowed values: <ul style="list-style-type: none"> <li>1: IP (TCP or UDP) connection</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <nv_upd_freq>  | Number | NVM update frequency in seconds. Valid range of 0-3600 seconds indicating how frequently to flush the settings to NVM. A zero value indicates that settings should never be saved to NVM, otherwise the following settings will be saved to NVM based on the timer: <GPIO_mode>, <text>, <IP_addr:PORT>, <urc_enable>, <tx_count>. Factory-programmed value: 60.                                                                                                                                                                            |
| <tx_count>     | Number | Indicates the number of times to transmit the last gasp message. Valid range is 1-10. Factory-programmed value: 1.                                                                                                                                                                                                                                                                                                                                                                                                                          |

### 14.12.4 Notes

#### SARA-R410M-52B / SARA-N4

- The <urc\_enable>,<nv\_upd\_freq>,<tx\_count> parameters will return 0, 0 and 0 if read for the first time before setting the mandatory last gasp parameters. Once the mandatory last gasp parameters are set, these values take on the factory-programmed values.

## 14.13 LWM2M host device information +UHOSTDEV

| +UHOSTDEV  |                                                         |              |                |                |               |                 |
|------------|---------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                 |
|            | SARA-N4                                                 |              |                |                |               |                 |
| Attributes | Syntax                                                  | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                                                    | Yes          | NVM            | No             | -             | +CME Error      |

### 14.13.1 Description

Sets the host identification, manufacturer model number and software version for the LWM2M device management.

### 14.13.2 Syntax

| Type | Syntax                                                                   | Response                                                                      | Example                                                                       |
|------|--------------------------------------------------------------------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| Set  | AT+UHOSTDEV=<Host_ID>,<Host_Manufacturer>,<Host_Model>,<Host_SW_Version> | OK                                                                            | AT+UHOSTDEV="ubx123456-","u-blox","C030-R410","A1.01"<br>OK                   |
| Read | AT+UHOSTDEV?                                                             | +UHOSTDEV: <Host_ID>,<Host_Manufacturer>,<Host_Model>,<Host_SW_Version><br>OK | +UHOSTDEV: "ubx123456-","u-blox","C030-R410","A1.01"<br>OK                    |
| Test | AT+UHOSTDEV=?                                                            | +UHOSTDEV: (Host_ID),(Host_Manufacturer),(Host_Model)<br>OK                   | +UHOSTDEV: (Host_ID),(Host_Manufacturer),(Host_Model),(Host_SW_Version)<br>OK |

### 14.13.3 Defined values

| Parameter           | Type   | Description                                                      |
|---------------------|--------|------------------------------------------------------------------|
| <Host_ID>           | String | Host identification. The factory-programmed value is HMAN0.      |
| <Host_Manufacturer> | String | Host manufacturer name. The factory-programmed value is HMOD0.   |
| <Host_Model>        | String | Host model identification. The factory-programmed value is HSW0. |
| <Host_SW_Version>   | String | Host software version. The factory-programmed value is HUID0.    |

## 14.14 RING line configuration +URINGCFG

| +URINGCFG  |                |              |                |                |               |                 |
|------------|----------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R410M-52B |              |                |                |               |                 |
|            | SARA-N4        |              |                |                |               |                 |
| Attributes | Syntax         | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full           | No           | NVM            | No             | -             | +CME Error      |

### 14.14.1 Description

Configures the RING line of the UART interface for events such as the incoming SMS indication and incoming data. This command is independent of the URC setting for SMS.

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).

### 14.14.2 Syntax

| Type | Syntax             | Response                | Example             |
|------|--------------------|-------------------------|---------------------|
| Set  | AT+URINGCFG=<mode> | OK                      | AT+URINGCFG=1<br>OK |
| Read | AT+URINGCFG?       | +URINGCFG: <mode><br>OK | +URINGCFG: 1<br>OK  |

| Type | Syntax        | Response                                            | Example                |
|------|---------------|-----------------------------------------------------|------------------------|
| Test | AT+URINGCFG=? | +URINGCFG: (list of the supported<br><mode>s)<br>OK | +URINGCFG: (0-3)<br>OK |

### 14.14.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <mode>    | Number | Configures the RING line handling: <ul style="list-style-type: none"> <li>0 (factory-programmed value): feature disabled</li> <li>1: RING line asserted for incoming SMS</li> <li>2: RING line asserted for all the incoming data (PPP, sockets in Direct Link mode, FTP in Direct Link mode)</li> <li>3: RING line asserted for both incoming SMS and all incoming data (PPP, sockets in Direct Link mode, FTP in Direct Link mode)</li> </ul> |

### 14.14.4 Notes

- Configure the UART Ring Indicator (RI) line for the ring indication by means of the [+UGPIOC](#) AT command.

# 15 GPIO

## 15.1 Introduction

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

### 15.1.1 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 16](#) for an overview of the custom functions supported by u-blox cellular modules.

| <gpio_mode>                 | 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 <sup>2</sup> 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 |
|-----------------------------|--------|-------|---------------------------|--------------------|-----------------|------------------|-------------------|--------------------|-------------------|-------------------------|------------------------------------|----------------------------------------|------------------------------------------|----------------------|-------------------------|---------------------------------------|--------------|-----------------|------------------|--------------|
|                             | 0      | 1     | 2                         | 3                  | 4               | 5                | 6                 | 7                  | 8                 | 9                       | 10                                 | 11                                     | 12                                       | 13                   | 14                      | 15                                    | 16           | 18              | 19               | 255          |
| SARA-R404M / SARA-R410M-01B | *      | *     | *                         |                    |                 |                  |                   | *                  |                   |                         | *                                  |                                        |                                          |                      |                         |                                       |              |                 |                  | *            |
| SARA-R412M / SARA-R410M-02B | *      | *     | *                         |                    | *               |                  |                   | *                  |                   |                         | *                                  |                                        |                                          |                      |                         |                                       |              |                 |                  | *            |
| SARA-R410M-52B              | *      | *     | *                         |                    | *               |                  |                   | *                  |                   |                         | *                                  |                                        |                                          |                      |                         |                                       |              | *               | *                | *            |
| SARA-N4                     | *      | *     | *                         |                    | *               |                  |                   | *                  |                   |                         | *                                  |                                        |                                          |                      |                         |                                       |              |                 | *                | *            |

**Table 16: 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.

### 15.1.2 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.

| <gpio_id> | Pin name | Pin number | Factory-programmed function | Remarks                                                            |
|-----------|----------|------------|-----------------------------|--------------------------------------------------------------------|
| 7         | RI       | 7          | UART RI                     | Only pin 7 can be configured for UART RI line functionality        |
| 16        | GPIO1    | 16         | Pin disabled                | -                                                                  |
| 23        | GPIO2    | 23         | Pin disabled                | -                                                                  |
| 24        | GPIO3    | 24         | Pin disabled                | -                                                                  |
| 25        | GPIO4    | 25         | Pin disabled                | -                                                                  |
| 42        | GPIO5    | 42         | Pin disabled                | Only pin 42 can be configured for SIM card detection functionality |
| 19        | GPIO6    | 19         | Pin disabled                | -                                                                  |

**Table 17: SARA-R4 / SARA-N4 series GPIO mapping**



SARA-R4 / SARA-N4

When the SIM card detection functionality is enabled, the **+CIND** AT command reports the status.

When the SIM card detection functionality is enabled, the status can be read with the **+UGPIOR** AT command.



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

### 15.1.3 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-R4 / SARA-N4

When registered on 4G (LTE) network, the GPIO pin progress is the same as for data transmission ([Figure 8](#)) because a PDP context/EPS bearer is available.

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.

#### 15.1.3.1 No service (no network coverage or not registered)

- Continuous Output / Low



**Figure 1: GPIO pin progress for no service**

#### 15.1.3.2 Registered home network 2G

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

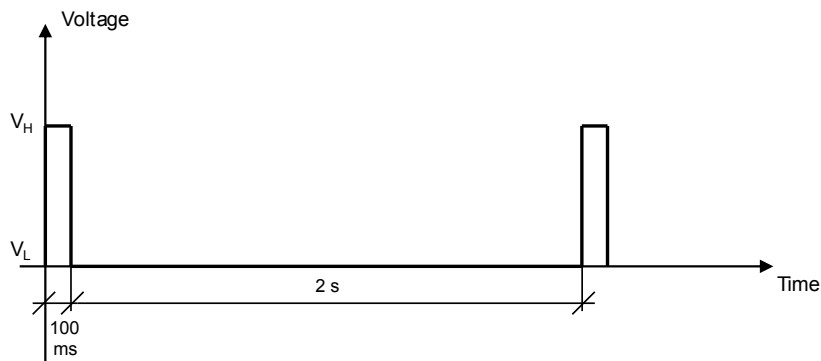


**Figure 2: GPIO pin progress for registered home network 2G**

### 15.1.3.3 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

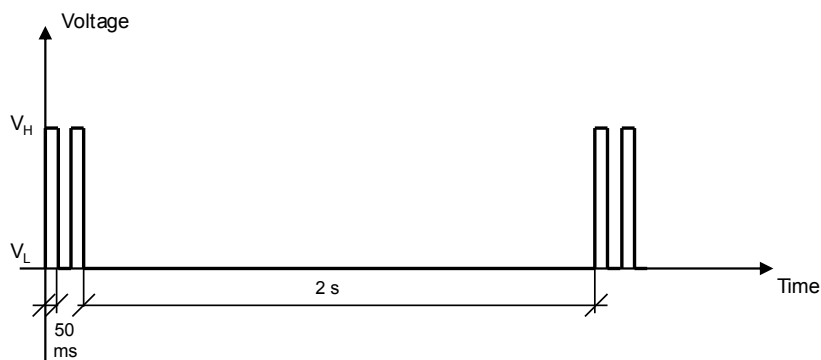


**Figure 3: GPIO pin progress for registered home network 3G**

#### 15.1.3.4 Registered home network Cat NB1

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

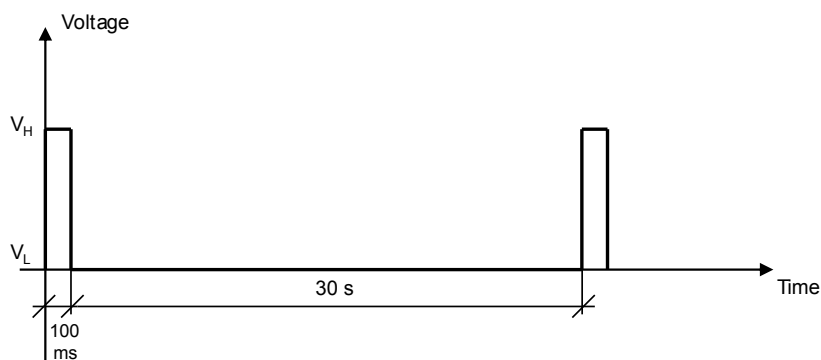


**Figure 4: GPIO pin progress for registered home network Cat NB1**

### 15.1.3.5 Registered roaming 2G

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

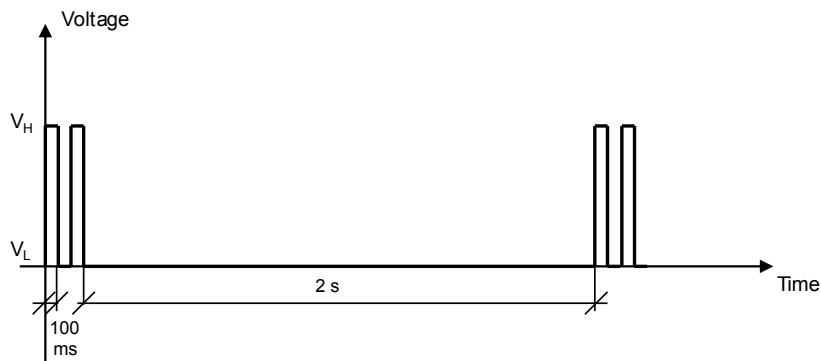


**Figure 5: GPIO pin progress for registered roaming 2G**

#### 15.1.3.6 Registered roaming 3G

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

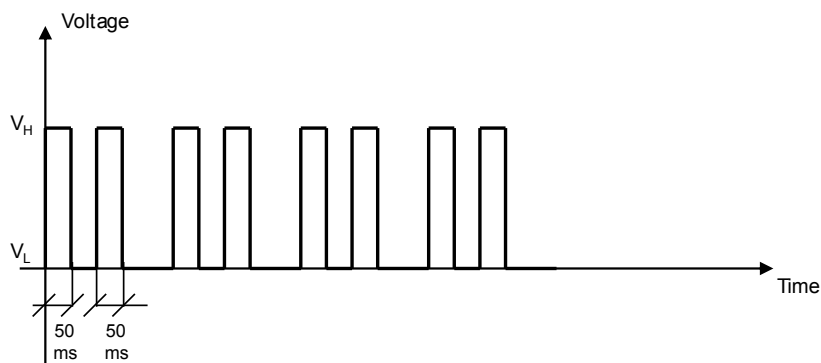


**Figure 6: GPIO pin progress for registered roaming 3G**

#### 15.1.3.7 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

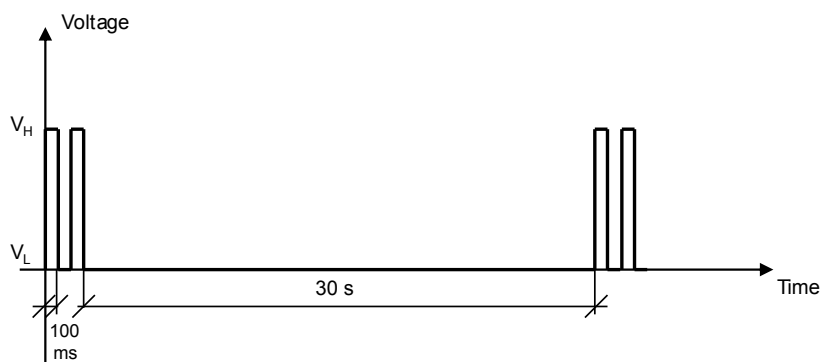


**Figure 7: GPIO pin progress for registered roaming Cat NB1**

#### 15.1.3.8 Data transmission

- Continuous Output / High

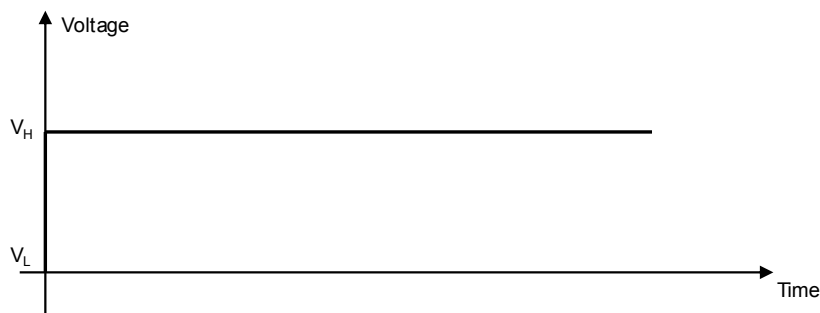


Figure 8: GPIO pin progress for data transmission

### 15.1.3.9 Data transmission roaming

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

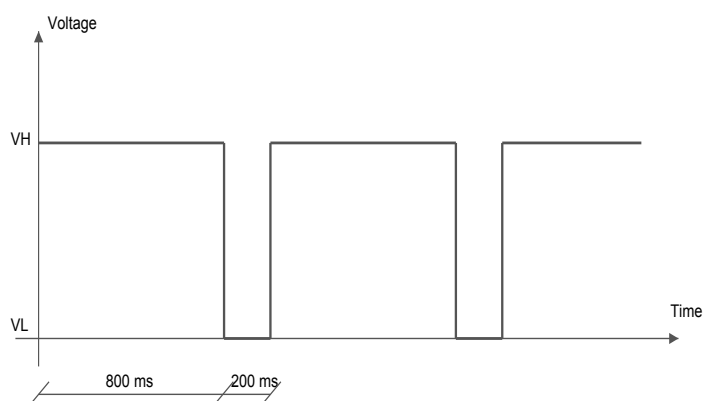


Figure 9: GPIO pin progress for data transmission roaming

## 15.2 GPIO select configuration command +UGPIOC

| +UGPIOC    |                                                                            |              |                |                |               |                 |
|------------|----------------------------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M SARA-N4 |              |                |                |               |                 |
| Attributes | Syntax                                                                     | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | partial                                                                    | No           | NVM            | No             | < 10 s        | +CME Error      |

### 15.2.1 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](#).

## 15.2.2 Syntax

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

## 15.2.3 Defined values

| Parameter   | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <gpio_id>   | Number | GPIO pin identifier: pin number<br><br>See the <a href="#">GPIO mapping</a> for the available GPIO pins, their mapping and factory-programmed values on different u-blox cellular modules series and product version.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <gpio_mode> | Number | Mode identifier: configured function<br><br>See the <a href="#">GPIO functions</a> for custom functions supported by different u-blox cellular modules series and product version.<br><br>Allowed values: <ul style="list-style-type: none"> <li>• 0: output</li> <li>• 1: input</li> <li>• 2: network status indication</li> <li>• 3: GNSS supply enable</li> <li>• 4: GNSS data ready</li> <li>• 5: GNSS RTC sharing</li> <li>• 7: SIM card detection</li> <li>• 8: headset detection</li> <li>• 9: GSM Tx burst indication</li> <li>• 10: module operating status indication</li> <li>• 11: module functionality status indication</li> <li>• 12: I<sup>2</sup>S digital audio interface</li> <li>• 13: SPI serial interface</li> <li>• 14: master clock generation</li> </ul> |

| Parameter      | Type   | Description                                                                                                                                                                                                                    |
|----------------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                |        | <ul style="list-style-type: none"> <li>15: UART (DSR, DTR, DCD e RI) interface</li> <li>16: Wi-Fi enable</li> <li>18: Ring indication</li> <li>19: Last gasp enable</li> <li>255: pad disabled</li> </ul>                      |
| <gpio_out_val> | Number | GPIO output value (for output function <gpio_mode>=0 only): <ul style="list-style-type: none"> <li>0 (default value): low</li> <li>1: high</li> </ul>                                                                          |
| <gpio_in_pull> | Number | GPIO input value (for input function <gpio_mode>=1 only): <ul style="list-style-type: none"> <li>0 (default value): no resistor activated</li> <li>1: pull up resistor active</li> <li>2: pull down resistor active</li> </ul> |

## 15.3 GPIO read command +UGPIOR

| +UGPIOR    |                                                                               |              |                |                |               |                 |
|------------|-------------------------------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |              |                |                |               |                 |
| Attributes | Syntax                                                                        | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                                                                          | No           | No             | No             | < 10 s        | +CME Error      |

### 15.3.1 Description

Reads the current value of the specified GPIO pin, no matter whether it is configured as input or output (see the [+UGPIOC](#) AT command to define the GPIO function). The parameters range is shown in the information text response to the test command.

### 15.3.2 Syntax

| Type | Syntax              | Response                                      | Example                             |
|------|---------------------|-----------------------------------------------|-------------------------------------|
| Set  | AT+UGPIOR=<gpio_id> | +UGPIOR: <gpio_id>,<gpio_val><br>OK           | AT+UGPIOR=20<br>+UGPIOR: 20,0<br>OK |
| Test | AT+UGPIOR=?         | +UGPIOR: (list of supported <gpio_id>s)<br>OK | +UGPIOR: (20, 21)<br>OK             |

### 15.3.3 Defined values

| Parameter  | Type   | Description                                                                                                                                                                                                   |
|------------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <gpio_id>  | Number | GPIO pin identifier: pin number<br><br>See the <a href="#">GPIO mapping</a> for the available GPIO pins, their mapping and factory-programmed values on different u-blox cellular modules series and version. |
| <gpio_val> | Number | GPIO value. Allowed values are 0 and 1.                                                                                                                                                                       |

### 15.3.4 Notes

- The command works only if the parameter <gpio\_mode> of the [+UGPIOC](#) AT command is set to 0 or 1.

## 15.4 GPIO set command +UGPIOW

| +UGPIOW    |                                                                    |              |                |                |               |                 |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                 |
|            | SARA-N4                                                            |              |                |                |               |                 |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                                                               | No           | No             | No             | < 10 s        | +CME Error      |

### 15.4.1 Description

Sets ("writes") the output of the specified GPIO pin, but only if it is configured in output function (see the [+UGPIOC](#) AT command to set the pin as output).

### 15.4.2 Syntax

| Type | Syntax                             | Response                                                                          | Example                       |
|------|------------------------------------|-----------------------------------------------------------------------------------|-------------------------------|
| Set  | AT+UGPIOW=<gpio_id>,<gpio_out_val> | OK                                                                                | AT+UGPIOW=20,1<br>OK          |
| Test | AT+UGPIOW=?                        | +UGPIOW: (list of supported <gpio_id>s),(list of supported <gpio_out_val>s)<br>OK | +UGPIOW: (20, 21),(0-1)<br>OK |

### 15.4.3 Defined values

| Parameter      | Type   | Description                                                                                                                                                                                                   |
|----------------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <gpio_id>      | Number | GPIO pin identifier: pin number<br><br>See the <a href="#">GPIO mapping</a> for the available GPIO pins, their mapping and factory-programmed values on different u-blox cellular modules series and version. |
| <gpio_out_val> | Number | GPIO value. Allowed values are 0 and 1.                                                                                                                                                                       |

### 15.4.4 Notes

- The command works only if the parameter <gpio\_mode> of the [+UGPIOC](#) AT command is set to 0.

# 16 File System

## 16.1 File tags

### 16.1.1 Description

File system commands have the optional <tag> parameter that allows you to specify a file type when an AT command is issued, to inform the system what to do with it. Application specific files must be saved with the correct type tag, otherwise they are treated as common user files.

[Table 18](#) defines the tags and their specific meanings while [Table 19](#) defines their applicability to module series:

| Tag         | Name                                                    | Specification                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------|---------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| "USER"      | User file system                                        | <p>This is the default type if the &lt;tag&gt; parameter is omitted in file system AT commands. All generic files can be stored in this manner.</p> <p>Example: AT+UDWNFILE="foobar", 25, "USER" is the same as AT+UDWNFILE="foobar", 25</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| "FOAT"      | FOAT file system                                        | <p>This tag is used to specify the file type as a firmware update package. It will place the firmware update package in the proper file cache to be used later by the <a href="#">+UFWINSTALL</a> command.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| "AUDIO"     | Audio parameters                                        | <p>This tag is used to store audio calibration file "audio_gain_calibration&lt;X&gt;.xml" and "voice&lt;X&gt;.nvm" in the selected profile &lt;X&gt;=0,1. The profile is stored into NVM by using <a href="#">ATZ&lt;X&gt;</a>.</p> <p> The "audio_gain_calibration&lt;X&gt;.xml" and "voice&lt;X&gt;.nvm" files can be overwritten with <a href="#">AT&amp;W&lt;X&gt;</a> command.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| "FOTA_EXT"  | Firmware for FOTA procedure                             | <p>This tag has to be used to store the firmware file for the FOTA procedure using a dedicated channel of the USB CDC-ACM interface.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| "AUDIO_EXT" | Audio configuration                                     | <p>This tag is used to read or download audio configuration (see <a href="#">Audio parameters tuning</a> section). The audio configuration file includes the NVM settings of the following AT commands (where applicable):</p> <ul style="list-style-type: none"> <li>• <a href="#">+CLVL</a> AT command</li> <li>• <a href="#">+CRSL</a> AT command</li> <li>• <a href="#">+UI2S</a> AT command</li> <li>• <a href="#">+UMAFE</a> AT command</li> <li>• <a href="#">+USAFE</a> AT command</li> <li>• <a href="#">+UMSEL</a> AT command</li> <li>• <a href="#">+UMGC</a> AT command</li> <li>• <a href="#">+USGC</a> AT command</li> <li>• <a href="#">+USPM</a> AT command</li> <li>• <a href="#">+UTI</a> AT command</li> </ul> <p>To download the audio configuration in the module, use the <a href="#">+UDWNFILE</a> command.</p> <p>To read configuration from the module, use the <a href="#">+URDFILE</a> command.</p> |
| "ECALL_EXT" | eCall controller configuration and custom eCall prompts | <p>This tag is used to read, download and delete the eCall controller configuration or download and delete custom eCall prompts (see <a href="#">eCall Prompts</a> section). Reading and downloading commands use a dedicated channel of the USB CDC-ACM interface.</p> <p>To download the eCall controller configuration or custom eCall prompts in the module, use the <a href="#">+UDWNFILE</a> command.</p> <p>To read the eCall controller configuration from the module, use the <a href="#">+URDFILE</a> command.</p> <p>To delete eCall controller configuration or custom eCall prompts from the module, use the <a href="#">+UDELFIL</a> command.</p>                                                                                                                                                                                                                                                                |
| "PROFILE"   | Profile files                                           | <p>This tag refers to the profile files that can be loaded on to the module to support Mobile Network Operators (MNOs) specific configurations. For more details on the profiles, see the <a href="#">+UMNOPROF</a> command. The <a href="#">+URDFILE</a> and <a href="#">+ULSTFILE</a> AT commands are not allowed with this tag, the user can only download or delete these files.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

| Tag           | Name                                         | Specification                                                                        |
|---------------|----------------------------------------------|--------------------------------------------------------------------------------------|
| "GNSS"        | GNSS files                                   | This tag has to be used to store the firmware file for the internal GNSS receiver.   |
| "CALLSRV_EXT" | Emergency Call Number List (ECNL) management | This tag is used to manage the Emergency Call Number List (ECNL) file stored in NVM. |

**Table 18: Tag meanings**

| Module            | "USER" | "FOAT" | "AUDIO" | "ECALL_EXT" | "FOTA_EXT" | "AUDIO_EXT" | "PROFILE" | "GNSS" | "CALLSRV_EXT" |
|-------------------|--------|--------|---------|-------------|------------|-------------|-----------|--------|---------------|
| SARA-R4 / SARA-N4 | *      | *      |         |             |            |             | *         |        |               |

**Table 19: Tag applicabilities to module series**


SARA-R4 / SARA-N4

The files specified with the "FOAT" tag (used to specify the firmware update package file) can only be downloaded or deleted. The [+URDFILE](#) and [+ULSTFILE](#) AT commands are not allowed.

## 16.2 Download file +UDWNFILE

| +UDWNFILE  |                                                                    |              |                |                |               |                            |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|----------------------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                            |
|            | SARA-N4                                                            |              |                |                |               |                            |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference            |
|            | partial                                                            | No           | No             | No             | -             | <a href="#">+CME Error</a> |

### 16.2.1 Description

Stores (writes) a file into the file system:

- The stream of bytes can be entered after the '>' prompt has been provided to the user. The file transfer is terminated exactly when <size> bytes have been sent entered and either "OK" final result code or an error result code is returned. The feed process cannot be interrupted i.e. the command mode is re-entered once the user has provided the declared the number of bytes.
- If the file already exists, the data will be appended to the file already stored in the file system.
- If the data transfer stops, after 20 s the command is stopped and the "+CME ERROR: FFS TIMEOUT" error result code (if [+CMEE=2](#)) is returned.
- If the module shuts down during the file storing, all bytes of the file will be deleted.
- If an error occurs during the file writing, the transfer is aborted and it is up to the user to delete the file.



The available free memory space is checked before starting the file transfer. If the file size exceeds the available space, the "+CME ERROR: NOT ENOUGH FREE SPACE" error result code will be provided (if [+CMEE=2](#)).



SARA-R4 / SARA-N4

If the HW flow control is disabled ([AT+IFC](#)), a data loss could be experienced. So the HW flow control usage is strongly recommended. If HW flow control is not supported, the use of [+UDWNBLOCK](#) is recommended.

### 16.2.2 Syntax

| Type | Syntax                                                      | Response | Example                                                                                 |
|------|-------------------------------------------------------------|----------|-----------------------------------------------------------------------------------------|
| Set  | AT+UDWNFILE=<filename>,<size>[, OK<br><tag>]<br>><br><text> |          | AT+UDWNFILE="filename",36,<br>"USER"<br>><br>The 36 downloaded bytes of the file!<br>OK |

#### Download audio configuration

| Type | Syntax                                           | Response | Example                                                  |
|------|--------------------------------------------------|----------|----------------------------------------------------------|
| Set  | AT+UDWNFILE=<filename>,<size>, OK<br>"AUDIO_EXT" | OK       | AT+UDWNFILE="audioconfig",4873,<br>"AUDIO_EXT"<br><br>OK |

### 16.2.3 Defined values

| Parameter  | Type   | Description                                                                                                                   |
|------------|--------|-------------------------------------------------------------------------------------------------------------------------------|
| <filename> | String | File name. For file system file name and data size limits see <a href="#">File system limits</a> .                            |
| <size>     | Number | File size expressed in bytes. For file system file name and data size limits see <a href="#">File system limits</a> .         |
| <tag>      | String | Optional parameter that specifies the application file type. <a href="#">FILE TAGS</a> table lists the allowed <tag> strings. |
| <text>     | String | Stream of bytes.                                                                                                              |

### 16.2.4 Notes

- Issue the [AT+ULSTFILE=1](#) command to retrieve the available user space in the file system.
- Two files with different types can have the same name, i.e. AT+UDWNFILE="testfile",20,"USER" and AT+UDWNFILE="testfile",43,"AUDIO".

## 16.3 List files information +ULSTFILE

| +ULSTFILE         |                                                                               |                     |                       |                       |                      |                            |
|-------------------|-------------------------------------------------------------------------------|---------------------|-----------------------|-----------------------|----------------------|----------------------------|
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                       |                       |                      |                            |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b>     |
|                   | partial                                                                       | No                  | No                    | No                    | -                    | <a href="#">+CME Error</a> |

### 16.3.1 Description

Retrieves some information about the FS. Depending on the specified <op\_code>, it can print:

- List of files stored into the FS
- Remaining free FS space expressed in bytes
- Size of the specified file expressed in bytes



The available free space on FS in bytes reported by the command AT+ULSTFILE=1 is the theoretical free space including the space occupied by the hidden and temporary files which are not displayed by the AT+ULSTFILE=0.

### 16.3.2 Syntax

| Type                                              | Syntax                                            | Response                                                                 | Example                                             |
|---------------------------------------------------|---------------------------------------------------|--------------------------------------------------------------------------|-----------------------------------------------------|
| <b>Generic syntax</b>                             |                                                   |                                                                          |                                                     |
| Set                                               | AT+ULSTFILE[=<op_code>[,<br><param1>[,<param2>]]] | +ULSTFILE: [<param3>,...[,<br><paramN>]]<br><br>OK                       | AT+ULSTFILE=1<br><br>+ULSTFILE: 236800<br><br>OK    |
| <b>List of files stored into the FS</b>           |                                                   |                                                                          |                                                     |
| Set                                               | AT+ULSTFILE[=0[,<tag>]]                           | +ULSTFILE: [<filename1>[,<br><filename2>[,...[,<filenameN>]]]]<br><br>OK | AT+ULSTFILE=<br><br>+ULSTFILE: "filename"<br><br>OK |
| <b>Remaining free FS space expressed in bytes</b> |                                                   |                                                                          |                                                     |
| Set                                               | AT+ULSTFILE=1[,<tag>]                             | +ULSTFILE: <free_fs_space><br><br>OK                                     | AT+ULSTFILE=1<br><br>+ULSTFILE: 236800<br><br>OK    |
| <b>Size of the specified file</b>                 |                                                   |                                                                          |                                                     |
| Set                                               | AT+ULSTFILE=2,<filename>[,<br><tag>]              | +ULSTFILE: <file_size><br><br>OK                                         | AT+ULSTFILE=2,"filename"<br><br>+ULSTFILE: 784      |

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

### 16.3.3 Defined values

| Parameter                   | Type            | Description                                                                                                                                                                                                                                                                                                        |
|-----------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <op_code>                   | Number          | Allowed values are: <ul style="list-style-type: none"> <li>0 (default value): lists the files belonging to &lt;tag&gt; file type</li> <li>1: gets the free space for the specific &lt;tag&gt; file type</li> <li>2: gets the file size expressed in bytes, belonging to &lt;tag&gt; type (if specified)</li> </ul> |
| <tag>                       | String          | Specifies the application file type. <a href="#">FILE TAGS</a> table lists the allowed <tag> strings.                                                                                                                                                                                                              |
| <filename1>,...,<filenameN> | String          | File name. For file system file name and data size limits see <a href="#">File system limits</a> .                                                                                                                                                                                                                 |
| <free_fs_space>             | Number          | Available free space on FS in bytes.                                                                                                                                                                                                                                                                               |
| <file_size>                 | Number          | Size of the file specified with the <filename> parameter.                                                                                                                                                                                                                                                          |
| <param1>                    | Number / String | Type and supported content depend on related <op_code> (details are given above).                                                                                                                                                                                                                                  |
| <param2>                    | Number / String | Type and supported content depend on related <op_code> (details are given above).                                                                                                                                                                                                                                  |

## 16.4 Read file +URDFILE

| +URDFILE   |                                                                            |              |                |                |               |                            |
|------------|----------------------------------------------------------------------------|--------------|----------------|----------------|---------------|----------------------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M SARA-N4 |              |                |                |               |                            |
| Attributes | Syntax                                                                     | PIN required | Settings saved | Can be aborted | Response time | Error reference            |
|            | partial                                                                    | No           | No             | No             | -             | <a href="#">+CME Error</a> |

### 16.4.1 Description

Retrieves a file from the file system.



SARA-R4 / SARA-N4

If the HW flow control is disabled ([AT+IFC](#)), a data loss could be experienced. So the HW flow control usage is strongly recommended. If HW flow control is not supported, the use of [+URDBLOCK](#) is recommended.

### 16.4.2 Syntax

| Type | Syntax                        | Response                                 | Example                                                                                               |
|------|-------------------------------|------------------------------------------|-------------------------------------------------------------------------------------------------------|
| Set  | AT+URDFILE=<filename>[,<tag>] | +URDFILE: <filename>,<size>,<data><br>OK | AT+URDFILE="filename"<br><br>+URDFILE: "filename",36,"these bytes are the data of the file"<br><br>OK |

### 16.4.3 Defined values

| Parameter  | Type   | Description                                                                                                                                |
|------------|--------|--------------------------------------------------------------------------------------------------------------------------------------------|
| <filename> | String | File name. For file system file name and data size limits, see <a href="#">File system limits</a> .                                        |
| <tag>      | String | The optional parameter <tag> specifies a different application file type. <a href="#">FILE TAGS</a> table lists the allowed <tag> strings. |
| <size>     | Number | File size, in bytes.                                                                                                                       |
| <data>     | String | File content.                                                                                                                              |

### 16.4.4 Notes

- The returned file data is displayed as an ASCII string of <size> characters in the range [0x00,0xFF]. At the end of the string, <CR><LF> are provided for user convenience and visualization purposes.

## 16.5 Partial read file +URDBLOCK

| +URDBLOCK  |                                          |              |                |                |               |                 |
|------------|------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                 |
|            | SARA-N4                                  |              |                |                |               |                 |
| Attributes | Syntax                                   | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | partial                                  | No           | No             | No             | -             | +CME Error      |

### 16.5.1 Description

Retrieves a file from the file system.



Differently from +URDFILE command, this command allows the user to read only a portion of the file, indicating the offset and amount of bytes.

### 16.5.2 Syntax

| Type | Syntax                                         | Response                                  | Example                                                                              |
|------|------------------------------------------------|-------------------------------------------|--------------------------------------------------------------------------------------|
| Set  | AT+URDBLOCK=<filename>,<offset>,<size>[,<tag>] | +URDBLOCK: <filename>,<size>,<data><br>OK | AT+URDBLOCK="filename",0,20<br>+URDBLOCK: "filename",20,"these bytes are the "<br>OK |

### 16.5.3 Defined values

| Parameter  | Type   | Description                                                                                                                                |
|------------|--------|--------------------------------------------------------------------------------------------------------------------------------------------|
| <filename> | String | File name. For file system file name and data size limits see <a href="#">File system limits</a> .                                         |
| <offset>   | Number | Offset in bytes from the beginning of the file.                                                                                            |
| <size>     | Number | Number of bytes to be read starting from the <offset>.                                                                                     |
| <data>     | String | Content of the file read.                                                                                                                  |
| <tag>      | String | The optional parameter <tag> specifies a different application file type. <a href="#">FILE TAGS</a> table lists the allowed <tag> strings. |

### 16.5.4 Notes

- The returned file data is displayed as an ASCII string of <length> characters in the range [0x00,0xFF]. At the end of the string, <CR><LF> are provided for user convenience and visualization purposes.
- In case a size larger than the whole file size is required the command returns the file size only, indicating the amount of bytes read.
- In case an offset larger than the whole file size is required, the "+CME ERROR: FFS file range" error result code is triggered.

#### SARA-R4 / SARA-N4

- The <tag> parameter is not supported.

## 16.6 Delete file +UDELFIE

| +UDELFIE   |                                                                    |              |                |                |               |                 |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                 |
|            | SARA-N4                                                            |              |                |                |               |                 |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | partial                                                            | No           | No             | No             | -             | +CME Error      |

### 16.6.1 Description

Deletes a stored file from the file system.



If <filename> file is not stored in the file system the following error result code will be provided: "+CME ERROR: FILE NOT FOUND".



## 16.6.2 Syntax

| Type | Syntax                         | Response | Example                             |
|------|--------------------------------|----------|-------------------------------------|
| Set  | AT+UDELFILE=<filename>[,<tag>] | OK       | AT+UDELFILE="filename","USER"<br>OK |

## 16.6.3 Defined values

| Parameter  | Type   | Description                                                                                                                                |
|------------|--------|--------------------------------------------------------------------------------------------------------------------------------------------|
| <filename> | String | File name. For file system file name and data size limits see <a href="#">File system limits</a> .                                         |
| <tag>      | String | The optional parameter <tag> specifies a different application file type. <a href="#">FILE TAGS</a> table lists the allowed <tag> strings. |

## 16.7 Partial download file +UDWNBLOCK

| +UDWNBLOCK |                                          |              |                |                |               |                            |
|------------|------------------------------------------|--------------|----------------|----------------|---------------|----------------------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                            |
|            | SARA-N4                                  |              |                |                |               |                            |
| Attributes | Syntax                                   | PIN required | Settings saved | Can be aborted | Response time | Error reference            |
|            | full                                     | No           | No             | No             | -             | <a href="#">+CME Error</a> |

### 16.7.1 Description

Stores (writes) a file to the file system.

- The stream of bytes can be entered after the '>' prompt has been provided to the user. The file transfer is terminated exactly when <size> bytes have been sent entered and either "OK" final result code or an error result code is returned. The feed process cannot be interrupted i.e. the command mode is re-entered once the user has provided the declared the number of bytes.
- If the file already exists, the data will be appended to the file already stored in the file system.
- If the data transfer stops, after 20 s the command is stopped and the "+CME ERROR: FFS TIMEOUT" error result code (if [+CMEE=2](#)) is returned.
- If the module shuts down during the file storing, all bytes of the file will be deleted.
- If an error occurs during the file writing, the transfer is aborted and it is up to the user to delete the file.



Differently from [+UDWNFILE](#) command, this command allows the user to write only a portion of the file, indicating the offset and amount of bytes.

### 16.7.2 Syntax

| Type | Syntax                                                                    | Response | Example                                                                                    |
|------|---------------------------------------------------------------------------|----------|--------------------------------------------------------------------------------------------|
| Set  | AT+UDWNBLOCK=<filename>,<offset>,<size>,<filesize>[,<tag>]<br>><br><text> | OK       | AT+UDWNBLOCK="filename",0,36,500,"USER"<br>><br>The 36 downloaded bytes of the file!<br>OK |

### 16.7.3 Defined values

| Parameter  | Type   | Description                                                                                                                                |
|------------|--------|--------------------------------------------------------------------------------------------------------------------------------------------|
| <filename> | String | File name. For file system file name and data size limits see <a href="#">File system limits</a> .                                         |
| <offset>   | Number | Offset in bytes from the beginning of the file.                                                                                            |
| <size>     | Number | Number of bytes to be written starting from the <offset>.                                                                                  |
| <filesize> | Number | The size of the file to be written                                                                                                         |
| <tag>      | String | The optional parameter <tag> specifies a different application file type. <a href="#">FILE TAGS</a> table lists the allowed <tag> strings. |

### 16.7.4 Notes

- The <tag> parameter is supported only for "USER".

## 16.8 File system limits

### 16.8.1 Limits

Here below are listed the maximum file name length, the maximum data size of the file system and the maximum number of files for the u-blox cellular modules.

Maximum file name length:

- SARA-R4 / SARA-N4 - 248 characters

Maximum file size:

- SARA-R4 / SARA-N4 - File size limited by the available file system space retrieved by `+ULSTFILE=1` command

Maximum number of files:

- SARA-R4 / SARA-N4 - The theoretical maximum number of files that can be stored is 1100.



The theoretical maximum file size and the maximum number of files also includes system, hidden and temporary files whose number is not statically predictable, so the actual numbers can be less than stated.

## 17 DNS

DNS service requires the user to define and activate a connection profile, either PSD or CSD.

When these command report an error which is not a +CME ERROR, the error class and code is provided through +USOER AT command.

### 17.1 Resolve name / IP number through DNS +UDNSRN

| +UDNSRN    |                |              |                |                |               |                  |
|------------|----------------|--------------|----------------|----------------|---------------|------------------|
| Modules    | SARA-R410M-52B |              |                |                |               |                  |
|            | SARA-N4        |              |                |                |               |                  |
| Attributes | Syntax         | PIN required | Settings saved | Can be aborted | Response time | Error reference  |
|            | full           | No           | No             | No             | < 70 s        | TCP/UDP/IP Error |

#### 17.1.1 Description

Translates a domain name to an IP address or an IP address to a domain name by using an available DNS. There are two available DNSs, primary and secondary. The network usually provides them after a GPRS activation or a CSD establishment. They are automatically used in the resolution process if available. The resolver will use first the primary DNS, otherwise if there is no answer, the second DNS will be involved.



Pay attention to the DNS setting for the different profiles since the user DNS can be put into action if the corresponding profile is activated (if the user sets a DNS for a profile, and a different profile is activated, the user DNS has no action and the network DNS is used if available).

#### 17.1.2 Syntax

| Type | Syntax                                                   | Response                                         | Example                        |
|------|----------------------------------------------------------|--------------------------------------------------|--------------------------------|
| Set  | AT+UDNSRN=<resolution_type>,<domain_ip_string>[,<async>] | +UDNSRN: <resolved_ip_address>                   | AT+UDNSRN=0,"www.google.com"   |
|      |                                                          | OK                                               | +UDNSRN: "216.239.59.147"      |
|      |                                                          | or                                               | OK                             |
|      |                                                          | +UDNSRN: <resolved_domain_name>                  | AT+UDNSRN=0,"www.google.com",1 |
|      |                                                          | OK                                               | OK                             |
| URC  |                                                          | +UUDNSRN: <result_code>[,<resolved_ip_address>]  | +UUDNSRN: "216.239.59.147"     |
|      |                                                          | +UUDNSRN: <result_code>[,<resolved_domain_name>] | +UUDNSRN: 0,"somedomain.com"   |
|      |                                                          | +UUDNSRN: -1                                     | +UUDNSRN: -1                   |
|      |                                                          |                                                  |                                |
|      |                                                          |                                                  |                                |

#### 17.1.3 Defined values

| Parameter          | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <resolution_type>  | Number | Type of resolution operation: <ul style="list-style-type: none"> <li>0: domain name to IP address</li> <li>1: IP address to domain name (host by name)</li> </ul>                                                                                                                                                                                                                                                                            |
| <domain_ip_string> | String | Domain name (<resolution_type>=0) or the IP address in (<resolution_type>=1) to be resolved                                                                                                                                                                                                                                                                                                                                                  |
| <async>            | Number | Asynchronous DNS resolution flag. Allowed values: <ul style="list-style-type: none"> <li>0 (default value): the final result code is returned only once the DNS response is available, locking the AT interface until the DNS activity is running</li> <li>1: a final result code (OK or an error result code) is returned immediately unlocking the AT interface and making it available for the execution of other AT commands.</li> </ul> |

| Parameter              | Type   | Description                                                                                                                                                                                                                               |
|------------------------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                        |        | Once the result of DNS resolution becomes available, it is notified to the AT interface through the +UUDNSRN URC                                                                                                                          |
| <resolved_ip_address>  | String | Resolved IP address corresponding to the specified domain name                                                                                                                                                                            |
| <resolved_domain_name> | String | Resolved domain name corresponding to the provided IP address                                                                                                                                                                             |
| <result_code>          | Number | Result code of DNS resolution: <ul style="list-style-type: none"><li>• 0: no error</li><li>• -1: DNS resolution failed. In this case the &lt;resolved_ip_address&gt; or the &lt;resolved_domain_name&gt; fields are not present</li></ul> |

### 17.1.4 Notes

#### SARA-R4 / SARA-N4

- <async> parameter and +UUDNSRN URC are not available.

# 18 Internet protocol transport layer

## 18.1 Introduction



SARA-R4 / SARA-N4

Before using TCP/IP services, a connection profile must be defined and activated. The sockets can be managed independently and simultaneously over the same bearer (either PSD or CSD). AT commands for both reading and writing data on sockets are provided and the URC notifies the external application of incoming data and transmission result, no need for polling.



SARA-R4 / SARA-N4

When these commands report an error result code which is not a +CME ERROR, the error code can be queried using the **+USOER** or **+USOCTL** (specifying the socket ID and with <param\_id>=1) AT commands.

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



SARA-R4 / SARA-N4

The maximum number of secure sockets that can be managed is 4.



SARA-R4 / SARA-N4

No need to establish a PSD connection explicitly. This device automatically establishes a PSD connection as part of the network registration and attach procedure.



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



Some network operators close dynamic NATs after few minutes if there is no activity on the connection (no data transfer in the period). To solve this problem enable the TCP keep alive options with 1 minute delay (see the **+USOSO** AT command).



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

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

## 18.2 IPv4/IPv6 addressing

### 18.2.1 Introduction

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

### 18.2.2 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 |

| IPv4 address        | Remarks                                                                          |
|---------------------|----------------------------------------------------------------------------------|
| 0x10.0xE4.0x4C.0x22 | Invalid address; dot-hexadecimal notation; decimals given as hexadecimal numbers |

**Table 20: IPv4 address format examples**

### 18.2.3 IPv6

#### Format:

- 128 bits long represented in 8 groups of 16 bits each.
- The 16 bits of a group are represented as 2 concatenated hexadecimal numbers.
- The groups are separated by a colon character (:).
- The leading 0 in a group is supported.
- A group containing 4 zeros can be abbreviated with one 0.
- Continuous groups (at least 2) with zeroes can be replaced with a double colon (::).
- The double colon can appear only once in an IPv6 address.

#### Examples:

| IPv6 address                            | Remarks                                            |
|-----------------------------------------|----------------------------------------------------|
| 2001:0104:0000:0000:0000:0104:0000:0000 | Full version, with leading zeros                   |
| 2001:104:0000:0000:0000:104:0000:0000   | Abbreviated version, leading zero abbreviation     |
| 2001:104:0:0:0:104:0:0                  | Abbreviated version, zero group abbreviation       |
| 2001:104::104:0:0                       | Abbreviated version, one double colon abbreviation |

**Table 21: IPv6 address format examples**


The following AT commands support the IPv6 address format:

- Dynamic DNS update: [+UDYNDNS](#)
- Connect Socket: [+USOCO](#)
- SendTo command: [+USOST](#)
- Receive From command: [+USORF](#)
- Set Listening Socket: [+USOLI](#)
- IP Change Notification: [+UIPCHGN](#)
- FTP service configuration: [+UFTP](#)
- HTTP control: [+UHTTP](#)

For packet switched services AT commands (i.e. PDP\_addr in +CGDCONT) the format is specified in the corresponding command section.

## 18.3 Create Socket +USOCR

| +USOCR     |                                                                               |              |                |                |               |                                             |
|------------|-------------------------------------------------------------------------------|--------------|----------------|----------------|---------------|---------------------------------------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |              |                |                |               |                                             |
| Attributes | Syntax                                                                        | PIN required | Settings saved | Can be aborted | Response time | Error reference                             |
|            | partial                                                                       | No           | No             | No             | -             | <a href="#">TCP/UDP/IP Error +CME Error</a> |

### 18.3.1 Description

Creates a socket and associates it with the specified protocol (TCP or UDP), returns a number identifying the socket. Such command corresponds to the BSD socket routine. Up to 7 sockets can be created. It is possible to specify the local port to bind within the socket in order to send data from a specific port. The bind functionality is supported for both TCP and UDP sockets.



The socket creation operation can be performed only after the PDP context activation on one of the defined profiles.

### 18.3.2 Syntax

| Type | Syntax                             | Response                                                                        | Example                        |
|------|------------------------------------|---------------------------------------------------------------------------------|--------------------------------|
| Set  | AT+USOCR=<protocol>[,<local_port>] | +USOCR: <socket><br>OK                                                          | AT+USOCR=17<br>+USOCR: 2<br>OK |
| Test | AT+USOCR=?                         | +USOCR: (list of supported <protocol>s),(list of supported <local_port>s)<br>OK | +USOCR: (6,17),(1-65535)<br>OK |

### 18.3.3 Defined values

| Parameter    | Type   | Description                                                                                                                                                                            |
|--------------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <protocol>   | Number | <ul style="list-style-type: none"> <li>6: TCP</li> <li>17: UDP</li> </ul>                                                                                                              |
| <local_port> | Number | Local port to be used while sending data. The range goes from 1 to 65535. If the parameter is omitted it will be set to 0; in this case a random port will be used while sending data. |
| <socket>     | Number | Socket identifier to be used for any future operation on that socket. The range goes from 0 to 6.                                                                                      |

## 18.4 SSL/TLS mode configuration on TCP socket +USOSEC

| +USOSEC    |                                                                    |              |                |                |               |                 |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |              |                |                |               |                 |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                                                               | No           | No             | No             | < 1 s         | +CME Error      |

### 18.4.1 Description

Enables or disables the use of SSL/TLS connection on a TCP socket. The configuration of the SSL/TLS properties is provided with an SSL/TLS profile managed by USECMNG.

The <usecmng\_profile\_id> parameter is listed in the information text response to the read command only if the SSL/TLS is enabled on the interested socket.

-  This operation is only available for TCP sockets.
-  The enable or disable operation can be performed only after the socket has been created with **+USOCR** AT command.
-  The SSL/TLS is supported only with **+USOCO** command (socket connect command). The SSL/TLS is not supported with **+USOLI** command (socket set listen command is not supported and the **+USOSEC** settings will be ignored).
-  SARA-R4 / SARA-N4  
Issue the command before the **+USOCO** AT command (socket connect command).

### 18.4.2 Syntax

| Type | Syntax                                                     | Response                                                                                                                     | Example                            |
|------|------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Set  | AT+USOSEC=<socket>,<ssl_tls_status>[,<usecmng_profile_id>] | OK                                                                                                                           | AT+USOSEC=0,1,1<br>OK              |
| Read | AT+USOSEC=<socket>                                         | +USOSEC=<socket>,<ssl_tls_status>[,<usecmng_profile_id>]<br>OK                                                               | AT+USOSEC=0<br>+USOSEC=0,1,1<br>OK |
| Test | AT+USOSEC=?                                                | +USOSEC: (list of supported <socket>s),(list of supported <ssl_tls_status>s),(list of supported <usecmng_profile_id>s)<br>OK | +USOSEC: (0-6),(0,1),(0-4)<br>OK   |

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

### 18.4.3 Defined values

| Parameter            | Type   | Description                                                                                                                                                                                                                             |
|----------------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <socket>             | Number | Socket identifier defined by the <a href="#">AT+USOCR</a> command. The range goes from 0 to 6.                                                                                                                                          |
| <ssl_tls_status>     | Number | <ul style="list-style-type: none"> <li>0 (default value): disable the SSL/TLS on the socket.</li> <li>1: enable the SSL/TLS on the socket; a USECMNG profile can be specified with the &lt;usecmng_profile_id&gt; parameter.</li> </ul> |
| <usecmng_profile_id> | Number | Defines the USECMNG profile which specifies the SSL/TLS properties to be used for the SSL/TLS connection. The range goes from 0 to 4. If no profile is set a default USECMNG profile is used (see <a href="#">USECMNG</a> section).     |

## 18.5 Set socket option +USOSO

| +USOSO            |                                                                            |                     |                       |                       |                      |                                             |
|-------------------|----------------------------------------------------------------------------|---------------------|-----------------------|-----------------------|----------------------|---------------------------------------------|
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M SARA-N4 |                     |                       |                       |                      |                                             |
| <b>Attributes</b> | <b>Syntax</b>                                                              | <b>PIN required</b> | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b>                      |
|                   | full                                                                       | No                  | No                    | No                    | -                    | <a href="#">TCP/UDP/IP Error +CME Error</a> |

### 18.5.1 Description

Sets the specified standard option (type of service, local address re-use, linger time, time-to-live, etc.) for the specified socket, like the BSD setsockopt routine.



Issue a set command to set each parameter.

### 18.5.2 Syntax

| Type | Syntax                                                      | Response                                                                 | Example                         |
|------|-------------------------------------------------------------|--------------------------------------------------------------------------|---------------------------------|
| Set  | AT+USOSO=<socket>,<level>,<opt_name>,<opt_val>[,<opt_val2>] | OK                                                                       | AT+USOSO=2,6,1,1<br>OK          |
| Test | AT+USOSO=?                                                  | +USOSO: (list of supported <socket>s),(list of supported <level>s)<br>OK | +USOSO: (0-6),(0,6,65535)<br>OK |

### 18.5.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <socket>  | Number | Socket identifier. The range goes from 0 to 6.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <level>   | Number | <ul style="list-style-type: none"> <li>0: IP protocol<br/>&lt;opt_name&gt; for IP protocol level may be: <ul style="list-style-type: none"> <li>1: type of service (TOS)<br/>&lt;opt_val&gt;: 8 bitmask that represents the flags of IP TOS. The range is 0-255 (the default value is 0). For more information see the RFC 791 <a href="#">[27]</a></li> <li>2: time-to-live (TTL)<br/>&lt;opt_val&gt;: unsigned 8 bit value representing the TTL. The range is 0-255 (the default value is 255)</li> </ul> </li> <li>6: TCP protocol<br/>&lt;opt_name&gt; for TCP protocol level may be: <ul style="list-style-type: none"> <li>1: no delay option; do not delay send to coalesce packets;<br/>&lt;opt_val&gt;: numeric parameter, it enables/disables the "no delay" option: <ul style="list-style-type: none"> <li>0 (default value): disabled</li> <li>1: enabled</li> </ul> </li> <li>2: keepidle option: send keepidle probes when it is idle for &lt;opt_val&gt; milliseconds</li> </ul> </li> </ul> |



| Parameter  | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|------------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|            |        | <p>&lt;opt_val&gt;: signed 32 bit numeric parameter representing the milliseconds for "keepidle" option. The range is 0-2147483647. The default value is 7200000 (2 hours)</p> <ul style="list-style-type: none"> <li>65535: socket</li> </ul> <p>&lt;opt_name&gt; for socket level options may be:</p> <ul style="list-style-type: none"> <li>4: local address re-use.<br/>&lt;opt_val&gt;: numeric parameter, it configures the "local address re-use" option. <ul style="list-style-type: none"> <li>0 (default value): disabled</li> <li>1: enabled</li> </ul> </li> <li>8: keep connections alive.<br/>&lt;opt_val&gt;: numeric parameter, it configures "keep connections alive" option. <ul style="list-style-type: none"> <li>0 (default value): disabled</li> <li>1: enabled</li> </ul> </li> <li>32: sending of broadcast messages.<br/>&lt;opt_val&gt;: numeric parameter, it configures "sending of broadcast messages". <ul style="list-style-type: none"> <li>0 (default value): disabled</li> <li>1: enabled</li> </ul> </li> <li>128: linger on close if data present.<br/>&lt;opt_val&gt;: numeric parameter, it configures the "linger" option. <ul style="list-style-type: none"> <li>0 (default value): disabled</li> <li>1: enabled</li> </ul> <p>&lt;opt_val2&gt;: signed 16 bit numeric parameter, it sets the linger time, the range goes from 0 to 32767 in milliseconds. The default value is 0.</p> </li> <li>512: local address and port re-use.<br/>&lt;opt_val&gt;: numeric parameter, it configures the "local address and port re-use". <ul style="list-style-type: none"> <li>0 (default value): disabled</li> <li>1: enabled</li> </ul> </li> </ul> |
| <opt_name> | Number | Type and supported content depend on the related <level> parameter value (details are given above).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <opt_val>  | Number | Type and supported content depend on the related <level> parameter value (details are given above).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <opt_val2> | Number | Type and supported content depend on the related <level> parameter value (details are given above).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

## 18.5.4 Notes

### SARA-R4 / SARA-N4

- <level>=6 (TCP protocol), <opt\_name>=2 (keepidle option) is not supported.
- <level>=65535 (socket), <opt\_name>=32 (sending of broadcast messages) is not supported.
- <level>=65535 (socket), <opt\_name>=512 (local address and port re-use) is not supported.

## 18.6 Get Socket Option +USOGO

| +USOGO     |                                                                            |              |                |                |               |                                             |
|------------|----------------------------------------------------------------------------|--------------|----------------|----------------|---------------|---------------------------------------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M SARA-N4 |              |                |                |               |                                             |
| Attributes | Syntax                                                                     | PIN required | Settings saved | Can be aborted | Response time | Error reference                             |
|            | full                                                                       | No           | No             | No             | -             | <a href="#">TCP/UDP/IP Error +CME Error</a> |

### 18.6.1 Description

Retrieves the specified standard option (type of service, local address re-use, linger time, time-to-live, etc) for the specified socket, like the BSD getsockopt routine.

## 18.6.2 Syntax

| Type | Syntax                               | Response                                                                 | Example                             |
|------|--------------------------------------|--------------------------------------------------------------------------|-------------------------------------|
| Set  | AT+USOGO=<socket>,<level>,<opt_name> | +USOGO: <opt_val>[,<opt_val2>]<br>OK                                     | AT+USOGO=0,0,2<br>+USOGO: 255<br>OK |
| Test | AT+USOGO=?                           | +USOGO: (list of supported <socket>s),(list of supported <level>s)<br>OK | +USOGO: (0-6),(0,6,65535)<br>OK     |

## 18.6.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <socket>  | Number | Socket identifier. The range goes from 0 to 6.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <level>   | Number | <ul style="list-style-type: none"> <li>0: IP Protocol<br/>&lt;opt_name&gt; for IP protocol level may be: <ul style="list-style-type: none"> <li>1: type of service<br/>&lt;opt_val&gt;: 8 bit mask that represents the flags of IP TOS. For more information see the RFC 791 [27]. The range is 0-255. The default value is 0</li> <li>2: time-to-live<br/>&lt;opt_val&gt;: unsigned 8 bit value representing the TTL. The range is 0-255. The default value is 0.</li> </ul> </li> <li>6: TCP Protocol<br/>&lt;opt_name&gt; for TCP protocol level may be: <ul style="list-style-type: none"> <li>1: no delay option: do not delay send to coalesce packets<br/>&lt;opt_val&gt;: numeric parameter, it enables/disables the "no delay" option <ul style="list-style-type: none"> <li>0 (default value): disabled</li> <li>1: enabled</li> </ul> </li> <li>2: keepidle option: send keepidle probes when idle for &lt;opt_val&gt; milliseconds<br/>&lt;opt_val&gt;: signed 32 bit number value representing the milliseconds for "keepidle" option. The range 0-2147483647. The default value is 7200000 (2 hours)</li> </ul> </li> <li>65535: socket<br/>&lt;opt_name&gt; for the socket level options may be: <ul style="list-style-type: none"> <li>4: local address re-use<br/>&lt;opt_val&gt;: numeric parameter, it configures the "local address re-use" option: <ul style="list-style-type: none"> <li>0 (default value): disabled</li> <li>1: enabled</li> </ul> </li> <li>8: keep connections alive<br/>&lt;opt_val&gt;: numeric parameter, it configures the "keep connections alive" option: <ul style="list-style-type: none"> <li>0 (default value): disabled</li> <li>1: enabled</li> </ul> </li> <li>32: sending of broadcast messages<br/>&lt;opt_val&gt;: numeric parameter, it configures the "sending of broadcast messages": <ul style="list-style-type: none"> <li>1: enabled</li> <li>0 (default value): disabled</li> </ul> </li> <li>128: linger on close if data present<br/>&lt;opt_val&gt;: numeric parameter, it sets on/off the "linger" option. <ul style="list-style-type: none"> <li>0 (default value): disabled</li> <li>1: enabled</li> </ul> <br/> &lt;opt_val2&gt;: signed 16 bit numeric value, linger time, the range goes from 0 to 32767 in milliseconds. The default value is 0. </li> <li>512: local address and port re-use<br/>&lt;opt_val&gt;: numeric parameter, it enables/disables "local address and port re-use": <ul style="list-style-type: none"> <li>0 (default value): disabled</li> <li>1: enabled</li> </ul> </li> </ul> </li> </ul> |

## 18.6.4 Notes

### SARA-R4 / SARA-N4

- The setting <level>= 6 (TCP protocol) and <opt\_name>= 2 (keepidle option) is not supported.

## 18.7 Close Socket +USOCL

| +USOCL     |                                                                    |              |                |                |                      |                 |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|----------------------|-----------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |                      |                 |
|            | SARA-N4                                                            |              |                |                |                      |                 |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time        | Error reference |
|            | partial                                                            | No           | No             | No             | < 120 s (except URC) | +CME Error      |

### 18.7.1 Description

Closes the specified socket, like the BSD close routine. In case of remote socket closure the user is notified via the URC.

By default the command blocks the AT command interface until the the completion of the socket close operation. By enabling the <async\_close> flag, the final result code is sent immediately. The following +UUSOCL URC will indicate the closure of the specified socket.

### 18.7.2 Syntax

| Type | Syntax                            | Response                                    | Example                   |
|------|-----------------------------------|---------------------------------------------|---------------------------|
| Set  | AT+USOCL=<socket>[,<async_close>] | OK                                          | AT+USOCL=2<br>OK          |
| Test | AT+USOCL=?                        | +USOCL: (list of supported <socket>s)<br>OK | +USOCL: (0-6),(0-1)<br>OK |
| URC  |                                   | +UUSOCL: <socket>                           | +UUSOCL: 2                |

### 18.7.3 Defined values

| Parameter     | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <socket>      | Number | Socket identifier. The range goes from 0 to 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <async_close> | Number | Asynchronous close flag. The flag has effect for TCP connections only. Allowed values: <ul style="list-style-type: none"> <li>0 (default value): the operation result is returned only once the result of the TCP close becomes available, locking the AT interface until the connection closes.</li> <li>1: the final result code is returned immediately unlocking the AT interface and making it available for the execution of other AT commands. Once the result of TCP close becomes available, it is notified to the AT interface through the +UUSOCL URC.</li> </ul> |

### 18.7.4 Notes

#### SARA-R404M / SARA-R410M-01B

- The <async\_connect> parameter is not supported.

## 18.8 Get Socket Error +USOER

| +USOER     |                                                                    |              |                |                |               |                                             |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|---------------------------------------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                                             |
|            | SARA-N4                                                            |              |                |                |               |                                             |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference                             |
|            | full                                                               | No           | No             | No             | -             | <a href="#">TCP/UDP/IP Error +CME Error</a> |

### 18.8.1 Description

Retrieves the last error occurred in the last socket operation, stored in the BSD standard variable error.

### 18.8.2 Syntax

| Type   | Syntax   | Response               | Example     |
|--------|----------|------------------------|-------------|
| Action | AT+USOER | +USOER: <socket_error> | +USOER: 104 |
|        |          | OK                     | OK          |

### 18.8.3 Defined values

| Parameter      | Type   | Description                                                                                                                                                                        |
|----------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <socket_error> | Number | Code of the last error occurred in a socket operation. The allowed values are listed in <a href="#">Appendix A.5</a> <ul style="list-style-type: none"> <li>0: no error</li> </ul> |

## 18.9 Connect Socket +USOCO

| +USOCO     |                                                                    |              |                |                |               |                                             |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|---------------------------------------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                                             |
|            | SARA-N4                                                            |              |                |                |               |                                             |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference                             |
|            | partial                                                            | No           | No             | No             | < 120 s       | <a href="#">TCP/UDP/IP Error +CME Error</a> |

### 18.9.1 Description

Establishes a peer-to-peer connection of the socket to the specified remote host on the given remote port, like the BSD connect routine. If the socket is a TCP socket, the command will actually perform the TCP negotiation (3-way handshake) to open a connection. If the socket is a UDP socket, this function will just declare the remote host address and port for later use with other socket operations (e.g. +USOWR, +USORD). This is important to note because if <socket> refers to a UDP socket, errors will not be reported prior to an attempt to write or read data on the socket.

### 18.9.2 Syntax

| Type | Syntax                                                          | Response                                                     | Example                                     |
|------|-----------------------------------------------------------------|--------------------------------------------------------------|---------------------------------------------|
| Set  | AT+USOCO=<socket>,<remote_addr>,<remote_port>[,<async_connect>] | OK                                                           | AT+USOCO=3,"151.63.16.9",1200               |
|      |                                                                 |                                                              | OK                                          |
|      |                                                                 |                                                              | AT+USOCO=2,"151.63.16.9",8200,1             |
|      |                                                                 |                                                              | OK                                          |
|      |                                                                 |                                                              | +UUSOCO: 2,0                                |
| Test | AT+USOCO=?                                                      | +USOCO: (list of supported <socket>s),"remote_host",(list of | AT+USOCO=2,"151.63.16.9",8230,0             |
|      |                                                                 |                                                              | OK                                          |
|      |                                                                 |                                                              | +USOCO: (0-6),"remote_host",(1-65535),(0-1) |
|      |                                                                 |                                                              | OK                                          |

| Type | Syntax | Response                                                             | Example      |
|------|--------|----------------------------------------------------------------------|--------------|
|      |        | supported <remote_port>s),(list of supported <async_connect>s)<br>OK |              |
| URC  |        | +UUSOCO: <socket>,<socket_error>                                     | +UUSOCO: 2,0 |

### 18.9.3 Defined values

| Parameter       | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <socket>        | Number | Socket identifier. The range goes from 0 to 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <remote_addr>   | String | Remote host IP address or domain name of the remote host. For IP address format reference see the <a href="#">IP addressing</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <remote_port>   | Number | Remote host port, in range 1-65535                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <async_connect> | Number | Asynchronous connect flag. The flag has effect for TCP connections only. Allowed values: <ul style="list-style-type: none"> <li>0 (default value): the operation result is returned only once the TCP connection is established, locking the AT interface until the connection activity is running</li> <li>1: the final result code is returned immediately unlocking the AT interface and making it available for the execution of other AT commands. Once the result of TCP connection becomes available, it is notified to the AT interface through the +UUSOCO URC.</li> </ul> |
| <socket_error>  | Number | Code of the last error occurred in a socket operation. The allowed values are listed in <a href="#">Appendix A.5</a> : <ul style="list-style-type: none"> <li>0: no error, connection successful</li> </ul>                                                                                                                                                                                                                                                                                                                                                                         |

### 18.9.4 Notes

- In case of the socket connection with the asynchronous flag:
  - the socket will be closed if a further +USOCO AT command is issued before having received the +UUSOCO URC of the first AT command.
  - it is not possible to connect a second socket before the reception of the +UUSOCO URC related to the pending socket connection.

#### SARA-R404M / SARA-R410M-01B

- The <async\_connect> parameter and the +UUSOCO URC are not available.

## 18.10 Write socket data +USOWR

| +USOWR     |                                                                               |              |                |                |               |                                             |
|------------|-------------------------------------------------------------------------------|--------------|----------------|----------------|---------------|---------------------------------------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |              |                |                |               |                                             |
| Attributes | Syntax                                                                        | PIN required | Settings saved | Can be aborted | Response time | Error reference                             |
|            | partial                                                                       | No           | No             | No             | < 120 s       | <a href="#">TCP/UDP/IP Error +CME Error</a> |

### 18.10.1 Description

Writes the specified amount of data to the specified socket, like the BSD write routine, and returns the number of bytes of data actually written. The command applies to UDP sockets too, after a [+USOCO](#) command.

There are three kinds of syntax:

- Base syntax normal: writing simple strings to the socket, some characters are forbidden
- Base syntax HEX: writing hexadecimal strings to the socket, the string will be converted in binary data and sent to the socket; see the [AT+UDCONF=1](#) command description to enable it
- Binary extended syntax: mandatory for writing any character in the ASCII range [0x00, 0xFF]



Some notes about the **TCP socket**:

- If no network signal is available, the TCP packets are enqueued until the network will become available again. If the TCP queue is full the +USOWR command will return an error result code. To get the last

socket error use the **+USOCTL=1** command. If the error code returned is 11, it means that the queue is full.

- If the connection is closed by the remote host, the **+UUSOCL** URC is not sent until all received data is read using the **AT+USORD** command. If **AT+USOWR** command is used in this situation, an error result code is returned. See also the **Notes** section about the specific product behaviour
- If the connection is closed by the remote host and binary interface started with **AT+USOWR** command is still waiting for data, an error result code is returned indicating that the binary interface was closed. After the error result code a **+UUSOCL** URC is reported indicating that the socket was closed.



Some notes about the **UDP socket**:

- Due to the UDP specific AT commands, it is preferred to use the **+USOST** command to send data via UDP socket. This command does not require the usage of **+USOCO** before sending data.
- If no network signal is available, out going UDP packet may be lost.



The information text response indicates that data has been sent to lower level of protocol stack. This is not an indication of an acknowledgement received by the remote server the socket is connected to.

## 18.10.2 Syntax

| Type                 | Syntax                            | Response                                                                                                                                                                                                                                  | Example                                                                                           |
|----------------------|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| <b>Base syntax</b>   |                                   |                                                                                                                                                                                                                                           |                                                                                                   |
| Set                  | AT+USOWR=<socket>,<length>,<data> | +USOWR: <socket>,<length><br>OK                                                                                                                                                                                                           | AT+USOWR=3,12,"Hello world!"<br>+USOWR: 3,12<br>OK                                                |
| <b>Binary syntax</b> |                                   |                                                                                                                                                                                                                                           |                                                                                                   |
| Set                  | AT+USOWR=<socket>,<length>        | @<data><br>+USOWR: <socket>,<length><br>OK                                                                                                                                                                                                | AT+USOWR=3,16<br>@16 bytes of data<br>+USOWR: 3,16<br>OK                                          |
| Test                 | AT+USOWR=?                        | +USOWR: (list of supported <socket>s),(list of supported <length>s),"HEX data"<br>+USOWR: (list of supported <socket>s),(list of supported <length>s),"data"<br>+USOWR: (list of supported <socket>s),(list of supported <length>s)<br>OK | +USOWR: (0-6),(0-512),"HEX data"<br>+USOWR: (0-6),(0-1024),"data"<br>+USOWR: (0-6),(0-1024)<br>OK |

## 18.10.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                           |
|-----------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <socket>  | Number | Socket identifier. The range goes from 0 to 6.                                                                                                                                                                        |
| <length>  | Number | Number of data bytes to write: <ul style="list-style-type: none"> <li>• Base syntax normal mode: range 1-1024</li> <li>• Base syntax HEX mode: range 1-512</li> <li>• Binary extended syntax: range 1-1024</li> </ul> |
| <data>    | String | Data bytes to be written. Not all of the ASCII charset can be used.                                                                                                                                                   |

## 18.10.4 Notes

- For base syntax:
  - The value of <length> and the actual length of <data> must match
- For base syntax HEX mode:
  - Only the ASCII characters 0-9, A-F and a-f are allowed.
  - The length of the <data> parameter must be two times the <length> parameter.
- For binary syntax:

- o After the command is sent, the user waits for the @ prompt. When it appears the stream of bytes can be provided. After the specified amount of bytes has been sent, the system provides the final result code. The feed process cannot be interrupted i.e. the return in the command mode can be effective only when the number of bytes provided is the declared one.
- o After the @ prompt reception, wait for a minimum of 50 ms before sending data.
- o The binary extended syntax is the only way for the system to accept control characters as data; for the AT command specifications 3GPP TS 27.005 [16], characters like <CR>, <CTRL-Z>, quotation marks, etc. have a specific meaning and they cannot be used like data in the command itself. The command is so extended with a specific acceptance state identified by the @ prompt.
- o This feature can be successfully used when there is need to send a byte stream which belongs to a protocol that has any kind of characters in the ASCII range [0x00,0xFF].
- o In binary mode the module does not display the echo of data bytes.
- o Binary syntax is not affected by HEX mode option.
- For <data> parameter not all of the ASCII charset can be used.

## 18.11 SendTo command (UDP only) +USOST

| +USOST     |                                                                               |              |                |                |               |                                   |
|------------|-------------------------------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------------------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |              |                |                |               |                                   |
| Attributes | Syntax                                                                        | PIN required | Settings saved | Can be aborted | Response time | Error reference                   |
|            | full                                                                          | No           | No             | No             | < 10 s        | TCP/UDP/IP<br>Error +CME<br>Error |

### 18.11.1 Description

Writes the specified amount of data to the remote address, like the BSD sendto routine, and returns the number of bytes of data actually written. It can be applied to UDP sockets only. This command allows the reuse of the same socket to send data to many different remote hosts.

There are three kinds of syntax:

- Base syntax normal: writing simple strings to the socket, there are characters which are forbidden
- Base syntax HEX: writing hexadecimal strings to the socket, the string will be converted in binary data and sent to the socket
- Binary extended syntax: mandatory for writing any character in the ASCII range [0x00, 0xFF]

 It is strongly recommended using this command to send data while using UDP sockets. It is also recommended avoiding +USOCO usage with UDP socket.

 (about UDP socket): if no network signal is available, outgoing UDP packet may be lost.

 To enable the base syntax HEX mode, see the AT+UDCONF=1 command description.

### 18.11.2 Syntax

| Type                 | Syntax                                                                                                            | Response                                                     | Example                                                                          |
|----------------------|-------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|----------------------------------------------------------------------------------|
| <b>Base syntax</b>   |                                                                                                                   |                                                              |                                                                                  |
| Set                  | AT+USOST=<socket>,<remote_addr>,<remote_port>,<length>,<data>                                                     | +USOST: <socket>,<length><br>OK                              | AT+USOST=3,"151.9.34.66",449,16,<br>"16 bytes of data"<br><br>+USOST: 3,16<br>OK |
| <b>Binary syntax</b> |                                                                                                                   |                                                              |                                                                                  |
| Set                  | AT+USOST=<socket>,<remote_addr>,<remote_port>,<length><br>After the "@" prompt <length> bytes of data are entered | @<data><br>+USOST: <socket>,<length><br>OK                   | AT+USOST=3,"151.9.34.66",449,16<br>@16 bytes of data<br>+USOST: 3,16<br>OK       |
| Test                 | AT+USOST=?                                                                                                        | +USOST: (list of supported <socket>s),"remote_host",(list of | +USOST: (0-6),"remote_host",(1-65535),(0-512),"HEX data"                         |

| Type | Syntax | Response                                                                                                                    | Example                                               |
|------|--------|-----------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|
|      |        | supported <remote_port>s),(list of supported <length>s),"HEX data"                                                          | +USOST: (0-6),"remote_host",(1-65535),(0-1024),"data" |
|      |        | +USOST: (list of supported <socket>s),"remote_host",(list of supported <remote_port>s),(list of supported <length>s),"data" | +USOST: (0-6),"remote_host",(1-65535),(0-1024)<br>OK  |
|      |        | +USOST: (list of supported <socket>s),"remote_host",(list of supported <remote_port>s),(list of supported <length>s)        | OK                                                    |

### 18.11.3 Defined values

| Parameter     | Type   | Description                                                                                                                                                                                                |
|---------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <socket>      | Number | Socket identifier. The range goes from 0 to 6                                                                                                                                                              |
| <remote_addr> | String | Remote host IP address or domain name of the remote host. For IP address format reference see the <a href="#">IP addressing</a> .                                                                          |
| <remote_port> | Number | Remote host port, in range 1-65535                                                                                                                                                                         |
| <length>      | Number | Number of data bytes to write <ul style="list-style-type: none"> <li>Base syntax normal mode: range 1-1024</li> <li>Base syntax HEX mode: range 1-512</li> <li>Binary syntax mode: range 1-1024</li> </ul> |
| <data>        | String | Data bytes to be written (not all of the ASCII charset can be used)                                                                                                                                        |

### 18.11.4 Notes

- For base syntax:
  - The value of <length> and the actual length of <data> must match
  - For base syntax HEX mode, only ASCII characters 0-9, A-F and a-f are allowed. The length of the <data> parameter must be two times the <length> parameter
- For binary syntax:
  - After the command is sent, the user waits for the @ prompt. When it appears the stream of bytes can be provided. After the specified amount of bytes has been sent, the system returns with final result code. The feed process cannot be interrupted i.e. the return in the command mode can be effective only when the number of bytes provided is the declared one
  - That binary extended syntax is the only way for the system to accept control characters as data; for the AT command specifications [16], characters like <CR>, <CTRL-Z>, quotation marks, etc. have a specific meaning and they cannot be used like data in the command itself. The command is so extended with a specific acceptance state identified by the @ prompt
  - This feature can be successfully used when there is need to send a byte stream which belongs to a protocol that has any kind of characters in the ASCII range [0x00,0xFF]
  - In binary mode the module does not display the echo of data bytes
  - Binary syntax is not affected by HEX mode option



## 18.12 Read Socket Data +USORD

| +USORD     |                                                                               |              |                |                |                    |                             |
|------------|-------------------------------------------------------------------------------|--------------|----------------|----------------|--------------------|-----------------------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |              |                |                |                    |                             |
| Attributes | Syntax                                                                        | PIN required | Settings saved | Can be aborted | Response time      | Error reference             |
|            | full                                                                          | No           | No             | No             | < 1 s (except URC) | TCP/UDP/IP Error +CME Error |

### 18.12.1 Description

Reads the specified amount of data from the specified socket, like the BSD read routine. This command can be used to know the total amount of unread data.

For the TCP socket type the URC **+UUSORD: <socket>,<length>** notifies the data bytes available for reading, either when buffer is empty and new data arrives or after a partial read by the user.

For the UDP socket type the URC **+UUSORD: <socket>,<length>** notifies that a UDP packet has been received, either when buffer is empty or after a UDP packet has been read and one or more packets are stored in the buffer.

In case of a partial read of a UDP packet **+UUSORD: <socket>,<length>** will show the remaining number of data bytes of the packet the user is reading.

-  (about UDP socket) Due to the UDP specific AT command, it is preferred to use the **+USORF** command to read data from UDP socket. **+USORF** command does not require the usage of **+USOCO** before reading data.
-  When applied to UDP active sockets if the UDP socket is not set in listening mode (see **+USOLI**) it will not be possible to receive any packet if a previous write operation is not performed.
-  If the HEX mode is enabled (refer to **AT+UDCONF=1** command) the received data will be displayed using an hexadecimal string.

### 18.12.2 Syntax

| Type | Syntax                     | Response                                                                  | Example                                                |
|------|----------------------------|---------------------------------------------------------------------------|--------------------------------------------------------|
| Set  | AT+USORD=<socket>,<length> | +USORD: <socket>,<length>,<data in the ASCII [0x00,0xFF] range><br>OK     | AT+USORD=3,16<br>+USORD: 3,16,"16 bytes of data"<br>OK |
| URC  |                            | +UUSORD: <socket>,<length>                                                | +UUSORD: 3,16                                          |
| Test | AT+USORD=?                 | +USORD: (list of supported <socket>s),(list of supported <length>s)<br>OK | +USORD: (0-6),(0-1024)<br>OK                           |

### 18.12.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                          |
|-----------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <socket>  | Number | Socket identifier. The range goes from 0 to 6                                                                                                                                                                        |
| <length>  | Number | Number of data bytes <ul style="list-style-type: none"> <li>to read stored in buffer, in range 0-1024 in the set command</li> <li>read from buffer, in range 0-1024</li> <li>stored in buffer for the URC</li> </ul> |
| <data>    | String | Data bytes to be read                                                                                                                                                                                                |

### 18.12.4 Notes

- The returned data may be any ASCII character in the range [0x00,0xFF] i.e. control characters. The starting quotation marks shall not be taken into account like data; the first byte of data starts after the first quotation marks. Then the other characters are provided for a <length> amount. An application

should rely on the <length> info to count the received number of characters (after the starting quotation marks) especially if any protocol control characters are expected.

- If an application deals with letter and number characters only i.e. all of the expected characters are outside the [0x00, 0x1F] range and are not quotation marks, the AT+USORD response quotation marks can be assumed to identify the start and the end of the received data packet. Always check <length> to identify the valid data stream.
- If the number of data bytes requested to be read from the buffer is bigger than the number of bytes stored in the buffer only the available amount of data bytes will be read.
- When <length>= 0, the command returns the total amount of data present in the network buffer.

**Example:** 23 unread bytes in the socket

AT+USORD=3,0

+USORD: 3,23

OK

- If the HEX mode is enabled, the length of <data> will be 2 times <length>.

## 18.13 Receive From command (UDP only) +USORF

| +USORF            |                                                                               |                     |                       |                       |                      |                                   |
|-------------------|-------------------------------------------------------------------------------|---------------------|-----------------------|-----------------------|----------------------|-----------------------------------|
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                       |                       |                      |                                   |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b>            |
|                   | full                                                                          | No                  | No                    | No                    | < 1 s (except URC)   | TCP/UDP/IP<br>Error +CME<br>Error |

### 18.13.1 Description

Reads the specified amount of data from the specified UDP socket, like the BSD recvfrom routine. The URC **+UUSORF: <socket>,<length>** (or also **+UUSORD: <socket>,<length>**) notifies that new data is available for reading, either when new data arrives or after a partial read by the user for the socket. This command can also return the total amount of unread data.

This command can be applied to UDP sockets only, and it can be used to read data after both +UUSORD and +UUSORF unsolicited indication.



If the HEX mode is enabled (see **+UDCONF=1**) the received data will be displayed using an hexadecimal string.

### 18.13.2 Syntax

| Type | Syntax                     | Response                                                                                             | Example                                                                   |
|------|----------------------------|------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|
| Set  | AT+USORF=<socket>,<length> | +USORF: <socket>,<remote_ip_addr>,<remote_port>,<length>,<data in the ASCII [0x00,0xFF] range><br>OK | AT+USORF=3,16<br>+USORF: 3,"151.9.34.66",2222,16,"16 bytes of data"<br>OK |
| Test | AT+USORF=?                 | +USORF: (list of supported <socket>s),(list of supported <length>s)<br>OK                            | +USORF: (0-6),(0-1024)<br>OK                                              |
| URC  |                            | +UUSORF: <socket>,<length>                                                                           | +UUSORF: 3,16                                                             |

### 18.13.3 Defined values

| Parameter        | Type   | Description                                                                                     |
|------------------|--------|-------------------------------------------------------------------------------------------------|
| <socket>         | Number | Socket identifier. The range goes from 0 to 6                                                   |
| <remote_ip_addr> | String | Remote host IP address. For IP address format reference see the <a href="#">IP addressing</a> . |
| <remote_port>    | Number | Remote host port, in range 1-65535                                                              |
| <length>         | Number | Number of data bytes to read, in range 0-1024                                                   |
| <data>           | String | Data bytes to be read                                                                           |

### 18.13.4 Notes

- Each packet received from the network is stored in a separate buffer and the command is capable to read only a packet (or a portion of it) at time. This means that if <length> is greater than the packet size, the command will return a maximum amount of data equal to the packet size, also if there are other packets in the buffer. The remaining data (i.e. the remaining UDP packets) can be read with further reads.
- The returned data may have any kind of ASCII character in the range [0x00,0xFF] i.e. control characters too. The starting quotation marks shall not be taken into account like data; the first byte of data starts after the first quotation marks. Then the other characters are provided for a <length> amount. At the end of the length byte stream, another quotation marks followed by <CR><LF> are provided for user convenience and visualization purposes. An application should rely on the <length> info to count the received number of characters (after the starting quotation marks) especially if any protocol control characters are expected.
- If an application deals with letter and number characters only i.e. all of the expected characters are outside the [0x00, 0x1F] range and are not quotation marks, the [AT+USORD](#) response quotation marks can be assumed to identify the start and the end of the received data packet, anyway the <length> field usage to identify the valid data stream is recommended.
- When <length>= 0, the command returns the total amount of data present in the network buffer.

**Example:** 23 unread bytes in the socket

AT+USORF=3,0

+USORF: 3,23

OK

- If the HEX mode is enabled, the length of <data> will be 2 times <length>.

## 18.14 Set Listening Socket +USOLI

| +USOLI            |                                                                               |                     |                       |                       |                      |                                   |
|-------------------|-------------------------------------------------------------------------------|---------------------|-----------------------|-----------------------|----------------------|-----------------------------------|
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                       |                       |                      |                                   |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b>            |
|                   | full                                                                          | No                  | No                    | No                    | < 1 s (except URC)   | TCP/UDP/IP<br>Error +CME<br>Error |

### 18.14.1 Description

Sets the specified socket in listening mode on the specified port of service, waiting for incoming connections (TCP) or data (UDP):

- For **TCP sockets**, incoming connections will be automatically accepted and notified via the URC **+UUSOLI: <socket>,<ip\_address>,<port>,<listening\_socket>,<local\_ip\_address>,<listening\_port>**, carrying the connected socket identifier, the remote IP address and port.
- For **UDP sockets**, incoming data will be notified via URC **+UUSORF: <listening\_socket>,<length>**. To know from which remote IP address and port the data is coming from, use the [AT+USORF](#) command.

### 18.14.2 Syntax

| Type | Syntax                   | Response | Example                                                                                                                                                              |
|------|--------------------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Set  | AT+USOLI=<socket>,<port> | OK       | <b>TCP sockets</b><br>AT+USOLI=2,1200<br>OK<br>+UUSOLI: 3,"151.63.16.7",1403,2,"82.89.67.164",1200<br><b>UDP sockets</b><br>AT+USOLI=0,1182<br>OK<br>+UUSORF: 0,1024 |

| Type         | Syntax     | Response                                                                                             | Example                                                |
|--------------|------------|------------------------------------------------------------------------------------------------------|--------------------------------------------------------|
| Test         | AT+USOLI=? | +USOLI: (list of supported<br><socket>s),(list of supported<br><port>s)<br>OK                        | +USOLI: (0-6),(1-65535)<br>OK                          |
| URC<br>(TCP) |            | +UUSOLI: <socket>,<ip_address>,<br><port>,<listening_socket>,<local_<br>ip_address>,<listening_port> | +UUSOLI: 3,"151.63.16.7",1403,0,<br>"82.89.67.164",200 |
| URC<br>(UDP) |            | +UUSORF: <listening_socket>,<br><length>                                                             | +UUSORF: 1,967                                         |

### 18.14.3 Defined values

| Parameter          | Type   | Description                                                                                                                                                                           |
|--------------------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <socket>           | Number | Socket identifier. The range goes from 0 to 6                                                                                                                                         |
| <port>             | Number | Port of service, range 1-65535. Port numbers below 1024 are not recommended since they are usually reserved                                                                           |
| <ip_address>       | String | Remote host IP address (only in URC +UUSOLI). For IP address format reference see the <a href="#">IP addressing</a> .                                                                 |
| <listening_socket> | Number | Socket identifier specified within the AT+USOLI command, indicates on which listening socket the connection has been accepted (only in +UUSOLI URC)                                   |
| <local_ip_address> | String | TE IP address (only in +UUSOLI URC). For IP address format reference see the <a href="#">IP addressing</a> .                                                                          |
| <listening_port>   | Number | Listening port that has accepted the connection. This port is specified within the AT+USOLI command (only in +UUSOLI URC)                                                             |
| <length>           | Number | Data length received on the UDP listening socket (only in +UUSORF unsolicited indication). In order to know the sender IP address and port, use the <a href="#">AT+USORF</a> command. |

### 18.14.4 Notes

- In case of notification via the URC +UUSOLI <port> is intended as the remote port.

## 18.15 HEX mode configuration +UDCONF=1

| +UDCONF=1  |                                                                               |              |                |                |               |                            |
|------------|-------------------------------------------------------------------------------|--------------|----------------|----------------|---------------|----------------------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |              |                |                |               |                            |
| Attributes | Syntax                                                                        | PIN required | Settings saved | Can be aborted | Response time | Error reference            |
|            | full                                                                          | No           | No             | No             | -             | <a href="#">+CME Error</a> |

### 18.15.1 Description

Enables/disables the HEX mode for [+USOWR](#), [+USOST](#), [+USORD](#) and [+USORF](#) AT commands.

### 18.15.2 Syntax

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

### 18.15.3 Defined values

| Parameter          | Type   | Description                                                                                                                                                                                                                                                          |
|--------------------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <hex_mode_disable> | Number | Enables/disables the HEX mode for <a href="#">+USOWR</a> , <a href="#">+USOST</a> , <a href="#">+USORD</a> and <a href="#">+USORF</a> AT commands. Allowed values: <ul style="list-style-type: none"> <li>0 (factory-programmed value): HEX mode disabled</li> </ul> |

| Parameter | Type | Description                                                           |
|-----------|------|-----------------------------------------------------------------------|
|           |      | <ul style="list-style-type: none"> <li>1: HEX mode enabled</li> </ul> |

## 18.16 Set socket in Direct Link mode +USODL

| +USODL     |                                                                               |              |                |                |               |                 |
|------------|-------------------------------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |              |                |                |               |                 |
| Attributes | Syntax                                                                        | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                                                                          | No           | No             | No             | < 1 s         | +CME Error      |

### 18.16.1 Description

Establishes a transparent end to end communication with an already connected TCP or UDP socket via the serial interface. The data can be sent to the socket and can be received via the serial interface: the HW flow control usage is strongly recommended to avoid data loss.

The transparent TCP/UDP connection mode can be exited via the +++ sequence, entered after at least 2 s of suspension of transmission to the port. The socket will remain connected and communication can be re-established any time.

The **+UDCONF=5**, **+UDCONF=6**, **+UDCONF=7**, **+UDCONF=8** commands allow the configuration of UDP and TCP direct link triggers.



When using Direct Link with UDP sockets, if no network signal is available, outgoing UDP packet may be lost.



SARA-R404M / SARA-R410M-01B / SARA-R410M-02B  
The HW flow control is not supported.

### 18.16.2 Syntax

| Type | Syntax            | Response                                       | Example               |
|------|-------------------|------------------------------------------------|-----------------------|
| Set  | AT+USODL=<socket> | CONNECT                                        | AT+USODL=0<br>CONNECT |
| Test | AT+USODL=?        | +USODL: (list of supported<br><socket>s)<br>OK | +USODL: (0-6)<br>OK   |

### 18.16.3 Defined values

| Parameter | Type   | Description                                    |
|-----------|--------|------------------------------------------------|
| <socket>  | Number | Socket identifier. The range goes from 0 to 6. |

### 18.16.4 Enhanced Direct Link

The enhanced DL functionality allows the user set up to three kinds of trigger for data transmission:

- Timer Trigger
- Data Length Trigger
- Character Trigger

The triggers can be applied independently to each socket. A socket may be set with more than one trigger.

The trigger must be set after the socket creation and before switching to direct link mode.

By default Timer Trigger and Data Length Trigger are enabled for UDP sockets.

By default no triggers are enabled for TCP sockets.

See the **+UDCONF=5**, **+UDCONF=6**, **+UDCONF=7**, **+UDCONF=8** commands description for the transmission triggers configuration.

#### 18.16.4.1 Timer Trigger (TT)

The user can configure a timeout for sending the data. The timer starts every time a character is read from the serial interface. When the timer expires, buffered data is sent.

The timer range is between 100 and 120000 ms; the special value 0 (zero) means that the timer is disabled.

By default the timer trigger is disabled for TCP sockets and enabled with a value of 500 ms for UDP sockets.

The **+UDCONF=5** command can configure the timer trigger.

#### 18.16.4.2 Data Length Trigger (DLT)

The user can configure a maximum buffered data length to reach before sending the data. When this length is reached the data is sent.

The minimum data length is 3, the maximum data length is 2048 bytes for TCP and 1472 bytes for UDP. If the data length is set to 0 (zero) the trigger is disabled (every data chunk received from the serial port is immediately sent to the network).

By default the data length trigger is disabled for TCP sockets and set to 1024 for UDP sockets.

The **+UDCONF=6** command can configure the data length trigger.

#### 18.16.4.3 Character Trigger (CT)

The user can configure a character that will trigger the data transmission. When the character is detected the data (including the trigger character) is sent.

If the specified character is -1, the character trigger is disabled.

By default it is disabled for both TCP and UDP sockets.

The **+UDCONF=7** command can configure the character trigger.

#### 18.16.4.4 Combined Triggers

The user can enable multiple triggers together. The triggers work with an OR logic. This means that the first trigger reached fires the data transmission.

#### 18.16.4.5 About serial data chunks

A data chunk is the amount of data that SIO recognizes as a single data transmission.



If the baud rate is lower than 115200 b/s the time to receive 255 characters is always calculated with timings for 115200 b/s.

#### 18.16.4.6 Data from the network

The data received from the network is immediately forwarded to the serial interface.

#### 18.16.4.7 Congestion timer

Is it also possible to set a congestion timer after which, in case of network congestion, the module exits from direct link.

The timer range is between 1000 and 720000 ms, the special value 0 (zero) means that the timer is disabled.

By default the congestion timer is set to 60000 (60 s) for both TCP and UDP sockets.

The **+UDCONF=8** command can configure the congestion timer.

## 18.17 UDP Direct Link Packet Size configuration +UDCONF=2

| +UDCONF=2  |                                                                               |              |                |                |               |                 |
|------------|-------------------------------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |              |                |                |               |                 |
| Attributes | Syntax                                                                        | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                                                                          | No           | No             | No             | -             | +CME Error      |

### 18.17.1 Description

Set the packet size for the UDP direct link packet.

### 18.17.2 Syntax

| Type | Syntax                                | Response                                   | Example                                  |
|------|---------------------------------------|--------------------------------------------|------------------------------------------|
| Set  | AT+UDCONF=2,<socket_id>,<packet_size> | OK                                         | AT+UDCONF=2,1,1024<br>OK                 |
| Read | AT+UDCONF=2,<socket_id>               | +UDCONF: 2,<socket_id>,<packet_size><br>OK | AT+UDCONF=2,1<br>+UDCONF: 2,1,1024<br>OK |

### 18.17.3 Defined values

| Parameter     | Type   | Description                                                                                                     |
|---------------|--------|-----------------------------------------------------------------------------------------------------------------|
| <socket_id>   | Number | Socket identifier; used when changing the UDP Direct Link settings.<br>Valid range is 0-6                       |
| <packet_size> | Number | Packet size (in bytes) for UDP direct link; valid range is 100-1472; the factory-programmed value is 1024 bytes |

## 18.18 UDP Direct Link Sending timer configuration +UDCONF=3

| +UDCONF=3  |                                                                               |              |                |                |               |                            |
|------------|-------------------------------------------------------------------------------|--------------|----------------|----------------|---------------|----------------------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |              |                |                |               |                            |
| Attributes | Syntax                                                                        | PIN required | Settings saved | Can be aborted | Response time | Error reference            |
|            | full                                                                          | No           | No             | No             | -             | <a href="#">+CME Error</a> |

### 18.18.1 Description

Configures the UDP direct link set sending timer.

### 18.18.2 Syntax

| Type | Syntax                                          | Response                                             | Example                                  |
|------|-------------------------------------------------|------------------------------------------------------|------------------------------------------|
| Set  | AT+UDCONF=3,<socket_id>,<sending_timer_timeout> | OK                                                   | AT+UDCONF=3,1,1000<br>OK                 |
| Read | AT+UDCONF=3,<socket_id>                         | +UDCONF: 3,<socket_id>,<sending_timer_timeout><br>OK | AT+UDCONF=3,1<br>+UDCONF: 3,1,1000<br>OK |

### 18.18.3 Defined values

| Parameter               | Type   | Description                                                                                                  |
|-------------------------|--------|--------------------------------------------------------------------------------------------------------------|
| <socket_id>             | Number | Socket identifier; used when changing the UDP Direct Link settings.<br>Allowed range is 0-6                  |
| <sending_timer_timeout> | Number | Sending timer (in milliseconds) for UDP direct link; valid range is 100-120000; the default value is 1000 ms |

## 18.19 Timer Trigger configuration for Direct Link +UDCONF=5

| +UDCONF=5  |                                                                               |              |                |                |               |                            |
|------------|-------------------------------------------------------------------------------|--------------|----------------|----------------|---------------|----------------------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |              |                |                |               |                            |
| Attributes | Syntax                                                                        | PIN required | Settings saved | Can be aborted | Response time | Error reference            |
|            | full                                                                          | No           | No             | No             | -             | <a href="#">+CME Error</a> |

### 18.19.1 Description

Sets the timer trigger of the interested socket identifier for the data transmission enhanced Direct Link.

### 18.19.2 Syntax

| Type | Syntax                                  | Response                                     | Example                                 |
|------|-----------------------------------------|----------------------------------------------|-----------------------------------------|
| Set  | AT+UDCONF=5,<socket_id>,<timer_trigger> | OK                                           | AT+UDCONF=5,0,500<br>OK                 |
| Read | AT+UDCONF=5,<socket_id>                 | +UDCONF: 5,<socket_id>,<timer_trigger><br>OK | AT+UDCONF=5,0<br>+UDCONF: 5,0,500<br>OK |

### 18.19.3 Defined values

| Parameter       | Type   | Description                                                                                                                                                                       |
|-----------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <socket_id>     | Number | Socket identifier; used when changing the UDP Direct Link settings. The range is 0-6.                                                                                             |
| <timer_trigger> | Number | Enhanced Direct Link sending timer trigger (in milliseconds); valid range is 0, 100-120 000; the factory-programmed value is 500 ms for UDP, 0 for TCP, 0 means trigger disabled. |

### 18.19.4 Notes

#### SARA-R4 / SARA-N4

- The factory-programmed value is 1000 ms for TCP.

## 18.20 Data Length Trigger configuration for Direct Link +UDCONF=6

| +UDCONF=6  |                                                                               |              |                |                |               |                            |
|------------|-------------------------------------------------------------------------------|--------------|----------------|----------------|---------------|----------------------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |              |                |                |               |                            |
| Attributes | Syntax                                                                        | PIN required | Settings saved | Can be aborted | Response time | Error reference            |
|            | full                                                                          | No           | No             | No             | -             | <a href="#">+CME Error</a> |

### 18.20.1 Description

Sets the data length trigger of the interested socket identifier for the data transmission enhanced Direct Link.

### 18.20.2 Syntax

| Type | Syntax                                        | Response                                           | Example                                  |
|------|-----------------------------------------------|----------------------------------------------------|------------------------------------------|
| Set  | AT+UDCONF=6,<socket_id>,<data_length_trigger> | OK                                                 | AT+UDCONF=6,0,1024<br>OK                 |
| Read | AT+UDCONF=6,<socket_id>                       | +UDCONF: 6,<socket_id>,<data_length_trigger><br>OK | AT+UDCONF=6,0<br>+UDCONF: 6,0,1024<br>OK |

### 18.20.3 Defined values

| Parameter             | Type   | Description                                                                                                                                                                                  |
|-----------------------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <socket_id>           | Number | Socket identifier; used when changing the UDP Direct Link settings.<br>Valid range is 0-6                                                                                                    |
| <data_length_trigger> | Number | Enhanced Direct Link data length trigger in bytes, valid range is 0, 3 1472 for UDP and 0, 3-2048 for TCP, the factory-programmed value is 1024 for UDP, 0 for TCP, 0 means trigger disabled |



## 18.21 Character trigger configuration for Direct Link +UDCONF=7

| +UDCONF=7  |                                                                    |              |                |                |               |                            |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|----------------------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                            |
|            | SARA-N4                                                            |              |                |                |               |                            |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference            |
|            | full                                                               | No           | No             | No             | -             | <a href="#">+CME Error</a> |

### 18.21.1 Description

Sets the character trigger of the interested socket identifier for the data transmission enhanced Direct Link.

### 18.21.2 Syntax

| Type | Syntax                                      | Response                                         | Example                                |
|------|---------------------------------------------|--------------------------------------------------|----------------------------------------|
| Set  | AT+UDCONF=7,<socket_id>,<character_trigger> | OK                                               | AT+UDCONF=7,0,13<br>OK                 |
| Read | AT+UDCONF=7,<socket_id>                     | +UDCONF: 7,<socket_id>,<character_trigger><br>OK | AT+UDCONF=7,0<br>+UDCONF: 7,0,13<br>OK |

### 18.21.3 Defined values

| Parameter           | Type   | Description                                                                                                                                                                                                                              |
|---------------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <socket_id>         | Number | Socket identifier; used when changing the Direct Link settings.<br>The allowed range is 0-6                                                                                                                                              |
| <character_trigger> | Number | Enhanced Direct Link character trigger, the value represents the ASCII code (in base 10) of the character to be used as character trigger. The allowed range is -1, 0-255, the factory-programmed value is -1; -1 means trigger disabled |

## 18.22 Congestion timer configuration for Direct Link +UDCONF=8

| +UDCONF=8  |                                                                    |              |                |                |               |                            |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|----------------------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                            |
|            | SARA-N4                                                            |              |                |                |               |                            |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference            |
|            | full                                                               | No           | No             | No             | -             | <a href="#">+CME Error</a> |

### 18.22.1 Description

Sets the congestion timer of the interested socket identifier for the data transmission enhanced Direct Link.

### 18.22.2 Syntax

| Type | Syntax                                     | Response                                        | Example                                    |
|------|--------------------------------------------|-------------------------------------------------|--------------------------------------------|
| Set  | AT+UDCONF=8,<socket_id>,<congestion_timer> | OK                                              | AT+UDCONF=8,0,120000<br>OK                 |
| Read | AT+UDCONF=8,<socket_id>                    | +UDCONF: 8,<socket_id>,<congestion_timer><br>OK | AT+UDCONF=8,0<br>+UDCONF: 8,0,120000<br>OK |

### 18.22.3 Defined values

| Parameter   | Type   | Description                                                     |
|-------------|--------|-----------------------------------------------------------------|
| <socket_id> | Number | Socket identifier; used when changing the Direct Link settings. |

| Parameter          | Type   | Description                                                                                                                                              |
|--------------------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
|                    |        | Valid range is 0-6                                                                                                                                       |
| <congestion_timer> | Number | Enhanced Direct Link congestion timer (in milliseconds); valid range is 0, 1000-72000 0; the factory-programmed value is 60000, 0 means trigger disabled |

## 18.23 Socket control +USOCTL

| +USOCTL    |                                                                               |              |                |                |               |                            |
|------------|-------------------------------------------------------------------------------|--------------|----------------|----------------|---------------|----------------------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |              |                |                |               |                            |
| Attributes | Syntax                                                                        | PIN required | Settings saved | Can be aborted | Response time | Error reference            |
|            | partial                                                                       | No           | No             | No             | -             | <a href="#">+CME Error</a> |

### 18.23.1 Description

Allows interaction with the low level socket layer.

### 18.23.2 Syntax

| Type | Syntax                        | Response                                                                     | Example                                |
|------|-------------------------------|------------------------------------------------------------------------------|----------------------------------------|
| Set  | AT+USOCTL=<socket>,<param_id> | +USOCTL: <socket>,<param_id>,<param_val>[,<param_val2>]<br>OK                | AT+USOCTL=0,2<br>+USOCTL: 0,2,38<br>OK |
| Test | AT+USOCTL=?                   | +USOCTL: (list of supported <socket>s),(list of supported <param_id>s)<br>OK | +USOCTL: (0-6),(0-4,10-11)<br>OK       |

### 18.23.3 Defined values

| Parameter   | Type            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <socket>    | Number          | Socket identifier. The range goes from 0 to 6.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <param_id>  | Number          | Control request identifier. Possible values are: <ul style="list-style-type: none"> <li>0: query for socket type</li> <li>1: query for last socket error</li> <li>2: get the total amount of bytes sent from the socket</li> <li>3: get the total amount of bytes received by the socket</li> <li>4: query for remote peer IP address and port</li> <li>10: query for TCP socket status (only TCP sockets)</li> <li>11: query for TCP outgoing unacknowledged data (only TCP sockets)</li> <li>5-9, 12-99: RFU</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <param_val> | Number / String | This value may assume different means depending on the <param_id> parameter. <p>If &lt;param_id&gt;= 0, &lt;param_val&gt; can assume these values:</p> <ul style="list-style-type: none"> <li>6 TCP socket</li> <li>17: UDP socket</li> </ul> <p>If &lt;param_id&gt;= 1, &lt;param_val&gt; can assume these values:</p> <ul style="list-style-type: none"> <li>N: last socket error</li> </ul> <p>If &lt;param_id&gt;= 2, &lt;param_val&gt; can assume these values:</p> <ul style="list-style-type: none"> <li>N: the total amount (in bytes) of sent (acknowledged + unacknowledged) data</li> </ul> <p>If &lt;param_id&gt;= 3, &lt;param_val&gt; can assume these values:</p> <ul style="list-style-type: none"> <li>N: the total amount (in bytes) of received (read) data</li> </ul> <p>If &lt;param_id&gt;= 4, &lt;param_val&gt; can assume these values:</p> <ul style="list-style-type: none"> <li>A string representing the remote peer IP address expressed in dotted decimal form</li> </ul> <p>If &lt;param_id&gt;= 10, &lt;param_val&gt; can assume these values:</p> <ul style="list-style-type: none"> <li>0: the socket is in INACTIVE status (it corresponds to CLOSED status defined in RFC793 "TCP Protocol Specification" <a href="#">[12]</a>)</li> <li>1: the socket is in LISTEN status</li> </ul> |

| Parameter    | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|              |        | <ul style="list-style-type: none"> <li>2: the socket is in SYN_SENT status</li> <li>3: the socket is in SYN_RCVD status</li> <li>4: the socket is in ESTABLISHED status</li> <li>5: the socket is in FIN_WAIT_1 status</li> <li>6: the socket is in FIN_WAIT_2 status</li> <li>7: the socket is in CLOSE_WAIT status</li> <li>8: the socket is in CLOSING status</li> <li>9: the socket is in LAST_ACK status</li> <li>10: the socket is in TIME_WAIT status</li> </ul> <p>If &lt;param_id&gt;= 11, &lt;param_val&gt; can assume these values:</p> <ul style="list-style-type: none"> <li>N: the total amount of outgoing unacknowledged data</li> </ul> |
| <param_val2> | Number | This value is present only when <param_id> is 4. It represents the remote peer IP port. For IP address format reference see the <a href="#">IP addressing</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

## 18.23.4 Notes

### SARA-R4 / SARA-N4

- <param\_id>=4 and 11 are not supported.

### SARA-R404M / SARA-R410M-01B / SARA-R410M-02B

- <param\_id>=2 and 3 are not supported.

## 18.24 Configure Dormant Close Socket Behavior +USOCLCFG

| +USOCLCFG  |                                          |              |                |                |               |                 |
|------------|------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                 |
|            | SARA-N4                                  |              |                |                |               |                 |
| Attributes | Syntax                                   | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                                     | Yes          | NVM            | No             | -             | +CME Error      |

### 18.24.1 Description

Enables or disables the TCP socket Graceful Dormant Close feature. When enabled, if the RRC connection is released and a TCP socket is closed with the **+USOCL**, the module will re-establish the RRC connection to close the socket both locally and remotely. When this feature is disabled, the module will close the socket locally without re-establishing the RRC connection. In this case the socket will remain open on the remote side until it is closed.

### 18.24.2 Syntax

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

### 18.24.3 Defined values

| Parameter    | Type   | Description                                                                                                                                                               |
|--------------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <GDC_enable> | Number | Status of TCP socket Graceful Dormant Close. Allowed values: <ul style="list-style-type: none"> <li>0: disabled</li> <li>1 (factory-programmed value): enabled</li> </ul> |

## 19 SSL/TLS

### 19.1 Introduction

SSL/TLS provides a secure connection between two entities using TCP socket for communication (i.e. HTTP/FTP server and HTTP/FTP client).

The SSL/TLS with digital certificates support provides different connection security aspects:

- **Server authentication:** use of the server certificate verification against a specific trusted certificate or a trusted certificates list;
- **Client authentication:** use of the client certificate and the corresponding private key;
- **Data security and integrity:** data encryption and Hash Message Authentication Code (HMAC) generation.

The security aspects used in the current connection depend on the SSL/TLS configuration and features supported by the communicating entities.

u-blox cellular modules support all the described aspects of SSL/TLS security protocol with these AT commands:

- **AT+USECMNG:** import, removal, list and information retrieval of certificates or private keys;
- **AT+USECPRF:** configuration of USECMNG (u-blox SECurity MaNaGement) profiles used for an SSL/TLS connection.

The USECMNG provides a default SSL/TLS profile which cannot be modified. The default USECMNG profile provides the following SSL/TLS settings:

| Setting                                | Value     | Meaning                                                                         |
|----------------------------------------|-----------|---------------------------------------------------------------------------------|
| Certificates validation level          | Level 0   | The server certificate will not be checked or verified.                         |
| Minimum SSL/TLS version                | Any       | The server can use any of the TLS1.0/TLS1.1/TLS1.2 versions for the connection. |
| Cipher suite                           | Automatic | The cipher suite will be negotiated in the handshake process.                   |
| Trusted root certificate internal name | "" (none) | No certificate will be used for the server authentication.                      |
| Expected server host-name              | "" (none) | No server host-name is expected.                                                |
| Client certificate internal name       | "" (none) | No client certificate will be used.                                             |
| Client private key internal name       | "" (none) | No client private key will be used.                                             |



SARA-R4 / SARA-N4

The default USECMNG profile does not provide the client certificate internal name and the client private key internal name.

### 19.2 SSL/TLS certificates and private keys manager +USECMNG

| +USECMNG   |                                                         |              |                |                |               |                 |
|------------|---------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                 |
|            | SARA-N4                                                 |              |                |                |               |                 |
| Attributes | Syntax                                                  | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                                                    | No           | No             | No             | -             | +CME Error      |

#### 19.2.1 Description

Manages the X.509 certificates and private keys with the following functionalities:

- Import of certificates and private keys
- List and information retrieval of imported certificates and private keys
- Removal of certificates and private keys
- MD5 calculation of imported certificate or private key



SARA-R4 / SARA-N4

The command accepts certificates and private keys in DER (Distinguished Encoding Rules) format only. If the provided format is PEM, the imported certificate or private key will be invalid.

-  The certificates and private keys are kept in DER format and are not retrievable (i.e. cannot be downloaded from the module); for data validation purposes an MD5 hash string of the stored certificate or private key (stored in DER format) can be retrieved.
-  Up to 16 certificates or private keys can be imported.
-  Data for certificate or private key import can be provided with a stream of byte similar to **+UDWNFILE** or from a file stored on the FS.
-  When using the stream of byte import functionality:
  - If the data transfer is stopped before its completion, a guard timer of 20 s will ensure the termination of the data transmission. In this case the prompt will switch back in AT command mode and an error result code will be returned.
  - If the module shuts down during the data transfer, all the bytes are discarded.
  - If any error occurs during the data transfer, all bytes are discarded.
-  All the imported certificates or private keys are listed if the type of the security data is omitted.

## 19.2.2 Syntax

| Type                                                                 | Syntax                                                                     | Response                                                                                    | Example                                                                                                                                                                                                                            |
|----------------------------------------------------------------------|----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Generic syntax:</b>                                               |                                                                            |                                                                                             |                                                                                                                                                                                                                                    |
| Action                                                               | AT+USECMNG=<op_code>,<br>[<type>,<internal_name>[,<br><param1>,<param2>]]] | OK                                                                                          | -                                                                                                                                                                                                                                  |
| <b>Import a certificate or private key from serial I/O:</b>          |                                                                            |                                                                                             |                                                                                                                                                                                                                                    |
| Action                                                               | AT+USECMNG=0,<type>,<internal_name>,<data_size>,<password>]                | Start transfer of data ...<br><br>+USECMNG: 0,<type>,<internal_name>,<md5_string><br><br>OK | AT+USECMNG=0,0,"AddTrustCA",<br>1327<br><br>>-----BEGIN CERTIFICATE-----<br>(...other certificate data bytes...)<br><br>+USECMNG: 0,0,"AddTrustCA",<br>"77107370ec4db40a0<br>8a6e36a64a1435b"<br><br>OK                            |
| <b>Import a certificate or private key from a file stored on FS:</b> |                                                                            |                                                                                             |                                                                                                                                                                                                                                    |
| Action                                                               | AT+USECMNG=1,<type>,<internal_name>,<filename>,<password>]                 | +USECMNG: 1,<type>,<internal_name>,<md5_string><br><br>OK                                   | AT+USECMNG=1,0,"AddTrustCA",<br>"addtrust.cert"<br><br>+USECMNG: 1,0,"AddTrustCA","7710<br>7370ec4db40a08a6e36a64a1435b"<br><br>OK                                                                                                 |
| <b>Remove an imported certificate or private key:</b>                |                                                                            |                                                                                             |                                                                                                                                                                                                                                    |
| Action                                                               | AT+USECMNG=2,<type>,<internal_name>                                        | OK                                                                                          | AT+USECMNG=2,0,"AddTrustCA"<br><br>OK                                                                                                                                                                                              |
| <b>List imported certificates or private keys:</b>                   |                                                                            |                                                                                             |                                                                                                                                                                                                                                    |
| Read                                                                 | AT+USECMNG=3[,<type>]                                                      | <cert_type>,<internal_name>[,<br><common_name>,<expiration_date>]<br><br>...<br><br>OK      | AT+USECMNG=3<br><br>"CA","AddTrustCA","AddTrust<br>External CA Root","2020/05/30"<br><br>"CA","GlobalSignCA","GlobalSign",<br>"2029/03/18"<br><br>"CC","JohnDoeCC","GlobalSign","20<br>10/01/01"<br><br>"PK","JohnDoePK"<br><br>OK |
| <b>Retrieve the MD5 of an imported certificate or private key:</b>   |                                                                            |                                                                                             |                                                                                                                                                                                                                                    |
| Read                                                                 | AT+USECMNG=4,<type>,<internal_name>                                        | +USECMNG: 4,<type>,<internal_name>,<md5_string><br><br>OK                                   | AT+USECMNG=4,0,"AddTrustCA"<br><br>+USECMNG: 4,0,"AddTrustCA",<br>"77107370ec4db40a0<br>8a6e36a64a1435b"                                                                                                                           |

| Type | Syntax       | Response                                                                   | Example                           |
|------|--------------|----------------------------------------------------------------------------|-----------------------------------|
| Test | AT+USECMNG=? | +USECMNG: (list of supported <op_code>s),(list of supported <type>s)<br>OK | OK<br>+USECMNG: (0-4),(0-2)<br>OK |

### 19.2.3 Defined values

| Parameter         | Type              | Description                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <op_code>         | Number            | Type of operation: <ul style="list-style-type: none"> <li>0: import a certificate or a private key (data provided by the stream of byte)</li> <li>1: import a certificate or a private key (data provided from a file on FS)</li> <li>2: remove an imported certificate or private key</li> <li>3: list imported certificates or private keys</li> <li>4: retrieve the MD5 of an imported certificate or private key</li> </ul> |
| <type>            | Number            | Type of the security data: <ul style="list-style-type: none"> <li>0: trusted root CA (certificate authority) certificate</li> <li>1: client certificate</li> <li>2: client private key</li> </ul>                                                                                                                                                                                                                               |
| <cert_type>       | String            | Type of the security data: <ul style="list-style-type: none"> <li>"CA": trusted root CA (certificate authority) certificate</li> <li>"CC": client certificate</li> <li>"PK": client private key</li> </ul>                                                                                                                                                                                                                      |
| <internal_name>   | String            | Unique identifier of an imported certificate or private key. If an existing name is used the data will be overridden. The maximum length is 200 characters.                                                                                                                                                                                                                                                                     |
| <data_size>       | Number            | Size in bytes of a certificate or private key being imported. The maximum allowed size is 8192 bytes.                                                                                                                                                                                                                                                                                                                           |
| <password>        | String            | Decryption password; applicable only for PKCS8 encrypted client private keys. The maximum length is 128 characters.                                                                                                                                                                                                                                                                                                             |
| <filename>        | String            | Name of the FS file containing the certificate or private key data to be imported. The maximum allowed file size is 8192 bytes.                                                                                                                                                                                                                                                                                                 |
| <md5_string>      | String            | MD5 formatted string.                                                                                                                                                                                                                                                                                                                                                                                                           |
| <common_name>     | String            | Certificate subject (issued to) common name; applicable only for trusted root and client certificates.                                                                                                                                                                                                                                                                                                                          |
| <expiration_date> | String            | Certificate expiration (valid to date); applicable only for trusted root and client certificates.                                                                                                                                                                                                                                                                                                                               |
| <param1>          | Number/<br>String | Type and supported content depend on the related <op_code> parameter; see the <op_code> specification.                                                                                                                                                                                                                                                                                                                          |
| <param2>          | Number/<br>String | Type and supported content depend on the related <op_code> parameter; see the <op_code> specification.                                                                                                                                                                                                                                                                                                                          |

### 19.2.4 Notes

#### SARA-R4 / SARA-N4

- The <password>, <common\_name> and <expiration\_date> parameters are not supported.

#### SARA-R410M

- The certificates in the PEM format are not supported; they will not be automatically converted to the DER format.

## 19.3 SSL/TLS security layer profile manager +USECPRF

| +USECPRF   |                                                                    |              |                |                |               |                 |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |              |                |                |               |                 |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                                                               | No           | No             | No             | -             | +CME Error      |

### 19.3.1 Description

Manages security profiles for the configuration of the following SSL/TLS connections properties:

- **Certificate validation level:**
  - o Level 0: no certificate validation; the server certificate will not be checked or verified. No additional certificates are needed.
  - o Level 1: certificate validation against a specific or a list of imported trusted root certificates.
  - o Level 2: certificate validation with an additional URL integrity check (the server certificate common name must match the server hostname).
  - o Level 3: certificate validation with an additional check on the certificate validity date.

CA certificates should be imported with the [+USECMNG](#) AT command
- **Minimum SSL/TLS version to be used:**
  - o Any
  - o TLS 1.0
  - o TLS 1.1
  - o TLS 1.2
- **Exact cipher suite to be used** (the cipher suite register of Internet Assigned Numbers Authority (IANA) is provided in brackets):
  - o (0x002f) TLS\_RSA\_WITH\_AES\_128\_CBC\_SHA
  - o (0x003C) TLS\_RSA\_WITH\_AES\_128\_CBC\_SHA256
  - o (0x0035) TLS\_RSA\_WITH\_AES\_256\_CBC\_SHA
  - o (0x003D) TLS\_RSA\_WITH\_AES\_256\_CBC\_SHA256
  - o (0x000a) TLS\_RSA\_WITH\_3DES\_EDE\_CBC\_SHA
  - o (0x008c) TLS\_PSK\_WITH\_AES\_128\_CBC\_SHA
  - o (0x008d) TLS\_PSK\_WITH\_AES\_256\_CBC\_SHA
  - o (0x008b) TLS\_PSK\_WITH\_3DES\_EDE\_CBC\_SHA
  - o (0x0094) TLS\_RSA\_PSK\_WITH\_AES\_128\_CBC\_SHA
  - o (0x0095) TLS\_RSA\_PSK\_WITH\_AES\_256\_CBC\_SHA
  - o (0x0093) TLS\_RSA\_PSK\_WITH\_3DES\_EDE\_CBC\_SHA
  - o (0x00ae) TLS\_PSK\_WITH\_AES\_128\_CBC\_SHA256
  - o (0x00af) TLS\_PSK\_WITH\_AES\_256\_CBC\_SHA384
  - o (0x00b6) TLS\_RSA\_PSK\_WITH\_AES\_128\_CBC\_SHA256
  - o (0x00b7) TLS\_RSA\_PSK\_WITH\_AES\_256\_CBC\_SHA384

See [Table 23](#) for the applicability of cipher suite depending on the module series.
- **Certificate to be used for server and mutual authentication:**
  - o The trusted root certificate. The CA certificate should be imported with the [AT+USECMNG](#) command.
  - o The client certificate that should be imported with the [AT+USECMNG](#) command.
  - o The client private key that should be imported with the [AT+USECMNG](#) command.
- **Expected server hostname, when using certificate validation level 2 or 3.**
- **Password for the client private key, if it is password protected.**
- **Pre-shared key used for connection. Defines a pre-shared key and key-name (PSK), when a TLS\_PSK\_\* cipher suite is used.**
- **SNI (Server Name Indication).** SNI is a feature of SSL/TLS which uses an additional SSL/TLS extension header to specify the server name to which the client is connecting to. The extension was introduced to support the certificate handling used with virtual hosting provided by the various SSL/TLS enabled servers mostly in cloud based infrastructures. With the SNI a server has the opportunity to present a different server certificate (or/and whole SSL/TLS configuration) based on the host indicated by the SNI extension.

Table 22 provides the list the applicability of SSL connection properties depending on the module series.

|                 | Certificate validation level | Minimum SSL/TLS version | Cipher suite | Trusted root certificate internal name | Expected server hostname | Password for the client private key | Pre-shared key used for connection | SNI |
|-----------------|------------------------------|-------------------------|--------------|----------------------------------------|--------------------------|-------------------------------------|------------------------------------|-----|
| SARA-R4 SARA-N4 | *                            | *                       | *            | *                                      | *                        |                                     |                                    |     |

**Table 22: SSL/TLS connections properties applicability**

-  To set all the parameters in security profile, a set command for each <op\_code> needs to be issued (e.g. certificate validation level, minimum SSL/TLS version, ...).
-  To reset (set to factory programmed value) all the parameters of a specific security profile, issue the AT +USECPRF=<profile\_id> command.

### 19.3.2 Syntax

| Type | Syntax                                            | Response                                                                         | Example                                 |
|------|---------------------------------------------------|----------------------------------------------------------------------------------|-----------------------------------------|
| Set  | AT+USECPRF=<profile_id>[,<op_code>[,<param_val>]] | OK                                                                               | AT+USECPRF=0,0,0<br>OK                  |
| Read | AT+USECPRF=<profile_id>,<op_code>                 | +USECPRF: <profile_id>,<op_code>,<param_val><br>OK                               | AT+USECPRF=0,0<br>+USECPRF: 0,0,0<br>OK |
| Test | AT+USECPRF=?                                      | +USECPRF: (list of supported <profile_id>s),(list of supported <op_code>s)<br>OK | +USECPRF: (0-4),(0-6)<br>OK             |

### 19.3.3 Defined values

| Parameter    | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <profile_id> | Number | USECMNG security profile identifier, in range 0-4; if it is not followed by other parameters the profile settings will be reset (set to factory programmed value).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <op_code>    | Number | <ul style="list-style-type: none"> <li>• 0: certificate validation level; allowed values for &lt;param_val&gt;: <ul style="list-style-type: none"> <li>o 0 (factory-programmed value): Level 0 - No validation; the server certificate will not be checked or verified. The server in this case is not authenticated.</li> <li>o 1: Level 1 - Root certificate validation without URL integrity check. The server certificate will be verified with a specific trusted certificates or with each of the imported trusted root certificates.</li> <li>o 2: Level 2 - Root certificate validation with URL integrity check. Level 1 validation with an additional URL integrity check.</li> <li>o 3: Level 3 - Root certificate validation with check of certificate validity date. Level 2 validation with an additional check of certificate validity date.</li> </ul> </li> <li>• 1: SSL/TLS version to use; allowed values for &lt;param_val&gt;: <ul style="list-style-type: none"> <li>o 0 (factory-programmed value): any; server can use any version for the connection.</li> <li>o 1: TLSv1.0; connection allowed only to TLS/SSL servers which support TLSv1.0</li> <li>o 2: TLSv1.1; connection allowed only to TLS/SSL servers which support TLSv1.1</li> <li>o 3: TLSv1.2; connection allowed only to TLS/SSL servers which support TLSv1.2</li> </ul> </li> <li>• 2: cipher suite; allowed values for &lt;param_val&gt; define which cipher suite will be used: <ul style="list-style-type: none"> <li>o 0 (factory-programmed value): (0x0000) Automatic the cipher suite will be negotiated in the handshake process</li> </ul> </li> </ul> |



| Parameter | Type | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           |      | <ul style="list-style-type: none"> <li>o 1: (0x002f) TLS_RSA_WITH_AES_128_CBC_SHA</li> <li>o 2: (0x003C) TLS_RSA_WITH_AES_128_CBC_SHA256</li> <li>o 3: (0x0035) TLS_RSA_WITH_AES_256_CBC_SHA</li> <li>o 4: (0x003D) TLS_RSA_WITH_AES_256_CBC_SHA256</li> <li>o 5: (0x000a) TLS_RSA_WITH_3DES_EDE_CBC_SHA</li> <li>o 6: (0x008c) TLS_PSK_WITH_AES_128_CBC_SHA</li> <li>o 7: (0x008d) TLS_PSK_WITH_AES_256_CBC_SHA</li> <li>o 8: (0x008b) TLS_PSK_WITH_3DES_EDE_CBC_SHA</li> <li>o 9: (0x0094) TLS_RSA_PSK_WITH_AES_128_CBC_SHA</li> <li>o 10: (0x0095) TLS_RSA_PSK_WITH_AES_256_CBC_SHA</li> <li>o 11: (0x0093) TLS_RSA_PSK_WITH_3DES_EDE_CBC_SHA</li> <li>o 12: (0x00ae) TLS_PSK_WITH_AES_128_CBC_SHA256</li> <li>o 13: (0x00af) TLS_PSK_WITH_AES_256_CBC_SHA384</li> <li>o 14: (0x00b6) TLS_RSA_PSK_WITH_AES_128_CBC_SHA256</li> <li>o 15: (0x00b7) TLS_RSA_PSK_WITH_AES_256_CBC_SHA384</li> <li>• 3: trusted root certificate internal name; <ul style="list-style-type: none"> <li>o &lt;param_val&gt; (string) is the internal name identifying a trusted root certificate; the maximum length is 200 characters. The factory programmed value is an empty string.</li> </ul> </li> <li>• 4: expected server hostname; <ul style="list-style-type: none"> <li>o &lt;param_val&gt; (string) is the hostname of the server, used when certificate validation level is set to Level 2; the maximum length is 256 characters. The factory programmed value is an empty string.</li> </ul> </li> <li>• 5: client certificate internal name; <ul style="list-style-type: none"> <li>o &lt;param_val&gt; (string) is the internal name identifying a client certificate to be sent to the server; the maximum length is 200 characters. The factory programmed value is an empty string.</li> </ul> </li> <li>• 6: client private key internal name; <ul style="list-style-type: none"> <li>o &lt;param_val&gt; (string) is the internal name identifying a private key to be used; the maximum length is 200 characters. The factory programmed value is an empty string.</li> </ul> </li> <li>• 7: client private key password; <ul style="list-style-type: none"> <li>o &lt;param_val&gt; (string) is the password for the client private key if it is password protected; the maximum length is 128 characters. The factory programmed value is an empty string.</li> </ul> </li> <li>• 8: pre-shared key; <ul style="list-style-type: none"> <li>o &lt;param_val&gt; (string) is the pre-shared key used for connection; the maximum length is 64 characters. The factory programmed value is an empty string.</li> </ul> </li> <li>• 9: pre-shared key name; <ul style="list-style-type: none"> <li>o &lt;param_val&gt; (string) is the pre-shared key name used for connection; the maximum length is 128 characters. The factory programmed value is an empty string.</li> </ul> </li> <li>• 10: SNI (Server Name Indication); <ul style="list-style-type: none"> <li>o &lt;param_val&gt; (string) value for the additional negotiation header SNI (Server Name Indication) used in SSL/TLS connection negotiation; the maximum length is 128 characters. The factory programmed value is an empty string.</li> </ul> </li> </ul> |

## 19.3.4 Notes

•

|                 | TLS_RSA_WITH_AES_128_CBC_SHA | TLS_RSA_WITH_AES_128_CBC_SHA256 | TLS_RSA_WITH_AES_256_CBC_SHA | TLS_RSA_WITH_AES_256_CBC_SHA256 | TLS_RSA_WITH_3DES_EDE_CBC_SHA | TLS_PSK_WITH_AES_128_CBC_SHA | TLS_PSK_WITH_AES_256_CBC_SHA | TLS_PSK_WITH_3DES_EDE_CBC_SHA | TLS_RSA_PSK_WITH_AES_128_CBC_SHA | TLS_RSA_PSK_WITH_AES_256_CBC_SHA | TLS_RSA_PSK_WITH_3DES_EDE_CBC_SHA | TLS_PSK_WITH_AES_128_CBC_SHA256 | TLS_PSK_WITH_AES_256_CBC_SHA384 | TLS_RSA_PSK_WITH_AES_128_CBC_SHA256 | TLS_RSA_PSK_WITH_AES_256_CBC_SHA384 |
|-----------------|------------------------------|---------------------------------|------------------------------|---------------------------------|-------------------------------|------------------------------|------------------------------|-------------------------------|----------------------------------|----------------------------------|-----------------------------------|---------------------------------|---------------------------------|-------------------------------------|-------------------------------------|
| SARA-R4 SARA-N4 | *                            | *                               | *                            | *                               | *                             | *                            | *                            | *                             | *                                | *                                | *                                 | *                               | *                               | *                                   | *                                   |
| SARA-R410M-01B  | *                            | *                               | *                            | *                               | *                             |                              |                              |                               |                                  |                                  |                                   |                                 |                                 |                                     |                                     |

**Table 23: Cipher suite applicability**

### SARA-R4 / SARA-N4

- <op\_code>=7, 8, 9 and 10 are not supported.

### SARA-R410M-01B

- The unique certificate validation level (<op\_code>=0) supported is the level 0 (no validation, <param\_val>=0).
- The unique minimum SSL/TLS version (<op\_code>=1) supported is <param\_val>=0 (the server can use any version for the connection).

## 19.4 AT+USECMNG command example

| Command                                                                                                         | Response                                                          | Description                                                                                                                 |
|-----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| <b>Step 1: Import a trusted root certificate using the stream of byte similar to <a href="#">+UDWNFILE</a></b>  |                                                                   |                                                                                                                             |
| AT+USECMNG=0,0,"ThawteCA", ><br>1516                                                                            |                                                                   | Start the data transfer using the stream of byte.                                                                           |
| <a href="#">PEM encoded trusted root certificate data.</a>                                                      | +USECMNG: 1,0,"ThawteCA","8ccadc0b22cef5be72ac411a11a8d812"<br>OK | Input PEM formatted trusted root certificate data bytes. Output MD5 hash string of the stored trusted root certificate DER. |
| <b>Step 2: List all available certificates and private keys</b>                                                 |                                                                   |                                                                                                                             |
| AT+USECMNG=3                                                                                                    | CA, "ThawteCA","thawte Primary Root CA",<br>"2036/07/17"<br>OK    | List all available certificates and private keys.                                                                           |
| <b>Step 3: Set the security profile 2 validation level to trusted root</b>                                      |                                                                   |                                                                                                                             |
| AT+USECPRF=2,0,1                                                                                                | OK                                                                | Security profile 2 has the validation level set to trusted root.                                                            |
| <b>Step 4: Set the security profile 2 trusted root certificate to the CA certificate imported as "ThawteCA"</b> |                                                                   |                                                                                                                             |
| AT+USECPRF=2,3,"ThawteCA"                                                                                       | OK                                                                | Security profile 2 will use the CA certificate imported as "ThawteCA" for server certificate validation.                    |
| <b>Step 5: Use the configured USECMNG profile 2 with the UHTTP application</b>                                  |                                                                   |                                                                                                                             |
| AT+UHTTP=0,1,"www.ssl_tls_test_server.com"                                                                      | OK                                                                | Configure the UHTTP server name.                                                                                            |
| AT+UHTTP=0,6,1,2                                                                                                | OK                                                                | Enable the SSL/TLS for the UHTTP profile #0 and specify the SSL/TLS security profile 2.                                     |
| AT+UHTTPC=0,1,"/","https.resp"                                                                                  | OK                                                                | Execute the HTTP GET command.                                                                                               |
|                                                                                                                 | +UUHTTPCR: 0,1,1                                                  | HTTP GET URC response.                                                                                                      |

In the above example the following PEM encoded trusted certificate is used:

```
-----BEGIN CERTIFICATE-----
MIIEIDCCAwigAwIBAgIQNE7VVyDV7exJ9C/ON9srbTANBgkqhkiG9w0BAQUFADCB
qTELMAkGA1UEBhMCVVMxFTATBgNVBAoTDHROyXZ0ZSwgSW5jLjEoMCMYGA1UECzMf
Q2VydGhmaWNhdGlvbiBTZXJ2aWNlcyBEaXZpc2lvcjE4MDYGA1UECxMvKGMpIDIw
MDYgdGhhZD3RlLCBjb250ZSBQcm9yIGF1dGhvcml6ZWQgdXN1IG9ubHkxH2AdBgNV
BAMTFnRoYXZ0ZSBQcm9yIGF1dGhvcml6ZWQgdXN1IG9ubHkxH2AdBgNV
NzE2MjM1OTU5WjCBqTELMAkGA1UEBhMCVVMxFTATBgNVBAoTDHROyXZ0ZSwgSW5j
LjEoMCMYGA1UECzMfQ2VydGhmaWNhdGlvbiBTZXJ2aWNlcyBEaXZpc2lvcjE4MDYGA1
UECxMvKGMpIDIwMDYgdGhhZD3RlLCBjb250ZSBQcm9yIGF1dGhvcml6ZWQgdXN1
IG9ubHkxH2AdBgNVBAMTFnRoYXZ0ZSBQcm9yIGF1dGhvcml6ZWQgdXN1IG9ubHkxH2
AdBgNVBAMTFnRoYXZ0ZSBQcm9yIGF1dGhvcml6ZWQgdXN1IG9ubHkxH2AdBgNV
S1B3DQEBAAQAA4IBDwAwggEKAoIBAQCsoPD7gFnUnMekz52hWXMJEEUMDSxuaPFs
W0hoSVk3/AszGcJ3f8wQLZU0H0brTQmnHNK4yZc2AreJlCRfBsDMRJSUjQJib+ta
3RGNKJpchJAQeg29dGYvajig4tVUROSdB58Hum/u6f1OCyn1PoSgAfGcq/gcfomk
6KHYcWUNolF77rzSiMANuVud37r8UVsLr5iy6S7pBOhih94ryNdOwUxkHt3Phli6
Sk/KaAcDHJlKxtUvkcxc8cXIcxcBn6zL9yZJclNqFwJu/U30rCfSMnZEfl2pSy94J
NqR32HuHUETVPM4paf5SSSYeCaWAe0At6+gnhcn+Yf1+5nyXHdWdAgMBAAGjQjBA
MA8GA1UdEwEB/wQFMAMBAf8wDgYDVR0PAQH/BAQDAgEGMB0GA1UdDgQWBBR7W0XP
r87Lev0xkhpqtvNG61dIUdANBgkqhkiG9w0BAQUFAAOCAQEAErHAS70Rtvzw6WfU
DW5Fv1Xok9LOAz/t2iWwHVfLHjp2oEzsUHboZHIMpKnXuIvW1oeEuzLlQRHAd9mz
YJ3rG9XRbkREqaYB7FViHXe4XI5ISXyc01cRrK1zN44veFyQaEfZYGDm/Ac9IiAX
xPcW6cTYcvnIc3zfFi8VqT79aie2oetaupgf1eNNZAqdE8hhuvU5HIe6uL17In/2
/qxAeeWsEG89jxt5dovEN7MhGITlNgDrYyCZuen+MwS7QcjBAv1EYyCegc5C09Y/
LHbTY5xZ3Y+m4Q6gLkH3LpVHz7z9M/P2C2F+fpErgUfCJzDupxBdN49cOSvkBPB7
jVaMaA==
-----END CERTIFICATE-----
```

## 19.5 Notes

Due to significant memory fingerprint of an SSL/TLS connection, the number of concurrent SSL/TLS connections is limited. The USECMNG and the underlying SSL/TLS infrastructure allows 4 concurrent SSL/TLS connections (i.e. 4 HTTPS requests or 2 HTTPS and 2 FTPS request).

## 20 FTP

Proprietary u-blox AT commands. FTP AT commands set can be used for sending and receiving files over the available bearer, transparently retrieving and storing them in the file system. Standard file and directory management operations on the remote FTP server are as well possible. PSD or CSD connection must be activated before using FTP client services.

Basically, two AT commands are necessary for an FTP client service: one AT command (**+UFTP**) to configure the FTP profile, a second AT command to execute a specific FTP command (**+UFTPC**). The final result of an FTP command will be notified through the +UUFTPCR URC whereas data will be provided through +UUFTPCD URC.

When these commands report an error which is not a +CME ERROR, the error code can be queried using the **+UFTPER** AT command.



SARA-R4 / SARA-N4

No need to establish a PSD connection explicitly. This device automatically establishes a PSD connection as part of the network registration and attach procedure.

### 20.1 FTP service configuration +UFTP

| +UFTP             |                                                                               |                     |                       |                       |                      |                                |
|-------------------|-------------------------------------------------------------------------------|---------------------|-----------------------|-----------------------|----------------------|--------------------------------|
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                     |                       |                       |                      |                                |
| <b>Attributes</b> | <b>Syntax</b>                                                                 | <b>PIN required</b> | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b>         |
|                   | partial                                                                       | No                  | No                    | No                    | -                    | <a href="#">Appendix A.6.1</a> |

#### 20.1.1 Description

Sets up a parameter for FTP service, or resets a parameter to its factory-programmed value. The set/reset command needs to be executed for each single <op\_code>. The read command returns the current setting of all the FTP parameters, one per line (i.e. the FTP profile). The FTP parameter values set with this command are all volatile (not stored in non-volatile memory).



If the set command is issued without <param1> parameter, the corresponding <op\_code> parameter is reset to the default value.

#### 20.1.2 Syntax

| Type                         | Syntax                                  | Response | Example                          |
|------------------------------|-----------------------------------------|----------|----------------------------------|
| <b>Generic syntax</b>        |                                         |          |                                  |
| Set                          | AT+UFTP=<op_code>[,<param1>[,<param2>]] | OK       | AT+UFTP=7,21<br>OK               |
| <b>FTP server IP address</b> |                                         |          |                                  |
| Set                          | AT+UFTP=0[,<IP_address>]                | OK       | AT+UFTP=0,"192.168.1.0"<br>OK    |
| <b>FTP server name</b>       |                                         |          |                                  |
| Set                          | AT+UFTP=1[,<server_name>]               | OK       | AT+UFTP=1,"ftp.server.com"<br>OK |
| <b>Username</b>              |                                         |          |                                  |
| Set                          | AT+UFTP=2[,<username>]                  | OK       | AT+UFTP=2,"user_test"<br>OK      |
| <b>Password</b>              |                                         |          |                                  |
| Set                          | AT+UFTP=3[,<password>]                  | OK       | AT+UFTP=3,"PWD"<br>OK            |
| <b>Account</b>               |                                         |          |                                  |
| Set                          | AT+UFTP=4[,<account>]                   | OK       | AT+UFTP=4,"test"<br>OK           |
| <b>Inactivity timeout</b>    |                                         |          |                                  |

| Type                                      | Syntax                                       | Response                                                                                                                                                                                                                     | Example                                                                                                                                              |
|-------------------------------------------|----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Set                                       | AT+UFTP=5[,<timeout>]                        | OK                                                                                                                                                                                                                           | AT+UFTP=5,21<br>OK                                                                                                                                   |
| <b>FTP mode</b>                           |                                              |                                                                                                                                                                                                                              |                                                                                                                                                      |
| Set                                       | AT+UFTP=6[,<FTP_mode>]                       | OK                                                                                                                                                                                                                           | AT+UFTP=6,1<br>OK                                                                                                                                    |
| <b>FTP server port</b>                    |                                              |                                                                                                                                                                                                                              |                                                                                                                                                      |
| Set                                       | AT+UFTP=7[,<FTP_server_port>]                | OK                                                                                                                                                                                                                           | AT+UFTP=7,30<br>OK                                                                                                                                   |
| <b>FTP Secure option in explicit mode</b> |                                              |                                                                                                                                                                                                                              |                                                                                                                                                      |
| Set                                       | AT+UFTP=8[,<FTP_secure>[,<USECMNG_profile>]] | OK                                                                                                                                                                                                                           | AT+UFTP=8,1,2<br>OK                                                                                                                                  |
| Read                                      | AT+UFTP?                                     | +UFTP: 0,<IP_address><br>+UFTP: 1,<server_name><br>+UFTP: 2,<username><br>+UFTP: 4,<account><br>+UFTP: 5,<timeout><br>+UFTP: 6,<FTP_mode><br>+UFTP: 7,<FTP_server_port><br>[+UFTP: 8,<FTP_secure>[,<USECMNG_profile>]]<br>OK | +UFTP: 0,"216.239.59.147"<br>+UFTP: 1,""<br>+UFTP: 2,"username"<br>+UFTP: 4,"account"<br>+UFTP: 5,0<br>+UFTP: 6,0<br>+UFTP: 7,21<br>+UFTP: 8,0<br>OK |
| Test                                      | AT+UFTP=?                                    | +UFTP: (list of supported <param_tag>s)<br>OK                                                                                                                                                                                | +UFTP: (0-8)<br>OK                                                                                                                                   |

### 20.1.3 Defined values

| Parameter     | Type   | Description                                                                                                                                                                                                                                                                                                                                                          |
|---------------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <op_code>     | String | FTP parameter: <ul style="list-style-type: none"> <li>• 0: FTP server IP address</li> <li>• 1: FTP server name</li> <li>• 2: FTP username</li> <li>• 3: FTP password</li> <li>• 4: FTP additional user account</li> <li>• 5: FTP inactivity timeout period</li> <li>• 6: FTP mode</li> <li>• 7: Remote FTP server listening port</li> <li>• 8: FTP secure</li> </ul> |
| <IP_address>  | String | FTP server IP address. The default value is an empty string. For IP address format reference see the <a href="#">IP addressing</a> .                                                                                                                                                                                                                                 |
| <server_name> | String | FTP server name (e.g. "ftp.server.com"). The maximum length is 128 characters. The default value is an empty string.                                                                                                                                                                                                                                                 |
| <username>    | String | User name (the maximum length is 30 characters) for the FTP login procedure. The default value is an empty string.                                                                                                                                                                                                                                                   |
| <password>    | String | Password (the maximum length is 30 characters) for the FTP login procedure. The default value is an empty string.                                                                                                                                                                                                                                                    |
| <account>     | String | Additional user account (if required) for the FTP login procedure. The maximum length is 30 characters. The default value is an empty string.                                                                                                                                                                                                                        |
| <timeout>     | Number | Inactivity timeout period in seconds. The range goes from 0 to 86400 s; 0 means no timeout (the FTP session will not be terminated in the absence of incoming traffic). The default value is 30 s.                                                                                                                                                                   |
| <FTP_mode>    | Number | FTP mode: <ul style="list-style-type: none"> <li>• 0 (default value): active</li> <li>• 1: passive</li> </ul>                                                                                                                                                                                                                                                        |

| Parameter         | Type            | Description                                                                                                                                                                                                                                                                                                                                   |
|-------------------|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <FTP_server_port> | Number          | Remote FTP server listening port; it must be a valid TCP port value. The range goes from 1 to 65535; the default value is 21.                                                                                                                                                                                                                 |
| <FTP_secure>      | Number          | Enables / disables the Secure option (explicit mode) of FTP client service. FTP Secure option in explicit mode (SSL encryption of FTP control channel; FTP data channel is not encrypted): <ul style="list-style-type: none"> <li>0 (default value): no SSL encryption</li> <li>1: enable SSL encryption of FTP control connection</li> </ul> |
| <USECMNG_profile> | Number          | USECMNG profile (number). Defines the USECMNG profile which specifies the SSL/TLS properties to be used for the SSL/TLS connection. The range goes from 0 to 4. If no profile is set a default USECMNG profile is used (see <a href="#">USECMNG</a> section).                                                                                 |
| <param1>          | Number / String | Type and supported content depend on related <op_code> (details are given above). If <param1> is not specified the value of the corresponding parameter <op_code> is reset to default value.                                                                                                                                                  |
| <param2>          | Number / String | Type and supported content depend on related <op_code> (details are given above). If <param2> is not specified the value of the corresponding parameter <op_code> is reset to default value.                                                                                                                                                  |

## 20.1.4 Notes

- The information text response to the read command does not display the password.
- The FTP server IP address and the FTP server name are mutually exclusive. If value for <op\_code>=0 is specified by user, then value for <op\_code>=1 is reset or vice versa.
- Some network operators do not allow incoming connections. Due to these limitations introduced by network operators it is possible to encounter problems using FTP active mode. If the FTP active mode fails to exchange files, try the passive mode to solve the problem.
- Some network operators do not allow FTPS. In this case the **+UFTPCR=1** command (FTP login) will return a failure response via **+UUFTPCR** URC after an SSL timeout of 30 s.

### SARA-R404M / SARA-R410M-01B

- <op\_code>=8 is not supported.

### SARA-R4 / SARA-N4

- During connection to FTP remote server (via FTP login command) the FTP profile parameters cannot be changed or reset to factory-programmed values until disconnection takes place (FTP logout). Only <op\_code>=5 (inactivity timeout), and <op\_code>=6 (FTP mode), can be updated while the FTP connection is on the go.

## 20.2 FTP command +UFTPC

| +UFTPC            |                                                                            |                     |                       |                       |                      |                                |
|-------------------|----------------------------------------------------------------------------|---------------------|-----------------------|-----------------------|----------------------|--------------------------------|
| <b>Modules</b>    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M SARA-N4 |                     |                       |                       |                      |                                |
| <b>Attributes</b> | <b>Syntax</b>                                                              | <b>PIN required</b> | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b>         |
|                   | partial                                                                    | No                  | No                    | No                    | -                    | <a href="#">Appendix A.6.1</a> |

### 20.2.1 Description

Triggers the FTP actions corresponding to the <op\_code> parameter. The final result code indicates if sending the command request to the FTP process was successful or not. The +UUFTPCR (FTP command result) URC returns to the user the final result of the FTP command previously sent with **+UFTPC**. As well, the +UUFTPCD FTP unsolicited data URC provides the data requested by the user (e.g. file or directory lists) and received from the FTP server.

### 20.2.2 Syntax

| Type                  | Syntax                                                     | Response | Example                                |
|-----------------------|------------------------------------------------------------|----------|----------------------------------------|
| <b>General syntax</b> |                                                            |          |                                        |
| Set                   | AT+UFTPC=<op_code>[,<param1>[, OK<br><param2>[,<param3>]]] |          | AT+UFTPC=4,"data.zip","data.zip"<br>OK |
| <b>FTP logout</b>     |                                                            |          |                                        |

| Type                                                              | Syntax                                                              | Response                                      | Example                                   |
|-------------------------------------------------------------------|---------------------------------------------------------------------|-----------------------------------------------|-------------------------------------------|
| Set                                                               | AT+UFTPC=0                                                          | OK                                            | AT+UFTPC=0<br>OK                          |
| <b>FTP login</b>                                                  |                                                                     |                                               |                                           |
| Set                                                               | AT+UFTPC=1                                                          | OK                                            | AT+UFTPC=1<br>OK                          |
| <b>Delete the file from the FTP server</b>                        |                                                                     |                                               |                                           |
| Set                                                               | AT+UFTPC=2,<file_name>                                              | OK                                            | AT+UFTPC=2,"mytest"<br>OK                 |
| <b>Rename a file of FTP server</b>                                |                                                                     |                                               |                                           |
| Set                                                               | AT+UFTPC=3,<file_name>,<new_file_name>                              | OK                                            | AT+UFTPC=3,"old_name","final_name"<br>OK  |
| <b>Retrieve the file from the FTP server</b>                      |                                                                     |                                               |                                           |
| Set                                                               | AT+UFTPC=4,<remote_file_name>,<local_file_name>[,<retrieving_mode>] | OK                                            | AT+UFTPC=4,"data.zip","data.zip"<br>OK    |
| <b>Store the file on the FTP server</b>                           |                                                                     |                                               |                                           |
| Set                                                               | AT+UFTPC=5,<local_file_name>,<remote_file_name>[,<number_of_byte>]  | OK                                            | AT+UFTPC=5,"data.zip","data.zip",30<br>OK |
| <b>Retrieve a file from the FTP server using direct link mode</b> |                                                                     |                                               |                                           |
| Set                                                               | AT+UFTPC=6,<remote_file_name>[,<number_of_byte>]                    | OK                                            | AT+UFTPC=6,"data.zip",30<br>OK            |
| <b>Send a file to the FTP server using the direct link mode</b>   |                                                                     |                                               |                                           |
| Set                                                               | AT+UFTPC=7,<remote_file_name>[,<number_of_byte>]                    | OK                                            | AT+UFTPC=7,"data.zip",30<br>OK            |
| <b>Change the working directory to the specified one</b>          |                                                                     |                                               |                                           |
| Set                                                               | AT+UFTPC=8,<directory_name>                                         | OK                                            | AT+UFTPC=8,"data_folder"<br>OK            |
| <b>Create a directory on the FTP host</b>                         |                                                                     |                                               |                                           |
| Set                                                               | AT+UFTPC=10,<directory_name>                                        | OK                                            | AT+UFTPC=10,"new_data_folder"<br>OK       |
| <b>Remove the directory from the remote FTP server</b>            |                                                                     |                                               |                                           |
| Set                                                               | AT+UFTPC=11,<directory_name>                                        | OK                                            | AT+UFTPC=11,"data_folder"<br>OK           |
| <b>Information of a file or a directory</b>                       |                                                                     |                                               |                                           |
| Set                                                               | AT+UFTPC=13[,<file_directory_name>]                                 | OK                                            | AT+UFTPC=13,"data_folder"<br>OK           |
| <b>List the file names in a specified directory</b>               |                                                                     |                                               |                                           |
| Set                                                               | AT+UFTPC=14[,<file_directory_name>]                                 | OK                                            | AT+UFTPC=14,"data.zip"<br>OK              |
| <b>Retrieve the FOTA update file</b>                              |                                                                     |                                               |                                           |
| Set                                                               | AT+UFTPC=100,<remote_file_name>                                     | OK                                            | AT+UFTPC=100,"data.zip"<br>OK             |
| Test                                                              | AT+UFTPC=?                                                          | +UFTPC: (list of supported <op_code>s)<br>OK  | +UFTPC: (0-5,8,10,11,13,14,100)<br>OK     |
| URC                                                               |                                                                     | +UUFTPCD: <op_code>,<ftp_data_len>,<ftp_data> | +UUFTPCD: 13,16,"16 bytes of data"        |
| URC                                                               |                                                                     | +UUFTPCR: <op_code>,<ftp_result>[,<md5_sum>]  | +UUFTPCR: 1,1                             |

### 20.2.3 Defined values

| Parameter             | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <op_code>             | Number | FTP command request. Allowed values: <ul style="list-style-type: none"> <li>0: FTP logout; terminates the FTP session by performing a logout.</li> <li>1: FTP login; connects to the FTP server using the parameters of the current FTP profile (set via <a href="#">AT+UFTP</a> command).</li> <li>2: deletes the file from the FTP server.</li> <li>3: renames the file. This AT command just sends requests to the FTP process.</li> <li>4: retrieves the file from the FTP server.</li> <li>5: stores the file on the FTP server.</li> <li>6: retrieves a file from the FTP server using direct link mode. This command handles the initial steps of the FTP protocol for retrieving a file; after that it will establish a transparent end to end communication with the data connection TCP socket via the serial interface. After the CONNECT result code, the file content will be directly sent to the serial interface. When the data transfer is completed, the module will automatically exit from direct link mode (no need to send +++ sequence).</li> <li>7: sends a file to the FTP server using the direct link mode. This command handles the initial steps of the FTP protocol for sending a file; after that it will establish a transparent end to end communication with the data connection TCP socket via the serial interface. After the CONNECT result code, the user can send the file content via the serial interface. Once finished, the user must wait at least 2 s before sending the +++ sequence to switch off the direct link mode. This operation may take a few seconds because the command also handles the final steps of the FTP protocol</li> <li>8: changes the working directory to the specified one.</li> <li>9: RFU.</li> <li>10: creates a directory on the FTP host.</li> <li>11: removes the directory from the remote FTP server.</li> <li>12: RFU.</li> <li>13: information of a file or a directory. The URC +UUFTPCD returns the information of the specified file or directory from the FTP server.</li> <li>14: lists the file names in a specified directory. The URC +UUFTPCD returns the list of the file names received from FTP server. If the directory name is omitted, the list of the files names of current working directory is requested.</li> <li>100: retrieves the FOTA update file. The downloaded file will not be accessible to the user. The +UUFTPCR URC will display the MD5 checksum of the downloaded file.</li> </ul> |
| <file_name>           | String | File name to be deleted/renamed from the FTP host. For the limit of the length of the string, see <a href="#">Command line</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <new_file_name>       | String | New file name. For the limit of the length of the string, see <a href="#">Command line</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <remote_file_name>    | String | Remote file name to be retrieved from the FTP host or stored in it. The maximum parameter length is 256 characters.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <local_file_name>     | String | Local file name (module file system) text string to be stored/sent on the file system. For the limit of the length of the string, see the <a href="#">File system limits</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <retrieving_mode>     | Number | Allowed values: <ul style="list-style-type: none"> <li>0 (default value): the file is retrieved from beginning.</li> <li>1: restart the data retrieving from the last data received during the previous download interrupted due to error.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <number_of_byte>      | Number | Represents the number of bytes already sent to the FTP server or received from it. <ul style="list-style-type: none"> <li>During a file retrieval the server writes the file from the offset indicated with this parameter.</li> <li>During a file storing the server sends the data from the value indicated with this parameter.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <directory_name>      | String | Directory name on the FTP server. For the limit of the length of the string, see <a href="#">Command line</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <file_directory_name> | String | Path file/directory name to be listed. If not specified, the current directory list is requested. For the limit of the length of the string, see <a href="#">Command line</a> . <ul style="list-style-type: none"> <li>&lt;param1&gt; optional parameter; the text string of the path (file or directory) to be name listed. If not specified, the list of the files names of current working directory is requested.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <ftp_data_len>        | Number | Amount of data in bytes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |



| Parameter    | Type   | Description                                                                                                                                                                                                                                                                                                                                                             |
|--------------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ftp_data>   | String | Data available from the FTP server in the ASCII [0x00,0xFF] range. The starting quotation mark shall not be taken into account like data, the first byte of data starts after the first quotation mark. The total number of bytes is <ftp_data_len>. At the end of the byte stream, another quotation mark is provided for user convenience and visualization purposes. |
| <ftp_result> | Number | <ul style="list-style-type: none"> <li>0: fail</li> <li>1: success</li> </ul>                                                                                                                                                                                                                                                                                           |
| <md5_sum>    | String | MD5 checksum of the FOTA update file downloaded via <b>+UFTPC=100</b> AT command. This parameter is issued only for <b>+UFTPC=100</b> AT command.                                                                                                                                                                                                                       |
| <param1>     | String | Content depend on related <op_code> (details are given above)                                                                                                                                                                                                                                                                                                           |
| <param2>     | String | Content depend on related <op_code> (details are given above)                                                                                                                                                                                                                                                                                                           |
| <param3>     | String | Content depend on related <op_code> (details are given above)                                                                                                                                                                                                                                                                                                           |

## 20.2.4 Notes

- If <op\_code>=6 the user must switch off the direct link mode (sending +++ to the serial interface) when the data stream is finished. This operation may take up to 10 s because the command also handles the final steps of the FTP protocol.

### SARA-R4 / SARA-N4

- <md5\_sum> is not supported.

## 20.3 FTP error +UFTPER

| +UFTPER    |                                                                    |              |                |                |               |                                |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|--------------------------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                                |
|            | SARA-N4                                                            |              |                |                |               |                                |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference                |
|            | full                                                               | No           | No             | No             | -             | <a href="#">Appendix A.6.1</a> |

### 20.3.1 Description

This command retrieves the error class and code of the last FTP operation.

### 20.3.2 Syntax

| Type   | Syntax    | Response                                  | Example            |
|--------|-----------|-------------------------------------------|--------------------|
| Action | AT+UFTPER | +UFTPER: <error_class>,<error_code><br>OK | +UFTPER: 1,1<br>OK |

### 20.3.3 Defined values

| Parameter     | Type   | Description                                                                                                                    |
|---------------|--------|--------------------------------------------------------------------------------------------------------------------------------|
| <error_class> | Number | Value of error class. Values are listed in <a href="#">Appendix A.6</a>                                                        |
| <error_code>  | Number | Value of class-specific error code (reply code if <error_class> is 0). The values are listed in <a href="#">Appendix A.6.1</a> |

## 21 HTTP

The section describes the u-blox proprietary AT commands that can be used for sending requests to a remote HTTP server, receiving the server response and transparently storing it in the file system. The supported methods are: HEAD, GET, DELETE, PUT, POST file and POST data. A PSD or CSD connection must be activated before using HTTP AT commands.

When these commands report an HTTP error, the error code can be queried using the **+UHTTPER** AT command.



### SARA-R4

No need to establish a PSD connection explicitly. This device automatically establishes a PSD connection as part of the network registration and attach procedure.

### 21.1 HTTP control +UHTTP

| +UHTTP     |                                                                    |              |                |                |               |                              |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|------------------------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                              |
|            | SARA-N4                                                            |              |                |                |               |                              |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference              |
|            | partial                                                            | No           | No             | No             | -             | <a href="#">Appendix A.6</a> |

#### 21.1.1 Description

Configures, reads or resets (to the factory-programmed values) the HTTP application profile parameters. Up to 4 different HTTP profiles can be defined. To set all the parameters in an HTTP profile a set command for each <op\_code> needs to be issued.



The configured HTTP profile parameters are not saved in the non volatile memory.



The read command has two possible usages. The functionality of the command differs with the number of command parameters issued:

- Only the first command parameter (<profile\_id>) issued: the module resets all the profile parameters (to the factory-programmed values) for the profile specified with <profile\_id>
- Only the first and second command parameters used (<profile\_id>, <op\_code>): the module returns the current value of the profile parameter specified with <op\_code> and related to the profile specified with <profile\_id>

#### 21.1.2 Syntax

| Type                          | Syntax                                                     | Response                                                        | Example                                           |
|-------------------------------|------------------------------------------------------------|-----------------------------------------------------------------|---------------------------------------------------|
| <b>Generic syntax</b>         |                                                            |                                                                 |                                                   |
| Set                           | AT+UHTTP=<profile_id>,<op_code>,<param_val>[,<param_val1>] | OK                                                              | AT+UHTTP=2,0,"125.24.51.133"<br>OK                |
| Read                          | AT+UHTTP=<profile_id>,<op_code>                            | +UHTTP: <profile_id>,<op_code>,<param_val>[,<param_val1>]<br>OK | AT+UHTTP=2,0<br>+UHTTP: 2,0,"125.24.51.133"<br>OK |
| <b>HTTP server IP address</b> |                                                            |                                                                 |                                                   |
| Set                           | AT+UHTTP=<profile_id>,0,<HTTP_server_IP_address>           | OK                                                              | AT+UHTTP=2,0,"125.24.51.133"<br>OK                |
| Read                          | AT+UHTTP=<profile_id>,0                                    | +UHTTP: <profile_id>,0,<HTTP_server_IP_address><br>OK           | AT+UHTTP=2,0<br>+UHTTP: 2,0,"125.24.51.133"<br>OK |
| <b>HTTP server name</b>       |                                                            |                                                                 |                                                   |
| Set                           | AT+UHTTP=<profile_id>,1,<HTTP_server_name>                 | OK                                                              | AT+UHTTP=2,1,"www.u-blox.com"<br>OK               |
| Read                          | AT+UHTTP=<profile_id>,1                                    | +UHTTP: <profile_id>,1,<HTTP_server_name><br>OK                 | AT+UHTTP=2,1<br>+UHTTP: 2,1,"www.u-blox.com"      |

| Type                                   | Syntax                                                    | Response                                                                       | Example                                         |
|----------------------------------------|-----------------------------------------------------------|--------------------------------------------------------------------------------|-------------------------------------------------|
| <b>Username</b>                        |                                                           |                                                                                |                                                 |
| Set                                    | AT+UHTTP=<profile_id>,2,<username>                        | OK                                                                             | AT+UHTTP=2,2,"my_user"<br>OK                    |
| Read                                   | AT+UHTTP=<profile_id>,2                                   | +UHTTP: <profile_id>,2,<username><br>OK                                        | AT+UHTTP=2,2<br>+UHTTP: 2,2,"my_user"<br>OK     |
| <b>Password</b>                        |                                                           |                                                                                |                                                 |
| Set                                    | AT+UHTTP=<profile_id>,3,<password>                        | OK                                                                             | AT+UHTTP=2,3,"pwd"<br>OK                        |
| Read                                   | AT+UHTTP=<profile_id>,3                                   | +UHTTP: <profile_id>,3,<password><br>OK                                        | AT+UHTTP=2,3<br>+UHTTP: 2,3,"pwd"<br>OK         |
| <b>Authentication type</b>             |                                                           |                                                                                |                                                 |
| Set                                    | AT+UHTTP=<profile_id>,4,<HTTP_authentication>             | OK                                                                             | AT+UHTTP=2,4,1<br>OK                            |
| Read                                   | AT+UHTTP=<profile_id>,4                                   | +UHTTP: <profile_id>,4,<HTTP_authentication><br>OK                             | AT+UHTTP=2,4<br>+UHTTP: 2,4,1<br>OK             |
| <b>HTTP server port</b>                |                                                           |                                                                                |                                                 |
| Set                                    | AT+UHTTP=<profile_id>,5,<HTTP_port>                       | OK                                                                             | AT+UHTTP=2,5,30<br>OK                           |
| Read                                   | AT+UHTTP=<profile_id>,5                                   | +UHTTP: <profile_id>,5,<HTTP_port><br>OK                                       | AT+UHTTP=2,5<br>+UHTTP: 2,5,30<br>OK            |
| <b>HTTP secure option</b>              |                                                           |                                                                                |                                                 |
| Set                                    | AT+UHTTP=<profile_id>,6,<HTTP_secure>[,<USECMNG_profile>] | OK                                                                             | AT+UHTTP=2,6,1<br>OK                            |
| Read                                   | AT+UHTTP=<profile_id>,6                                   | +UHTTP: <profile_id>,6,<HTTP_secure>[,<USECMNG_profile>]<br>OK                 | AT+UHTTP=2,6<br>+UHTTP: 2,6,1<br>OK             |
| <b>HTTP add custom request headers</b> |                                                           |                                                                                |                                                 |
| Set                                    | AT+UHTTP=<profile_id>,9,<custom_request_header>           | OK                                                                             | AT+UHTTP=2,9,"0:hdr0:val0"<br>OK                |
| Read                                   | AT+UHTTP=<profile_id>,9                                   | +UHTTP: <profile_id>,9,<custom_request_header><br>OK                           | AT+UHTTP=2,9<br>+UHTTP: 2,9,"0:hdr0:val0"<br>OK |
| Read                                   | AT+UHTTP=<profile_id>                                     | OK                                                                             | AT+UHTTP=2<br>OK                                |
| Test                                   | AT+UHTTP=?                                                | +UHTTP: (list of supported <profile_id>s),(list of supported <op_code>s)<br>OK | +UHTTP: (0-3),(0-9)<br>OK                       |

### 21.1.3 Defined values

| Parameter    | Type   | Description                                                                                                                                          |
|--------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| <profile_id> | Number | HTTP profile identifier, in range 0-3                                                                                                                |
| <op_code>    | Number | <ul style="list-style-type: none"> <li>0: HTTP server IP address;</li> <li>1: HTTP server name;</li> <li>2: username</li> <li>3: password</li> </ul> |

| Parameter                | Type            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                          |                 | <ul style="list-style-type: none"> <li>4: authentication type</li> <li>5: HTTP server port</li> <li>6: HTTP Secure option (SSL encryption)</li> <li>7: reserved for internal use only</li> <li>8: reserved for internal use only</li> <li>9: HTTP add custom request headers</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <HTTP_server_IP_address> | String          | HTTP server IP address; The factory-programmed value is an empty text string. For IP address format reference see the <a href="#">IP addressing</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <HTTP_server_name>       | String          | HTTP server name; the maximum length is 128 characters (e.g. "http.server.com"). The factory-programmed value is an empty text string.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <username>               | String          | User name; the maximum length is 30 characters; it is used for the HTTP login procedure if the authentication is used. The factory-programmed value is an empty text string.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <password>               | String          | Password; the maximum length is 30 characters; it is used for the HTTP login procedure if the authentication is used. The factory-programmed value is an empty text string.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <HTTP_authentication>    | Number          | HTTP authentication method; the allowed values are: <ul style="list-style-type: none"> <li>0 (factory-programmed value): no authentication</li> <li>1: basic authentication (the password and username must be set)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <HTTP_port>              | Number          | HTTP server port; range 1-65535. It means the HTTP server port to be used in a HTTP request; the factory-programmed value is 80.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <HTTP_secure>            | Number          | HTTP Secure option (SSL encryption). It enables or disables the HTTPS (SSL secured connection for HTTP application) usage: <ul style="list-style-type: none"> <li>0 (factory-programmed value): HTTPS (SSL encryption) disabled and the HTTP server port set to 80</li> <li>1: HTTPS (SSL encryption) enabled and the HTTP server port set to 443; an USECMNG profile can be specified with an additional parameter.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <USECMNG_profile>        | Number          | Defines the USECMNG profile which specifies the SSL/TLS properties to be used for the SSL/TLS connection. The range goes from 0 to 4. If no profile is set a default USECMNG profile is used                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <custom_request_header>  | String          | Sets/clears the custom request header (string); the custom header option follows a defined format "hdr_id:hdr_name:hdr_value"; the hdr_id is a number in the range [0-4]; the hdr_name and hdr_value are strings having a maximum length of 64 characters (see examples below). <ul style="list-style-type: none"> <li>"0:hdr0:val0": set header 0 with name hdr0 and value val0</li> <li>"0:": clear header 0</li> <li>"1:hdr1:val1": set header 1 with name hdr1 and value val1</li> <li>"1:": clear header 1</li> <li>"2:hdr2:val2": set header 2 with name hdr2 and value val2</li> <li>"2:": clear header 2</li> <li>"3:hdr3:val3": set header 3 with name hdr3 and value val3</li> <li>"3:": clear header 3</li> <li>"4:hdr4:val4": set header 4 with name hdr4 and value val4</li> <li>"4:": clear header 4</li> </ul> The following character is not allowed in the <custom_request_header> parameter: <ul style="list-style-type: none"> <li>0x3A (:)</li> </ul> |
| <param_val>              | Number / String | Type and supported content depend on the related <op_code> parameter; details are given above                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <param_val1>             | Number / String | Type and supported content depend on the related <op_code> parameter; details are given above.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

## 21.1.4 Notes

- HTTP server IP address and HTTP server name are mutually exclusive. If the HTTP server IP address is specified by the user, then the value for the HTTP server name is reset, or vice versa.

### SARA-R404M / SARA-R410M-01B

- <op\_code>=9 is not supported.

### SARA-R404M / SARA-R410M-01B

- <op\_code>=6 is not supported.

## 21.2 HTTP advanced control+UHTTTPAC

| +UHTTTPAC  |                                                                    |              |                |                |               |                              |
|------------|--------------------------------------------------------------------|--------------|----------------|----------------|---------------|------------------------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                              |
|            | SARA-N4                                                            |              |                |                |               |                              |
| Attributes | Syntax                                                             | PIN required | Settings saved | Can be aborted | Response time | Error reference              |
|            | full                                                               | No           | No             | No             | -             | <a href="#">Appendix A.6</a> |

### 21.2.1 Description

Configures, reads or resets (to the factory-programmed values) the HTTP application profile advanced parameters.

 The configured HTTP profile advanced parameters are not saved in the non volatile memory.

### 21.2.2 Syntax

| Type | Syntax                                             | Response                                                                                                       | Example                                                             |
|------|----------------------------------------------------|----------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|
| Set  | AT+UHTTTPAC=<profile_id>,<param_tag>,<key>,<value> | OK                                                                                                             | AT+UHTTTPAC=0,0,0,"UBLX_SESSION_COOKIE_0"<br>OK                     |
| Read | AT+UHTTTPAC=<profile_id>,<param_tag>,<key>         | +UHTTTPAC: <profile_id>,<param_tag>,<key>,<value><br>OK                                                        | AT+UHTTTPAC=0,0,0<br>+UHTTTPAC: 0,0,0,"UBLX_SESSION_COOKIE_0"<br>OK |
| Test | AT+UHTTTPAC=?                                      | +UHTTTPAC: (list of supported <profile_id>s),(list of supported <param_tag>s),(list of supported <key>s)<br>OK | +UHTTTPAC: (0-3),(0),(0-3)<br>OK                                    |

### 21.2.3 Defined values

| Parameter    | Type              | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <profile_id> | Number            | HTTP profile identifier, in range 0-3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <param_tag>  | Number            | <ul style="list-style-type: none"> <li>0: HTTP request COOKIES; manage request COOKIES sent to the HTTP server. <ul style="list-style-type: none"> <li>&lt;key&gt;: index of the cookie (number); range 0-3. Identifies the cookie to be read if &lt;value&gt; is omitted or configured if &lt;value&gt; is a valid string.</li> <li>&lt;value&gt;: value of the cookie (string); the maximum length is 256 characters. The cookie values respect the following rules: <ul style="list-style-type: none"> <li>Empty string (""): the cookie will be cleared and will not be present in the request;</li> <li>Simple one-value cookie: the cookie will be set and sent in the request;</li> <li>Complex multi-value cookie: the cookies will be set and sent in the request. The multiple cookies must be separated by a left-attached semicolon(";") and a space(" ");</li> </ul> </li> </ul> </li> </ul> |
| <key>        | Number/<br>String | Content depends on the related <param_tag> (see above).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <value>      | Number/<br>String | Content depends on the related <param_tag> (see above).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

### 21.2.4 Examples and use cases

In this section some AT+UHTTTPAC command examples and use cases are listed.

| Command                                        | Response | Description                               |
|------------------------------------------------|----------|-------------------------------------------|
| Example 1<br>AT+UHTTTPAC=0,0,0,""              | OK       | Clear HTTP request cookie at index 0      |
| Example 2<br>AT+UHTTTPAC=0,0,0,"SIMPLE_COOKIE" | OK       | Set simple HTTP request cookie at index 0 |

| Command                                            | Response | Description                                                    |
|----------------------------------------------------|----------|----------------------------------------------------------------|
| Example 3                                          |          |                                                                |
| AT+UHTTTPAC=0,0,0,"COMPLEX_COOKIE; COMPLEX_COOKIE" | OK       | Overwrite HTTP request cookie at index 0 with a complex cookie |

## 21.3 HTTP command +UHTTTPC

| +UHTTTPC   |                                                                               |              |                |                |               |                              |
|------------|-------------------------------------------------------------------------------|--------------|----------------|----------------|---------------|------------------------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |              |                |                |               |                              |
| Attributes | Syntax                                                                        | PIN required | Settings saved | Can be aborted | Response time | Error reference              |
|            | partial                                                                       | No           | No             | No             | -             | <a href="#">Appendix A.6</a> |

### 21.3.1 Description

Triggers the HTTP command specified with <http\_command> parameter, using the HTTP application profile parameters (previously set up by +UHTTTP AT command), specified with <profile\_id>. The response indicates if sending the command request to HTTP process was successful or not. The final result of HTTP command will be returned to the user via the +UUHTTTPCR URC.

### 21.3.2 Syntax

| Type | Syntax                                                                                    | Response                                                                                  | Example                                                           |
|------|-------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| Set  | AT+UHTTTPC=<profile_id>,<http_command>,<path>,<filename>[,<param1>[,<param2>[,<param3>]]] | OK                                                                                        | AT+UHTTTPC=0,1,"/path/file.html",<br>"responseFilename"<br><br>OK |
| Test | AT+UHTTTPC=?                                                                              | +UHTTTPC: (list of supported <profile_id>s),(list of supported <http_command>s)<br><br>OK | +UHTTTPC: (0-3),(0-5),100<br><br>OK                               |
| URC  |                                                                                           | +UUHTTTPCR: <profile_id>,<http_command>,<http_result>[,<http_status_code>,<md5_sum>]      | +UUHTTTPCR: 0,1,1                                                 |

### 21.3.3 Defined values

| Parameter      | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <profile_id>   | Number | HTTP profile identifier, in range 0-3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <http_command> | Number | <ul style="list-style-type: none"> <li>0: HEAD command; issue an HEAD request to the HTTP server. <ul style="list-style-type: none"> <li>&lt;param1&gt;: not allowed</li> <li>&lt;param2&gt;: not allowed</li> <li>&lt;param3&gt;: not allowed</li> </ul> </li> <li>1: GET command; perform a GET request to the HTTP server. <ul style="list-style-type: none"> <li>&lt;param1&gt;: not allowed</li> <li>&lt;param2&gt;: not allowed</li> <li>&lt;param3&gt;: not allowed</li> </ul> </li> <li>2: DELETE command; send a DELETE request to the HTTP server. <ul style="list-style-type: none"> <li>&lt;param1&gt;: not allowed</li> <li>&lt;param2&gt;: not allowed</li> <li>&lt;param3&gt;: not allowed</li> </ul> </li> <li>3: PUT command; perform a PUT request to the HTTP server. <ul style="list-style-type: none"> <li>&lt;param1&gt;: filesystem filename (string). It is a mandatory string representing the file system filename to be sent to the HTTP server within the PUT request. For file system file name and data size limits see <a href="#">File system limits</a>.</li> <li>&lt;param2&gt;: HTTP Content-Type identifier (number); the range is 0-6. It is an optional numeric parameter representing the HTTP Content-Type identifier <ul style="list-style-type: none"> <li>0: application/x-www-form-urlencoded</li> <li>1: text/plain</li> </ul> </li> </ul> </li> </ul> |

| Parameter     | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               |        | <ul style="list-style-type: none"> <li>- 2: application/octet-stream</li> <li>- 3: multipart/form-data</li> <li>- 4: application/json</li> <li>- 5: application/xml</li> <li>- 6: user defined with &lt;param3&gt;</li> </ul> <ul style="list-style-type: none"> <li>o &lt;param3&gt;: used only when &lt;param2&gt;=6 (user defined Content-Type). The maximum length is 64 characters</li> </ul> <ul style="list-style-type: none"> <li>• 4: POST a file command; issue a POST request for sending a file to the HTTP server. <ul style="list-style-type: none"> <li>o &lt;param1&gt;: filesystem filename (string). It is a mandatory string representing the file system filename to be sent to the HTTP server within the POST request. For file system file name and data size limits see <a href="#">File system limits</a>.</li> <li>o &lt;param2&gt;: HTTP Content-Type identifier (number); the range is 0-6. It is a mandatory numeric parameter representing the HTTP Content-Type identifier <ul style="list-style-type: none"> <li>- 0: application/x-www-form-urlencoded</li> <li>- 1: text/plain</li> <li>- 2: application/octet-stream</li> <li>- 3: multipart/form-data</li> <li>- 4: application/json</li> <li>- 5: application/xml</li> <li>- 6: user defined with &lt;param3&gt;</li> </ul> </li> <li>o &lt;param3&gt;: used only when &lt;param2&gt;=6 (user defined Content-Type). The maximum length is 64 characters</li> </ul> </li> <li>• 5: POST data command; send a POST request to the HTTP server using the data specified in &lt;param1&gt; parameter <ul style="list-style-type: none"> <li>o &lt;param1&gt;: data (string); the maximum length is 128 bytes. It is a mandatory string representing the data to be sent to the HTTP server with the POST request. The data must be formatted according to the Content-Type specified in &lt;param2&gt; parameter.</li> <li>o &lt;param2&gt;: HTTP Content-Type identifier (number); the range is 0-6. It is a mandatory numeric parameter representing the HTTP Content-Type identifier <ul style="list-style-type: none"> <li>- 0: application/x-www-form-urlencoded</li> <li>- 1: text/plain</li> <li>- 2: application/octet-stream</li> <li>- 3: multipart/form-data</li> <li>- 5: application/xml</li> <li>- 6: user defined with &lt;param3&gt;</li> </ul> </li> <li>o &lt;param3&gt;: used when &lt;param2&gt; is set to 6 (user defined Content-Type). The maximum length of the user defined content type is 64 characters.</li> </ul> </li> <li>• 100: GET FOTA update file; download FOTA update file <ul style="list-style-type: none"> <li>o &lt;filename&gt;: not allowed</li> <li>o &lt;param1&gt;: not allowed</li> <li>o &lt;param2&gt;: not allowed</li> <li>o &lt;param3&gt;: not allowed</li> </ul> </li> </ul> |
| <path>        | String | Path of HTTP server resource; the maximum length is 128 characters.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <filename>    | String | Filename where the HTTP server response will be stored. If the file already exists, it will be overwritten. If <filename> is an empty string (""), the default "http_last_response_<profile_id>" filename will be used. For file system file name and data size limits see <a href="#">File system limits</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <param1>      | String | Content depends on the related <http_command> (see above).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <param2>      | Number | Content depends on the related <http_command> (see above).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <param3>      | String | Content depends on the related <http_command> (see above).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <http_result> | Number | <ul style="list-style-type: none"> <li>• 0: fail</li> <li>• 1: success</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

| Parameter          | Type   | Description                                                                                                                                                                    |
|--------------------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <http_status_code> | Number | HTTP status code reported in the server response header after a GET FOTA update file request. This parameter is issued only for AT+UHTTTPC=<profile_id>,100,<path> AT command. |
| <md5_sum>          | String | MD5 checksum of the FOTA update file. This parameter is issued only for AT+UHTTTPC=<profile_id>,100,<path> AT command.                                                         |

### 21.3.4 Notes

- The +UHTTTPC command has a default timeout setting set to 180 s. The timeout is counted from the last successful network read or send operation performed by the HTTP application, so in a real timeout case the application might be executing a command more than 180 s.
- The data string must not exceed the maximum length of 128 bytes.
- If <http\_command>=4 (POST a file) and the <param2>=3 (multipart/form-data), then the module automatically encapsulates the file content in the following multipart/form-data HTTP request:

```
--U1Blox2Http3Unique4Boundary5\r\n
Content-Disposition: form-data; name="file_post"; filename="<param3>"\r\n
Content-Length: <length of file specified with param3>\r\n
Content-Type: application/octet-stream\r\n
\r\n
<content of file specified with param3>\r\n
--U1Blox2Http3Unique4Boundary5--\r\n
\r\n
```

### SARA-R4 / SARA-N4

- <http\_command> = 100 is not supported.

## 21.4 HTTP protocol error +UHTTTPER

| +UHTTTPER  |                                                                               |              |                |                |               |                              |
|------------|-------------------------------------------------------------------------------|--------------|----------------|----------------|---------------|------------------------------|
| Modules    | SARA-R404M SARA-R410M-01B SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |              |                |                |               |                              |
| Attributes | Syntax                                                                        | PIN required | Settings saved | Can be aborted | Response time | Error reference              |
|            | full                                                                          | No           | No             | No             | -             | <a href="#">Appendix A.6</a> |

### 21.4.1 Description

Retrieves the error class and code of the latest HTTP operation on the specified HTTP profile.

### 21.4.2 Syntax

| Type | Syntax                   | Response                                                 | Example                                 |
|------|--------------------------|----------------------------------------------------------|-----------------------------------------|
| Set  | AT+UHTTTPER=<profile_id> | +UHTTTPER: <profile_id>,<error_class>,<error_code><br>OK | AT+UHTTTPER=1<br>+UHTTTPER: 1,0,0<br>OK |

### 21.4.3 Defined values

| Parameter     | Type   | Description                                                                                                                                                                                 |
|---------------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <profile_id>  | Number | HTTP profile identifier, in range 0-3                                                                                                                                                       |
| <error_class> | Number | List of the allowed values is available in <a href="#">Appendix A.6</a>                                                                                                                     |
| <error_code>  | Number | Value of class-specific error codes (reply code if class is 0). When <error_class>=10 (wrong HTTP API usage), the allowed <error_code>; values are listed in <a href="#">Appendix A.6.2</a> |



## 22 GNSS

### 22.1 NMEA

u-blox cellular modules support reading NMEA strings from the GNSS receiver through AT commands.

Before being able to read a specific NMEA string, it is necessary to activate the storage of the last value of that particular NMEA string. If storing a particular NMEA string was not activated, the response to the query will be "0,NULL". The last value of a specific NMEA string is saved in RAM and is made available even after the GNSS receiver switch off.

The NMEA standard differentiates between GPS, GLONASS and Multi-GNSS receivers using a different 'Talker ID'. Depending upon device model and system configuration, the u-blox receiver could output messages using any one of these Talker IDs.

By default, the receivers configured to support GPS, SBAS and QZSS use the 'GP' Talker ID, receivers configured to support GLONASS use the 'GL' Talker ID, receivers configured to support BeiDou use the 'GB' Talker ID and receivers configured for any combinations of multiple GNSS use the 'GN' Talker ID.

Even if the NMEA specification indicates that the GGA message is GPS specific, u-blox receivers support the output of a GGA message for each of the Talker IDs.



As a factory-programmed setting, the cellular modules configure the GNSS receiver through +UGPS AT command to not provide the NMEA sentences.



When reading an NMEA message, if the response value is "1,Not available" then the storing of the NMEA string is activated but this information has not been still sent to the user, if this persist check that the relative NMEA message is enabled. To enable it use the +UGUBX command (for further information see the UBX-CFG-MSG message in the u-blox GNSS Protocol Specification).

### 22.2 GNSS power management +UGPS

| +UGPS      |                               |              |                |                |               |                 |
|------------|-------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B |              |                |                |               |                 |
|            | SARA-N4                       |              |                |                |               |                 |
| Attributes | Syntax                        | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                          | No           | No             | No             | < 10 s        | +CME Error      |

#### 22.2.1 Description

Switches on or off a u-blox GNSS receiver connected to the cellular module via a dedicated DDC (I<sup>2</sup>C) interface. For more details about the connection between cellular module and u-blox GNSS receiver see the corresponding module system integration manual.

Furthermore the command sets the aiding type to be used to enhance GNSS performance, e.g. decreasing Time To First Fix (TTFF), thus allowing to calculate the position in a shorter time with higher accuracy. The following aiding types are supported:

- Local aiding: the cellular module automatically uploads data such as ephemeris, almanac, last position, time, etc. from the GNSS receiver into its local memory, and restores back the GNSS receiver at the next power up of the GNSS module (if the data are still valid, otherwise it uses GSM information such as country code for a rough position estimation)
- AssistNow Online: a connection profile (either PSD or CSD) must be defined and activated before selecting the AssistNow Online; see the [+UGAOP](#) and [+UGSRV](#) command descriptions. If CellLocate<sup>®</sup> is used, the first HTTP profile will be properly configured
- AssistNow Offline: a connection profile (either PSD or CSD) must be defined and activated before selecting the AssistNow Offline if the almanac file must be downloaded; see the [+UGAOF](#) and [+UGSRV](#) command descriptions.
- AssistNow Autonomous: based on a broadcast ephemeris downloaded from the satellite (or obtained by AssistNow Online) the receiver can autonomously generate an accurate satellite orbit representation («AssistNow Autonomous data») that is usable for navigation much longer than the underlying broadcast

ephemeris was intended for. This makes downloading new ephemeris or aiding data for the first fix unnecessary for subsequent start-ups of the receiver.



The AssistNow Autonomous feature may be not fully supported on all Multi-GNSS receivers. For more details on AssistNow Autonomous feature see the corresponding u-blox-GNSS receiver description.

For a more detailed description on aiding modes and possible suggestions, see the GNSS Implementation Application Note [52].

It is possible to combine different aiding modes: to enable them the sum of the <mode> value of the interested aiding modes is needed (e.g.: aiding <mode>=3 means local aiding plus AssistNow Offline). Moreover it is also possible to switch from one aiding mode to another one without powering off the GNSS receiver. If the following sequence is provided (AT+UGPS=1,1 and then AT+UGPS=1,5) at the beginning the GNSS receiver will power on with local aiding support and after the second command will be added the AssistNow Online. After the second command the local aiding is not restarted, therefore the +UUGIND URC for it will not be sent again.

The latest u-blox GNSS products are multi-GNSS receivers capable of receiving and processing signals from multiple Global Navigation Satellite Systems (GNSS). u-blox concurrent GNSS receivers are multi-GNSS receivers that can acquire and track satellites from more than one GNSS system at the same time, and utilize them for positioning. The <GNSS\_systems> parameter configures the GNSS receiver into the required mode of operation. It is possible to combine different GNSS systems. The combinations of systems, which can be configured simultaneously depends on the receivers capability to receive several carrier frequencies. See the corresponding GNSS receiver data sheet for the supported GNSS systems. If the Assisted GNSS unsolicited indication is enabled, the +UUGIND URC will provide the current activated combinations of systems.

## 22.2.2 Syntax

| Type | Syntax                                       | Response                                                                                                                                   | Example             |
|------|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| Set  | AT+UGPS=<mode>[,<aid_mode>[,<GNSS_systems>]] | OK                                                                                                                                         | AT+UGPS=1,0,1<br>OK |
| Read | AT+UGPS?                                     | +UGPS: <mode>[,<aid_mode>[,<GNSS_systems>]]<br>OK                                                                                          | +UGPS: 1,0,1<br>OK  |
| Test | AT+UGPS=?                                    | +UGPS: (list of supported <mode>s), +UGPS: (0-1),(0-15),(1-127)<br>(list of supported <aid_mode>),(list of supported <GNSS_systems>)<br>OK | OK                  |

## 22.2.3 Defined values

| Parameter      | Type   | Description                                                                                                                                                                                                                                                                                                                             |
|----------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <mode>         | Number | <ul style="list-style-type: none"> <li>0 (default value): GNSS receiver powered off</li> <li>1: GNSS receiver powered on</li> </ul>                                                                                                                                                                                                     |
| <aid_mode>     | Number | Supported aiding modes; the parameter is mandatory if <mode>=1; all these allowed values can be combined together: <ul style="list-style-type: none"> <li>0 (default value): no aiding</li> <li>1: automatic local aiding</li> <li>2: AssistNow Offline</li> <li>4: AssistNow Online</li> <li>8: AssistNow Autonomous</li> </ul>        |
| <GNSS_systems> | Number | Bitmask for combining the supported GNSS types; the parameter is optional and the allowed values can be combined together. The default value is 3 (GPS+SBAS): <ul style="list-style-type: none"> <li>1: GPS</li> <li>2: SBAS</li> <li>4: Galileo</li> <li>8: BeiDou</li> <li>16: IMES</li> <li>32: QZSS</li> <li>64: GLONASS</li> </ul> |

## 22.2.4 Notes

- To know the allowed combinations of GNSS type for <GNSS\_systems> see the corresponding GNSS receiver documentation.
- If <GNSS\_systems> type is not supported by the GNSS receiver, the set command turns on the GNSS receiver with built-in supported type. The current <GNSS\_systems> can be queried by means of the read command or the [+UUGIND](#) URC.
- An error result code is provided in the following cases:
  - <mode>, <aid\_mode> or <GNSS\_systems> values are out of range
  - <mode> is set to 1 without <aid\_mode> value
  - Attempt to power off the GNSS when it is already off
  - The value of <aid\_mode> to be set is equal to the current GNSS aiding mode and the value of <GNSS\_systems> to be set is equal to the last requested <GNSS\_systems>
- The parameter <GNSS\_systems> is displayed in the information text response of the read command only if the connected GNSS receiver supports Multi-GNSS

## 22.3 Assisted GNSS unsolicited indication +UGIND

| +UGIND     |                               |              |                     |                |               |                            |
|------------|-------------------------------|--------------|---------------------|----------------|---------------|----------------------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B |              |                     |                |               |                            |
|            | SARA-N4                       |              |                     |                |               |                            |
| Attributes | Syntax                        | PIN required | Settings saved      | Can be aborted | Response time | Error reference            |
|            | full                          | No           | <a href="#">NVM</a> | No             | -             | <a href="#">+CME Error</a> |

### 22.3.1 Description

Enables or disables sending of URCs from MT to TE in the case of GNSS aiding operations. The <mode> parameter controls the processing of URCs specified within this command.

The URC returns the result of an assisted GNSS operation. This information is sent to all the interfaces. The URC is provided only if one or more aiding modes are enabled (for more details see the [+UGPS](#) and [+UGAOP](#) command descriptions).

There can be more than a +UUGIND URC for a single aiding operation: the +UUGIND is reported for each error. For instance if the local aiding is enabled and there are no space left in the file system after +UGPS=0, there will be an error for every failure writing on FFS.

The commands +UGAOS=0 and +UGAOS=1 both relate to the GNSS local aiding, so the unsolicited message will be +UUGIND=1,x in both cases.

Local aiding and AssistNow Autonomous will produce URC both after GNSS power on and before GNSS power off because some data are transferred from the GNSS receiver to the cellular module.

If the connected GNSS receiver is Multi-GNSS then an additional +UUGIND=0,<GNSS\_systems> URC for the currently activated GNSS systems is displayed.

### 22.3.2 Syntax

| Type | Syntax          | Response                                            | Example             |
|------|-----------------|-----------------------------------------------------|---------------------|
| Set  | AT+UGIND=<mode> | OK                                                  | AT+UGIND=1<br>OK    |
| Read | AT+UGIND?       | +UGIND: <mode><br>OK                                | +UGIND: 1<br>OK     |
| Test | AT+UGIND=?      | +UGIND: (list of supported <mode>'s)<br>OK          | +UGIND: (0-1)<br>OK |
| URC  |                 | Current activated GNSS system:                      | +UUGIND: 0,3        |
|      |                 | +UUGIND: 0,<GNSS_systems>                           |                     |
|      |                 | GNSS aiding status:<br>+UUGIND: <aid_mode>,<result> | +UUGIND: 4,5        |

### 22.3.3 Defined values

| Parameter      | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <mode>         | Number | URC configuration: <ul style="list-style-type: none"> <li>0 (default value): disabled</li> <li>1: enabled</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <aid_mode>     | Number | Provides the supported aiding mode: <ul style="list-style-type: none"> <li>0: GNSS system(s)</li> <li>1: automatic local aiding</li> <li>2: AssistNow Offline</li> <li>4: AssistNow Online</li> <li>8: AssistNow Autonomous</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <GNSS_systems> | Number | Current activated GNSS types; the allowed values can be combined together: <ul style="list-style-type: none"> <li>1: GPS</li> <li>2: SBAS</li> <li>4: Galileo</li> <li>8: BeiDou</li> <li>16: IMES</li> <li>32: QZSS</li> <li>64: GLONASS</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <result>       | Number | Represents the result of the aiding operation: <ul style="list-style-type: none"> <li>0: No error</li> <li>1: Wrong URL (for AssistNow Offline)</li> <li>2: HTTP error (for AssistNow Offline)</li> <li>3: Create socket error (for AssistNow Online)</li> <li>4: Close socket error (for AssistNow Online)</li> <li>5: Write to socket error (for AssistNow Online)</li> <li>6: Read from socket error (for AssistNow Online)</li> <li>7: Connection/DNS error (for AssistNow Online)</li> <li>8: File system error</li> <li>9: Generic error</li> <li>10: No answer from GNSS (for local aiding and AssistNow Autonomous)</li> <li>11: Data collection in progress (for local aiding)</li> <li>12: GNSS configuration failed (for AssistNow Autonomous)</li> <li>13: RTC calibration failed (for local aiding)</li> <li>14: feature not supported (for AssistNow Autonomous)</li> <li>15: feature partially supported (for AssistNow Autonomous)</li> <li>16: authentication token missing (required for aiding for u-blox M8 and future versions)</li> </ul> |

## 22.4 GNSS profile configuration +UGPRF

| +UGPRF     |                               |              |                     |                |               |                            |
|------------|-------------------------------|--------------|---------------------|----------------|---------------|----------------------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B |              |                     |                |               |                            |
|            | SARA-N4                       |              |                     |                |               |                            |
| Attributes | Syntax                        | PIN required | Settings saved      | Can be aborted | Response time | Error reference            |
|            | full                          | No           | <a href="#">NVM</a> | No             | -             | <a href="#">+CME Error</a> |

### 22.4.1 Description

Configures the data flow to and from a u-blox GNSS receiver connected to the cellular module. The data flow is possible to and from the:

- UART (via multiplexer)
- USB (or alternatively AUX UART)
- Over the air to a remote host: To send data over the air an internet connection must be active and there must be at least one free TCP socket (the GNSS shares the socket pool with the other applications). Setting up an Internet connection and network registration is not part of this command and must be handled by the user separately from this command.

- Into a file on the cellular module: A file with GNSS data can be accessed via [+ULSTFILE](#) command. The file name is automatically chosen by the cellular module as a unique ID based on date and time or a further incremental number (e.g. "GPS\_200910061500" or "GPS\_20091006\_001" according to the used cellular module). When the files size reaches 500 kB the file is closed and no more data is saved. It is possible to save further data by restarting the GNSS (this will create a new file)

It is possible to send GNSS data to multiple destinations at the same time by summing the <GNSS\_I/O\_configuration> values of each required destinations (e.g. if AT+UGPRF=6 the data will be sent on multiplexer and stored in a file in the file system).

The messages to be output by the u-blox GNSS receiver need to be activated separately with UBX-CFG-MSG configuration messages according to the GNSS Receiver Protocol Specification.

 It is not possible to select the GNSS data flow to and from USB (or alternatively AUX UART) and multiplexer concurrently.

 The configuration of the GNSS profile must be performed only when GNSS is switched off, otherwise an error result code will be displayed.

## 22.4.2 Syntax

| Type | Syntax                                                                | Response                                                                                                         | Example                                |
|------|-----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|----------------------------------------|
| Set  | AT+UGPRF=<GNSS_I/O_configuration>[,<IP Port>,<server address string>] | OK                                                                                                               | AT+UGPRF=0<br>OK                       |
| Read | AT+UGPRF?                                                             | +UGPRF: <GNSS_I/O_configuration>,<IP port>,<server address string><br>OK                                         | +UGPRF: 0,0,""<br>OK                   |
| Test | AT+UGPRF=?                                                            | +UGPRF: (list of supported <GNSS_I/O_configuration>),(list of supported <IP port>),<server address string><br>OK | +UGPRF: (0-127),(0-65535),"addr"<br>OK |

## 22.4.3 Defined values

| Parameter               | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <GNSS_IO_configuration> | Number | <ul style="list-style-type: none"> <li>• 0 (default value and factory-programmed value): no data flow to multiplexer, file or IP address</li> <li>• 1: GNSS data flow to and from USB (or alternatively AUX UART)</li> <li>• 2: GNSS data flow to and from multiplexer</li> <li>• 4: GNSS data flow saved to file</li> <li>• 8: GNSS data flow over the air to an Internet host</li> <li>• 16: GNSS data ready function</li> <li>• 32: GNSS RTC sharing function</li> <li>• 64: reserved</li> <li>• 128: reset the GNSS after the GNSS power on (see <a href="#">AT+UGPS</a> command description)</li> <li>• 256: use the auxiliary GNSS receiver instead of the default one. If the feature is not provided then an error result code will be displayed</li> </ul> |
| <IP port>               | Number | IP port of the server where the GNSS data are sent (default value and factory-programmed value: 0). If GNSS data flow over the air is enabled the parameter is mandatory otherwise is forbidden.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <server address string> | String | Address string of the server where the GNSS data are sent (default value and factory-programmed value: ""). If GNSS data flow over the air is enabled the parameter is mandatory otherwise is forbidden. The address could be provided in both URL or IP format and the maximum length of the string is 47 characters.                                                                                                                                                                                                                                                                                                                                                                                                                                              |

## 22.4.4 Notes

### SARA-R4 / SARA-N4

- <GNSS\_IO\_configuration>=128 (GNSS reset after the GNSS power on) and <GNSS\_IO\_configuration>=256 (use an auxiliary GNSS receiver) are not supported.

## 22.5 Aiding server configuration +UGSRV

| +UGSRV     |                               |              |                |                |               |                 |
|------------|-------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B |              |                |                |               |                 |
|            | SARA-N4                       |              |                |                |               |                 |
| Attributes | Syntax                        | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                          | No           | NVM            | No             | -             | +CME Error      |

### 22.5.1 Description

Configures the network connection to a Multi GNSS Assistance (MGA) server. The configuration is saved in NVM and applied at the next GNSS power cycle. The MGA server is accessed with the HTTP. This assistance mode requires a packet data connection to exchange information with u-blox servers. By default, the cellular module connects to u-blox' primary MGA server; if the connection fails then the cellular module connects to u-blox' secondary MGA server. Authorization tokens are used as a means of authorizing access to the u-blox services and for gathering anonymised statistics. To obtain a token customers should use the form in <http://www.u-blox.com/services-form.html>. The set command registers a token for gathering assistance data from MGA servers. Once a token is set it cannot be cleared so that registered hostnames in +UGAOP and +UGAOF commands are discarded.



Setting up Internet connection and network registration is not part of this command and must be handled by the user separately to this command.

### 22.5.2 Syntax

| Type | Syntax                                                                                                                                        | Response                                                                                                                                                                                                                                                         | Example                                                                                                                 |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| Set  | AT+UGSRV=[<mga_primary_server>],[<mga_secondary_server>],<auth_token>[,<days>[,<period>[,<resolution>[,<GNSS_types>[,<mode>[,<datatype>]]]]]] | OK                                                                                                                                                                                                                                                               | AT+UGSRV="cell-live1.services.u-blox.com","cell-live2.services.u-blox.com","123456789abcdefghijklm",14,4,1,65,0,1<br>OK |
| Read | AT+UGSRV?                                                                                                                                     | +UGSRV: <mga_primary_server>,<mga_secondary_server>,<auth_token>,<days>,<period>,<resolution>,<GNSS_types>,<mode>,<datatype><br>OK                                                                                                                               | +UGSRV: "cell-live1.services.u-blox.com","cell-live2.services.u-blox.com","123456789abcdefghijklm",14,4,1,65,0,1<br>OK  |
| Test | AT+UGSRV=?                                                                                                                                    | +UGSRV: <mga_primary_server>,<mga_secondary_server>,<auth_token>,(list of supported <days>s),(list of supported <period>s),(list of supported <resolution>s),(list of supported <GNSS_types>s),(list of supported <mode>s),(list of supported <datatype>s)<br>OK | +UGSRV: "srv1","srv2","token",(1,2,3,5,7,10,14),(1-5),(1-3),(1,64,65),(0-2),(0-15)<br>OK                                |

### 22.5.3 Defined values

| Parameter              | Type   | Description                                                                                                                                                                                                                                                            |
|------------------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <mga_primary_server>   | String | Host name of the primary MGA server; the maximum length is 254 characters. Empty string is not allowed. The default and factory-programmed value is "cell-live1.services.u-blox.com". If the primary MGA server is omitted, the current stored value is preserved.     |
| <mga_secondary_server> | String | Host name of the secondary MGA server; the maximum length is 254 characters. Empty string is not allowed. The default and factory-programmed value is "cell-live2.services.u-blox.com". If the secondary MGA server is omitted, the current stored value is preserved. |
| <auth_token>           | String | Authentication Token for MGA server access.                                                                                                                                                                                                                            |

| Parameter    | Type   | Description                                                                                                                                                                                                                                                                                                                   |
|--------------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <days>       | Number | The number of days into the future the Offline data for u-blox 7 and previous version should be valid for. The allowed values are: 1, 2, 3, 5, 7, 10 and 14. The default and factory-programmed value is 14.                                                                                                                  |
| <period>     | Number | The number of weeks into the future the Offline data for u-blox M8 should be valid for. The range of the allowed values goes from 1 to 5. The default and factory-programmed value is 4.                                                                                                                                      |
| <resolution> | Number | Resolution of offline data for u-blox M8. Allowed values: <ul style="list-style-type: none"> <li>1 (default and factory-programmed value): every day</li> <li>2: every other day</li> <li>3: every third day</li> </ul>                                                                                                       |
| <GNSS_types> | Number | Bitmask for combining the desired GNSS for the (offline) aiding <ul style="list-style-type: none"> <li>1: GPS</li> <li>64: GLONASS</li> </ul> The default and factory-programmed value is all (65). If the parameter is omitted, the current stored value is preserved.                                                       |
| <mode>       | Number | Mode of operation of AssistNow Online data management <ul style="list-style-type: none"> <li>0 (default and factory-programmed value): AssistNow Online data are downloaded at GNSS receiver power up</li> <li>1: AssistNow Online data automatically kept alive</li> <li>2: manual AssistNow Online data download</li> </ul> |
| <datatype>   | Number | Bitmask for combining the desired data types for the (online) aiding <ul style="list-style-type: none"> <li>0: time</li> <li>1: position</li> <li>2: ephemeris</li> <li>4: almanac</li> <li>8: auxiliary</li> </ul> The default and factory-programmed value is all (15)                                                      |

## 22.6 GNSS aiding request command +UGAOS

| +UGAOS     |                               |              |                |                |               |                 |
|------------|-------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B |              |                |                |               |                 |
|            | SARA-N4                       |              |                |                |               |                 |
| Attributes | Syntax                        | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                          | No           | No             | No             | < 10 s        | +CME Error      |

### 22.6.1 Description

Triggers the manual download of AssistNow Online and AssistNow Offline data from the configured server in case automatic AssistNow operation is not enabled. The command returns only when the received data from the server are valid or an error occurs.

The command is also used to trigger the manual upload of local aiding data (e.g. ephemeris, almanac, last position, time, etc) from a u-blox GNSS receiver prior to shutting it down and to restore it into the receiver after the power up of the GNSS receiver (for more details refer to command +UGPS, [Chapter 22.2](#)).

### 22.6.2 Syntax

| Type | Syntax              | Response                                        | Example             |
|------|---------------------|-------------------------------------------------|---------------------|
| Set  | AT+UGAOS=<aid_mode> | OK                                              | AT+UGAOS=0<br>OK    |
| Test | AT+UGAOS=?          | AT+UGAOS: (list of supported <aid_mode>s)<br>OK | +UGAOS: (0-8)<br>OK |

### 22.6.3 Defined values

| Parameter  | Type   | Description                                                                                                            |
|------------|--------|------------------------------------------------------------------------------------------------------------------------|
| <aid_mode> | Number | <ul style="list-style-type: none"> <li>0: Upload of local aiding data from GNSS receiver to cellular module</li> </ul> |

| Parameter | Type | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-----------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           |      | <ul style="list-style-type: none"> <li>1: Download of local aiding data from the cellular module to the GNSS receiver</li> <li>2: AssistNow Offline file download request (file loaded into cellular module)</li> <li>4: AssistNow Online data download request (data loaded into the GNSS receiver). This is only needed if AssistNow Online is not used with automatic operation</li> <li>8: AssistNow autonomous</li> <li>Other values are reserved for future use</li> </ul> |

## 22.7 Send of UBX string +UGUBX

| +UGUBX     |                               |              |                |                |               |                 |
|------------|-------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B |              |                |                |               |                 |
|            | SARA-N4                       |              |                |                |               |                 |
| Attributes | Syntax                        | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                          | No           | No             | No             | < 10 s        | +CME Error      |

### 22.7.1 Description

Sends UBX protocol messages, embedded in an AT command, to a u-blox GNSS receiver. The command is transparent, that is the data is sent to the GNSS receiver without any check: it is up to the user to control if the UBX data is valid. The checksum in +UGUBX command string is ignored, this is calculated when the data is sent to the GNSS receiver.

When the GNSS is off the UBX string is saved in RAM and, later, passed to the GNSS as configuration for "GNSS data ready" function when the GNSS receiver is used. This message is used only if the GNSS receiver HW is unknown (newer than the cellular module FW). In this case the UBX checksum bytes must be filled correctly.



It is recommended to not send UBX messages to reset the GNSS receiver while it is in use, this will cause a misalignment between the configuration of the cellular module and the one of the GNSS receiver. Furthermore it is recommended to not configure the GNSS power saving with the "GNSS data ready" active, because the GNSS receiver could send wrong reading requests to the cellular module.

### 22.7.2 Syntax

| Type | Syntax                | Response                            | Example                                                                                     |
|------|-----------------------|-------------------------------------|---------------------------------------------------------------------------------------------|
| Set  | AT+UGUBX=<UBX_string> | +UGUBX: <UBX_string_response><br>OK | AT+UGUBX="B56206010800010600<br>010000000017DA"<br><br>+UGUBX: "B5620501020006010F38"<br>OK |

### 22.7.3 Defined values

| Parameter             | Type   | Description                                                                                                                                                                                                                                                                                                                            |
|-----------------------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <UBX_string>          | String | UBX message in hexadecimal format. The messages can include spaces to simplify copy/paste from u-center separated with spaces, e.g. AT+UGUBX="B5 62 06 01 08 0 0 01 06 00 01 00 00 00 00 17 DA" (this is important when copying messages from u-center). For the limit of the length of the string, see <a href="#">Command line</a> . |
| <UBX_string_response> | String | The response message depends by the request sent: query/poll UBX messages will return the requested data in hexadecimal format, while the configuration message will return the corresponding acknowledge or not-acknowledge. See the UBX protocol specification                                                                       |

### 22.7.4 Notes

- If a +UGUBX command triggers multiple strings answer only a single UBX string is returned. E. g. polling GPS Aiding Ephemeris Data (AID-EPH) is done by sending a single message to the receiver but returns 32 messages; only the first one is sent to AT interface.
- The answer can be split in multiple information text responses all starting with "+UGUBX:".



## 22.8 GNSS indications timer +UGTMR

| +UGTMR     |                               |              |                |                |               |                 |
|------------|-------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B |              |                |                |               |                 |
|            | SARA-N4                       |              |                |                |               |                 |
| Attributes | Syntax                        | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                          | No           | No             | No             | < 10 s        | +CME Error      |

### 22.8.1 Description

Sets the date and time format. With the <time\_zone> parameter is possible to set the time zone value; the time and the date will be updated as the local time. With the action command is possible to synchronize the UTC timing.

### 22.8.2 Syntax

| Type | Syntax               | Response                                       | Example                  |
|------|----------------------|------------------------------------------------|--------------------------|
| Set  | AT+UGTMR=<time_zone> | OK                                             | AT+UGTMR=-1<br>OK        |
| Read | AT+UGTMR?            | +UGTMR: <time_zone><br>OK                      | +UGTMR: -1<br>OK         |
| Test | AT+UGTMR=?           | +UGTMR: (list of supported <time_zone>s)<br>OK | +UGTMR: (-96 - 96)<br>OK |

### 22.8.3 Defined values

| Parameter   | Type   | Description                                                                                                                                                                                                |
|-------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <time_zone> | Number | Indicates the time zone value set by the user; the module can provide an error result code if the offset has not been calculated. The factory-programmed time zone value is 0.<br>• -96, 96: defined range |

### 22.8.4 Notes

- The time zone is expressed in quarters of hour.
- The time is updated with the current UTC time plus the time zone and the time zone is unchanged, for example:

| Command      | Response                      | Remarks                                                                                                                                                            |
|--------------|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AT+UGTMR=-36 | OK                            | The command returns the "OK" final result code and sets the new date and time if the GNSS has this information, otherwise a generic error result code is returned. |
| AT+CCLK?     | +CCLK: "12/05/23,21:54:21+00" |                                                                                                                                                                    |

## 22.9 Get GNSS time and date +UGZDA

| +UGZDA     |                               |              |                |                |               |                 |
|------------|-------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B |              |                |                |               |                 |
|            | SARA-N4                       |              |                |                |               |                 |
| Attributes | Syntax                        | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                          | No           | NVM            | No             | < 10 s        | +CME Error      |

### 22.9.1 Description

Enables/disables the storing of the last value of NMEA \$ZDA messages, and get the current messaging state. If the <state> parameter is enabled, the last value of NMEA \$ZDA messages can be retrieved with the read command even when the GNSS is switched off.

The NMEA \$ZDA messages are volatile.

## 22.9.2 Syntax

| Type | Syntax           | Response                                   | Example                                                                       |
|------|------------------|--------------------------------------------|-------------------------------------------------------------------------------|
| Set  | AT+UGZDA=<state> | OK                                         | AT+UGZDA=1<br>OK                                                              |
| Read | AT+UGZDA?        | +UGZDA: <state>,<\$ZDA msg><br>OK          | +UGZDA: 1,\$GPZDA,142351.00,12,12,2013,00,00*66<br>OK<br>+UGZDA: 0,NULL<br>OK |
| Test | AT+UGZDA=?       | +UGZDA: (list of supported <state>s)<br>OK | +UGZDA: (0-1)<br>OK                                                           |

## 22.9.3 Defined values

| Parameter   | Type   | Description                                                                                                                                                |
|-------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <state>     | Number | <ul style="list-style-type: none"> <li>0 (factory-programmed value): disable the NMEA \$ZDA messages</li> <li>1: enable the NMEA \$ZDA messages</li> </ul> |
| <\$ZDA msg> | String | NMEA \$ZDA messages or "Not available" if the NMEA string is enabled, but this information has not been still sent to the user.                            |

## 22.10 Get GNSS fix data +UGGGA

| +UGGGA     |                               |              |                |                |               |                 |
|------------|-------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B |              |                |                |               |                 |
|            | SARA-N4                       |              |                |                |               |                 |
| Attributes | Syntax                        | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                          | No           | NVM            | No             | < 10 s        | +CME Error      |

### 22.10.1 Description

Enables/disables the storing of the last value of NMEA \$GGA messages, and gets the current messaging state. If the <state> parameter is enabled, the last value of NMEA \$GGA messages can be retrieved with the read command even when the GNSS is switched off.

The NMEA \$GGA messages are volatile.

### 22.10.2 Syntax

| Type | Syntax           | Response                                   | Example                                                                           |
|------|------------------|--------------------------------------------|-----------------------------------------------------------------------------------|
| Set  | AT+UGGGA=<state> | OK                                         | AT+UGGGA=1<br>OK                                                                  |
| Read | AT+UGGGA?        | +UGGGA: <state>,<\$GGA msg><br>OK          | +UGGGA: 1,\$GPZDA,142351.00,,,,,0,0,0,99.99,,,,,*66<br>OK<br>+UGGGA: 0,NULL<br>OK |
| Test | AT+UGGGA=?       | +UGGGA: (list of supported <state>s)<br>OK | +UGGGA: (0-1)<br>OK                                                               |

### 22.10.3 Defined values

| Parameter | Type   | Description                                                                                                                                                      |
|-----------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <state>   | Number | <ul style="list-style-type: none"> <li>0 (factory-programmed value): to disable the NMEA \$GGA messages</li> <li>1: to enable the NMEA \$GGA messages</li> </ul> |

| Parameter   | Type   | Description                                                                                                                     |
|-------------|--------|---------------------------------------------------------------------------------------------------------------------------------|
| <\$GGA msg> | String | NMEA \$GGA messages or "Not available" if the NMEA string is enabled, but this information has not been still sent to the user. |

## 22.11 Get geographic position +UGLL

| +UGLL      |                               |              |                |                |               |                 |
|------------|-------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B |              |                |                |               |                 |
|            | SARA-N4                       |              |                |                |               |                 |
| Attributes | Syntax                        | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                          | No           | NVM            | No             | < 10 s        | +CME Error      |

### 22.11.1 Description

Enables/disables the storing of the last value of NMEA \$GLL messages, and gets the current messaging state. If the <state> parameter is enabled, the last value of NMEA \$GLL messages can be retrieved with the read command even when the GNSS is switched off.

The NMEA \$GLL messages are volatile.

### 22.11.2 Syntax

| Type | Syntax          | Response                                     | Example                                                                |
|------|-----------------|----------------------------------------------|------------------------------------------------------------------------|
| Set  | AT+UGLL=<state> | OK                                           | AT+UGLL=1<br>OK                                                        |
| Read | AT+UGLL?        | +UGLL: <state>,<\$GLL msg><br>OK             | +UGLL: 1,\$GPGLL,,,,,142351.00,V,<br>N*4A<br>OK<br>+UGLL: 0,NULL<br>OK |
| Test | AT+UGLL=?       | +UGLL: (list of supported<br><state>s)<br>OK | +UGLL: (0-1)<br>OK                                                     |

### 22.11.3 Defined values

| Parameter   | Type   | Description                                                                                                                                                      |
|-------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <state>     | Number | <ul style="list-style-type: none"> <li>0 (factory-programmed value): to disable the NMEA \$GLL messages</li> <li>1: to enable the NMEA \$GLL messages</li> </ul> |
| <\$GLL msg> | String | NMEA \$GLL messages or "Not available" if the NMEA string is enabled, but this information has not been still sent to the user.                                  |

## 22.12 Get number of GNSS satellites in view +UGGSV

| +UGGSV     |                               |              |                |                |               |                 |
|------------|-------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B |              |                |                |               |                 |
|            | SARA-N4                       |              |                |                |               |                 |
| Attributes | Syntax                        | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                          | No           | NVM            | No             | < 10 s        | +CME Error      |

### 22.12.1 Description

Enable/disables the storing of the last value of NMEA \$GSV messages, and gets the current messaging state. If the <state> parameter is enabled, the last value of NMEA \$GSV messages can be retrieved with the read command even when the GNSS is switched off.

The NMEA \$GSV messages are volatile.

## 22.12.2 Syntax

| Type | Syntax           | Response                                   | Example                                                                                                                                                                                                                                                                                                  |
|------|------------------|--------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Set  | AT+UGGSV=<state> | OK                                         | AT+UGGSV=1<br>OK                                                                                                                                                                                                                                                                                         |
| Read | AT+UGGSV?        | +UGGSV: <state>,<\$GSV msg><br>OK          | +UGGSV: 1,\$GPGSV,3,1,11,03,67,298,22,06,88,149,29,07,06,302,,08,05,332,25*73<br>\$GPGSV,3,2,11,09,02,334,25,14,02,141,,15,10,041,43,16,46,209,16*7D<br>\$GPGSV,3,3,11,18,48,066,35,21,26,070,35,27,80,314,25*40<br>\$GLGSV,1,1,03,73,13,248,,74,23,298,20,75,09,348,19*51<br>OK<br>+UGGSV: 0,NULL<br>OK |
| Test | AT+UGGSV=?       | +UGGSV: (list of supported <state>s)<br>OK | +UGGSV: (0-1)<br>OK                                                                                                                                                                                                                                                                                      |

## 22.12.3 Defined values

| Parameter   | Type   | Description                                                                                                                                                      |
|-------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <state>     | Number | <ul style="list-style-type: none"> <li>0 (factory-programmed value): to disable the NMEA \$GSV messages</li> <li>1: to enable the NMEA \$GSV messages</li> </ul> |
| <\$GSV msg> | String | NMEA \$GSV messages or "Not available" if the NMEA string is enabled, but this information has not been still sent to the user.                                  |

## 22.12.4 Notes

- Since the \$GSV message reports satellite information, the output of the different GNSS systems is not combined, but it is reported in sequence as in the example above with GPS and GLONASS.

## 22.13 Get recommended minimum GNSS data +UGRMC

| +UGRMC     |                               |              |                |                |               |                 |
|------------|-------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B |              |                |                |               |                 |
|            | SARA-N4                       |              |                |                |               |                 |
| Attributes | Syntax                        | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                          | No           | NVM            | No             | < 10 s        | +CME Error      |

### 22.13.1 Description

Enable/disables the storing of the last value of NMEA \$RMC messages, and gets the current messaging state. If the <state> parameter is enabled, the last value of NMEA \$RMC messages can be retrieved with the read command even when the GNSS is switched off.

The NMEA \$RMC messages are volatile.

### 22.13.2 Syntax

| Type | Syntax           | Response                          | Example                                                                 |
|------|------------------|-----------------------------------|-------------------------------------------------------------------------|
| Set  | AT+UGRMC=<state> | OK                                | AT+UGRMC=1<br>OK                                                        |
| Read | AT+UGRMC?        | +UGRMC: <state>,<\$RMC msg><br>OK | +UGRMC: 1,\$GPRMC,142351.00,V,,,,,121213,,,N*7F<br>OK<br>+UGRMC: 0,NULL |

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

### 22.13.3 Defined values

| Parameter   | Type   | Description                                                                                                                                                      |
|-------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <state>     | Number | <ul style="list-style-type: none"> <li>0 (factory-programmed value): to disable the NMEA \$RMC messages</li> <li>1: to enable the NMEA \$RMC messages</li> </ul> |
| <\$RMC msg> | String | NMEA \$RMC messages or "Not available" if the NMEA string is enabled, but this information has not been still sent to the user.                                  |

## 22.14 Get course over ground and ground speed +UGVTG

| +UGVTG     |                               |              |                |                |               |                 |
|------------|-------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B |              |                |                |               |                 |
|            | SARA-N4                       |              |                |                |               |                 |
| Attributes | Syntax                        | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                          | No           | NVM            | No             | < 10 s        | +CME Error      |

### 22.14.1 Description

Enables/disables the storing of the last value of NMEA \$VTG messages, and gets know the current messaging state. If the <state> parameter is enabled, the last value of NMEA \$VTG messages can be retrieved with the read command even when the GNSS is switched off.

The NMEA \$VTG messages are volatile.

### 22.14.2 Syntax

| Type | Syntax           | Response                                   | Example                                                      |
|------|------------------|--------------------------------------------|--------------------------------------------------------------|
| Set  | AT+UGVTG=<state> | OK                                         | AT+UGVTG=1<br>OK                                             |
| Read | AT+UGVTG?        | +UGVTG: <state>,<\$VTG msg><br>OK          | +UGVTG: 1,\$GPVTG,,,,,,,,,N*30<br>OK<br>+UGVTG: 0,NULL<br>OK |
| Test | AT+UGVTG=?       | +UGVTG: (list of supported <state>s)<br>OK | +UGVTG: (0-1)<br>OK                                          |

### 22.14.3 Defined values

| Parameter   | Type   | Description                                                                                                                                                      |
|-------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <state>     | Number | <ul style="list-style-type: none"> <li>0 (factory-programmed value): to disable the NMEA \$VTG messages</li> <li>1: to enable the NMEA \$VTG messages</li> </ul> |
| <\$VTG msg> | String | NMEA \$VTG messages or "Not available" if the NMEA string is enabled, but this information has not been still sent to the user.                                  |

## 22.15 Get satellite information +UGGSA

| +UGGSA     |                               |              |                |                |               |                 |
|------------|-------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B |              |                |                |               |                 |
|            | SARA-N4                       |              |                |                |               |                 |
| Attributes | Syntax                        | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                          | No           | NVM            | No             | < 10 s        | +CME Error      |

### 22.15.1 Description

Enables/disables the storing of the last value of NMEA \$GSA messages, and gets the current messaging state. If <state> parameter is enabled, the last value of NMEA \$GSA messages can be retrieved with the read command even when the GNSS is switched off.

The NMEA \$GSA messages are volatile.

### 22.15.2 Syntax

| Type | Syntax           | Response                                   | Example                                                                              |
|------|------------------|--------------------------------------------|--------------------------------------------------------------------------------------|
| Set  | AT+UGGSA=<state> | OK                                         | AT+UGGSA=1<br>OK                                                                     |
| Read | AT+UGGSA?        | +UGGSA: <state>,<\$GSA msg><br>OK          | +UGGSA: 1,\$GPGSA,A,1,,,,,,,,,,,,,99.99,99.99,99.99*30<br>OK<br>+UGGSA: 0,NULL<br>OK |
| Test | AT+UGGSA=?       | +UGGSA: (list of supported <state>s)<br>OK | +UGGSA: (0-1)<br>OK                                                                  |

### 22.15.3 Defined values

| Parameter   | Type   | Description                                                                                                                                                      |
|-------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <state>     | Number | <ul style="list-style-type: none"> <li>0 (factory-programmed value): to disable the NMEA \$GSA messages</li> <li>1: to enable the NMEA \$GSA messages</li> </ul> |
| <\$GSA msg> | String | NMEA \$GSA messages or "Not available" if the NMEA string is enabled, but this information has not been still sent to the user.                                  |

## 22.16 Ask for localization information +ULOC

| +ULOC      |                               |              |                |                |               |                 |
|------------|-------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B |              |                |                |               |                 |
|            | SARA-N4                       |              |                |                |               |                 |
| Attributes | Syntax                        | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                          | No           | No             | No             | < 10 s        | +CME Error      |

### 22.16.1 Description

Requests cellular module to provide the location data; the location can be determined using:

- GNSS receiver
- CellLocate® (location based on network cells data)
- Combination of both technologies (hybrid)

The final result code indicates if sending the command request to the localization information process was successful or not. The URC is issued to provide the requested information via +ULOC set command.

The GNSS interface and CellLocate® can be used at the same time: if the GNSS sensor is reserved to another interface an error result code is provided (" +CME ERROR: GPS busy" if +CMEE=2).

It is possible to configure the Hybrid Positioning through +ULOCGNSS and +ULOCCELL AT commands even if it is running: the parameters are stored in NVM and will be applied at the next +ULOC command.

-  If the +ULOC command is sent while a previous +ULOC activity is still in progress the previous activity is aborted, the available position is immediately output and the next +ULOC request is served.
-  The data connection cannot be immediately dropped at the +ULOC timeout expiration. This could lead to a delay in the expected response time.
-  Depending on the aiding chosen, a data connection could be required; see the [AT+UGPS](#) command description.
-  If no position is available (no GNSS coverage, no network information and no previous data available) then the <lat> latitude and <long> longitude will be set to '0'.
-  If the previous position degraded by the elapsed time satisfies the desired accuracy then the sensor '0' is reported in the information text response.
-  If multi-hypothesis is required the GNSS solution and the CellLocate® solutions are reported, if available. If no GNSS or CellLocate® solutions are present, the previous position degraded is used instead.
-  If multi-hypothesis is required but the sensor is set to GNSS (<sensor>=1), only one solution will be provided: the GNSS one (or the previous position degraded if GNSS solution not available).
-  If a valid GNSS fix with an accuracy below the required value (<accuracy>) occurs before the end of the network scan, the GNSS-only solution will be available, even if multi-hypothesis has been required.

## 22.16.2 Syntax

| Type | Syntax                                                                          | Response                                                                                                                                                                                                                         | Example                                                                                                                           |
|------|---------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| Set  | AT+ULOC=<mode>,<sensor>,<response_type>,<timeout>,<accuracy>[,<num_hypothesis>] | OK                                                                                                                                                                                                                               | AT+ULOC=2,3,0,120,1<br>OK                                                                                                         |
| Read | AT+ULOC?                                                                        | +ULOC: <mode>,<sensor>,<response_type>,<timeout>,<accuracy>,<num_hypothesis><br>OK                                                                                                                                               | +ULOC: 2,3,1,0,20,0<br>OK                                                                                                         |
| Test | AT+ULOC=?                                                                       | +ULOC: (list of supported <mode>s), (list of supported <sensor>s), (list of supported <response_type>s), (list of supported <timeout>s), (list of supported <accuracy>s), (list of supported <num_hypothesis>s)<br>OK            | +ULOC: (0-2),(0-3),(0-2),(1-999),(1-999999),(1-16)<br>OK                                                                          |
| URC  |                                                                                 | If <response_type>=0:<br>+UULOC: <date>,<time>,<lat>,<long>,<alt>,<uncertainty>                                                                                                                                                  | +UULOC: 13/04/2011,09:54:51.000,45.6334520,13.0618620,49,1                                                                        |
|      |                                                                                 | If <response_type>=1:<br>+UULOC: <date>,<time>,<lat>,<long>,<alt>,<uncertainty>,<speed>,<direction>,<vertical_acc>,<sensor_used>,<SV_used>,<antenna_status>,<jamming_status>                                                     | +UULOC: 25/09/2013,10:13:29.000,45.7140971,13.7409172,266,17,0,0,16,3,9                                                           |
|      |                                                                                 | If <response_type>=2, <sensor_used>=1 and <num_hypothesis>=N:<br>+UULOC: <sol>,<num>,<sensor_used>,<date>,<time>,<lat>,<long>,<alt>,<uncertainty>,<speed>,<direction>,<vertical_acc>,<SV_used>,<antenna_status>,<jamming_status> | +UULOC: 1,2,1,08/04/2015,09:02:32.000,45.7141652,13.7410666,266,47,0,0,40,3,0,0                                                   |
|      |                                                                                 | If <response_type>=2, <sensor_used>=2 and <num_hypothesis>=N:<br>+UULOC: <sol>,<num>,<sensor_used>,<date>,<time>,<lat>,<long>,<alt>,<uncertainty>,<speed>,<direction>,<vertical_acc>,<SV_used>,<antenna_status>,<jamming_status> | +UULOC: 2,2,2,08/04/2015,09:02:19.000,45.7140665,13.7411681,0,45.7240260,13.7511276,113,10,0,50,45.7240260,13.7511276,143,41,0,95 |

| Type | Syntax | Response                                                                                                                                                                                                                                   | Example                                                                       |
|------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
|      |        | <code>&lt;alt&gt;,&lt;lat50&gt;,&lt;long50&gt;,&lt;major50&gt;,&lt;minor50&gt;,&lt;orientation50&gt;,&lt;confidence50&gt;[,&lt;lat95&gt;,&lt;long95&gt;,&lt;major95&gt;,&lt;minor95&gt;,&lt;orientation95&gt;,&lt;confidence95&gt;]</code> |                                                                               |
|      |        | If <code>&lt;response_type&gt;=2</code> , <code>&lt;sensor_used&gt;=0</code> :<br><code>+UULOC: &lt;sol&gt;,&lt;num&gt;,&lt;sensor_used&gt;,&lt;date&gt;,&lt;time&gt;,&lt;lat&gt;,&lt;long&gt;,&lt;alt&gt;,&lt;uncertainty&gt;</code>      | <code>+UULOC: 1,1,0,08/04/2015,09:03:45.000,45.7140290,13.7410695,0,32</code> |

### 22.16.3 Defined values

| Parameter                                                | Type   | Description                                                                                                                                                                                                                                                                                                                                                     |
|----------------------------------------------------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>&lt;mode&gt;</code>                                | Number | <ul style="list-style-type: none"> <li>0: reserved</li> <li>1: reserved</li> <li>2: single shot position</li> </ul>                                                                                                                                                                                                                                             |
| <code>&lt;sensor&gt;</code>                              | Number | Sensor selection: it is possible to combine different sensors summing <code>&lt;sensor&gt;</code> values of the selected sensors: <ul style="list-style-type: none"> <li>0: use the last fix in the internal database and stop the GNSS receiver</li> <li>1: use the GNSS receiver for localization</li> <li>2: use CellLocate® location information</li> </ul> |
| <code>&lt;response_type&gt;</code>                       | Number | Type of response: <ul style="list-style-type: none"> <li>0: standard (single-hypothesis) response</li> <li>1: detailed (single-hypothesis) response</li> <li>2: multi-hypotheses response</li> </ul>                                                                                                                                                            |
| <code>&lt;timeout&gt;</code>                             | Number | Timeout period in seconds (1 - 999)                                                                                                                                                                                                                                                                                                                             |
| <code>&lt;accuracy&gt;</code>                            | Number | Target accuracy in meters (1 - 999999)                                                                                                                                                                                                                                                                                                                          |
| <code>&lt;num_hypothesis&gt;</code>                      | Number | Maximum desired number of responses from CellLocate® (up to 16): multiple positions followed by their ellipsoidal uncertainties. This value has to be increased by 1 (GNSS solution) to get the maximum number of possible solutions. This optional parameter can be used only if <code>&lt;response_type&gt;=2</code> . The default value is 1.                |
| <code>&lt;date&gt;</code>                                | String | GPS date <sup>2</sup> (DD/MM/YY) of the estimated position                                                                                                                                                                                                                                                                                                      |
| <code>&lt;time&gt;</code>                                | String | GPS time <sup>2</sup> (hh:mm:ss.sss) of the estimated position                                                                                                                                                                                                                                                                                                  |
| <code>&lt;lat&gt;</code>                                 | String | Estimated latitude, in degrees                                                                                                                                                                                                                                                                                                                                  |
| <code>&lt;long&gt;</code>                                | String | Estimated longitude, in degrees                                                                                                                                                                                                                                                                                                                                 |
| <code>&lt;alt&gt;</code>                                 | Number | Estimated altitude, in meters <sup>3</sup>                                                                                                                                                                                                                                                                                                                      |
| <code>&lt;uncertainty&gt;</code>                         | Number | Maximum possible error, in meters (0 - 20000000)                                                                                                                                                                                                                                                                                                                |
| <code>&lt;speed&gt;</code>                               | Number | Speed over ground m/s <sup>3</sup>                                                                                                                                                                                                                                                                                                                              |
| <code>&lt;direction&gt;</code>                           | Number | Course over ground in degree (0 deg - 360 deg) <sup>(3)</sup>                                                                                                                                                                                                                                                                                                   |
| <code>&lt;vertical_acc&gt;</code>                        | Number | Vertical accuracy, in meters <sup>3</sup>                                                                                                                                                                                                                                                                                                                       |
| <code>&lt;sensor_used&gt;</code>                         | Number | Sensor used for the position calculation                                                                                                                                                                                                                                                                                                                        |
| <code>&lt;SV_used&gt;</code>                             | Number | Number of satellite used to calculate the position <sup>3</sup>                                                                                                                                                                                                                                                                                                 |
| <code>&lt;sol&gt;</code>                                 | Number | Solution index (between 1 and <code>&lt;num&gt;</code> )                                                                                                                                                                                                                                                                                                        |
| <code>&lt;num&gt;</code>                                 | Number | Total number of the available hypotheses (less than or equal to <code>&lt;num_hypothesis&gt;</code> )                                                                                                                                                                                                                                                           |
| <code>&lt;lat50&gt;/&lt;lat95&gt;</code>                 | String | Estimated latitude (50/95% confidence levels), in degrees                                                                                                                                                                                                                                                                                                       |
| <code>&lt;long50&gt;/&lt;long95&gt;</code>               | String | Estimated longitude (50/95% confidence levels), in degrees                                                                                                                                                                                                                                                                                                      |
| <code>&lt;major50&gt;/&lt;major95&gt;</code>             | Number | Semi-major axis of the ellipse (50/95% confidence levels), in meters                                                                                                                                                                                                                                                                                            |
| <code>&lt;minor50&gt;/&lt;minor95&gt;</code>             | Number | Semi-minor axis of the ellipse (50/95% confidence levels), in meters                                                                                                                                                                                                                                                                                            |
| <code>&lt;orientation50&gt;/&lt;orientation95&gt;</code> | Number | Orientation of the ellipse (50/95% confidence levels), in degrees                                                                                                                                                                                                                                                                                               |
| <code>&lt;confidence50&gt;/&lt;confidence95&gt;</code>   | Number | 50/95% confidence levels, in percentage                                                                                                                                                                                                                                                                                                                         |

<sup>2</sup> Coming either from the CellLocate® server or the GNSS receiver (GPS time)

<sup>3</sup> only for GNSS positioning, 0 in case of CellLocate®



| Parameter        | Type   | Description                                                                                                  |
|------------------|--------|--------------------------------------------------------------------------------------------------------------|
| <antenna_status> | Number | Antenna status (0 - 4) <sup>(3)</sup> . For more details see the u-blox GNSS receiver protocol specification |
| <jamming_status> | Number | Jamming status <sup>3</sup> . For more details see the u-blox GNSS receiver protocol specification           |

## 22.16.4 Notes

- If AssistNow Online aiding data has been configured by means of the <aiding> parameter of [+ULOC](#) AT command, the +ULOC request using <sensor>=1 (GNSS receiver only) can provide a +UULOC URC reporting a CellLocate solution (<sensor\_used>=2). This can happen if:
  - a GNSS fix is not available.
  - the CellLocate solution is more accurate (i.e. CellLocate solution's uncertainty is better than the GNSS's one).
- The <jamming\_status> value must be ignored if the jamming is disabled through [+ULOC](#) command.
- The <date>, <time>, <lat>, <long> values are not enclosed in double quotes in the URC.

## 22.17 Localization information request status unsolicited indication +ULOCIND

| +ULOCIND   |                               |              |                     |                |               |                            |
|------------|-------------------------------|--------------|---------------------|----------------|---------------|----------------------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B |              |                     |                |               |                            |
|            | SARA-N4                       |              |                     |                |               |                            |
| Attributes | Syntax                        | PIN required | Settings saved      | Can be aborted | Response time | Error reference            |
|            | full                          | No           | <a href="#">NVM</a> | No             | -             | <a href="#">+CME Error</a> |

### 22.17.1 Description

Configures sending of URCs from MT to TE in the case of [+ULOC](#) operations. The URC provides the result of the steps of an [+ULOC](#) operation.

### 22.17.2 Syntax

| Type | Syntax            | Response                                     | Example               |
|------|-------------------|----------------------------------------------|-----------------------|
| Set  | AT+ULOCIND=<mode> | OK                                           | AT+ULOCIND=1<br>OK    |
| Read | AT+ULOCIND?       | +ULOCIND: <mode><br>OK                       | +ULOCIND: 1<br>OK     |
| Test | AT+ULOCIND=?      | +ULOCIND: (list of supported <mode>'s)<br>OK | +ULOCIND: (0-1)<br>OK |
| URC  |                   | +UULOCIND: <step>,<result><br>OK             | +UULOCIND: 1,0<br>OK  |

### 22.17.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                                                           |
|-----------|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <mode>    | Number | URC configuration: <ul style="list-style-type: none"> <li>0 (default value): disabled</li> <li>1: enabled</li> </ul>                                                                                                                                                                  |
| <step>    | Number | Informs the user about the operation in progress: <ul style="list-style-type: none"> <li>0: network scan start</li> <li>1: network scan end</li> <li>2: requesting data to the server</li> <li>3: received data from the server</li> <li>4: sending feedback to the server</li> </ul> |
| <result>  | Number | Represents the result of the aiding operation: <ul style="list-style-type: none"> <li>0: no error</li> </ul>                                                                                                                                                                          |

## 22.18 GNSS sensor configuration +ULO CGNSS

### 22.18.1 Description

Configures the GNSS sensor used with the **+ULOC** command.

| Type | Syntax                                                                                                                                                                                                     | Response                                                                                                                                                                                                                                                                                                                                                                                                             | Example                                                                                                       |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| Set  | AT+ULOGCNSS=<aiding>[,<psv_mode>[,<minSV>[,<minCNO>[,<ini_3d_fix>[,<staticHoldMode>[,<SBAS>[,<jamming>[,<antenna>[,<BBthreshold>[,<CWthreshold>[,<GNSS_system>[,<reserved1>[,<reserved2>]]]]]]]]]]]]]]]]]] | OK                                                                                                                                                                                                                                                                                                                                                                                                                   | AT+ULOGCNSS=15<br><br>OK                                                                                      |
| Read | AT+ULOGCNSS?                                                                                                                                                                                               | +ULOGCNSS: <aiding>,<psv_mode>,<minSV>,<minCNO>,<ini_3d_fix>,<staticHoldMode>,<SBAS>,<jamming>,<antenna>,<BBthreshold>,<CWthreshold>,<GNSS_system>,<reserved1>,<reserved2><br><br>OK                                                                                                                                                                                                                                 | +ULOGCNSS: 15,1,6,8,0,1,1,1,1,0,0,0<br><br>OK                                                                 |
| Test | AT+ULOGCNSS=?                                                                                                                                                                                              | +ULOGCNSS: (list of supported <aiding>),(list of supported <psv_mode>),(list of supported <minSV>),(list of supported <minCNO>),(list of supported <ini_3d_fix>),(list of supported <staticHoldMode>),(list of supported <SBAS>),(list of supported <jamming>),(list of supported <antenna>),(list of supported <BBthreshold>),(list of supported <CWthreshold>),(list of supported <GNSS_system>),(0),(0)<br><br>OK | +ULOGCNSS: (0-15),(0-1),(3-32),(0-50),(0-1),(0-255),(0-1),(0-1),(0-2),(0-15),(0-31),(1-127),(0),(0)<br><br>OK |

### 22.18.3 Defined values

| Parameter        | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------------------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <aiding>         | Number | GNSS aiding mode configuration; it is possible the combination of different aiding modes: to enable more aiding modes it is needed to sum the <mode> value of the interested aiding modes: <ul style="list-style-type: none"> <li>1: local aiding (including RTC sharing)</li> <li>2: AssistNow Offline</li> <li>4: AssistNow Online</li> <li>8: AssistNow Autonomous</li> </ul> All the modes (15) are enabled as a factory programmed setting. |
| <psv_mode>       | Number | Power Save Mode (UBX-CFG-PM2): <ul style="list-style-type: none"> <li>0 (factory-programmed value): disabled</li> <li>1: enabled</li> </ul>                                                                                                                                                                                                                                                                                                      |
| <minSV>          | Number | <ul style="list-style-type: none"> <li>Minimum number of satellites for navigation (UBX-CFG-NAVX5). The range goes from 3 to 32. (factory-programmed value: 3)</li> </ul>                                                                                                                                                                                                                                                                        |
| <minCNO>         | Number | <ul style="list-style-type: none"> <li>Minimum satellite signal level for navigation (UBX-CFG-NAVX5). The range goes from 0 to 50. (factory-programmed value: 7)</li> </ul>                                                                                                                                                                                                                                                                      |
| <ini_3d_fix>     | Number | Initial Fix must be 3D flag (UBX-CFG-NAVX5): <ul style="list-style-type: none"> <li>0 (factory-programmed value): disabled</li> <li>1: enabled</li> </ul>                                                                                                                                                                                                                                                                                        |
| <staticHoldMode> | Number | Static Hold Mode (UBX-CFG-NAV5). The range goes from 0 to 255 cm/s. (factory-programmed value: 0).<br><br>If the parameter is omitted, the Static Hold Mode threshold will not be configured to GNSS.                                                                                                                                                                                                                                            |
| <SBAS>           | Number | SBAS configuration: <ul style="list-style-type: none"> <li>0 (factory-programmed value): disabled</li> <li>1: enabled</li> </ul>                                                                                                                                                                                                                                                                                                                 |
| <jamming>        | Number | Jamming indicator (UBX-CFG-ITFM): <ul style="list-style-type: none"> <li>0 (factory-programmed value): disabled</li> <li>1: enabled</li> </ul>                                                                                                                                                                                                                                                                                                   |
| <antenna>        | Number | Antenna setting: <ul style="list-style-type: none"> <li>0 (factory-programmed value): unknown</li> <li>1: passive</li> <li>2: active</li> </ul>                                                                                                                                                                                                                                                                                                  |
| <BBthreshold>    | Number | Broadband jamming detection threshold (dB) (UBX-CFG-ITFM). The range goes from 0 to 15. (factory-programmed value: 0)                                                                                                                                                                                                                                                                                                                            |
| <CWthreshold>    | Number | Continuous wave jamming detection threshold (dB) (UBX-CFG-ITFM). The range goes from 0 to 31. (factory-programmed value: 0)                                                                                                                                                                                                                                                                                                                      |
| <GNSS_systems>   | Number | Supported GNSS types; the parameter is optional, the allowed values can be combined together: <ul style="list-style-type: none"> <li>1 (factory-programmed value): GPS</li> <li>2: SBAS</li> <li>4: Galileo</li> <li>8: BeiDou</li> <li>16: IMES</li> <li>32: QZSS</li> <li>64: GLONASS</li> </ul>                                                                                                                                               |
| <Reserved1>      | Number | 0 (reserved value)                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <Reserved2>      | Number | 0 (reserved value)                                                                                                                                                                                                                                                                                                                                                                                                                               |

### 22.18.4 Notes

- To enable SBAS system opportunely configure both <SBAS> and <GNSS\_systems> parameters.
- If a parameter is omitted, the current set value is kept.
- For more details on parameter description see the corresponding u-blox-GNSS receiver description.

## 23 I<sup>2</sup>C

### 23.1 Introduction

The I<sup>2</sup>C AT commands support communication with more than one connected device via one of the controllers, but require opening and closing a logical channel for each connected device. Only one logical channel at a time can be opened.



The availability and hardware description of the I<sup>2</sup>C interfaces are out of the scope of this document and are described in a separate document. Refer to the corresponding module System Integration Manual.

The procedure for communicating with two different devices is:

- Open the logical channel for device1 (with [AT+UI2CO](#))
- Read/write to/from device1 (with [AT+UI2CR](#), [AT+UI2CW](#) and [+UI2CREGR](#))
- Close the logical channel for device1 (with [AT+UI2CC](#))
- Open the logical channel for device2 (with [AT+UI2CO](#))
- Read/write to/from device2 (with [AT+UI2CR](#), [AT+UI2CW](#) and [+UI2CREGR](#))
- Close the logical channel for device2 (with [AT+UI2CC](#))

Once the controller has been configured, it is possible to start I<sup>2</sup>C communication (read/write) with I<sup>2</sup>C slave peripherals.



The I<sup>2</sup>C controllers available on the u-blox cellular modules module work only in Master Mode so they can be connected to slave devices only.



In case of a controller/device malfunction, the command's response is only "ERROR".

### 23.2 I<sup>2</sup>C open logical channel +UI2CO

| +UI2CO     |                                          |              |                |                |               |                            |
|------------|------------------------------------------|--------------|----------------|----------------|---------------|----------------------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                            |
|            | SARA-N4                                  |              |                |                |               |                            |
| Attributes | Syntax                                   | PIN required | Settings saved | Can be aborted | Response time | Error reference            |
|            | full                                     | No           | No             | No             | -             | <a href="#">+CME Error</a> |

#### 23.2.1 Description

Changes the hardware and logical configuration of the selected I<sup>2</sup>C controller.

It is only possible to configure the I<sup>2</sup>C controller in Master Mode.

This command selects:

- The controller available in the u-blox cellular module
- The bus mode type
- The bit rate
- The address size (7-10 bit address)
- The slave device address

Once the selected controller has been configured, a logical channel between it and the selected slave device is set up and there is no need to further specify it. All the following I<sup>2</sup>C write, read and close commands refer to the currently opened logical channel. It is not possible to use the I<sup>2</sup>C write, read and open commands for writing or reading to/from a different slave device without first closing the I<sup>2</sup>C logical channel.

#### 23.2.2 Syntax

| Type | Syntax                                                                                  | Response                                                      | Example                                     |
|------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------|---------------------------------------------|
| Set  | AT+UI2CO=<I2C_controller_number>,<bus_mode>,<bit_rate>,<device_address>,<address_width> | OK                                                            | AT+UI2CO=1,0,0,0x42,0<br>OK                 |
| Test | AT+UI2CO=?                                                                              | +UI2CO: (list of supported <I2C_controller_number>s),(list of | +UI2CO: (1),(0-1),(0-1),(0x000-0x3FF),(0-1) |

| Type | Syntax | Response                                                                                                                   | Example |
|------|--------|----------------------------------------------------------------------------------------------------------------------------|---------|
|      |        | supported <bus_mode>s),(list of supported <bit_rate>),( <device_address> range),(list of supported <address_width>s)<br>OK | OK      |

### 23.2.3 Defined values

| Parameter               | Type       | Description                                                                                                     |
|-------------------------|------------|-----------------------------------------------------------------------------------------------------------------|
| <I2C_controller_number> | Number     | I <sup>2</sup> C HW controller to use:<br>• 1: controller 1                                                     |
| <bus_mode>              | Number     | I <sup>2</sup> C bus mode type:<br>• 0: Bus Mode Standard (0 - 100 kbaud)<br>• 1: Bus Mode Fast (0 - 400 kbaud) |
| <bit_rate>              | Number     | I <sup>2</sup> C bit rate:<br>• 0: 100 kb/s<br>• 1: 400 kb/s                                                    |
| <device_address>        | Hex Number | Device address in HEX format                                                                                    |
| <address_width>         | Number     | I <sup>2</sup> C size of the controller address:<br>• 0: 7 bit address<br>• 1: 10 bit address                   |

## 23.3 I<sup>2</sup>C write to peripheral +UI2CW

| +UI2CW     |                                                     |              |                |                |               |                            |
|------------|-----------------------------------------------------|--------------|----------------|----------------|---------------|----------------------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |              |                |                |               |                            |
| Attributes | Syntax                                              | PIN required | Settings saved | Can be aborted | Response time | Error reference            |
|            | full                                                | No           | No             | No             | -             | <a href="#">+CME Error</a> |

### 23.3.1 Description

Writes the HEX data to the I<sup>2</sup>C slave device of the current logical channel. The HEX data formats are without 0x prefix (see example).

### 23.3.2 Syntax

| Type | Syntax                                  | Response                                                               | Example                                |
|------|-----------------------------------------|------------------------------------------------------------------------|----------------------------------------|
| Set  | AT+UI2CW=<hex_data>,<nof_byte_to_write> | OK                                                                     | AT+UI2CW="0011AABCCDDEEFF",<br>8<br>OK |
| Test | AT+UI2CW=?                              | +UI2CW: (byte to write),(range of supported <nof_byte_to_write>)<br>OK | +UI2CW: "data", (1-100)<br>OK          |

### 23.3.3 Defined values

| Parameter            | Type   | Description                                                                                                        |
|----------------------|--------|--------------------------------------------------------------------------------------------------------------------|
| <hex_data>           | String | Hex data sequence without prefix 0x, enclosed in double quotes, to be written to the I <sup>2</sup> C slave device |
| <nof_bytes_to_write> | Number | Number of byte to write to the slave I <sup>2</sup> C device. Range: 1-100                                         |

## 23.4 I<sup>2</sup>C read from peripheral +UI2CR

| +UI2CR     |                                          |              |                |                |               |                            |
|------------|------------------------------------------|--------------|----------------|----------------|---------------|----------------------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                            |
|            | SARA-N4                                  |              |                |                |               |                            |
| Attributes | Syntax                                   | PIN required | Settings saved | Can be aborted | Response time | Error reference            |
|            | full                                     | No           | No             | No             | -             | <a href="#">+CME Error</a> |

### 23.4.1 Description

Reads <nof\_bytes\_to\_read> of data from the I<sup>2</sup>C slave device of the current logical channel and prints them in HEX format in separate rows.

### 23.4.2 Syntax

| Type | Syntax                       | Response                                        | Example         |
|------|------------------------------|-------------------------------------------------|-----------------|
| Read | AT+UI2CR=<nof_bytes_to_read> | +UI2CR: <index_1>: <byte_1>                     | AT+UI2CR=3      |
|      |                              | [+UI2CR: <index_n>: <byte_n>                    | +UI2CR: 0: 0xA3 |
|      |                              | [..]]                                           | +UI2CR: 1: 0x0F |
|      |                              | OK                                              | +UI2CR: 2: 0xDB |
|      |                              |                                                 | OK              |
| Test | AT+UI2CR=?                   | +UI2CR: (list of supported <nof_byte_to_read>s) | +UI2CR: (1-100) |
|      |                              | OK                                              | OK              |

### 23.4.3 Defined values

| Parameter              | Type   | Description                                                                                                                                                        |
|------------------------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <nof_bytes_to_read>    | Number | Number of bytes to read from the slave I <sup>2</sup> C device: <ul style="list-style-type: none"> <li>SARA-R4 / SARA-N4 - The range goes from 1 to 87.</li> </ul> |
| <index1>,...,<index_n> | Number | Index of the byte being printed.                                                                                                                                   |
| <byte_1>,...,<byte_n>  | Number | n-th byte of the data, in hex mode (unquoted, prefixed by 0x).                                                                                                     |

## 23.5 I<sup>2</sup>C read from peripheral register +UI2CREGR

| +UI2CREGR  |                                          |              |                |                |               |                            |
|------------|------------------------------------------|--------------|----------------|----------------|---------------|----------------------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                            |
|            | SARA-N4                                  |              |                |                |               |                            |
| Attributes | Syntax                                   | PIN required | Settings saved | Can be aborted | Response time | Error reference            |
|            | full                                     | No           | No             | No             | -             | <a href="#">+CME Error</a> |

### 23.5.1 Description

Reads <nof\_bytes\_to\_read> of data from the slave register of the I<sup>2</sup>C slave device of the current logical channel and prints them in HEX format in separate rows.

### 23.5.2 Syntax

| Type | Syntax                                             | Response                                                                                    | Example                        |
|------|----------------------------------------------------|---------------------------------------------------------------------------------------------|--------------------------------|
| Read | AT+UI2CREGR=<register_address>,<nof_bytes_to_read> | +UI2CREGR: <index_1>: <byte_1>                                                              | AT+UI2CREGR=0x42,3             |
|      |                                                    | [+UI2CREGR: <index_n>: <byte_n>                                                             | +UI2CREGR: 0: 0xA3             |
|      |                                                    | [..]]                                                                                       | +UI2CREGR: 1: 0x0F             |
|      |                                                    | OK                                                                                          | +UI2CREGR: 2: 0xDB             |
|      |                                                    |                                                                                             | OK                             |
| Test | AT+UI2CREGR=?                                      | +UI2CREGR: (list of supported <register_address>s),(list of supported <nof_bytes_to_read>s) | +UI2CREGR: (0x00-0xFF),(1-100) |
|      |                                                    |                                                                                             | OK                             |

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

### 23.5.3 Defined values

| Parameter              | Type   | Description                                                                                     |
|------------------------|--------|-------------------------------------------------------------------------------------------------|
| <register_address>     | Number | Device address in HEX format                                                                    |
| <nof_bytes_to_read>    | Number | Number of bytes to read from the slave I <sup>2</sup> C register. The range goes from 1 to 100. |
| <index1>,...,<index_n> | Number | Index of the byte being printed.                                                                |
| <byte_1>,...,<byte_n>  | Number | n-th byte of the data, in hex mode (unquoted, prefixed by 0x).                                  |

## 23.6 I<sup>2</sup>C close logical channel +UI2CC

| +UI2CC     |                                          |              |                |                |               |                            |
|------------|------------------------------------------|--------------|----------------|----------------|---------------|----------------------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                            |
|            | SARA-N4                                  |              |                |                |               |                            |
| Attributes | Syntax                                   | PIN required | Settings saved | Can be aborted | Response time | Error reference            |
|            | full                                     | No           | No             | No             | -             | <a href="#">+CME Error</a> |

### 23.6.1 Description

Closes the I<sup>2</sup>C logical channel being used.

 The logical channel must be closed before opening a new one.

### 23.6.2 Syntax

| Type   | Syntax     | Response | Example  |
|--------|------------|----------|----------|
| Action | AT+UI2CC   | OK       | AT+UI2CC |
|        |            |          | OK       |
| Test   | AT+UI2CC=? | OK       | OK       |

## 24 MQTT

The MQ Telemetry Transport (MQTT) protocol specifies a simple and lightweight messaging protocol, designed for constrained devices and low-bandwidth, high-latency, or unreliable networks. An MQTT client uses publish and subscribe methods to interact over a TCP connection with an MQTT message broker (henceforth referred to as an MQTT server). The u-blox modules can be configured to operate as an MQTT client.

To publish or subscribe, the MQTT client must first establish a TCP connection to an MQTT server.

The MQTT protocol specifies case-sensitive Topics, with Topic Names containing Topic Level separators "/" to which messages will be published. For example, a message of "78 Fahrenheit or 25 Celsius" could be published to the Topic Name of "/heat/sensor/SD/bldg5/DelMarConfRm". MQTT clients subscribe to Topic Filters to determine if the client receives messages published to a given Topic name.

The Topic Filters may exactly specify a Topic Name or may contain either of the following wildcards:

- '+' - (Single level wildcard) applies to a single Topic Level
- '#' - (Multi-level wildcard) applies to potentially many Topic Levels (and must be the last character specified in a Topic Filter);

'#' can be specified on its own or following a topic level separator ('/'). For example, the Topic Filter, "/heat/sensor/SD/#", would receive any messages published to the "/heat/sensor/SD/bldg5/DelMarConfRm" Topic Name.



MQTT specification states that Topic Filters starting with either wildcard will not match any Topic Name that starts with "\$".

The MQTT protocol also specifies a Quality of Service (QoS) level to be applied to message transactions:

- 0 - At most once delivery [default]
- 1 - At least once delivery
- 2 - Exactly once delivery

The MQTT protocol also allows an MQTT client to create a Will message, which the MQTT remote server will store and only publish (to the Topic name specified as the Will Topic name) when the MQTT client gets disconnected from the MQTT server, but not if the MQTT client explicitly sends a disconnect command.

### 24.1 MQTT profile configuration +UMQTT

| +UMQTT            |               |                                                     |                       |                       |                      |                            |
|-------------------|---------------|-----------------------------------------------------|-----------------------|-----------------------|----------------------|----------------------------|
| <b>Modules</b>    |               | SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |                       |                       |                      |                            |
| <b>Attributes</b> | <b>Syntax</b> | <b>PIN required</b>                                 | <b>Settings saved</b> | <b>Can be aborted</b> | <b>Response time</b> | <b>Error reference</b>     |
|                   | full          | No                                                  | No                    | No                    | -                    | <a href="#">MQTT Error</a> |

#### 24.1.1 Description

Configures or reads the parameter value of an MQTT client profile. Issue a set command for each <op\_code> parameter to set all of the parameters in an MQTT client profile.

#### 24.1.2 Syntax

| Type                              | Syntax                                   | Response                         | Example                                           |
|-----------------------------------|------------------------------------------|----------------------------------|---------------------------------------------------|
| <b>Generic syntax</b>             |                                          |                                  |                                                   |
| Set                               | AT+UMQTT=<op_code>[,<param1>[,<param2>]] | +UMQTT: <op_code>,<result><br>OK | AT+UMQTT=12,1<br>+UMQTT: 12,1<br>OK               |
| <b>MQTT unique client ID</b>      |                                          |                                  |                                                   |
| Set                               | AT+UMQTT=0,<client_id>                   | +UMQTT: 0,<result><br>OK         | AT+UMQTT=0,"352753090041680"<br>+UMQTT: 0,1<br>OK |
| <b>MQTT local TCP port number</b> |                                          |                                  |                                                   |



| Type                          | Syntax                                         | Response                                     | Example                                                            |
|-------------------------------|------------------------------------------------|----------------------------------------------|--------------------------------------------------------------------|
| Set                           | AT+UMQTT=1,<local_port>                        | +UMQTT: 1,<result><br>OK                     | AT+UMQTT=1,1883<br><br>+UMQTT: 1,1<br>OK                           |
| <b>MQTT server name</b>       |                                                |                                              |                                                                    |
| Set                           | AT+UMQTT=2,<server_name>[,<server_port>]       | +UMQTT: 2,<result><br>OK                     | AT+UMQTT=2,<br>"www.commercialmqttbroker.com"<br>+UMQTT: 2,1<br>OK |
| <b>MQTT server IP address</b> |                                                |                                              |                                                                    |
| Set                           | AT+UMQTT=3,<IP_address>[,<server_port>]        | +UMQTT: 3,<result><br>OK                     | AT+UMQTT=3,"192.168.1.0",1883<br>+UMQTT: 3,1<br>OK                 |
| <b>User name and password</b> |                                                |                                              |                                                                    |
| Set                           | AT+UMQTT=4,<username>,<password>               | +UMQTT: 4,<result><br>OK                     | AT+UMQTT=4,"test","abc123"<br>+UMQTT: 4,1<br>OK                    |
| <b>Inactivity timeout</b>     |                                                |                                              |                                                                    |
| Set                           | AT+UMQTT=10,<timeout>                          | +UMQTT: 10,<result><br>OK                    | AT+UMQTT=10,3600<br>+UMQTT: 10,1<br>OK                             |
| <b>MQTT secure option</b>     |                                                |                                              |                                                                    |
| Set                           | AT+UMQTT=11,<MQTT_secure>[,<USECMNG_profile>]] | +UMQTT: 11,<result><br>OK                    | AT+UMQTT=11,1,2<br>+UMQTT: 11,1<br>OK                              |
| <b>MQTT clean session</b>     |                                                |                                              |                                                                    |
| Set                           | AT+UMQTT=12,<clean_session>                    | +UMQTT: 12,<result><br>OK                    | AT+UMQTT=12,1<br>+UMQTT: 12,1<br>OK                                |
| Read                          | AT+UMQTT?                                      | +UMQTT: <(more)><br>OK                       | +UMQTT: (more)<br>OK                                               |
| Test                          | AT+UMQTT=?                                     | +UMQTT: (list of supported <op_code>s)<br>OK | +UMQTT: (0-4,10-12)<br>OK                                          |
| URC                           |                                                | +UUMQTT<op_code>: <param1>[,<param2>]        | +UUMQTT0: "352753090041680"                                        |

### 24.1.3 Defined values

| Parameter | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <op_code> | Number | MQTT parameter: <ul style="list-style-type: none"> <li>0: MQTT unique client id</li> <li>1: MQTT local port number</li> <li>2: MQTT server name</li> <li>3: MQTT IP address</li> <li>4: MQTT username and password</li> <li>6: MQTT Will QoS value; the set command is not supported</li> <li>7: MQTT Will Retain value; the set command is not supported</li> <li>8: MQTT Will Topic; the set command is not supported</li> <li>9: MQTT Will Message; the set command is not supported</li> <li>10: MQTT inactivity timeout period</li> <li>11: MQTT secure</li> <li>12: MQTT clean session</li> <li>14: MQTT Terse/Verbose mode; the set command is not supported</li> </ul> |

| Parameter         | Type            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <client_id>       | String          | Uniquely identifies this client connection to a given MQTT message broker. If a new connection request is received with the same unique client ID as a current connection, the MQTT message broker disconnects the previous connection and responds to (and uses the parameters from) the new connection request. If this parameter is not defined, the module will attempt to create a unique client ID, based on the module's IMEI value. |
| <local_port>      | Number          | MQTT client TCP port; if the MQTT client port number is not specified, the port number defaults to the IANA assigned port of 1883 for non-TLS MQTT and 8883 for TLS MQTT.                                                                                                                                                                                                                                                                   |
| <server_name>     | String          | Indicates the remote server name. The default value is an empty string.                                                                                                                                                                                                                                                                                                                                                                     |
| <IP_address>      | String          | Indicates the remote server IP address. The default value is an empty string.                                                                                                                                                                                                                                                                                                                                                               |
| <username>        | String          | User name for the MQTT login procedure. The maximum length is 30 characters. The default value is an empty string.                                                                                                                                                                                                                                                                                                                          |
| <password>        | String          | Password for the MQTT login procedure. The maximum length is 30 characters. The default value is an empty string.                                                                                                                                                                                                                                                                                                                           |
| <timeout>         | Number          | Indicates the inactivity timeout expressed in seconds. According to the MQTT specification, an MQTT server must disconnect a client if it receives nothing from the client within 1.5x the inactivity timeout. An inactivity timeout value of 0 indicates no timeout. The default value is 0 s. The maximum value corresponds to 18 hours, 12 minutes and 15 seconds.                                                                       |
| <server_port>     | Number          | Remote MQTT server listening port; it must be a valid port value. The range goes from 1 to 65535; the default value is 1883 for non-TLS MQTT and 8883 for TLS MQTT.                                                                                                                                                                                                                                                                         |
| <MQTT_secure>     | Number          | Enables / disables the secure option of MQTT service: <ul style="list-style-type: none"> <li>0 (default value): no TLS encryption</li> <li>1: enable the MQTT TLS encryption</li> </ul>                                                                                                                                                                                                                                                     |
| <USECMNG_profile> | Number          | USECMNG profile (number). Defines the USECMNG profile which specifies the SSL/TLS properties to be used for the SSL/TLS connection. The range goes from 0 to 4. If no profile is set a default USECMNG profile is used (see <a href="#">USECMNG</a> section).                                                                                                                                                                               |
| <clean_session>   | Number          | Clean Session value. Allowed values: <ul style="list-style-type: none"> <li>0: indicates that the client subscription and delivered messages received by the client should be remembered across disconnects by both the MQTT client and the MQTT server</li> <li>1: indicates that disconnects clean all session state information</li> </ul>                                                                                               |
| <param1>          | Number / String | Type and supported content depend on the related <op_code> parameter (details are given above). If <param1> is not specified the value of the corresponding parameter <op_code> is reset to the default value.                                                                                                                                                                                                                              |
| <param2>          | Number / String | Type and supported content depend on the related <op_code> parameter (details are given above). If <param2> is not specified the value of the corresponding parameter <op_code> is reset to the default value.                                                                                                                                                                                                                              |
| <result>          | Number          | <ul style="list-style-type: none"> <li>0: failure</li> <li>1: success</li> </ul>                                                                                                                                                                                                                                                                                                                                                            |

## 24.1.4 Notes

- The information text response to the read command does not display the password.
- The MQTT server IP address and the MQTT server name are mutually exclusive. If value for <op\_code>= 2 is specified by the user, then the value for <op\_code>=3 is reset or vice versa.
- Some network operators do not allow Secure MQTT. In this case the **+UMQTTTC=1** command (MQTT login) will return a failure response by means of the **+UUMQTTTC** URC after an TLS timeout of 30 s.

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- The information text response to the read command provides a continuation string, **(more)**, if more information remains to be displayed. By issuing again the read command, the MQTT will attempt to continue the previous display attempt.
- For individual MQTT parameter fields, especially the string fields (double-quote delimited), the continuation symbol + indicates whether the current display is a continuation from a previous display or whether the current display has more information to be displayed.
- If the continuation symbol precedes the first double-quote, e.g., **Topic: +"is continuing from previous display"**, then this MQTT parameter field continues from a previous display command. If the continuation symbol trails the last double-quote, e.g., **Topic: "This message won't fit within the limita"+**, then it

indicates that more information from this MQTT parameter remains to be displayed. If the continuation symbol appears on both sides of the double-quotes, then this message is the continuation of a previous display (and requires future displays to complete), e.g., **Topic: +"is in the middle of a long messa"+**.

- The profile parameters 6, 7, 8, 9 and 14 are provided in the read response for informational purposes. They cannot be set using the +UMQTT set command. Profile parameters 6, 7 and 8 are set with the +UMQTTWTOPIC command. Profile parameter 9 is set with the +UMQTTWMSG command. Parameter 14 is set with the +UMQTTTC command.
- When displaying all of the MQTT Client profile parameters, (AT+UMQTT?), only the non-default string parameters are displayed. Thus, if Will Message, Will Topic, server name, IP address, username, or password are not entered, they will not be displayed.
- Only IPv4 is supported.
- Client subscriptions and delivered messages across disconnects by either the server or the client <clean\_session>=0 is not supported.
- The MQTT <op\_code>=8 has no effect on the server behavior because the MQTT client automatically sends an MQTT ping to the MQTT server prior to the <timeout>

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- Secure MQTT (TLS) is not supported.

## 24.2 MQTT Will Topic configuration +UMQTTWTOPIC

| +UMQTTWTOPIC |                                                     |              |                |                |               |                            |
|--------------|-----------------------------------------------------|--------------|----------------|----------------|---------------|----------------------------|
| Modules      | SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |              |                |                |               |                            |
| Attributes   | Syntax                                              | PIN required | Settings saved | Can be aborted | Response time | Error reference            |
|              | full                                                | No           | No             | No             | -             | <a href="#">MQTT Error</a> |

### 24.2.1 Description

Configures the MQTT profile parameters related to the MQTT's Will Message ("Last Will and Testament"). In the MQTT protocol, an MQTT client can configure a Will Message to be broadcast from the MQTT message broker (MQTT server) whenever the server disconnects the MQTT client outside of a specific MQTT client disconnect request. Upon disconnect, the MQTT server will publish the Will Message for a given connection to the specified Will Topic name, with the specified Will QoS (Quality of Service). The Will Retain flag indicates whether the MQTT server saves the Will Message (and the corresponding Will Message parameters) across MQTT disconnects.

### 24.2.2 Syntax

| Type | Syntax                                               | Response                                                                             | Example                                                                                    |
|------|------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| Set  | AT+UMQTTWTOPIC=<Will_QoS>,<Will_Retain>,<Will_Topic> | +UMQTTWTOPIC: <result><br>OK                                                         | AT+UMQTTWTOPIC=0,0,"sensor/heat/SD/bldg5/DelMarConfRm/status"<br><br>+UMQTTWTOPIC: 1<br>OK |
| Read | AT+UMQTTWTOPIC?                                      | OK                                                                                   |                                                                                            |
| Test | AT+UMQTTWTOPIC=?                                     | +UMQTTWTOPIC: (list of supported <Will_QoS>),(list of supported <Will_Retain>)<br>OK | +UMQTTWTOPIC: (0-2),(0-1)<br>OK                                                            |
| URC  |                                                      | +UUMQTTWTOPIC: <Will_QoS>,<Will_Retain>,<Will_Topic>                                 | +UUMQTTWTOPIC: 0,0,"/user/u-blox"                                                          |

### 24.2.3 Defined values

| Parameter  | Type   | Description                                                                                                                                                                                         |
|------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <Will_QoS> | Number | MQTT Will Quality of Service: <ul style="list-style-type: none"> <li>• 0 (default value): at most once delivery</li> <li>• 1: at least once delivery</li> <li>• 2: exactly once delivery</li> </ul> |

| Parameter     | Type   | Description                                                                                                                                                                                                                                                                                                                                                                        |
|---------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <Will_Retain> | Number | Whether or not the Will Message will be retained across disconnects: <ul style="list-style-type: none"> <li>0 (default value): the Will Message will not be retained at the MQTT server across disconnects from MQTT client</li> <li>1: the Will Message will be retained by the MQTT server across disconnects from MQTT client (until superseded by another message).</li> </ul> |
| <Will_Topic>  | String | Standard MQTT Topic Name. It could include various Topic Separators "/" to form various Topic levels.                                                                                                                                                                                                                                                                              |
| <result>      | Number | Operation result: <ul style="list-style-type: none"> <li>0: failure</li> <li>1: success</li> </ul>                                                                                                                                                                                                                                                                                 |

#### 24.2.4 Notes

- If a connection is attempted when the Will Message is not valid (i.e., either the empty string or the default value), then the <Will\_QoS> and <Will\_Retain> parameters revert to default values.

### 24.3 MQTT Will Message configuration +UMQTTWMSG

| +UMQTTWMSG |                                          |              |                |                |               |                            |
|------------|------------------------------------------|--------------|----------------|----------------|---------------|----------------------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                            |
|            | SARA-N4                                  |              |                |                |               |                            |
| Attributes | Syntax                                   | PIN required | Settings saved | Can be aborted | Response time | Error reference            |
|            | full                                     | No           | No             | No             | -             | <a href="#">MQTT Error</a> |

#### 24.3.1 Description

Configures the Will Message associated with the other MQTT profile parameters for an MQTT client's connection. In the MQTT Protocol, an MQTT client can configure a Will Message to be broadcast from the MQTT message broker (MQTT server) whenever it disconnects the MQTT client outside of a specific MQTT client disconnect request.

#### 24.3.2 Syntax

| Type | Syntax                  | Response                   | Example                                                                                                              |
|------|-------------------------|----------------------------|----------------------------------------------------------------------------------------------------------------------|
| Set  | AT+UMQTTWMSG=<Will_Msg> | +UMQTTWMSG: <result><br>OK | AT+UMQTTWMSG="Unrequested Disconnect. Please check network connectivity or battery life."<br><br>+UMQTTWMSG: 1<br>OK |
| Read | AT+UMQTTWMSG?           | OK                         |                                                                                                                      |
| Test | AT+UMQTTWMSG=?          | OK                         |                                                                                                                      |
| URC  |                         | +UUMQTTWMSG: <Will_Msg>    | +UUMQTTWMSG: "Unrequested Disconnect. Please check network connectivity or battery life."                            |

#### 24.3.3 Defined values

| Parameter  | Type   | Description                                                                                        |
|------------|--------|----------------------------------------------------------------------------------------------------|
| <Will_Msg> | String | Standard MQTT message                                                                              |
| <result>   | Number | Operation result: <ul style="list-style-type: none"> <li>0: failure</li> <li>1: success</li> </ul> |

## 24.4 Save/Restore MQTT profile from NVM +UMQTTNV

| +UMQTTNV   |                                          |              |                |                |               |                            |
|------------|------------------------------------------|--------------|----------------|----------------|---------------|----------------------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                            |
|            | SARA-N4                                  |              |                |                |               |                            |
| Attributes | Syntax                                   | PIN required | Settings saved | Can be aborted | Response time | Error reference            |
|            | full                                     | No           | No             | No             | -             | <a href="#">+CME Error</a> |

### 24.4.1 Description

Either saves all of the MQTT client profile parameters to NVM (non-volatile memory) or sets all of the MQTT client profile parameters to either default or non-volatile stored values.

### 24.4.2 Syntax

| Type | Syntax                | Response                                    | Example                                     |
|------|-----------------------|---------------------------------------------|---------------------------------------------|
| Set  | AT+UMQTTNV=<NVM_mode> | +UMQTTNV: <NVM_mode>,<br><result><br><br>OK | AT+UMQTTNV=2<br><br>+UMQTTNV: 2,1<br><br>OK |
| Test | AT+UMQTTNV=?          | +UMQTTNV: (list of <NVM_mode>s)<br><br>OK   | +UMQTTNV: (0-2)<br><br>OK                   |

### 24.4.3 Defined values

| Parameter  | Type   | Description                                                                                                                                                                                                                                                                                                                               |
|------------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <NVM_mode> | Number | Operation to set or save the MQTT client profile parameters as follows: <ul style="list-style-type: none"> <li>0: restore MQTT client profile parameters to factory defaults</li> <li>1: set MQTT client profile parameters to values stored previously in NVM</li> <li>2: store current MQTT client profile parameters to NVM</li> </ul> |
| <result>   | Number | Operation result: <ul style="list-style-type: none"> <li>0: failure</li> <li>1: success</li> </ul>                                                                                                                                                                                                                                        |

## 24.5 MQTT command +UMQTTC

| +UMQTTC    |                                          |              |                |                |               |                            |
|------------|------------------------------------------|--------------|----------------|----------------|---------------|----------------------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B SARA-R412M |              |                |                |               |                            |
|            | SARA-N4                                  |              |                |                |               |                            |
| Attributes | Syntax                                   | PIN required | Settings saved | Can be aborted | Response time | Error reference            |
|            | full                                     | No           | No             | No             | < 60 s        | <a href="#">MQTT Error</a> |

### 24.5.1 Description

Triggers the MQTT actions corresponding to the <op\_code> parameter. The final result code indicates if sending the command request to the MQTT process was successful or not.

The +UUMQTTC URC provides the result of the requested action from the MQTT server for login and subscribe. In addition, the +UUMQTTC URC also provides notification to the client that unread messages are available from the MQTT server. The +UUMQTTC URC is by default enabled.

The +UUMQTTCM URC provides the contents of the received message when after having issued the AT +UMQTTC=6 command. The +UUMQTTCM URC is enabled by default.

### 24.5.2 Syntax

| Type                  | Syntax                                                                            | Response                                       | Example                                   |
|-----------------------|-----------------------------------------------------------------------------------|------------------------------------------------|-------------------------------------------|
| <b>Generic syntax</b> |                                                                                   |                                                |                                           |
| Set                   | AT+UMQTTC=<op_code>[,<br><param1>[,<param2>][,<param3>][,<br><param4>[,<param5>]] | +UMQTTC: <op_code>,<MQTT_<br>result><br><br>OK | AT+UMQTTC=0<br><br>+UMQTTC: 0,1<br><br>OK |

| Type                                                    | Syntax                                                         | Response                                          | Example                                                                                                  |
|---------------------------------------------------------|----------------------------------------------------------------|---------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| <b>MQTT logout</b>                                      |                                                                |                                                   |                                                                                                          |
| Set                                                     | AT+UMQTTTC=0                                                   | +UMQTTTC: 0,<MQTT_result><br>OK                   | AT+UMQTTTC=0<br>+UMQTTTC: 0,1<br>OK                                                                      |
| <b>MQTT login</b>                                       |                                                                |                                                   |                                                                                                          |
| Set                                                     | AT+UMQTTTC=1                                                   | +UMQTTTC: 1,<MQTT_result><br>OK                   | AT+UMQTTTC=1<br>+UMQTTTC: 1,1<br>OK                                                                      |
| URC                                                     |                                                                | +UUMQTTTC: 1,<login_result>                       | +UUMQTTTC: 1,0                                                                                           |
| <b>MQTT publish to a topic</b>                          |                                                                |                                                   |                                                                                                          |
| Set                                                     | AT+UMQTTTC=2,<QoS>,<retain>,<br>[<hex_mode>],<topic>,<message> | +UMQTTTC: 2,<MQTT_result><br>OK                   | AT+UMQTTTC=2,0,0,"/sensor/heat/<br>SD/bldg5/DelMarConfRm","23<br>degrees Celsius"<br>+UMQTTTC: 2,1<br>OK |
| <b>MQTT publish a file to a topic</b>                   |                                                                |                                                   |                                                                                                          |
| Set                                                     | AT+UMQTTTC=3,<QoS>,<retain>,<br><topic_name>,<filename>        | +UMQTTTC: 3,<MQTT_result><br>OK                   | AT+UMQTTTC=3,0,0,"/home/u-blox",<br>"/home/greetings/will.txt"<br>+UMQTTTC: 3,1<br>OK                    |
| <b>MQTT subscribe to the specified topic filter</b>     |                                                                |                                                   |                                                                                                          |
| Set                                                     | AT+UMQTTTC=4,<max_QoS>,<br><topic_filter>                      | +UMQTTTC: 4,<MQTT_result><br>OK                   | AT+UMQTTTC=4,0,"/sensor/heat/SD/<br>#"<br>+UMQTTTC: 4,1<br>OK                                            |
| URC                                                     |                                                                | +UUMQTTTC: 4,<reason>,<QoS>,<br><topic_name>      | +UUMQTTTC: 4,0,2,"/sensor/heat/<br>SD/#"                                                                 |
| <b>MQTT unsubscribe from the specified Topic Filter</b> |                                                                |                                                   |                                                                                                          |
| Set                                                     | AT+UMQTTTC=5,<topic_filter>                                    | +UMQTTTC: 5,<MQTT_result><br>OK                   | AT+UMQTTTC=5,"/sensor/heat/SD/<br>#"<br>+UMQTTTC: 5,1<br>OK                                              |
| <b>MQTT read message</b>                                |                                                                |                                                   |                                                                                                          |
| Set                                                     | AT+UMQTTTC=6                                                   | +UMQTTTC: 6,<MQTT_result><br>OK                   | AT+UMQTTTC=6<br>+UMQTTTC: 6,1<br>OK                                                                      |
| URC                                                     |                                                                | +UUMQTTTC: 6,<num_unread_msgs>                    | +UUMQTTTC: 6,3                                                                                           |
| <b>MQTT verbose/terse Reception format</b>              |                                                                |                                                   |                                                                                                          |
| Set                                                     | AT+UMQTTTC=7,<format>                                          | +UMQTTTC: 7,<MQTT_result><br>OK                   | AT+UMQTTTC=7,1<br>+UMQTTTC: 7,1<br>OK                                                                    |
| <b>Ping MQTT server</b>                                 |                                                                |                                                   |                                                                                                          |
| Set                                                     | AT+UMQTTTC=8,<mqtts_server>                                    | +UMQTTTC: 8,<MQTT_result><br>OK                   | AT+UMQTTTC=8,"192.168.1.0"<br>+UMQTTTC: 8,1<br>OK                                                        |
| Test                                                    | AT+UMQTTTC=?                                                   | +UMQTT: (list of supported <op_codes>s)<br>OK     | +UMQTTTC: (0-8)<br>OK                                                                                    |
| <b>Generic syntax</b>                                   |                                                                |                                                   |                                                                                                          |
| URC                                                     |                                                                | +UUMQTTTC: <op_code>,<param1>[, <param2>,<param3> | +UUMQTTTC: 4,0,2,"/sensor/heat/<br>SD/#"                                                                 |

| Type                | Syntax | Response                                                                                                                 | Example                                                                                            |
|---------------------|--------|--------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| <b>MQTT Message</b> |        |                                                                                                                          |                                                                                                    |
| URC                 |        | +UUMQTTTCM: <op_code>,<num_unread_msgs> [Topic: <topic_name>] [Len: <msg_length> Qos: <Qos>] Message: <message_contents> | +UUMQTTTCM: 6,1 Topic: /sensor/heat/SD/bldg5/DelMarConfRm Len: 16 QoS: 0 Message: 16 bytes of data |

### 24.5.3 Defined values

| Parameter          | Type   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <op_code>          | Number | MQTT command request. Allowed values: <ul style="list-style-type: none"> <li>0: logs out/disconnects from MQTT server. Will message will not be sent</li> <li>1: logs in/connects to MQTT server</li> <li>2: publish a message to a specific topic to the MQTT message broker</li> <li>3: publish a message from a file to a specific topic to the MQTT message broker</li> <li>4: subscribe to a topic from the MQTT message broker</li> <li>5: unsubscribe to a topic from the MQTT message broker. This should exactly match the Topic Filter used during the Subscribe</li> <li>6: read all unread messages received from MQTT message broker, at the terse/verbose mode set at the time of message reception</li> <li>7: sets the terse/verbose format for received messages (i.e. the amount of information and headers with each received MQTT message)</li> <li>8: ping the MQTT message broker</li> </ul> |
| <QoS>              | Number | Quality of service: <ul style="list-style-type: none"> <li>0 (default value): at most once delivery</li> <li>1: at least once delivery</li> <li>2: exactly once delivery</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <retain>           | Number | Allowed values: <ul style="list-style-type: none"> <li>0 (default value): the message will not be retained at the MQTT server across disconnects from MQTT client</li> <li>1: the message will be retained by the MQTT server across disconnects from MQTT client (until superceded by another message)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <hex_mode>         | Number | Allowed values: <ul style="list-style-type: none"> <li>0 (default value): ASCII input for &lt;message_contents&gt;</li> <li>1: hexadecimal input for &lt;message_contents&gt;</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <message_contents> | String | ASCII or hexadecimal data. The starting quotation mark shall not be taken into account like data. At the end of the byte stream, another quotation mark is provided for user convenience and visualization purposes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <mqtt_server>      | String | IP address or URL of MQTT server                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <num_unread_msgs>  | Number | Indicates the number of unread received messages.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <format>           | Number | Specifies format of the messages when read using the <op_code>=6. Possible values" <ul style="list-style-type: none"> <li>0: no formatting. All messages will be concatenated into a single line with no separation between meeages</li> <li>1 (default value): each messages will contain the &lt;topic_name&gt; and &lt;message_contents&gt;</li> <li>2: each messages will contain the &lt;topic_name&gt;, &lt;msg_length&gt;, &lt;QoS&gt; and &lt;message_contents&gt;</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <topic_name>       | String | Indicates the topic to which the given MQTT message was published                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <msg_length>       | Number | Specifies the number of octets in <message_contents>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <reason>           | Number | Result of an MQTT subscribe request: <ul style="list-style-type: none"> <li>0: success</li> <li>128: failure</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <MQTT_result>      | Number | Result of an MQTT command request: <ul style="list-style-type: none"> <li>0: fail</li> <li>1: success</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <login_result>     | Number | Result of an MQTT login request. <ul style="list-style-type: none"> <li>0: connection accepted</li> <li>1: the server does not support the level of the MQTT protocol requested by the Client</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

| Parameter | Type | Description                                                                                                                                                                                                                                                                                                                                                               |
|-----------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           |      | <ul style="list-style-type: none"> <li>2: the client identifier is correct UTF-8 but not allowed by the Server</li> <li>3: the network connection has been made but the MQTT service is unavailable</li> <li>4: the data in the user name or password is malformed</li> <li>5: the client is not authorized to connect</li> <li>6-255: reserved for future use</li> </ul> |

## 24.5.4 Notes

- The topic name should not include any wildcards for the Publish commands.
- The topic filter could include the '+' wildcard to substitute for a single topic folder or the '#' wildcard to substitute for any number of topic folders. The '#' wildcard must be the last character in a topic filter.
- Login to the MQTT server will have two responses, an immediate "+UMQTTC: 1,1" response that indicates that the module has sent the MQTT login request to the MQTT server. The MQTT server's login response will happen asynchronously when the MQTT server has finished processing the MQTT login request and decided whether or not to accept it.
- Subscription to a given Topic Filter will have two responses, an immediate "+UMQTTC: 4,1" response that indicates that the module has sent the MQTT Subscription Request to the MQTT server. The MQTT server's Subscription Response will happen asynchronously when the MQTT server has finished processing the MQTT Subscription Request and decided whether or not to accept it.

### SARA-R4 / SARA-N4

- <op\_code>= 3 and 8 are not supported

## 24.6 MQTT error +UMQTTER

| +UMQTTER   |                                                     |              |                |                |               |                 |
|------------|-----------------------------------------------------|--------------|----------------|----------------|---------------|-----------------|
| Modules    | SARA-R410M-02B SARA-R410M-52B SARA-R412M<br>SARA-N4 |              |                |                |               |                 |
| Attributes | Syntax                                              | PIN required | Settings saved | Can be aborted | Response time | Error reference |
|            | full                                                | No           | No             | No             | -             | -               |

### 24.6.1 Description

Retrieves the error code and module (plus possible supplemental information) of the last MQTT operation that resulted in an error response.

### 24.6.2 Syntax

| Type | Syntax     | Response                                            | Example                                   |
|------|------------|-----------------------------------------------------|-------------------------------------------|
| Set  | AT+UMQTTER | +UMQTTER: <error_code>,<suppl_<br>error_code><br>OK | AT+UMQTTER<br><br>+UMQTTER: 1,1<br><br>OK |

### 24.6.3 Defined values

| Parameter          | Type   | Description                                                                                 |
|--------------------|--------|---------------------------------------------------------------------------------------------|
| <error_code>       | Number | Value of error code. Values are listed in <a href="#">Appendix A.7</a> .                    |
| <suppl_error_code> | Number | Value of supplemental error code. The values are listed in <a href="#">Appendix A.7.1</a> . |



## 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     |
| 114                | GPRS services not allowed in this PLMN        |
| 115                | No Suitable Cells In Location Area            |
| 122                | Congestion                                    |
| 125                | Not authorized for this CSG                   |

| Numeric error code | Description                                         |
|--------------------|-----------------------------------------------------|
| 126                | Insufficient resources                              |
| 132                | Service option not supported                        |
| 133                | Requested service option not subscribed             |
| 134                | Service option temporarily out of order             |
| 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                           |
| 172                | Semantically incorrect message                      |
| 173                | Mandatory information element error                 |
| 174                | Information element non-existent or not implemented |
| 175                | Conditional IE error                                |
| 176                | Protocol error, unspecified                         |
| 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                                       |
| 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                                           |

| Numeric error code | Description                                                        |
|--------------------|--------------------------------------------------------------------|
| 1018               | No user responding                                                 |
| 1019               | User alerting, no answer                                           |
| 1021               | Call rejected                                                      |
| 1022               | Number changed                                                     |
| 1026               | Non selected user clearing                                         |
| 1027               | Destination out of order                                           |
| 1028               | Invalid number format (incomplete number)                          |
| 1029               | Facility rejected                                                  |
| 1030               | Response to STATUS ENQUIRY                                         |
| 1031               | Normal, unspecified                                                |
| 1034               | No circuit/channel available                                       |
| 1038               | Network out of order                                               |
| 1041               | Temporary failure                                                  |
| 1042               | Switching equipment congestion                                     |
| 1043               | Access information discarded                                       |
| 1044               | requested circuit/channel not available                            |
| 1047               | Resources unavailable, unspecified                                 |
| 1049               | Quality of service unavailable                                     |
| 1050               | Requested facility not subscribed                                  |
| 1055               | Incoming calls barred within the CUG                               |
| 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                                            |

| Numeric error code | Description                                                     |
|--------------------|-----------------------------------------------------------------|
| 1542               | LLC or SMDCP failure                                            |
| 1543               | Regular deactivation                                            |
| 1544               | Reactivation requested                                          |
| 1545               | Single address bearers only allowed                             |
| 1546               | Invalid transaction identifier value                            |
| 1547               | APN restriction val incompatible with PDP context               |
| 1548               | PDP activation rejected                                         |
| 1549               | unknown PDP address or PDP type                                 |
| 1550               | GPRS generic operation error                                    |
| 1551               | GPRS invalid APN                                                |
| 1552               | GPRS authentication failure                                     |
| 1553               | GPRS QoS parameters inconsistent                                |
| 1554               | GPRS network failure                                            |
| 1555               | GPRS context busy                                               |
| 1556               | CSD generic operation error                                     |
| 1557               | CSD undefined profile                                           |
| 1558               | CSD context busy                                                |
| 1559               | PLMN scan not allowed                                           |
| 1600               | FFS error                                                       |
| 1600               | PDP type IPv4 only allowed                                      |
| 1601               | 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                        |

| Numeric error code | Description                                          |
|--------------------|------------------------------------------------------|
| 1700               | GPS GPIO not configured                              |
| 1701               | GPS GPIO ownership error                             |
| 1702               | Invalid operation with GPS ON                        |
| 1703               | Invalid operation with GPS OFF                       |
| 1704               | Invalid GPS aiding mode                              |
| 1705               | Reserved GPS aiding mode                             |
| 1706               | GPS aiding mode already set                          |
| 1707               | Invalid GPS trace mode                               |
| 1708               | Parameter valid only in case of GPS OTA              |
| 1709               | GPS trace invalid server                             |
| 1710               | Invalid TimeZone                                     |
| 1711               | Invalid value                                        |
| 1712               | Invalid parameter                                    |
| 1713               | Invalid operation with LOC running / GPS Busy        |
| 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                                |

| Numeric error code | Description                                              |
|--------------------|----------------------------------------------------------|
| 47                 | Resources unavailable, unspecified                       |
| 50                 | Requested facility not subscribed                        |
| 69                 | Requested facility not implemented                       |
| 81                 | Invalid short message reference value                    |
| 95                 | Invalid message, unspecified                             |
| 96                 | invalid mandatory information                            |
| 97                 | Message type non-existent or not implemented             |
| 98                 | Message not compatible with short message protocol state |
| 99                 | Information element non-existent or not implemented      |
| 111                | Protocol error, unspecified                              |
| 127                | Interworking, unspecified                                |
| 128                | Telematic interworking not supported                     |
| 129                | Short message type 0 not supported                       |
| 130                | Cannot replace short message                             |
| 143                | Unspecified TP-PID error                                 |
| 144                | Data coding scheme (alphabet) not supported              |
| 145                | Message class not supported                              |
| 159                | Unspecified TP-DCS error                                 |
| 160                | Command cannot be actioned                               |
| 161                | Command unsupported                                      |
| 175                | Unspecified TP-Command error                             |
| 176                | TPDU not supported                                       |
| 192                | SC busy                                                  |
| 193                | No SC subscription                                       |
| 194                | SC system failure                                        |
| 195                | Invalid SME address                                      |
| 196                | Destination SME barred                                   |
| 197                | SM Rejected-Duplicate SM                                 |
| 198                | TP-VPF not supported                                     |
| 199                | TP-VP not supported                                      |
| 208                | SIM SMS storage full                                     |
| 209                | No SMS storage capability in SIM                         |
| 210                | Error in MS                                              |
| 211                | Memory Capacity Exceeded                                 |
| 212                | SIM Application Toolkit Busy                             |
| 213                | SIM data download error                                  |
| 287                | Network failure unspecified                              |
| 290                | Network no resource                                      |
| 296                | Radio Resources not 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                                     |

| Numeric error code | Description                                                        |
|--------------------|--------------------------------------------------------------------|
| 331                | no network service                                                 |
| 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                                             |

| Numeric error code | Description                                                                     |
|--------------------|---------------------------------------------------------------------------------|
| 568                | Incompatible By Destination                                                     |
| 569                | Invalid Transit Network Selection                                               |
| 571                | Message Not Compatible With Protocol State                                      |
| 572                | Recovery On Timer Expiry                                                        |
| 576                | Data Call Active                                                                |
| 577                | Speech Call Active                                                              |
| 579                | MOC Setup Rejected Due to Missing ACM Info                                      |
| 580                | Temporary Forbidden Call Attempt                                                |
| 581                | Called Party is Blacklisted                                                     |
| 583                | Temporary Forbidden Call Attempt No Service                                     |
| 584                | Temporary Forbidden Call Attempt Limited Service                                |
| 585                | Client Temporary Barred                                                         |
| 586                | Dual Service Call Active                                                        |
| 587                | Atc Fclass Not Speech                                                           |
| 590                | Client Not 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                                                       |



| Numeric error code | Description                                                                        |
|--------------------|------------------------------------------------------------------------------------|
| 647                | Lower Layer Failure From NW                                                        |
| 649                | Conditional IE Error                                                               |
| 650                | No Cell Allocation Available                                                       |
| 653                | Re Establishment Reject                                                            |
| 654                | Directed Sigconn Re Establishment                                                  |
| 656                | Release of RRC connection Witout Network Activity(3G) Lower Layer Failure Downlink |
| 657                | Lower Layer Failure Uplink                                                         |
| 658                | Cell Barred Due To Authentication Failure                                          |
| 659                | Signalling Connection Release                                                      |
| 660                | CS Connection Release Triggered By MM                                              |
| 661                | RRC Connection Establishment Failure                                               |
| 662                | RRC Connection Establsihment Reject With Redirection                               |
| 663                | Resource Conflict                                                                  |
| 664                | 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                                                       |

### A.3 Firmware install final result codes

The **+UFWINSTALL** command issues a final result code providing the result of the FW install procedure. In case the FW install procedure fails, the error result code provides some indication about the error cause (syntax error or issue during the installation procedure).

#### A.3.1 SARA-R4 / SARA-N4 final result codes

No error codes are generated.

### A.4 FOAT error result codes

See **+UFWUPD** command description.

#### A.4.1 SARA-R4 / SARA-N4 error result codes

No error codes are generated.

### A.5 Internal TCP/UDP/IP stack class error codes

The following table lists all allowed error classes that can be provided by the internal TCP/UDP/IP stack through **+USOER** and **+USOCTL** (with <param\_id>=1) AT commands.

| Numeric error code | Description                                      | Resulting from the following commands                                  |
|--------------------|--------------------------------------------------|------------------------------------------------------------------------|
| 0                  | No error                                         | +USOCR, +USOSO, +USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI |
| 1                  | EPERM - Operation not permitted (internal error) | +USOCR, +USOSO, +USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI |

| Numeric error code | Description                                                     | Resulting from the following commands                                  |
|--------------------|-----------------------------------------------------------------|------------------------------------------------------------------------|
| 2                  | ENOENT - No such resource (internal error)                      | +USOCR, +USOSO, +USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI |
| 4                  | EINTR - Interrupted system call (internal error)                | +USOCR, +USOSO, +USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI |
| 5                  | EIO - I/O error (internal error)                                | +USOCR, +USOSO, +USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI |
| 9                  | EBADF - Bad file descriptor (internal error)                    | +USOCR, +USOSO, +USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI |
| 10                 | ECHILD - No child processes (internal error)                    | +USOCR, +USOSO, +USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI |
| 11                 | EWOULDBLOCK / EAGAIN - Current operation would block, try again | +USOWR                                                                 |
| 12                 | ENOMEM - Out of memory (internal error)                         | +USOCR, +USOSO, +USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI |
| 14                 | EFAULT - Bad address (internal error)                           | +USOCR, +USOSO, +USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI |
| 22                 | EINVAL - Invalid argument                                       | +USOCR, +USOSO, +USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI |
| 32                 | EPIPE - Broken pipe (internal error)                            | +USOCR, +USOSO, +USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI |
| 38                 | ENOSYS - Function not implemented                               | +USOSO, +USOGO                                                         |
| 64                 | ENONET - Machine is not on the internet                         | +USOCR, +USOWR, +USOST, +USORD, +USORF, +USOLI                         |
| 65                 | EEOF - End of file                                              | +USOWR, +USOST, +USORD, +USORF                                         |
| 71                 | EPROTO - Protocol error                                         | +USOWR, +USOST, +USORD, +USORF                                         |
| 77                 | EBADFD - File descriptor in bad state (internal error)          | +USOCR, +USOSO, +USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI |
| 78                 | EREMCHG - Remote address changed                                | +USOWR, +USOST, +USORD, +USORF, +USOCL                                 |
| 89                 | EDESTADDRREQ - Destination address required                     | +USOCO, +USOST                                                         |
| 91                 | EPROTOTYPE - Wrong protocol type for socket                     | +USOCR                                                                 |
| 92                 | ENOPROTOOPT - Protocol not available                            | +USOCR                                                                 |
| 93                 | EPROTONOSUPPORT - Protocol not supported                        | +USOCR                                                                 |
| 94                 | ESOCKTNOSUPPORT - Socket type not supported                     | +USOCR                                                                 |
| 95                 | EOPNOTSUPP - Operation not supported on transport endpoint      | +USOWR, +USOST, +USORD, +USORF, +USOCL                                 |
| 96                 | EPFNOSUPPORT - Protocol family not supported                    | +USOCR                                                                 |
| 97                 | EAFNOSUPPORT - Address family not supported by protocol         | +USOCR                                                                 |
| 98                 | EADDRINUSE - Address already in use                             | +USOLI                                                                 |
| 99                 | EADDRNOTAVAIL - Cannot assign requested address                 | +USOCR, +USOLI, +USOCO                                                 |
| 100                | ENETDOWN - Network is down                                      | +USOCR, +USOLI, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOCL         |
| 101                | ENETUNREACH - Network is unreachable                            | +USOCO, +USOST, +USORF                                                 |
| 102                | ENETRESET - Network dropped connection because of reset         | +USOCR, +USOLI, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOCL         |
| 103                | ECONNABORTED - Software caused connection abort                 | +USOCR, +USOSO, +USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI |

| Numeric error code | Description                                                    | Resulting from the following commands                                  |
|--------------------|----------------------------------------------------------------|------------------------------------------------------------------------|
| 104                | ECONNRESET - Connection reset by peer                          | +USOCR, +USOSO, +USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI |
| 105                | ENOBUFS - No buffer space available                            | +USOCR, +USOSO, +USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI |
| 106                | EISCONN - Transport endpoint is already connected              | +USOCO                                                                 |
| 107                | ENOTCONN - Transport endpoint is not connected                 | +USOCR, +USOSO, +USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI |
| 108                | ESHUTDOWN - Cannot send after transport endpoint shutdown      | +USOCR, +USOSO, +USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI |
| 110                | ETIMEDOUT - Connection timed out                               | +USOCO, +USOST, +USORD, +USORF                                         |
| 111                | ECONNREFUSED - Connection refused                              | +USOCO                                                                 |
| 112                | EHOSTDOWN - Host is down                                       | +USOCL, +USOCO, +USOWR, +USOST, +USORD, +USORF                         |
| 113                | EHOSTUNREACH - No route to host                                | +USOCO, +USOWR, +USOST, +USORD, +USORF                                 |
| 115                | EINPROGRESS - Operation now in progress                        | +USOCR, +USOSO, +USOGO, +USOCO, +USOWR, +USOST, +USORD, +USORF, +USOLI |
| 160                | ENSRNODATA - DNS server returned answer with no data           | +UDNSRN                                                                |
| 161                | ENSRFORMERR - DNS server claims query was misformatted         | +UDNSRN                                                                |
| 162                | ENSRSERVFAIL - DNS server returned general failure             | +UDNSRN                                                                |
| 163                | ENSRNOTFOUND - Domain name not found                           | +UDNSRN                                                                |
| 164                | ENSRNOTIMP - DNS server does not implement requested operation | +UDNSRN                                                                |
| 165                | ENSRREFUSED - DNS server refused query                         | +UDNSRN                                                                |
| 166                | ENSRBADQUERY - Misformatted DNS query                          | +UDNSRN                                                                |
| 167                | ENSRBADNAME - Misformatted domain name                         | +UDNSRN                                                                |
| 168                | ENSRBADFAMILY - Unsupported address family                     | +UDNSRN                                                                |
| 169                | ENSRBADRESP - Misformatted DNS reply                           | +UDNSRN                                                                |
| 170                | ENSRCONNREFUSED - Could not contact DNS servers                | +UDNSRN                                                                |
| 171                | ENSRTIMEOUT - Timeout while contacting DNS servers             | +UDNSRN                                                                |
| 172                | ENSROF - End of file                                           | +UDNSRN                                                                |
| 173                | ENSFILE - Error reading file                                   | +UDNSRN                                                                |
| 174                | ENSRNOMEM - Out of memory                                      | +UDNSRN                                                                |
| 175                | ENSRDESTRUCTION - Application terminated lookup                | +UDNSRN                                                                |
| 176                | ENSRQUERYDOMAINTOOLONG - Domain name is too long               | +UDNSRN                                                                |
| 177                | ENSRNAMELOOP - Domain name is too long                         | +UDNSRN                                                                |

## A.6 Internet suite error classes

The following table lists all allowed error classes that can be provided by the <error\_class> parameter for each AT error command (+UFTPER, +UHTTPER) for FTP and HTTP.

| <error_class> | Description                   | <error_codes>                          | Resulting from the following commands                 |
|---------------|-------------------------------|----------------------------------------|-------------------------------------------------------|
| 0             | OK, no error occurred         |                                        | All                                                   |
| 1             | FTP Protocol error class      | See the <a href="#">Appendix A.6.1</a> | +UFTPC, +UFTF, +UFTPER                                |
| 3             | HTTP Protocol error class     | See the <a href="#">Appendix A.6.2</a> | +UHTTPC, +UHTTFC, +UHTTPER                            |
| 4             | Flash File System error class | See the <a href="#">Appendix A.6.3</a> | +UFTPC, +UFTPER, +UHTTFC, +UHTTPER                    |
| 5             | DNS error class               |                                        | +UFTPC, +UFTPER, +UHTTFC, +UHTTPER, +USMTPC, +USMTPER |

| <error_class> | Description                                                        | <error_codes>                          | Resulting from the following commands                 |
|---------------|--------------------------------------------------------------------|----------------------------------------|-------------------------------------------------------|
| 6             | Socket error class                                                 | BSD error codes standard               | All                                                   |
| 7             | Dynamic Memory error                                               | 0                                      | All                                                   |
| 8             | Wrong FTP API usage (e.g. missing/null parameters)                 | See the <a href="#">Appendix A.6.1</a> | +UFTPC, +UFTP, +UFTPER                                |
| 10            | Wrong HTTP API usage (e.g. missing/null parameters)                | See the <a href="#">Appendix A.6.2</a> | +UHTTP, +UHTTPC, +UHTTPER                             |
| 11            | Syntax error in high layer Protocol (wrong/missing/corrupted data) |                                        | +UFTPC, +UFTPER, +UHTTPC, +UHTTPER, +USMTPC, +USMTPER |
| 12            | Unspecified error                                                  | 0                                      | All                                                   |

## A.6.1 FTP class error codes

The following table lists the available values of <error\_code> parameter of the last FTP operation provided through [+UFTPER](#) AT command if <error\_class>=1 or 8 (for more details see the [AT+UFTP](#), [AT+UFTPC](#) commands description).

| Numeric error code | Description                                                            |
|--------------------|------------------------------------------------------------------------|
| 0                  | No error                                                               |
| 1                  | User missing                                                           |
| 2                  | Password missing                                                       |
| 3                  | Account missing                                                        |
| 4                  | Server missing                                                         |
| 5                  | Directory name missing                                                 |
| 6                  | File name missing                                                      |
| 7                  | Null parameter                                                         |
| 8                  | Unknown FTP command                                                    |
| 9                  | Unknown file action                                                    |
| 10                 | Wrong FTP state                                                        |
| 11                 | Wrong parameter                                                        |
| 12                 | PSD or CSD connection not established                                  |
| 13                 | No memory available for allocation                                     |
| 14                 | Reserved internal code                                                 |
| 15                 | Length of given web server (address or hostname) too long or too short |
| 16                 | Hostname of given web server invalid                                   |
| 17                 | Address of given web server is invalid                                 |
| 18                 | Username too long or too short                                         |
| 19                 | Password too long or too short                                         |
| 20                 | Account too long or too short                                          |
| 21                 | Operation not allowed because FTP client is busy                       |
| 22                 | Not possible to connect to FTP server                                  |
| 23                 | Error occurred in FTP request                                          |
| 24                 | Reserved internal code                                                 |
| 25                 | FFS filename pointer is null or its length is 0                        |
| 26-30              | Reserved internal code                                                 |
| 31                 | Timeout elapsed while performing requested operation                   |
| 32                 | Internal processing error                                              |
| 33                 | Not logged in                                                          |
| 34                 | Login incorrect                                                        |
| 35                 | File unavailable (not found or no access)                              |
| 36                 | File not ready                                                         |
| 37                 | Filename not allowed                                                   |
| 38                 | Folder not found                                                       |
| 39                 | Folder no access                                                       |
| 40                 | Operation aborted by user                                              |
| 41                 | Permission denied                                                      |

| Numeric error code | Description                                                                                                                                                    |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 42                 | Cannot open FTP data channel                                                                                                                                   |
| 43                 | Socket invalid parameter                                                                                                                                       |
| 44                 | Invalid socket                                                                                                                                                 |
| 45                 | No socket available                                                                                                                                            |
| 46                 | Cannot create socket                                                                                                                                           |
| 47                 | Cannot bind socket to network interface                                                                                                                        |
| 48                 | Cannot resolve hostname                                                                                                                                        |
| 49                 | Cannot connect socket                                                                                                                                          |
| 50                 | Cannot get socket name                                                                                                                                         |
| 51                 | Cannot bind socket to port                                                                                                                                     |
| 52                 | Socket cannot listen                                                                                                                                           |
| 53                 | Socket cannot accept                                                                                                                                           |
| 54                 | Socket would block                                                                                                                                             |
| 55                 | Socket cannot write                                                                                                                                            |
| 56                 | Socket cannot read                                                                                                                                             |
| 57                 | Reserved internal code                                                                                                                                         |
| 58                 | No socket data to send                                                                                                                                         |
| 59                 | Socket cannot get available data                                                                                                                               |
| 60                 | No socket data to read                                                                                                                                         |
| 61                 | Socket no response code found                                                                                                                                  |
| 62                 | Socket not connected                                                                                                                                           |
| 63                 | Cannot set secure socket                                                                                                                                       |
| 64                 | Socket cannot decode password                                                                                                                                  |
| 65                 | Socket cannot get size                                                                                                                                         |
| 66                 | FFS Invalid parameter                                                                                                                                          |
| 67                 | FFS invalid handle                                                                                                                                             |
| 68                 | FFS cannot open file                                                                                                                                           |
| 69                 | FFS cannot seek file                                                                                                                                           |
| 70                 | FFS cannot get file size                                                                                                                                       |
| 71                 | FFS cannot read                                                                                                                                                |
| 72                 | FFS bad offset                                                                                                                                                 |
| 73                 | FFS cannot write                                                                                                                                               |
| 74                 | Direct link internal error                                                                                                                                     |
| 75                 | Failed to open extended passive mode                                                                                                                           |
| 76                 | Failed to parse extended passive mode server reply                                                                                                             |
| 77                 | Internal error                                                                                                                                                 |
| 78                 | Client IP protocol not supported - try passive mode                                                                                                            |
| 79                 | Data transfer error. The transferred (received/sent) data is not complete                                                                                      |
| 226                | Closing data connection; requested file action successful (for example, file transfer or file abort)                                                           |
| 250                | Requested file action okay, completed                                                                                                                          |
| 350                | Requested file action pending further information                                                                                                              |
| 421                | Service not available, closing control connection.                                                                                                             |
|                    | User limit reached                                                                                                                                             |
|                    | Not authorized to make the connection                                                                                                                          |
|                    | Maximum connections reached                                                                                                                                    |
|                    | Maximum connections exceeded                                                                                                                                   |
| 425                | Cannot open data connection                                                                                                                                    |
| 426                | Connection closed; transfer aborted. The command opens a data connection to perform an action, but that action is cancelled, and the data connection is closed |
| 450                | Requested file action not taken. File unavailable (e.g. file busy)                                                                                             |
| 451                | Requested action aborted: local error in processing                                                                                                            |
| 452                | Requested action not taken. Insufficient storage space in system                                                                                               |
| 500                | Syntax error, command unrecognized, command line too long                                                                                                      |

| Numeric error code | Description                                                             |
|--------------------|-------------------------------------------------------------------------|
| 501                | Syntax error in parameters or arguments                                 |
| 502                | Command not implemented                                                 |
| 503                | Bad sequence of commands                                                |
| 504                | Command not implemented for that parameter                              |
| 530                | User not logged in                                                      |
| 532                | Need account for storing files                                          |
| 550                | Requested action not taken. File unavailable, not found, not accessible |
| 552                | Requested file action aborted. Exceeded storage allocation              |
| 553                | Requested action not taken. Filename not allowed                        |



For all the errors not listed in the table see the RFC 959 [75] and RFC 2428 [76].

## A.6.2 HTTP class error codes

The following table lists the available values of <error\_code> parameter of the last HTTP operation provided through [+UHTTPER](#) AT command if <error\_class>=3 or 10 (for more details see the [AT+UHTTTP](#) and [AT+UHTTTPC](#) commands description).

| Numeric error code | Description                                            |
|--------------------|--------------------------------------------------------|
| 0                  | No error                                               |
| 1                  | Invalid profile ID                                     |
| 2                  | Invalid input                                          |
| 3                  | Server hostname too long                               |
| 4                  | Invalid server hostname                                |
| 5                  | Invalid server IP address                              |
| 6                  | Invalid authorization method                           |
| 7                  | Server missing                                         |
| 8                  | Username length exceeded                               |
| 9                  | Password length exceeded                               |
| 10                 | Internal error                                         |
| 11                 | Server connection error                                |
| 12                 | Error occurred in HTTP request                         |
| 13                 | Internal error                                         |
| 14                 | Internal error                                         |
| 15                 | Invalid POST data size                                 |
| 16                 | Empty FFS file name                                    |
| 17                 | Invalid FFS file length                                |
| 18                 | Invalid content-type specified                         |
| 19                 | Internal error                                         |
| 20                 | Internal error                                         |
| 21                 | Internal error                                         |
| 22                 | PSD or CSD connection not established                  |
| 23                 | Server or proxy hostname lookup failed                 |
| 24                 | User authentication failed on server                   |
| 25                 | User authentication failed on proxy                    |
| 26                 | Connection timed out                                   |
| 27                 | Request prepare timeout expired                        |
| 28                 | Response receive timeout expired                       |
| 29                 | Request send timeout expired                           |
| 30                 | HTTP operation in progress                             |
| 31                 | Invalid HTTP parameter TCP port not in range (1-65535) |
| 32                 | Invalid HTTP parameter secure                          |
| 33                 | Invalid HTTP parameter authentication username         |
| 34                 | Invalid HTTP parameter authentication password         |
| 35                 | Invalid HTTP parameter output filename                 |
| 36                 | Invalid HTTP parameter output filename length          |

| Numeric error code | Description                                    |
|--------------------|------------------------------------------------|
| 37                 | Invalid HTTP parameter server path             |
| 38                 | Invalid HTTP parameter server path length      |
| 39                 | Invalid HTTP parameter content filename length |
| 40                 | Invalid custom content type string             |
| 41                 | Output file open error                         |
| 42                 | Output file close error                        |
| 43                 | Output file write error                        |
| 44                 | Connection lost                                |
| 45                 | Operation not allowed in current state         |
| 46 - 72            | Internal error                                 |
| 73                 | Secure socket connect error                    |

### A.6.3 File system class error codes



SARA-R4 / SARA-N4

The following table lists the available values of <error\_code> parameter of the last FTP or HTTP operation provided through [+UFTPER](#) and [+UHTTPER](#).

| Numeric error code | Description                                                     |
|--------------------|-----------------------------------------------------------------|
| 2                  | Operation performed with success                                |
| 3                  | Initialization in progress                                      |
| 4                  | File already opened                                             |
| 5                  | File not opened                                                 |
| 6                  | File not found                                                  |
| 7                  | File already created                                            |
| 8                  | Illegal id                                                      |
| 9                  | Illegal file handle                                             |
| 10                 | Illegal type                                                    |
| 11                 | Illegal mode                                                    |
| 12                 | File range error                                                |
| 13                 | The operation is not possible                                   |
| 14                 | Write error                                                     |
| 15                 | User id error                                                   |
| 16                 | Internal fatal error                                            |
| 17                 | Memory resource error                                           |
| 18                 | Maximum number of files exceeded                                |
| 19                 | Memory not available                                            |
| 20                 | Invalid filename                                                |
| 21                 | Streaming not enabled                                           |
| 22                 | Operation not allowed on static file                            |
| 23                 | Memory table inconsistency                                      |
| 24                 | Not a factory default file                                      |
| 25                 | Requested memory temporary not available                        |
| 26                 | Operation not allowed for a directory                           |
| 27                 | Space in the directory space not available                      |
| 28                 | Too many streaming files opened                                 |
| 29                 | Requested dynamic memory temporary not available                |
| 30                 | The user provided a NULL parameter instead of a suitable buffer |

## A.7 MQTT error codes

The following table lists the available values of <error\_code> parameter of the last MQTT operation provided through [+UMQTTER](#) AT command (for more details see the [AT+UMQTT](#) and [AT+UMQTTC](#) commands description).

| Numeric error code | Description |
|--------------------|-------------|
| 0                  | No error    |

| Numeric error code | Description                                                              |
|--------------------|--------------------------------------------------------------------------|
| 5                  | Error setting initial Default MQTT values                                |
| 10                 | Error creating new MQTT context in response to UMQTT                     |
| 11                 | Error in memory allocation for UMQTT command's response                  |
| 12                 | Error in UMQTT command number of arguments                               |
| 13                 | Error in UMQTT command syntax                                            |
| 14                 | UMQTT command parameter Invalid Error                                    |
| 15                 | Length (or termination) Error in UMQTT parameter                         |
| 16                 | Range Error in UMQTT command parameter                                   |
| 17                 | UMQTT context Invalid Error                                              |
| 18                 | UMQTT memory allocation failure Error                                    |
| 19                 | UMQTT Profile Restore From or Save To Fail Error                         |
| 20                 | Error creating new MQTT context in response to UMQTTC                    |
| 21                 | Error in memory allocation for UMQTTC command's response                 |
| 22                 | Error in UMQTTC command number of arguments                              |
| 23                 | Error in UMQTTC command syntax                                           |
| 24                 | UMQTTC command parameter Invalid Error                                   |
| 25                 | Length (or termination) Error in UMQTTC command specifier                |
| 26                 | Range Error in UMQTTC command specifier                                  |
| 27                 | UMQTTC context Invalid Error                                             |
| 28                 | No MQTT connection when attempting UMQTTC                                |
| 29                 | Error in UMQTTC's parameter length (or termination)                      |
| 30                 | Error in UMQTTC parameter range                                          |
| 40                 | Error in memory allocation for UMQTTER command's response                |
| 41                 | Error in UMQTTER command syntax                                          |
| 50                 | IP Address invalid error                                                 |
| 51                 | IP Address conversion failed                                             |
| 60                 | Input parameter invalid Error                                            |
| 61                 | Error in response to get Device                                          |
| 70                 | Hex input invalid Error                                                  |
| 71                 | Hex conversion failed Error                                              |
| 80                 | Attempt to display field(s) that exceed(s) the display size (suppressed) |
| 100                | Generic memory allocation failed Error                                   |
| 110                | QAPI FS Statvfs failed Error                                             |
| 111                | QAPI FS Mk Dir failed Error                                              |
| 112                | QAPI FS Open failed Error                                                |
| 113                | QAPI FS File Missing (only sometimes checked for explicitly)             |
| 114                | QAPI FS Stat failed Error                                                |
| 115                | QAPI FS Read failed Error                                                |
| 116                | QAPI FS Write failed Error                                               |
| 117                | QAPI FS Close failed Error                                               |
| 118                | QAPI FS Unlink failed Error                                              |
| 120                | QAPI FS Restore file noexist Error                                       |
| 130                | Failed allocation Error during Restore                                   |
| 150                | QMI DMS Init failed Error                                                |
| 151                | QMI DMS De-Init failed Error                                             |
| 160                | QMI DMS send msg fail Error                                              |
| 165                | QMI DMS Dev response fail Error                                          |
| 166                | QMI DMS Dev no IMEI fail Error                                           |
| 167                | QMI DMS Dev IMEI Invalid Error                                           |
| 200                | No Unique Client ID specified Error                                      |
| 201                | No Remote Server specified Error                                         |
| 202                | No Local Client IP Address specified Error                               |
| 240                | Error encountered when setting MQTT Connect callback                     |
| 241                | Error encountered when setting MQTT Subscribe callback                   |
| 242                | Error encountered when setting MQTT Message callback                     |



| Numeric error code | Description                                        |
|--------------------|----------------------------------------------------|
| 250                | Error in the MQTT Connect callback's parameters    |
| 251                | Error in the MQTT Subscribe callback's parameters  |
| 252                | Error in the MQTT Message callback's parameters    |
| 350                | Error returned when attempting an MQTT Connection  |
| 360                | Publish parameter invalid Error                    |
| 361                | Error returned when attempting an MQTT Publish     |
| 370                | Subscribe parameter invalid Error                  |
| 371                | Error returned when attempting an MQTT Subscribe   |
| 380                | Unsubscribe parameter invalid Error                |
| 381                | Error returned when attempting an MQTT Unsubscribe |
| 390                | Error returned when attempting an MQTT Disconnect  |
| 400                | Error returned when attempting an MQTT Destroy     |
| 410                | Error due to PING Failure                          |
| 411                | Error response to IPv4 PING attempt                |
| 412                | Error response to IPv6 PING attempt                |
| 500                | Device Info Init Error                             |
| 501                | Device Info Release Error                          |
| 502                | Device Info Get Error                              |
| 600                | DSS Handle Error                                   |
| 601                | DSS Init Error                                     |
| 602                | DSS Get Device Name Error                          |
| 603                | DSS allocation Fail Error                          |
| 604                | DSS Get IP Address Error                           |
| 700                | DNS Get Server Fail Error                          |
| 701                | DNS Add Server Fail Error                          |
| 702                | DNS Client Start Fail Error                        |
| 703                | DNS Client Stop Fail Error                         |
| 704                | DNS Name Resolution Fail Error                     |
| 1000               | Start Data Call Fail Error                         |

### A.7.1 MQTT supplemental error codes

The following table lists the available values of <suppl\_error\_code> parameter of the last MQTT operation provided through **+UMQTT** AT command (for more details see the **AT+UMQTT** and **AT+UMQTT** commands description).

| Numeric error code | Description                                                                   |
|--------------------|-------------------------------------------------------------------------------|
| 0                  | No error                                                                      |
| -1                 | General error (QAPI)                                                          |
| -2                 | Invalid parameter (QAPI)                                                      |
| -3                 | Memory allocation error (QAPI)                                                |
| -4                 | Resource allocation error (QAPI)                                              |
| -6                 | Operation busy (QAPI)                                                         |
| -7                 | Entry not found (QAPI)                                                        |
| -8                 | Feature not supported (QAPI)                                                  |
| -9                 | Operation timed out (QAPI)                                                    |
| -10                | Out of bounds (QAPI)                                                          |
| -11                | Bad Payload (QAPI)                                                            |
| -12                | Entry already exists (QAPI)                                                   |
| -20001             | Error in own certificate (QAPI MQTT)                                          |
| -20002             | Error with SSL connection (QAPI MQTT)                                         |
| -20003             | Handshake must be completed before the operation can be attempted (QAPI MQTT) |
| -20004             | Received SSL warning alert message (QAPI MQTT)                                |
| -20005             | Received SSL fatal alert message (QAPI MQTT)                                  |
| -20006             | Handshake in progress (QAPI MQTT)                                             |

| Numeric error code | Description                                                                                            |
|--------------------|--------------------------------------------------------------------------------------------------------|
| -20007             | Handshake successful (QAPI MQTT)                                                                       |
| -20008             | The SSL certificate of the peer is trusted, CN matches the host name, time is expired (QAPI MQTT)      |
| -20009             | The SSL certificate of the peer is trusted, CN does not match the host name, time is valid (QAPI MQTT) |
| -20010             | The SSL certificate of the peer is not trusted (QAPI MQTT)                                             |
| -20011             | Connection drops when out of network buffers (QAPI MQTT)                                               |
| -20012             | Socket error (QAPI MQTT)                                                                               |
| -20021             | IP address is invalid (QAPI MQTT)                                                                      |
| -20022             | Failed to get the scope ID (QAPI MQTT)                                                                 |
| -20023             | Socket command timed out (QAPI MQTT)                                                                   |
| -20024             | Max server add (v4/v6) reached in server's list (QAPI MQTT)                                            |
| -20025             | MQTT Memory allocation failed (QAPI MQTT)                                                              |
| -20026             | MQTT Bad parameter while invoking API (QAPI MQTT)                                                      |
| -20027             | MQTT Connection is in bad state (QAPI MQTT)                                                            |
| -20028             | MQTT Connection closed (QAPI MQTT)                                                                     |
| -20029             | MQTT Packet decode failed (QAPI MQTT)                                                                  |
| -20030             | MQTT Packet encode failed (QAPI MQTT)                                                                  |
| -20031             | MQTT Negative CONNACK received (QAPI MQTT)                                                             |
| -20032             | MQTT no data (QAPI MQTT)                                                                               |
| -20033             | MQTT no zero ref count while disconnecting (QAPI MQTT)                                                 |
| -20034             | MQTT Ping req msg creation failed (QAPI MQTT)                                                          |
| -20035             | MQTT Puback msg creation failed (QAPI MQTT)                                                            |
| -20036             | MQTT Pubcom msg creation failed (QAPI MQTT)                                                            |
| -20037             | MQTT Publish msg creation failed (QAPI MQTT)                                                           |
| -20038             | MQTT Pubrec msg creation failed (QAPI MQTT)                                                            |
| -20039             | MQTT Pubrel msg creation failed (QAPI MQTT)                                                            |
| -20040             | MQTT RX incomplete (QAPI MQTT)                                                                         |
| -20041             | MQTT Socket fatal error (QAPI MQTT)                                                                    |
| -20042             | MQTT TCP Bind error (QAPI MQTT)                                                                        |
| -20043             | MQTT TCP connection error (QAPI MQTT)                                                                  |
| -20044             | MQTT SSL connection failed (QAPI MQTT)                                                                 |
| -20045             | MQTT Subscribe msg creation failed (QAPI MQTT)                                                         |
| -20046             | MQTT Subscribe unknown topic (QAPI MQTT)                                                               |
| -20047             | MQTT Unsubscribe message creation failed (QAPI MQTT)                                                   |
| -20048             | MQTT unexpected messaged received (QAPI MQTT)                                                          |
| -20049             | MQTT Subscription failed (QAPI MQTT)                                                                   |
| -20050             | MQTT Restore failed (QAPI MQTT)                                                                        |
| -150001            | Operation is not permitted (QAPI FS)                                                                   |
| -150002            | Bad file descriptor (QAPI FS)                                                                          |
| -150003            | Permission denied (QAPI FS)                                                                            |
| -150004            | Attempt to cross the device (QAPI FS)                                                                  |
| -150005            | No such device (QAPI FS)                                                                               |
| -150006            | Not a directory (QAPI FS)                                                                              |
| -150007            | Is a directory (QAPI FS)                                                                               |
| -150008            | Too many open files (QAPI FS)                                                                          |
| -150009            | File or directory is already open (QAPI FS)                                                            |
| -150010            | No space is left on the device (QAPI FS)                                                               |
| -150011            | Seek is not permitted (QAPI FS)                                                                        |
| -150012            | File name is too long (QAPI FS)                                                                        |
| -150013            | Directory is not empty (QAPI FS)                                                                       |
| -150014            | Too many symbolic links were encountered (QAPI FS)                                                     |
| -150015            | Illegal byte sequence (QAPI FS)                                                                        |
| -150016            | Stale remote file handle (QAPI FS)                                                                     |
| -150017            | Attempt to write beyond the quota (QAPI FS)                                                            |

| Numeric error code | Description                                             |
|--------------------|---------------------------------------------------------|
| -150018            | End of file (QAPI FS)                                   |
| -150019            | Invalid ID was passed by the kernel framework (QAPI FS) |
| -150020            | Unknown error (QAPI FS)                                 |

## B Appendix: AT Commands List

| AT command     | Call control |   |    |  |
|----------------|--------------|---|----|--|
|                | A            | D | SO |  |
| SARA R404M-00B | •            | • | •  |  |
| R410M-01B      | •            | • | •  |  |
| R410M-02B      | •            | • | •  |  |
| R412M-02B      | •            | • | •  |  |
| R410M-52B      | •            | • | •  |  |
| N410-02B       |              |   |    |  |

| AT command     | File System |            |           |           |           |          |  |
|----------------|-------------|------------|-----------|-----------|-----------|----------|--|
|                | +UDELFILE   | +UDWNBLOCK | +UDWNFILE | +ULSTFILE | +URDBLOCK | +URDFILE |  |
| SARA R404M-00B | •           |            | •         | •         |           | •        |  |
| R410M-01B      | •           |            | •         | •         |           | •        |  |
| R410M-02B      | •           | •          | •         | •         | •         | •        |  |
| R412M-02B      | •           | •          | •         | •         | •         | •        |  |
| R410M-52B      | •           | •          | •         | •         | •         | •        |  |
| N410-02B       | •           | •          | •         | •         | •         | •        |  |

| AT command     | General commands |       |       |       |       |       |       |      |      |      |      |    |   |
|----------------|------------------|-------|-------|-------|-------|-------|-------|------|------|------|------|----|---|
|                | +CCID            | +CGMI | +CGMM | +CGMR | +CGSN | +CIMI | +CSCS | +GMI | +GMM | +GMR | +GSN | A/ | I |
| SARA R404M-00B | •                | •     | •     | •     | •     | •     | •     | •    | •    | •    | •    | •  | • |
| R410M-01B      | •                | •     | •     | •     | •     | •     | •     | •    | •    | •    | •    | •  | • |
| R410M-02B      | •                | •     | •     | •     | •     | •     | •     | •    | •    | •    | •    | •  | • |
| R412M-02B      | •                | •     | •     | •     | •     | •     | •     | •    | •    | •    | •    | •  | • |
| R410M-52B      | •                | •     | •     | •     | •     | •     | •     | •    | •    | •    | •    | •  | • |
| N410-02B       | •                | •     | •     | •     | •     | •     | •     | •    | •    | •    | •    | •  | • |

| AT command     | GPIO interface |         |         |  |
|----------------|----------------|---------|---------|--|
|                | +UGPIOC        | +UGPIOR | +UGPIOW |  |
| SARA R404M-00B | •              | •       | •       |  |
| R410M-01B      | •              | •       | •       |  |
| R410M-02B      | •              | •       | •       |  |
| R412M-02B      | •              | •       | •       |  |
| R410M-52B      | •              | •       | •       |  |
| N410-02B       | •              | •       | •       |  |

| AT command     | I2C interface |        |        |           |        |  |
|----------------|---------------|--------|--------|-----------|--------|--|
|                | +UI2CC        | +UI2CO | +UI2CR | +UI2CREGR | +UI2CW |  |
| SARA R404M-00B |               |        |        |           |        |  |
| R410M-01B      |               |        |        |           |        |  |
| R410M-02B      | •             | •      | •      | •         | •      |  |
| R412M-02B      | •             | •      | •      | •         | •      |  |
| R410M-52B      | •             | •      | •      | •         | •      |  |
| N410-02B       | •             | •      | •      | •         | •      |  |



| AT command     | Internet suite |       |        |         |        |          |         |          |          |          |  |
|----------------|----------------|-------|--------|---------|--------|----------|---------|----------|----------|----------|--|
|                | +UDNSRN        | +UFTP | +UFTPC | +UFTPER | +UHTTP | +UHTTPAC | +UHTTPC | +UHTTPER | +USECMNG | +USECPRF |  |
| SARA R404M-00B |                | •     | •      | •       | •      | •        | •       | •        |          |          |  |
| R410M-01B      |                | •     | •      | •       | •      | •        | •       | •        | •        | •        |  |
| R410M-02B      |                | •     | •      | •       | •      | •        | •       | •        | •        | •        |  |
| R412M-02B      |                | •     | •      | •       | •      | •        | •       | •        | •        | •        |  |
| R410M-52B      | •              | •     | •      | •       | •      | •        | •       | •        | •        | •        |  |
| N410-02B       | •              | •     | •      | •       | •      | •        | •       | •        | •        | •        |  |

| AT command |           | Localization features |       |       |       |       |        |        |       |        |        |        |        |        |        |       |           |          |  |
|------------|-----------|-----------------------|-------|-------|-------|-------|--------|--------|-------|--------|--------|--------|--------|--------|--------|-------|-----------|----------|--|
|            |           | +UGAOS                | +UGGA | +UGLL | +UGSA | +UGSV | +UGIND | +UGPRF | +UGPS | +UGRMC | +UGSRV | +UGTMR | +UGUBX | +UGVTG | +UGZDA | +ULOC | +ULOCGNSS | +ULOCIND |  |
| SARA       | R404M-00B |                       |       |       |       |       |        |        |       |        |        |        |        |        |        |       |           |          |  |
|            | R410M-01B |                       |       |       |       |       |        |        |       |        |        |        |        |        |        |       |           |          |  |
|            | R410M-02B | •                     | •     | •     | •     | •     | •      | •      | •     | •      | •      | •      | •      | •      | •      | •     | •         | •        |  |
|            | R412M-02B |                       |       |       |       |       |        |        |       |        |        |        |        |        |        |       |           |          |  |
|            | R410M-52B | •                     | •     | •     | •     | •     | •      | •      | •     | •      | •      | •      | •      | •      | •      | •     | •         | •        |  |
|            | N410-02B  | •                     | •     | •     | •     | •     | •      | •      | •     | •      | •      | •      | •      | •      | •      | •     | •         | •        |  |

| AT command     | Mobile equipment control and status |       |       |       |       |          |       |       |        |  |
|----------------|-------------------------------------|-------|-------|-------|-------|----------|-------|-------|--------|--|
|                | +CCLK                               | +CFUN | +CIND | +CMEE | +CMER | +CPWROFF | +CSGT | +CTZU | +UCIND |  |
| SARA R404M-00B | •                                   | •     | •     | •     | •     | •        |       | •     | •      |  |
| R410M-01B      | •                                   | •     | •     | •     | •     | •        |       | •     | •      |  |
| R410M-02B      | •                                   | •     | •     | •     | •     | •        |       | •     | •      |  |
| R412M-02B      | •                                   | •     | •     | •     | •     | •        |       | •     | •      |  |
| R410M-52B      | •                                   | •     | •     | •     | •     | •        | •     | •     | •      |  |
| N410-02B       | •                                   | •     | •     | •     | •     | •        | •     | •     | •      |  |

| AT command     | Network service |         |       |       |       |       |      |        |            |        |           |       |          |
|----------------|-----------------|---------|-------|-------|-------|-------|------|--------|------------|--------|-----------|-------|----------|
|                | +CEDRXDP        | +CEDRXS | +CESQ | +CNUM | +COPS | +CREG | +CSQ | +PACSP | +UBANDMASK | +UCGED | +UMNOPROF | +URAT | +VZWAPNE |
| SARA R404M-00B |                 |         | •     | •     | •     |       | •    |        |            |        |           | •     | •        |
| R410M-01B      |                 |         | •     | •     | •     |       | •    | •      |            |        |           | •     |          |
| R410M-02B      | •               | •       | •     | •     | •     | •     | •    | •      | •          | •      | •         | •     |          |
| R412M-02B      |                 |         | •     | •     | •     | •     | •    | •      | •          | •      | •         | •     |          |
| R410M-52B      | •               | •       | •     | •     | •     | •     | •    | •      | •          | •      | •         | •     |          |
| N410-02B       | •               | •       | •     | •     | •     | •     | •    | •      | •          | •      | •         | •     |          |

| AT command |           | Packet switched data services |        |        |        |          |        |         |          |        |           |            |            |       |    |   |  |
|------------|-----------|-------------------------------|--------|--------|--------|----------|--------|---------|----------|--------|-----------|------------|------------|-------|----|---|--|
|            |           | +CEMODE                       | +CEREG | +CGACT | +CGATT | +CGDCONT | +CGDEL | +CGEREP | +CGPADDR | +CGREG | +UAUTHREQ | +UDCONF=75 | +UDCONF=76 | +UPSD | D* | H |  |
| SARA       | R404M-00B |                               | •      | •      | •      | •        | •      |         | •        |        |           |            |            | •     | •  | • |  |
|            | R410M-01B |                               | •      | •      | •      | •        | •      |         | •        |        |           |            |            | •     | •  | • |  |
|            | R410M-02B | •                             | •      | •      | •      | •        | •      | •       | •        | •      | •         | •          | •          | •     | •  | • |  |
|            | R412M-02B | •                             | •      | •      | •      | •        | •      | •       | •        | •      | •         | •          | •          | •     | •  | • |  |
|            | R410M-52B | •                             | •      | •      | •      | •        | •      | •       | •        | •      | •         | •          | •          | •     | •  | • |  |
|            | N410-02B  | •                             | •      | •      | •      | •        | •      | •       | •        | •      | •         | •          | •          | •     | •  | • |  |
|            |           |                               |        |        |        |          |        |         |          |        |           |            |            |       |    |   |  |

| AT command     | Security |       |       |  |
|----------------|----------|-------|-------|--|
|                | +CLK     | +CPIN | +CPWD |  |
| SARA R404M-00B | •        | •     | •     |  |
| R410M-01B      | •        | •     | •     |  |
| R410M-02B      | •        | •     | •     |  |
| R412M-02B      | •        | •     | •     |  |
| R410M-52B      | •        | •     | •     |  |
| N410-02B       | •        | •     | •     |  |

| AT command |           | Serial interface |    |    |    |    |    |       |      |      |      |   |   |   |     |     |    |    |    |    |    |    |    |   |   |
|------------|-----------|------------------|----|----|----|----|----|-------|------|------|------|---|---|---|-----|-----|----|----|----|----|----|----|----|---|---|
|            |           | &C               | &D | &F | &K | &S | &V | +CMUX | +ICF | +IFC | +IPR | E | O | Q | S10 | S12 | S2 | S3 | S4 | S5 | S6 | S7 | S8 | V |   |
| SARA       | R404M-00B | .                | .  | .  |    | .  | .  | .     | .    |      | .    | . | . | . | .   | .   | .  | .  | .  | .  | .  | .  | .  | . |   |
|            | R410M-01B | .                | .  | .  |    | .  | .  | .     | .    |      | .    | . | . | . | .   | .   | .  | .  | .  | .  | .  | .  | .  | . |   |
|            | R410M-02B | .                | .  | .  |    | .  | .  | .     | .    |      | .    | . | . | . | .   | .   | .  | .  | .  | .  | .  | .  | .  | . |   |
|            | R412M-02B | .                | .  | .  | .  | .  | .  | .     | .    | .    | .    | . | . | . | .   | .   | .  | .  | .  | .  | .  | .  | .  | . |   |
|            | R410M-52B | .                | .  | .  | .  | .  | .  | .     | .    | .    | .    | . | . | . | .   | .   | .  | .  | .  | .  | .  | .  | .  | . |   |
|            | N410-02B  | .                | .  | .  | .  | .  | .  | .     | .    | .    | .    | . | . | . | .   | .   | .  | .  | .  | .  | .  | .  | .  | . | . |

| AT command     | Serial interface |   |   |  |
|----------------|------------------|---|---|--|
|                | x                | N | g |  |
| SARA R404M-00B | •                | • | • |  |
| R410M-01B      | •                | • | • |  |
| R410M-02B      | •                | • | • |  |
| R412M-02B      | •                | • | • |  |
| R410M-52B      | •                | • | • |  |
| N410-02B       | •                | • | • |  |



| AT command |           | Short Messages Service |       |       |       |       |       |       |       |       |       |       |       |         |       |       |       |       |         |        |        |        |        |   |  |
|------------|-----------|------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---------|-------|-------|-------|-------|---------|--------|--------|--------|--------|---|--|
|            |           | +CMGD                  | +CMGF | +CMGL | +CMGR | +CMGS | +CMGW | +CMMS | +CMSS | +CNMA | +CNMI | +CPMS | +CRES | +CRTDCP | +CSAS | +CSCA | +CSMP | +CSMS | +CSODCP | +UCMGL | +UCMGR | +UCMGS | +UCMGW |   |  |
| SARA       | R404M-00B | •                      | •     | •     | •     | •     | •     | •     | •     | •     | •     | •     | •     |         | •     | •     | •     | •     |         |        |        |        |        |   |  |
|            | R410M-01B | •                      | •     | •     | •     | •     | •     | •     | •     | •     | •     | •     | •     |         | •     | •     | •     | •     |         |        |        |        |        |   |  |
|            | R410M-02B | •                      | •     | •     | •     | •     | •     | •     | •     | •     | •     | •     | •     |         | •     | •     | •     | •     |         | •      | •      | •      | •      |   |  |
|            | R412M-02B | •                      | •     | •     | •     | •     | •     | •     | •     | •     | •     | •     | •     |         | •     | •     | •     | •     |         |        |        |        |        |   |  |
|            | R410M-52B | •                      | •     | •     | •     | •     | •     | •     | •     | •     | •     | •     | •     |         | •     | •     | •     | •     |         | •      | •      | •      | •      |   |  |
|            | N410-02B  | •                      | •     | •     | •     | •     | •     | •     | •     | •     | •     | •     | •     | •       | •     | •     | •     | •     | •       | •      | •      | •      | •      | • |  |

| AT command     | SIM functionalities |       |         |         |       |          |           |  |
|----------------|---------------------|-------|---------|---------|-------|----------|-----------|--|
|                | +CLAN               | +CSIM | +CUSATR | +CUSATW | +UBIP | +UCUSATA | +USIMSTAT |  |
| SARA R404M-00B |                     |       |         |         |       |          |           |  |
| R410M-01B      |                     |       |         |         |       |          |           |  |
| R410M-02B      | •                   | •     | •       | •       | •     | •        | •         |  |
| R412M-02B      | •                   | •     | •       | •       | •     | •        | •         |  |
| R410M-52B      | •                   | •     | •       | •       | •     | •        | •         |  |
| N410-02B       | •                   | •     | •       | •       | •     | •        | •         |  |

| AT command |           | System features |        |         |            |             |         |           |         |           |             |       |           |        |        |  |
|------------|-----------|-----------------|--------|---------|------------|-------------|---------|-----------|---------|-----------|-------------|-------|-----------|--------|--------|--|
|            |           | +CPSMS          | +UANTR | +UCPSMS | +UFOTACONF | +UFWINSTALL | +UFWUPD | +UHOSTDEV | +ULGASP | +ULWM2M=0 | +ULWM2MSTAT | +UPSV | +URINGCFG | +UTEMP | +UTEST |  |
| SARA       | R404M-00B | •               | •      |         |            | •           | •       |           |         | •         | •           |       |           |        | •      |  |
|            | R410M-01B | •               | •      | •       |            | •           | •       | •         |         | •         | •           |       |           |        | •      |  |
|            | R410M-02B | •               | •      | •       |            | •           | •       | •         |         | •         | •           |       |           |        | •      |  |
|            | R412M-02B | •               | •      | •       |            | •           | •       | •         |         | •         | •           |       |           |        | •      |  |
|            | R410M-52B | •               | •      | •       | •          | •           | •       | •         | •       | •         | •           | •     | •         | •      | •      |  |
|            | N410-02B  | •               | •      | •       | •          | •           | •       | •         | •       | •         | •           | •     | •         | •      | •      |  |

| AT command |           | Internet protocol transport layer |           |           |           |           |           |           |        |           |        |        |         |        |        |        |        |        |        |         |        |        |        |  |
|------------|-----------|-----------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|--------|-----------|--------|--------|---------|--------|--------|--------|--------|--------|--------|---------|--------|--------|--------|--|
|            |           | +UDCONF=1                         | +UDCONF=2 | +UDCONF=3 | +UDCONF=5 | +UDCONF=6 | +UDCONF=7 | +UDCONF=8 | +USOCL | +USOCLCFG | +USOCO | +USOCR | +USOCTL | +USODL | +USOER | +USOGO | +USOLI | +USORD | +USORF | +USOSEC | +USOSO | +USOST | +USOWR |  |
| SARA       | R404M-00B | •                                 | •         | •         | •         | •         | •         | •         | •      |           | •      | •      | •       | •      | •      | •      | •      | •      | •      |         | •      | •      | •      |  |
|            | R410M-01B | •                                 | •         | •         | •         | •         | •         | •         | •      |           | •      | •      | •       | •      | •      | •      | •      | •      | •      |         | •      | •      | •      |  |
|            | R410M-02B | •                                 | •         | •         | •         | •         | •         | •         | •      | •         |        | •      | •       | •      | •      | •      | •      | •      | •      | •       | •      | •      |        |  |
|            | R412M-02B | •                                 | •         | •         | •         | •         | •         | •         | •      | •         |        | •      | •       | •      | •      | •      | •      | •      | •      | •       | •      | •      |        |  |
|            | R410M-52B | •                                 | •         | •         | •         | •         | •         | •         | •      | •         |        | •      | •       | •      | •      | •      | •      | •      | •      | •       | •      | •      |        |  |
|            | N410-02B  | •                                 | •         | •         | •         | •         | •         | •         | •      | •         | •      |        | •       | •      | •      | •      | •      | •      | •      | •       | •      | •      | •      |  |

## B.1 Parameters stored in profiles

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



SARA-R4 / SARA-N4

To partially display these profiles, see the [AT&V](#) command description. Not all the parameter setting are displayed through [AT&V](#) command.



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

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

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                                                                                                                                                                                                                                                                                                                                                                                        |
|------------------------|----------------------------------|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <a href="#">&amp;C</a> | DCD status                       | No                                 | 1 (DCD enabled)                                                                                                                                                                                                                                                                                                                                                                                                           |
| <a href="#">&amp;D</a> | DTR status                       | No                                 | 1 (DTR enabled)                                                                                                                                                                                                                                                                                                                                                                                                           |
| <a href="#">&amp;K</a> | Flow control status              | No                                 | 3 (RTS/CTS DTE flow control enabled)                                                                                                                                                                                                                                                                                                                                                                                      |
| <a href="#">&amp;S</a> | DSR override                     | No                                 | 1 (DSR line set to ON in data mode and to OFF in command mode)                                                                                                                                                                                                                                                                                                                                                            |
| <a href="#">+CMGF</a>  | Preferred message format         | Yes                                | 0 (format of messages in PDU mode)<br>• SARA-R4 / SARA-N4 - The command settings is not persistent                                                                                                                                                                                                                                                                                                                        |
| <a href="#">+CNMI</a>  | New message indication           | Yes                                | • 1 (discard indication and reject new received message URCs when MT-DTE link is reserved)<br>• 0 (no SMS-DELIVER indications are routed to the TE)<br>• 0 (no CBM indications to the DTE)<br>• 0 (no SMS-STATUS-REPORTs are routed to the DTE)<br>• 0 (MT buffer of URCs defined within this command is flushed to the DTE when >mode< 1...3 is entered)<br>• SARA-R4 / SARA-N4 - The command settings is not persistent |
| <a href="#">+COPS</a>  | Operator selection               | Yes                                | • 0 (autoregistration enabled)<br>• 0 (operator expressed in long alphanumeric format)<br>• FFFF (undefined PLMN to register when COPS=1)<br>• SARA-R4 / SARA-N4 - The command settings is not persistent                                                                                                                                                                                                                 |
| <a href="#">+ICF</a>   | DTE-DCE character framing        | No                                 | • SARA-R4 / SARA-N4 - 3, 1 (framing format: 8 data 1 stop, no parity)                                                                                                                                                                                                                                                                                                                                                     |
| <a href="#">+IFC</a>   | DTE-DCE local flow control       | No                                 | 2 (<DCE_by_DTE> on circuit 106 (CTS)), 2 (<DTE_by_DCE> on circuit 105 (RTS))                                                                                                                                                                                                                                                                                                                                              |
| <a href="#">+IPR</a>   | Baud rate                        | No                                 | • SARA-R4 / SARA-N4 - 115200 (115200 b/s)<br>• SARA-R4 / SARA-N4 - The command settings is not persistent                                                                                                                                                                                                                                                                                                                 |
| <a href="#">+UPSV</a>  | Power Saving (mode, Yes timeout) |                                    | 0 (power saving disabled)                                                                                                                                                                                                                                                                                                                                                                                                 |
| <a href="#">E</a>      | Echo status                      | No                                 | 1 (echo enabled)                                                                                                                                                                                                                                                                                                                                                                                                          |
| <a href="#">Q</a>      | Result code suppression          | No                                 | 0 (DCE transmits result codes)                                                                                                                                                                                                                                                                                                                                                                                            |
| <a href="#">S0</a>     | Automatic answer                 | No                                 | 0 (automatic answering disabled)                                                                                                                                                                                                                                                                                                                                                                                          |
| <a href="#">S2</a>     | Escape character selection       | No                                 | 43 (043 corresponds the '+' character)                                                                                                                                                                                                                                                                                                                                                                                    |

| AT command | Description                                                | AT interface configuration sharing | Factory-programmed value / Remarks                                                                                     |
|------------|------------------------------------------------------------|------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| S3         | Command line termination character                         | No                                 | 13 (0x0d corresponds to the carriage return character)                                                                 |
| S4         | Response formatting character                              | No                                 | 10 (0x0a corresponds to the line feed character)                                                                       |
| S5         | Command line editing character                             | No                                 | 8 (008 corresponds to the backspace character)                                                                         |
| S7         | Connection completion timeout                              | No                                 | 60                                                                                                                     |
| V          | DCE response format                                        | No                                 | 1 (Verbose response text)                                                                                              |
| X          | Result code selection and call progress monitoring control | No                                 | 4 (CONNECT <text> result code is given upon entering online data state; dial tone and busy detection are both enabled) |

## B.2 Parameters stored in non volatile memory

The following table lists the AT commands which setting can be stored in the non volatile memory with their parameters and the factory-programmed values.

| AT command | Description                                   | Factory-programmed value / Comment                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------------|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| +CCLK      | Clock                                         | 04/01/01,00:00:00+00                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| +CEDRXS    | eDRX setting                                  | 1 (eDRX usage enabled)                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| +CEMODE    | UE modes of operation for EPS                 | • SARA-R4 / SARA-N4 - 2 (CS/PS mode 2 of operation; "data centric")                                                                                                                                                                                                                                                                                                                                                                                              |
| +CGDCONT   | PDP context definition                        | • SARA-R4 / SARA-N4 - all contexts are undefined                                                                                                                                                                                                                                                                                                                                                                                                                 |
| +CPMS      | Preferred message storage                     | • SARA-R4 / SARA-N4 - <mem1>, <mem2> and <mem3> are set to "ME"                                                                                                                                                                                                                                                                                                                                                                                                  |
| +CPSMS     | Power Save Mode                               | • SARA-R4 / SARA-N4 - 0 (PSM disabled)                                                                                                                                                                                                                                                                                                                                                                                                                           |
| +CSAS      | Save settings                                 | 0 (profile 0 where to store the active message settings)                                                                                                                                                                                                                                                                                                                                                                                                         |
| +CSGT      | Set greeting text                             | Greeting text is empty                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| +CTZU      | Automatic time zone update                    | • SARA-R4 / SARA-N4 - 0 (automatic time zone via NITZ disabled)                                                                                                                                                                                                                                                                                                                                                                                                  |
| +UBIP      | Bearer Independent Protocol status indication | 0 (BIP status indication disabled)<br>• SARA-R4 / SARA-N4 - The command setting is not stored in the NVM                                                                                                                                                                                                                                                                                                                                                         |
| +UCUSATA   | Enable USAT terminal URCs                     | 0 (+CUSATEND, +CUSATP and +UUSIMSTAT URC disabled)                                                                                                                                                                                                                                                                                                                                                                                                               |
| +UDCONF=75 | PDP IP configuration when roaming             | • SARA-R4 / SARA-N4 - no context is defined                                                                                                                                                                                                                                                                                                                                                                                                                      |
| +UDCONF=76 | Configure data when roaming                   | • SARA-R4 / SARA-N4 - no context is defined                                                                                                                                                                                                                                                                                                                                                                                                                      |
| +UFOTACONF | uFOTA configuration                           | 1 (module registration to uFOTA server enabled), 604800 (7 days as timer for the periodic connection to the uFOTA server)                                                                                                                                                                                                                                                                                                                                        |
| +UGGGA     | Get GPS fix data                              | 0 (NMEA \$GGA messages disabled)                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| +UGLL      | Get geographic position                       | 0 (NMEA \$GLL messages disabled)                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| +UGGSA     | Get satellite information                     | 0 (NMEA \$GSA messages disabled)                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| +UGGSV     | Get number of GNSS satellites in view         | 0 (NMEA \$GSV messages disabled)                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| +UGPIOC    | GPIO functionality setting                    | • SARA-R4 / SARA-N4 - 255 (<gpio1>), 255 (<gpio2>), 255 (<gpio3>), 255 (<gpio4>), 255 (<gpio5>), 255 (<gpio6>)                                                                                                                                                                                                                                                                                                                                                   |
| +UGPRF     | GNSS profile configuration                    | 0 (No data flow on multiplexer, file and IP address), 0 (IP port not defined), "" (Server address string not defined)                                                                                                                                                                                                                                                                                                                                            |
| +UGRMC     | Get recommended minimum GNSS data             | 0 (NMEA \$RMC messages disabled)                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| +UGSRV     | Aiding server configuration                   | "cell-live1.services.u-blox.com" (primary MGA server), "cell-live2.services.u-blox.com" (secondary MGA server), 14 (Number of days for validation of Offline data), 4 (Number of weeks for validation of Offline data), 1 (Resolution of offline data for MGA), 65 (Desired GNSS for the (offline) aiding: GPS and GLONASS), 0 (AssistNow Online data are downloaded at GNSS receiver power up), 15 (all the desired data types for the (online) aiding are set) |

| AT command                | Description                             | Factory-programmed value / Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <a href="#">+UGVTG</a>    | Get course over ground and ground speed | 0 (NMEA \$VTG messages disabled)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <a href="#">+UGZDA</a>    | Get GPS time and date                   | 0 (NMEA \$ZDA messages disabled)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <a href="#">+UHOSTDEV</a> | LWM2M Host device information           | HMAN0 (Host Identification), HMOD0 (Host manufacturer name), HSW0 (Host model identification), HUID0 (Host software version)                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <a href="#">+ULGASP</a>   | Last gasp configuration                 | <ul style="list-style-type: none"> <li>SARA-R4 / SARA-N4 <ul style="list-style-type: none"> <li>&lt;GPIO_mode&gt;: 0 (disabled)</li> <li>&lt;text&gt;: ""</li> <li>&lt;msg_format&gt;: 0 (text)</li> <li>&lt;profile_id&gt;: 1</li> <li>&lt;IP_protocol&gt;: 17 (UDP)</li> <li>&lt;IP_addr:PORT&gt;: "" (empty)</li> <li>&lt;method&gt;: 1 (use IP (TCP or UDP) connection)</li> <li>&lt;urc_enable&gt;: 1 (URC enabled)</li> <li>&lt;nv_upd_freq&gt;: 60 (NVM update frequency in seconds)</li> <li>&lt;tx_count&gt;: 1 (number of times to transmit the Last Gasp message)</li> </ul> </li> </ul> |
| <a href="#">+ULOGNSS</a>  | Configure GNSS sensor                   | <ul style="list-style-type: none"> <li>15 (Local aiding, AssistNow online, AssistNow offline, AssistNow autonomous enabled), 0 (power saving disabled), 3 (Minimum number of satellites for navigation), 7 (Minimum satellite signal level for navigation), 0 (Disabled initial Fix must be 3D flag), 0 (Static Hold Mode), 0 (SBAS disabled), 0 (Jamming indicator disabled), 0 (Antenna settings unknown), 0 (Broadband jamming detection threshold: 0 dB), 0 (Continuous wave jamming detection threshold: 0 dB), 1 (GPS), 0, 0</li> </ul>                                                       |
| <a href="#">+UPSD</a>     | Packet switched data                    | Empty profile                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <a href="#">+URAT</a>     | Selection of Radio Access Technology    | <ul style="list-style-type: none"> <li>SARA-R404M - 3 (LTE RAT)</li> <li>SARA-R410M - 7 (LTE Cat.M1), 8 (LTE Cat.NB1)</li> <li>SARA-N4 - 8 (LTE Cat.NB1)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <a href="#">+URINGCFG</a> | RING line configuration                 | 0 (RING line handling disabled)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <a href="#">+USIMSTAT</a> | (U)SIM initialization status reporting  | 0 (URC +UUSIMSTAT disabled) <ul style="list-style-type: none"> <li>SARA-R4 / SARA-N4 - The command setting is not stored in the NVM</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <a href="#">+USOCLCFG</a> | Configure Dormant Close Socket Behavior | 1 (TCP socket Graceful Dormant Close feature enabled)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <a href="#">+VZWAPNE</a>  | Edit Verizon wireless APN table         | Verizon wireless APN table (APN list entry, APN class, Network identifier, APN type, APN bearer, APN status, APN inactivity timer) <ul style="list-style-type: none"> <li>1,1,"VZWIMS","ipv4v6","LTE","Enabled",0</li> <li>2,2,"VZWADMIN","ipv4v6","LTE","Enabled",0</li> <li>3,3,"VZWINTERNET","ipv4v6","LTE","Enabled",0</li> <li>4,4,"VZWAPP","ipv4v6","LTE","Enabled",0</li> </ul>                                                                                                                                                                                                              |

## B.3 Saving AT commands configuration



SARA-R4 / SARA-N4

Saving AT commands configuration is not supported.

## 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 Commands response |                          |
|--------------------------|-------------------------------------------------|--------------------------|
| Power off                | < 40 s                                          | <a href="#">+CPWROFF</a> |
| Set module functionality | Up to 3 min                                     | <a href="#">+CFUN</a>    |

| Category                                 | Estimated maximum time to get Commands response                                 |                                                                                              |
|------------------------------------------|---------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| Call control                             | < 20 s                                                                          | A, H                                                                                         |
| Dial                                     | Up to 3 min                                                                     | D                                                                                            |
| Network commands                         | Up to 3 min                                                                     | +CGATT, +COPS                                                                                |
| Security                                 | Up to 3 min                                                                     | +CLCK, +CPWD                                                                                 |
| Delete all SMSes                         | < 55 s                                                                          | +CMGD                                                                                        |
| SMS acknowledgement to MT                | < 150 s                                                                         | +CNMA                                                                                        |
| SMS                                      | Up to 3 min (<1 s for prompt ">")                                               | +CPMS, +CMGL, +CMSS, +CMGS, +UCMGS, +UCMGL                                                   |
| SIM management                           | < 10 s                                                                          | +CMGW, +UCMGW, +CMGR, +UCMGR, +CNUM, +CPIN, +CRES, +CSCA, +CSMP                              |
| PDP context activation                   | < 150 s                                                                         | +CGACT                                                                                       |
| PDP context deactivation                 | < 40 s                                                                          | +CGACT                                                                                       |
| GPIO commands                            | < 10 s                                                                          | +UGPIOC, +UGPIOR, +UGPIOW                                                                    |
| Internet suite (socket connect)          | • SARA-R4 / SARA-N4 - < 120 s                                                   | +USOCO                                                                                       |
| Internet suite (socket connect with SSL) | • SARA-R4 / SARA-N4 - < 1 s                                                     | +USOSEC                                                                                      |
| Internet suite (socket write)            | • SARA-R4 / SARA-N4 - < 120 s                                                   | +USOWR                                                                                       |
| Internet suite (UDP socket write)        | • SARA-R4 / SARA-N4 - < 10 s                                                    | +USOST                                                                                       |
| Internet suite (socket closure)          | • SARA-R4 / SARA-N4 - < 120 s                                                   | +USOCL                                                                                       |
| Internet suite                           | • SARA-R4 / SARA-N4 - < 1 s                                                     | +USODL, +USOLI, +USORD, +USORF                                                               |
| Resolve name/IP number through DNS       | < 70 s (except URC)                                                             | +UDNSRN                                                                                      |
| GNSS commands                            | < 10 s (except +UGPS for which timeout is according to the performed operation) | +UGAOS, +UGGGA, +UGGLL, +UGGSA, +UGGSV, +UGPS, +UGRMC, +UGTMR, +UGUBX, +UGVTG, +UGZDA, +ULOC |
| Last gasp configuration                  | < 10 s                                                                          | +ULGASP                                                                                      |
| MQTT command                             | < 60 s                                                                          | +UMQTTC                                                                                      |

## B.5 Multiple AT command interfaces

u-blox cellular modules support multiple AT command interfaces, that means a certain number of virtual or physical channels that work as described in [Definitions](#).

Each interface maintains an own run-time AT commands configuration (AT command profile); this means that the AT command profile is different among the interfaces and therefore the AT commands configuration for the commands belonging to the profile can be different among the interfaces.

At the module start-up, since there is only a set of the profiles (not one for each interface), all the interfaces are configured in the same way (AT commands configuration for the commands in the profile is the same for all the interfaces). Subsequently, each interface can change its run-time AT profile (stored in RAM). The commands [AT+W](#), [AT+V](#) manage this run-time AT commands configuration for the interface where they are issued.

The USB interface implements multiple AT command interfaces. Unlike what happens for the other physical interfaces (e.g. UART, SPI), the AT command interfaces that run on the USB interface only exists as long as the USB interface connects the module with the DTE. As a result, if the USB connection between the module and the DTE is interrupted (e.g. by USB cable removal), all the AT command interfaces running on it are destroyed. This has two main consequences:

- Any data connection (both circuit switched and packet switched) established over an AT command interface associated to the USB interface is released.
- As already explained in [Appendix B.1](#), whenever the USB connection between the module and the DTE is re-established, the AT command interfaces running on it are created, and for each of these interfaces the AT command profile is reloaded from NVM and applied.





The reload of the AT command profile from the NVM also results in the re-application of the **+UPSV** setting, which is a shared "AT interface configuration". This must be kept in mind, since the change could have impacts on the communication over the UART interface.

As mentioned in [Definitions](#), generally there is not difference in the execution of an AT command among the interfaces. But, there are some exceptions due to interface restrictions. In particular, the differences relate to AT commands that configure the DCE-DTE interface.

[Table 24](#) provides the major differences.

| AT command    | UART / AUX UART<br>(where available) | Multiplexer                                                                           | USB (where available)                                                                                                    | SPI (where available)                                                                                                    |
|---------------|--------------------------------------|---------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| <b>&amp;K</b> | Effective                            | When it returns OK (the configuration is allowed), it is effective                    | When it returns OK (the configuration is allowed), it is not effective (only change the value in the AT command profile) | When it returns OK (the configuration is allowed), it is not effective (only change the value in the AT command profile) |
| <b>\Q</b>     | Effective                            | When it returns OK (the configuration is allowed), it is effective                    | When it returns OK (the configuration is allowed), it is not effective (only change the value in the AT command profile) | When it returns OK (the configuration is allowed), it is not effective (only change the value in the AT command profile) |
| <b>+ICF</b>   | Effective                            | Returns OK, but it is not effective (only change the value in the AT command profile) | Returns OK, but it is not effective (only change the value in the AT command profile)                                    | Returns OK, but it is not effective (only change the value in the AT command profile)                                    |
| <b>+IFC</b>   | Effective                            | When it returns OK (the configuration is allowed), it is effective                    | When it returns OK (the configuration is allowed), it is not effective (only change the value in the AT command profile) | When it returns OK (the configuration is allowed), it is not effective (only change the value in the AT command profile) |
| <b>+IPR</b>   | Effective                            | Returns OK, but it is not effective (only change the value in the AT command profile) | Returns OK, but it is not effective (only change the value in the AT command profile)                                    | Returns OK, but it is not effective (only change the value in the AT command profile)                                    |
| <b>+UPSV</b>  | Effective                            | Returns OK, but it changes UART setting                                               | Returns OK, but it changes UART setting                                                                                  | Returns OK, but it changes UART setting                                                                                  |

**Table 24: Interface comparison**

## C Appendix: UDP Direct Link workflow

### C.1 Data from the IP network to the external port

When a UDP data packet is received from the network, its payload is forwarded through the external port as soon as possible (according to the HW flow control, if any).

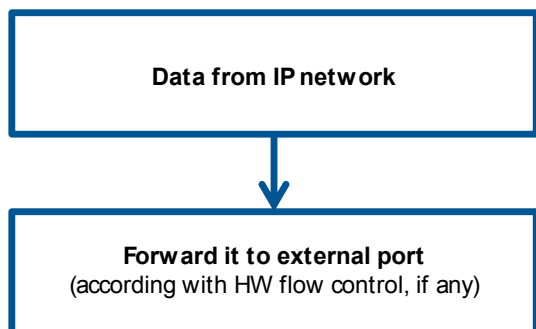


Figure 10: Workflow of data from the IP network to the external port

### C.2 Data from the external port to the IP network

When some data comes from the external port, there are 2 parameters involved:

1. The UDP DL packet size (factory-programmed: 1024 bytes; valid range 100-1472)
2. The UDP DL sending timer delay (factory-programmed: 1000 ms; valid range 100-120000)

Both parameters are specific for each socket and could be modified by the user. These values are not saved into the NVM and if not specified, the factory-programmed values are used.

There are 3 different cases that may occur while receiving data from the external port in UDP DL mode:

1. The received data from the external port is equal to the UDP DL packet size: the received data is immediately sent to the network
2. The received data from the external port is more than the UDP DL packet size: the amount of data till UDP DL packet size is immediately sent to the network, the remaining data is saved into an intermediate buffer.
3. The received data from the external port is less than UDP DL packet size: the received data is saved into an intermediate buffer and sent to the network when the UDP DL sending timer expires. The timer is reset (it restarts the countdown) every time new data is received from the external port, this means that the data will be sent to the network after N ms (default 1000 ms) since the last received byte.



The data sent from the serial port is not echoed to the sender.



The configuration of UDP DL packet size and UDP DL sending timer are NOT saved in NVM.

The following diagram shows how the events of external data input and sending timer expire are handled.

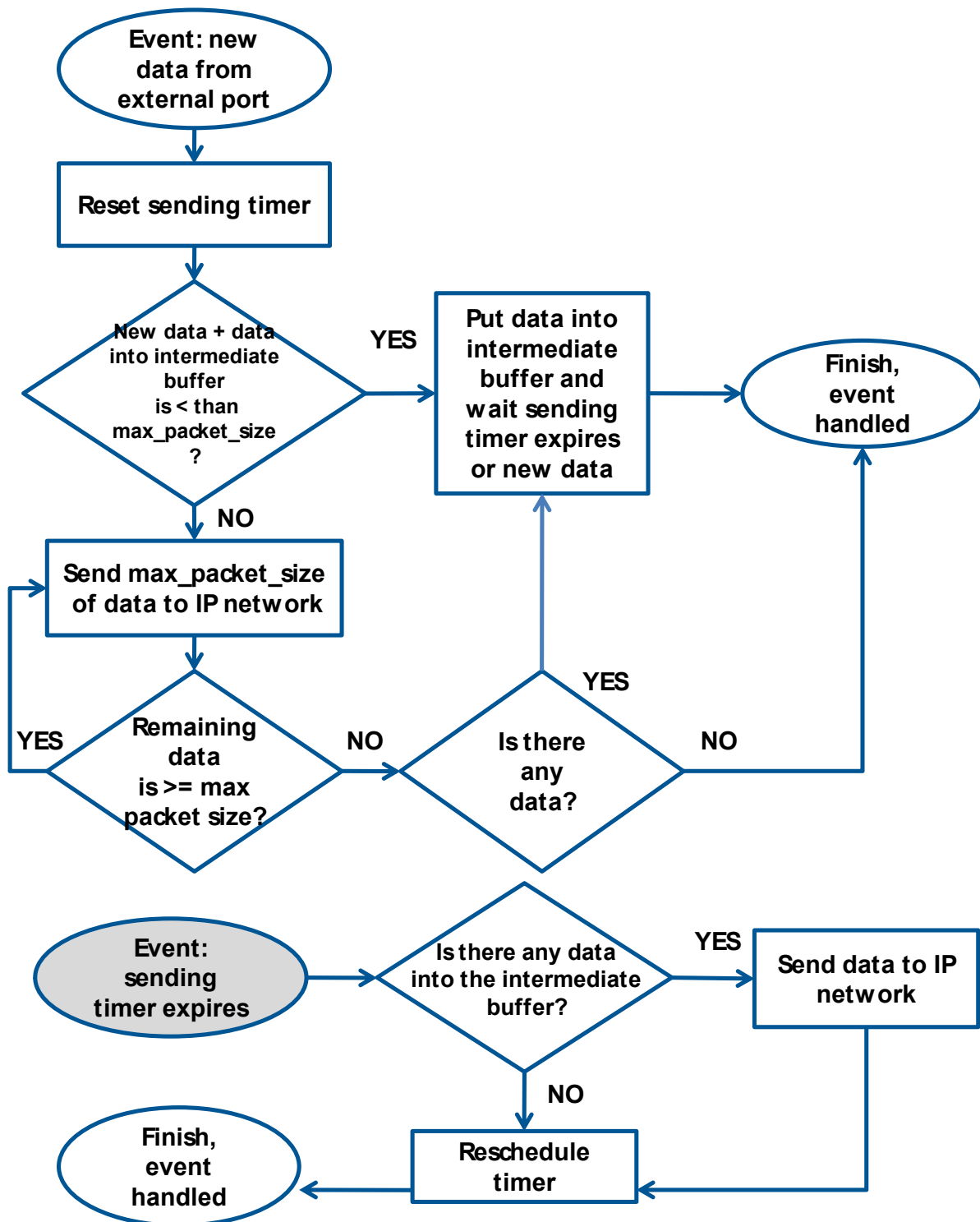


Figure 11: Workflow of data from the external port to the IP network

## D Appendix: Glossary

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

|                  |                                                         |
|------------------|---------------------------------------------------------|
| FOAT             | Firmware Over AT                                        |
| FOTA             | Firmware Over The Air                                   |
| FS               | File System                                             |
| FTP              | File Transfer Protocol                                  |
| FW               | Firmware                                                |
| FWINSTALL        | Firmware Install                                        |
| GAS              | Grouping information Alpha String                       |
| GERAN            | GSM/EDGE Radio Access Network                           |
| GPIO             | General Purpose Input Output                            |
| GPRS             | General Packet Radio Service                            |
| GPS              | Global Positioning System                               |
| GSM              | Global System for Mobile Communications                 |
| HDLC             | High Level Data Link Control                            |
| HNB              | Home Node B                                             |
| HPLMN            | Home PLMN                                               |
| HTTP             | HyperText Transfer Protocol                             |
| I                | Information                                             |
| I <sup>2</sup> C | Inter-Integrated Circuit                                |
| I <sup>2</sup> 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                              |
| NAA              | Network Access Application                              |
| NAS              | Non Access Stratum                                      |
| NITZ             | Network Identity and Time Zone                          |
| NVM              | Non-Volatile Memory                                     |
| ODIS             | OMA-DM IMEI Sync                                        |

|       |                                                 |
|-------|-------------------------------------------------|
| OLCM  | On Line Commands Mode                           |
| PAD   | Packet Assembler/Disassembler                   |
| P-CID | Physical Cell Id                                |
| PCN   | Personal Communication Network                  |
| PDP   | Packet Data Protocol                            |
| PDU   | Protocol Data Unit                              |
| PIN   | Personal Identification Number                  |
| PLMN  | Public Land Mobile Network                      |
| PPP   | Point-to-Point Protocol                         |
| PSAP  | Public Safety Answering Point (eCall related)   |
| PSD   | Packet-Switched Data                            |
| 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

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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
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- 159. RFC 7252 - Constrained Application Protocol (CoAP)



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## Revision history

| Revision | Date        | Name | Comments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------|-------------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| R01      | 27-Jan-2017 | jole | Initial release                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| R02      | 03-Apr-2017 | jole | Removed +UPSV. Added <a href="#">+CPSMS</a> . General document clean-up                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| R03      | 04-May-2017 | jole | Added SARA-R410M                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| R04      | 24-May-2017 | jole | Moved to Advance Information for SARA-R404M                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| R05      | 19-Jul-2017 | jole | Extended document applicability to SARA-R410M-02B.<br><br>Added <a href="#">+ULWM2M</a> , <a href="#">+ULWM2MSTAT</a> and <a href="#">+CNUM</a> . Changed <a href="#">+CPSMS</a> back to it's original 3GPP definition. Added FOAT file tag.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| R06      | 30-Oct-2017 | jole | Extended document applicability to SARA-R412M-02B.<br><br>Added DTR and PPP behavior clarification. Updated max response time for <a href="#">+USOCL</a> .<br><br>New commands: <a href="#">+UCPSMS</a> , <a href="#">+CCLK</a> , <a href="#">+CTZU</a> , <a href="#">+CEDRXS</a> , <a href="#">+CEDRXRDP</a> , <a href="#">+USECMNG</a> , <a href="#">+USECPRF</a> , <a href="#">+USOSEC</a> and <a href="#">O</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| R07      | 09-Feb-2018 | jole | New commands: <a href="#">+CSCS</a> , <a href="#">+UCGED</a> , <a href="#">+PACSP</a> , <a href="#">+UMNOPROF</a> , <a href="#">+UBANDMASK</a> , <a href="#">+UCMGR</a> , <a href="#">+UCMGL</a> , <a href="#">+UCMGS</a> , <a href="#">+UCMGW</a> , <a href="#">+USIMSTAT</a> , <a href="#">+CSIM</a> , <a href="#">+CLAN</a> , <a href="#">+UBIP</a> , <a href="#">+CUSATR</a> , <a href="#">+CUSATW</a> , <a href="#">+UCUSATA</a> , <a href="#">+CEMODE</a> , <a href="#">+UDCONF=75</a> , <a href="#">+UDCONF=76</a> , <a href="#">+UDWNBLOCK</a> , <a href="#">+URDBLOCK</a> , <a href="#">+USOCLCFG</a> , <a href="#">+UGPS</a> , <a href="#">+UGAOS</a> , <a href="#">+UGSRV</a> , <a href="#">+UGIND</a> , <a href="#">+UGPRF</a> , <a href="#">+UGUBX</a> , <a href="#">+UGTMR</a> , <a href="#">+UGZDA</a> , <a href="#">+UGGGA</a> , <a href="#">+UGGLL</a> , <a href="#">+UGGSV</a> , <a href="#">+UGRMC</a> , <a href="#">+UGVTG</a> , <a href="#">+UGGSA</a> , <a href="#">+ULOC</a> , <a href="#">+ULOCIND</a> , <a href="#">+ULOCGNSS</a> , <a href="#">+UI2CO</a> , <a href="#">+UI2CW</a> , <a href="#">+UI2CR</a> , <a href="#">+UI2CREGR</a> , <a href="#">+UI2CC</a> .<br><br>Modified commands: <a href="#">+CMUX</a> , <a href="#">D</a> , <a href="#">+COPS</a> , <a href="#">+URAT</a> , <a href="#">+CEDRXS</a> , <a href="#">+CEDRXRDP</a> , <a href="#">&amp;D</a> , <a href="#">S2</a> , <a href="#">+IPR</a> , <a href="#">D*</a> , <a href="#">+CEREG</a> , <a href="#">+CGACT</a> , <a href="#">+CPSMS</a> , <a href="#">+UCPSMS</a> , <a href="#">GPIO introduction</a> , <a href="#">File System Introduction</a> , <a href="#">+USODL</a> , <a href="#">+USOCTL</a> , <a href="#">+USECMNG</a> , <a href="#">+USECPRF</a> , <a href="#">AT commands</a> .<br><br>Updated estimated response time information for these commands: <a href="#">+USOCL</a> , <a href="#">+USOCO</a> , <a href="#">+USOWR</a> . |
| R08      | 27-Apr-2018 | jole | New commands: <a href="#">+CREG</a> , <a href="#">+UMNOPROF</a> , <a href="#">+UPSD</a> , <a href="#">+CGEREP</a> , <a href="#">+CGREG</a> , <a href="#">+UMQTT</a> , <a href="#">+UMQTTWTOPIC</a> , <a href="#">+UMQTTWMSG</a> , <a href="#">+UMQTTNV</a> , <a href="#">+UMQTTT</a> , <a href="#">+UMQTTT</a> .<br><br>Modified commands: <a href="#">+COPS</a> , <a href="#">\Q</a> , <a href="#">+CGDCONT</a> , <a href="#">+CEMODE</a> , <a href="#">+UAUTHREQ</a> , <a href="#">+UTEST</a> , <a href="#">File System Introduction</a> , <a href="#">Internet protocol transport layer</a> , <a href="#">+USOGO</a> , <a href="#">+USOCL</a> , <a href="#">+USOCLCFG</a> , <a href="#">+USOSEC</a> , <a href="#">+USOCO</a> , <a href="#">Internal TCP/UDP/IP stack class error codes</a> , <a href="#">Parameters stored in profiles</a> .<br><br>Updated estimated response time information for these commands: <a href="#">+USOCL</a> , <a href="#">+USOCO</a> , <a href="#">+USOST</a> , <a href="#">+USOSEC</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| R09      | 15-Jun-2018 | jole | Extended the document applicability to SARA-R410M-52B and SARA-N410-02B.<br><br>New commands: <a href="#">+CSGT</a> , <a href="#">+CRTDCP</a> , <a href="#">+CSODCP</a> , <a href="#">+UPSV</a> , <a href="#">+UFOTACONF</a> , <a href="#">+ULGASP</a> , <a href="#">+UTEMP</a> , <a href="#">+UDNSRN</a> .<br><br>Modified commands: <a href="#">+CMUX</a> , <a href="#">+CFUN</a> , <a href="#">+CSQ</a> , <a href="#">+COPS</a> , <a href="#">+UCGED</a> , <a href="#">+UMNOPROF</a> , <a href="#">&lt;PDP_Type&gt;</a> , <a href="#">+CEREG</a> , <a href="#">+UDCONF=76</a> , <a href="#">+UFWINSTALL</a> , <a href="#">+UTEST</a> , <a href="#">+CPSMS</a> , <a href="#">GPIO introduction</a> , <a href="#">+USODL</a> , <a href="#">SSL/TLS introduction</a> , <a href="#">+USECMNG</a> , <a href="#">+USECPRF</a> , <a href="#">+UHTTP</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| R10      | 03-Aug-2018 | jole | New commands: <a href="#">+UHOSTDEV</a> , <a href="#">+URINGCFG</a> .<br><br>Modified commands: <a href="#">+URAT</a> , <a href="#">+UBANDMASK</a> , <a href="#">+CEDRXS</a> , <a href="#">+CPMS</a> , <a href="#">&amp;K</a> , <a href="#">+IFC</a> , <a href="#">+USIMSTAT</a> , <a href="#">+UCUSATA</a> , <a href="#">+CUSATR</a> , <a href="#">+CUSATW</a> , <a href="#">+UTEST</a> , <a href="#">+UTEMP</a> , <a href="#">+UFOTACONF</a> , <a href="#">GPIO introduction</a> , <a href="#">+USOSO</a> , <a href="#">+USOCTL</a> , <a href="#">+UDCONF=5</a> , <a href="#">+UI2CR</a> , <a href="#">+UMQTT</a> , <a href="#">+UMQTTT</a> .<br><br>Review the command applicability for these commands: <a href="#">&amp;K</a> , <a href="#">+IFC</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

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