CELLULAR

SARA-N2 Modules

Power-optimized NB-IoT (LTE Cat NB1) modules

AT Commands Manual

Abstract

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

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Document Information		
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Preface

Applicable products

This document applies to the following products:

Name	Type number	Modem version	Application version	PCN reference
SARA-N200	SARA-N200-02B-00	06.57	A02.02	UBX-17056257
SARA-N201	SARA-N201-02B-00	06.57	A02.02	UBX-17056257
SARA-N210	SARA-N210-02B-00	06.57	A02.02	UBX-17056257
SARA-N211	SARA-N211-02B-00	06.57	A02.02	UBX-17056257
SARA-N280	SARA-N280-02B-00	06.57	A02.02	UBX-17056257

How to use this Manual

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

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

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

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

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

Summary table

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

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

It is composed by two sections:

- **Modules**: lists all the modules that support the command. The modules are grouped in rows by cellular standard (i.e. L for LTE high data rate (Cat 3 and above), R for LTE low data rate (Cat 1 and below), U for UMTS/HSPA, G for GSM/GPRS). In each row the modules are grouped by: form factor (i.e. SARA, LISA), platform technology (e.g. SARA-G), platform generation (e.g. SARA-G3), product name (e.g. SARA-G350) and ordering code (e.g. SARA-G350-00S). In example: if 'LISA-U2' is reported, the command applies to all the modules having LISA form factor, second chipset version provided with any release of firmware.
- **Attributes**
  - **Syntax**
    - **full**: the command syntax is fully compatible among all the products listed in the "Modules" section
    - **partial**: the products support different syntaxes (usually backward compatible with respect to previous cellular standards)
  - **PIN required**
    - **Yes**: it is necessary to insert the PIN before the set and/or read command execution
    - **No**: the PIN insertion is not needed to execute the command
  - **Settings saved**
    - **Profile**: the command setting can be saved in a personal profile as specified in *Chapter 1.2*

- **NVM**: the command setting is saved in the non-volatile memory as specified in *Chapter 1.2*
- **No**: the current command setting is volatile and cannot be saved
o **Can be aborted**
- **Yes**: the command execution can be aborted if a character is sent to the DCE during the command execution
- **No**: the command cannot be aborted during the command execution
o **Response time**: estimated maximum time to get the final result code for the AT command execution. More precisely, the command response time measures the time from the complete acquisition of the command line to the issuing of the command result code.

The response time specified in this manual is generally lower than the time measured by the application on the DTE, because the issuing of the command on the DTE is influenced by the AT interface characteristics (e.g. the synchronous/asynchronous transfer type, the selected baudrate, etc.), by power saving and flow control, which introduces a variable latency in the command acquisition by the DCE.

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

u-blox Technical Documentation

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

AT Commands Manual: This document provides the description of the AT commands supported by u-blox cellular modules.

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

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

Questions

If you have any questions about u-blox Cellular Hardware Integration, please:
• Read this manual carefully
• Contact our information service on our homepage *www.u-blox.com*
• Read the questions and answers on our FAQ database

Technical Support

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

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

Helpful Information when Contacting Technical Support
When contacting Technical Support please have the following information ready:
• Module type (e.g. SARA-G350-00S-00) and firmware version (e.g. 08.49)
• Module configuration
• Clear description of your question or the problem
• A short description of the application
• Your complete contact details

Contents

1 AT command settings

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

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

1.1 Definitions

In this document the following naming conventions are used:

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

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

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

The DCE/MT interface can operate in these modes:

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

☞ SARA-N2
The data mode is not supported.

1.1.1 Command description

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

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

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

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

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

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

1.1.2 Default values

If the command parameters are optional, they can be left out in the command line. If not otherwise specified, the default values are assumed as follows:
- For parameters of type Number, the default value is 0
- For parameters of type String, the default value is an empty string

1.1.3 Command line

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

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

Where:
- "AT": prefix to be set at the beginning of each command line
- <command_name>: command name string; it can have a "+" character as prefix
- <string>: string consisting of the parameters value following the syntax provided in this manual
  The following rules are used when describing the command syntax:
  o <...>: the name in angle brackets is a parameter. The brackets themselves do not appear in the command line
  o [...]: the square brackets represent the optional parameters of a command or an optional part of the DCE information text response. Brackets themselves do not appear in the command line. When a parameter is not given, the value will be set to the default value provided in the command description

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

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

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

☞ When writing or sending an SMS, Ctrl-Z or ESC terminates the command; <CR> is used between the two parts of the SMS (address and text).

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

1.1.3.1 Concatenation of AT commands

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

```
Example: ATI;+CGATT?;+COPS?<CR>
```

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

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

1.1.4 Notes

SARA-N2

- The maximum length of the command line is 1024 characters.
- String parameter type limitations - The following characters are not allowed in the parameter string:
    - 0x00 (NUL)
    - 0x0D (CR)
    - 0x15 (NAK)
    - 0x22 (")
    - 0x2C (,)

1.1.5 Information text responses and result codes

The AT command response comprises an optional information text string and a final result code. The *V* command configures the result code in numeric or verbose format:

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

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

Table 1 lists the allowed result codes.

Verbose	Numeric	Result code type	Description
OK	0	Final	Command line successfully processed and the command is correctly executed
CONNECT	1	Intermediate	Data connection established
RING	2	Unsolicited	Incoming call signal from the network
NO CARRIER	3	Final	Connection terminated from the remote part or attempt to establish a connection failed
ERROR	4	Final	General failure. The *AT+CMEE* command configures the error result format
NO DIALTONE	6	Final	No dialtone detected
BUSY	7	Final	Engaged signal detected (the called number is busy)
NO ANSWER	8	Final	No hang up detected after a fixed network timeout
CONNECT<data rate>	9	Intermediate	Same as CONNECT including also the data rate (data call). See the *+CBST* AT command for the allowed values of <data rate>. ☞ In case of data/fax call, see *Circuit 108/2, +++ behaviour for the different &D: summarizing table* to return in command mode and disconnect the call.
Command aborted	3000	Final	Command execution aborted issuing a character to the DCE

Table 1: Allowed result codes

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 *+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. In this manual it is assumed that AT+CMEE=2, which results in error result code of the format:

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

where <err> represents the verbose error result code. If AT+CMEE=1 command is issued, <err> represents the numeric error result code.

The most typical error result codes are the following:

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

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

1.2 Profiles

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

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

2 General operation

2.1 Start up and initialization
A complete start up can take place only with a SIM card with disabled PIN check.

2.2 AT commands types

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

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

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

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

2.2.5 Unsolicited Result Code (URC)
An unsolicited result code is a string message (provided by the DCE) that is not triggered as a information text response to a previous AT command and can be output, when enabled, at any time to inform the DTE of a specific event or status change.

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

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

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

The list of possible reboot reasons are:
• REBOOT_CAUSE_SECURITY_RESET_UNKNOWN
• REBOOT_CAUSE_SECURITY_SYSRESETREQ
• REBOOT_CAUSE_SECURITY_WATCHDOG
• REBOOT_CAUSE_SECURITY_SELF
• REBOOT_CAUSE_SECURITY_ALTBOOT
• REBOOT_CAUSE_SECURITY_REGIONS_UPDATED
• REBOOT_CAUSE_PROTOCOL_UNKNOWN
• REBOOT_CAUSE_PROTOCOL_SYSRESETREQ

- REBOOT_CAUSE_PROTOCOL_WATCHDOG
- REBOOT_CAUSE_PROTOCOL_MONITOR_REBOOT_REQ
- REBOOT_CAUSE_APPLICATION_UNKNOWN
- REBOOT_CAUSE_APPLICATION_SYSRESETREQ
- REBOOT_CAUSE_APPLICATION_WATCHDOG
- REBOOT_CAUSE_APPLICATION_AT
- REBOOT_CAUSE_UNKNOWN

3 General

3.1 Manufacturer identification +CGMI

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

3.1.1 Description
Text string identifying the manufacturer.

3.1.2 Syntax

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

3.1.3 Defined values

Parameter	**Type**	**Description**
<manufacturer>	String	Manufacturer name

3.2 Model identification +CGMM

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

3.2.1 Description
Text string identifying the model identification.

3.2.2 Syntax

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

3.2.3 Defined values

Parameter	**Type**	**Description**
<model>	String	Name of model

3.3 Firmware version identification +CGMR

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

3.3.1 Description
Returns the firmware version of the module.

3.3.2 Syntax

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

3.3.3 Defined values

Parameter	Type	Description
<version>	String	Firmware version

3.4 IMEI identification +CGSN

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

3.4.1 Description

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

3.4.2 Syntax

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

3.4.3 Defined values

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

3.4.4 Notes

SARA-N2

- <snt>=0 provides the 128-bit UUID of the UE.
- <snt>=255 is not supported.

3.5 Identification information I

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

3.5.1 Description

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

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

3.5.2 Syntax

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

3.5.3 Defined values

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

3.6 International mobile subscriber identification +CIMI

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

3.6.1 Description

Request the IMSI (International Mobile Subscriber Identity).

3.6.2 Syntax

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

3.6.3 Defined values

Parameter	Type	Description
<IMSI>	Number	International Mobile Subscriber Identity

3.6.4 Notes

SARA-N2
- The IMSI may not be displayed for a few seconds after the module power-on.

3.7 Card identification +CCID

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

3.7.1 Description

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

3.7.2 Syntax

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

3.7.3 Defined values

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

3.7.4 Notes
- The command needs of the SIM to correctly work.

3.8 List all available AT commands +CLAC

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

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

3.8.2 Syntax

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

3.8.3 Defined values

Parameter	Type	Description
<AT command>	String	AT command name

4 Mobile equipment control and status

4.1 Set module functionality +CFUN

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

4.1.1 Description

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

☞ 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.

4.1.2 Syntax

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

4.1.3 Defined values

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

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

4.1.4 Notes

SARA-N2
- Only <fun>=0 and <fun>=1 are allowed.
- Parameters <rst>, <power_mode> and <STK_mode> are not supported.
- The module enters the deep-sleep power mode whenever possible.

4.2 Clock +CCLK

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

4.2.1 Description

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

4.2.2 Syntax

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

4.2.3 Defined values

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

4.2.4 Notes

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

SARA-N2
- Time setting is not permanently stored in NVM.
- The set command is not supported.

4.3 Automatic time zone update +CTZU

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

4.3.1 Description

Configures the automatic time zone update via NITZ.

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

4.3.2 Syntax

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

4.3.3 Defined values

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

4.3.4 Notes

SARA-N2
• The factory-programmed value of the <on_off> parameter is 1.

4.4 Time zone reporting +CTZR

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

4.4.1 Description

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

4.4.2 Syntax

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

Type	Syntax	Response	Example
		OK	OK
URC		+CTZV: <tz>[,<time>]	+CTZV: +04,"12/12/31,23:46:33"
URC		+CTZE: <tz>,<dst>[,<time>]	+CTZE: +04,1,"12/12/31,23:46:33"
URC		+CTZEU: <tz>,<dst>[,<utime>]	+CTZEU: +04,1
URC		+CTZDST: <dst>	+CTZDST: 1

4.4.3 Defined values

Parameter	Type	Description
<onoff>	Number	• 0 (default value): disable the time zone change event reporting • 1: enable the time zone reporting by +CTZV and +CTZDST URCs • 2: enable the time zone reporting by +CTZE URC • 3: enable the time zone reporting and universal time reporting by +CTZEU URC
<tz>	Number	Indicates the time zone. The range goes from -48 to +56.
<time>	String	Current local time in format "yy/MM/dd,hh:mm:ss". The characters indicate year, month, day, hour, minutes, seconds.
<dst>	Number	Indicates the daylight saving time. The allowed values are: • 0: no adjustments • 1: +1 hour adjustment • 2: +2 hours adjustment
<utime>	String	Universal time in format "yyyy/MM/dd,hh:mm:ss". The characters indicate year, month, day, hour, minutes, seconds.

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

SARA-N2
- +CTZDST URC is not supported.
- Format for <time> will be "yy/MM/dd,hh:mm:ss".

4.5 Report mobile termination error +CMEE

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

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

4.5.2 Syntax

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

4.5.3 Defined values

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

4.5.4 Notes

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

SARA-N2

- <n> = 2 is not supported.

4.6 Reboot +NRB

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

4.6.1 Description

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

4.6.2 Syntax

Type	Syntax	Response	Example
Action	AT+NRB		
IRC		REBOOTING	REBOOTING

4.7 UE statistics +NUESTATS

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

4.7.1 Description

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

4.7.2 Syntax

Type	Syntax	Response	Example
Generic syntax			
Read	AT+NUESTATS[=<type>]	+NUESTATS: <type>,<param_name>, <value> OK	
Radio specific information			
Read	AT+NUESTATS[="RADIO"]	+NUESTATS: "RADIO",<param_name>, <value> [[..]	AT+NUESTATS="RADIO" +NUESTATS: "RADIO","Signal_power", -508

Type	Syntax	Response	Example
		[+NUESTATS: "RADIO",<param_name>, <value>]]	+NUESTATS: "RADIO","Total_power",-500
		OK	+NUESTATS: "RADIO","TX_power",-30
			+NUESTATS: "RADIO","TX_time",2393
			+NUESTATS: "RADIO","RX_time",28903
			+NUESTATS: "RADIO","Cell_ID",25
			+NUESTATS: "RADIO","ECL",1
			+NUESTATS: "RADIO","SNR",20
			+NUESTATS: "RADIO","EARFCN",30
			+NUESTATS: "RADIO","PCI",11
			+NUESTATS: "RADIO","RSRQ",0
			OK

Cell information

Type	Syntax	Response	Example
Read	AT+NUESTATS="CELL"	+NUESTATS: "CELL",<earfcn>,<physical_cell_id>,<primary_cell>,<rsrp>,<rsrq>, <rssi>,<snr> OK	AT+NUESTATS="CELL" +NUESTATS: "CELL",3569,69,1,23,-1073,-1145,5 OK

Block error rate information

Type	Syntax	Response	Example
Read	AT+NUESTATS="BLER"	+NUESTATS: "BLER",<param_name>, <value> [[..]] [+NUESTATS: "BLER",<param_name>, <value>]] OK	AT+NUESTATS="BLER" +NUESTATS: "BLER","RLC_UL_BLER",10 +NUESTATS: "BLER","RLC_DL_BLER",5 +NUESTATS: "BLER","MAC_UL_BLER",8 +NUESTATS: "BLER","MAC_DL_BLER",3 +NUESTATS: "BLER","Total_TX_bytes",1080 +NUESTATS: "BLER","Total_RX_bytes",900 +NUESTATS: "BLER","Total_TX_blocks",80 +NUESTATS: "BLER","Total_RX_blocks",80 +NUESTATS: "BLER","Total_RTX_blocks",100 +NUESTATS: "BLER","Total_ACK/NACK_RX",100 OK

Throughput information

Type	Syntax	Response	Example
Read	AT+NUESTATS="THP"	+NUESTATS: "THP",<param_name>, <value> [[..]] [+NUESTATS: "THP",<param_name>, <value>]] OK	AT+NUESTATS="THP" +NUESTATS: "THP","RLC_UL",100 +NUESTATS: "THP","RLC_DL",98 +NUESTATS: "THP","MAC_UL",103 +NUESTATS: "THP","MAC_DL",100 OK

Application core memory information

Type	Syntax	Response	Example
Read	AT+NUESTATS="APPSMEM"	+NUESTATS: "APPSMEM",<param_name>:<value> [[..]] [+NUESTATS: "APPSMEM",<param_name>:<value>]] OK	AT+NUESTATS="APPSMEM" +NUESTATS: "APPSMEM","Current_Allocated":8240 +NUESTATS: "APPSMEM","Total_Free":198

Type	Syntax	Response	Example
			+NUESTATS: "APPSMEM","Max_ Free":8496
			+NUESTATS: "APPSMEM","Num_ Allocs":300
			+NUESTATS: "APPSMEM","Num_ Frees":240
			OK
Test	AT+NUESTATS=?		AT+NUESTATS=?
			+NUESTATS: ("RADIO","CELL","BLER", "THP","APPSMEM","ALL")
			OK

4.7.3 Defined values

UE statistics <type>

Parameter	Type	Description
<type>	String	Type of data to be displayed. Allowed values: • "RADIO" (default value): radio specific information • "CELL": per-cell information for the top 8 cells • "BLER": block error rate information • "APPSMEM": application Core dynamic memory usage • "THP": throughput information • "ALL": all information
<param_name>	String	Alphabetical names for the specific information, provided with their numeric values for each <type>.
<type>="RADIO"		
<value>	Number	Allowed values: • <power>: NB-IoT signal power expressed in tenth of dBm • <tot_power>: total power within receive bandwidth expressed in tenth of dBm • <tx_power>: TX power expressed in tenth of dBm • <tx_time>: elapsed TX time since last power on event expressed in milliseconds • <rx_time>: elapsed RX time since last power on event expressed in milliseconds • <cell_ID>: physical ID of the cell providing service to the module • <ECL>: last ECL value • <snr>: last SNR value • <earfcn>: last EARFCN value • <pci>: last PCI value • <rsrq>: last RSRQ value
<type>="BLER"		
<value>	Number	Allowed values: • <rlc_ul_bler>: uplink block error rate of RLC layer, expressed in percentage • <rlc_dl_bler>: downlink block error rate of RLC layer, expressed in percentage • <mac_ul_bler>: uplink block error rate of physical layer, expressed in percentage • <mac_dl_bler>: downlink block error rate of physical layer, expressed in percentage • <total_tx_bytes>: total bytes transmitted • <total_rx_bytes>: total bytes received • <total_tx_blocks>: transmitted transport blocks • <total_rx_blocks>: received transport blocks • <total_rtx_blocks>: retransmitted transport blocks • <total_ack/nack_rx>: total received ack/nack messages
<type>="CELL"		
<earfcn>	Number	Absolute radio-frequency channel number
<physical_cell_id>	Number	Physical id of the cell
<primary_cell>	Number	The current serving cell is indicated by 1
<rsrp>	Number	Reference signal received power
<rsrq>	Number	Reference signal received quality

Parameter	Type	Description
<rssi>	Number	Received signal strength indicator
<snr>	Number	Signal to noise ratio
<type>="THP"		
<value>	Number	Allowed values: • <rlc_ul>: uplink throughput of RLC layer, expressed in kb/s • <rlc_dl>: downlink throughput of RLC layer, expressed in kb/s • <mac_ul>: uplink throughput of physical layer, expressed in kb/s • <mac_dl>: downlink throughput of physical layer, expressed in kb/s
<type>="APPSMEM"		
<value>	Number	Application core dynamic memory usage in KBs. Allowed values: • <allocated>: current allocated memory • <free>: total free memory • <max_free>: maximum free memory • <num_allocs>: number of Allocs • <num_frees>: number of frees

4.8 Configure UE behaviour +NCONFIG

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

4.8.1 Description

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

4.8.2 Syntax

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

4.8.3 Defined values

Parameter	Type	Description
<function>	String	• "AUTOCONNECT": control if the platform will automatically attempt to connect to the network after power-on or reboot. When enabled, will set *+CFUN=1* and read the PLMN from the SIM. It will use the APN provided by the network • "COMBINE_ATTACH": enable/disable combined EPS/IMSI attach • "CELL_RESELECTION": enable support for RRC cell reselection • "ENABLE_BIP": enable/disable BIP (Bearer Independent Protocol), where BIP is the interface between SIM/USIM and the ME which provides access to the data bearers supported by the ME
<value>	String	• "TRUE" • "FALSE"

5 Network service

5.1 Signal quality +CSQ

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

5.1.1 Description

Returns the Received Signal Strength Indication (RSSI) <rssi> and <qual> from the MT.

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

5.1.2 Syntax

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

5.1.3 Defined values

Parameter	Type	Description
<rssi>	Number	The allowed range is 0-31 and 99. Remapped indication of the following parameters: • the Received Signal Strength Indication (RSSI) in GSM RAT • the Received Signal Code Power (RSCP) in UMTS RAT • the Reference Signal Received Power (RSRP) in LTE RAT When the RF power level of the received signal is the highest possible, the value 31 is reported. When it is not known, not detectable or currently not available, 99 is returned.
<qual>	Number	The allowed range is 0-7 and 99. The information provided depends on the selected RAT: • In 2G RAT CS dedicated and GPRS packet transfer mode indicates the Bit Error Rate (BER) as specified in 3GPP TS 45.008 [*148*] • In 2G RAT EGPRS packet transfer mode indicates the Mean Bit Error Probability (BEP) of a radio block. 3GPP TS 45.008 [*148*] specifies the range 0-31 for the Mean BEP which is mapped to the range 0-7 of <qual> • In UMTS RAT indicates the Energy per Chip/Noise (ECN0) ratio in dB levels of the current cell. 3GPP TS 25.133 [*106*] specifies the range 0-49 for EcN0 which is mapped to the range 0-7 of <qual> • In LTE RAT indicates the Reference Signal Received Quality (RSRQ). TS 36.133 [*105*] specifies the range 0-34 for RSRQ which is mapped to the range 0-7 of <qual> See *Notes* for the complete parameter mapping

5.1.4 Notes

<qual>	2G RAT CS and GPRS	2G RAT EGPRS	UMTS RAT	LTE RAT
0	BER < 0.2%	28 <= MEAN_BEP <= 31	ECN0_LEV >= 44	RSRQ_LEV < 5
1	0.2% < BER < 0.4%	24 <= MEAN_BEP <= 27	38 <= ECNO_LEV < 44	5 <= RSRQ_LEV < 10
2	0.4% < BER < 0.8%	20 <= MEAN_BEP <= 23	32 <= ECNO_LEV < 38	10 <= RSRQ_LEV < 14
3	0.8% < BER < 1.6%	16 <= MEAN_BEP <= 19	26 <= ECNO_LEV < 32	14 <= RSRQ_LEV < 18
4	1.6% < BER < 3.2%	12 <= MEAN_BEP <= 15	20 <= ECNO_LEV < 26	18 <= RSRQ_LEV < 22
5	3.2% < BER < 6.4%	8 <= MEAN_BEP <= 11	14 <= ECNO_LEV < 20	22 <= RSRQ_LEV < 26
6	6.4% < BER < 12.8%	4 <= MEAN_BEP <= 7	8 <= ECNO_LEV < 14	26 <= RSRQ_LEV < 30
7	BER > 12.8%	0 <= MEAN_BEP <= 3	ECNO_LEV < 8	RSRQ _LEV >= 30

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

SARA-N2
• Only LTE RAT is supported.

5.2 Operator selection +COPS

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

5.2.1 Description

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

☞ SARA-N2
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, UMTS 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* (parameter <format> is then also visible).

The command handling depends on the <mode> parameter value:
• **<mode>=0 and <mode>=1**: the AT command setting is immediately stored in the current activated profile. If the MT is set in automatic selection mode (<mode>= 0), only the mode will be saved. If the MT is set in manual mode (<mode>= 1), also the format (<format>) and operator (<oper>) will be stored in the profile.
• **<mode>=4**: the module starts a manual selection of the specified operator; if this operation is not successful, the module will start an automatic network selection and will remain in automatic mode.
• **<mode>=5 and <mode>=6**: an extended network search is performed
  o **For GSM networks**: all cells found will be reported, including those belonging to the neighbour list of the serving cell. The command response includes the following data (if supported): AcT, MCC, MNC, LAC, CI, BSIC, Arfcn, RxLev (see the *+CGED* command for the parameter description)
  o **For UMTS networks**: all cells found will be reported, including those belonging to the neighbour list of the serving cell. For each cell, the scan will trigger the additional reception of the SIB type 1 and type 3, to properly report the LAC, RAC, and CI of the cell. The command response includes the following data: MCC, MNC, LAC, RAC, CI, DLF, ULF, SC, RSCP LEV, ECN0 LEV (see the *+CGED* command for the parameter description)
• **<mode>=8**: a network timing advance search is performed
  o The network timing advance search is performed only on the serving cell and the 6 neighbour cells of BA list with the higher power levels.

o The information text response always includes the following data for the serving cell and for the other 6 neighbour cells: MCC, MNC, LAC, CI, BSIC, Arfcn, RxLev (see the +CGED command for the parameter description) and TA. When the <CI> value is not valid, no data of the correspondent neighbour cell is inside the information text response.

o It can be started only when the module is in idle mode and no reselection is ongoing. The network condition could sometimes increase the estimated response time.

o No mobile terminated/originated SMS, PS or CS call are handled when the network timing advance search is running. Furthermore mobility management procedures (for example: routing area update procedure or location update procedure) are delayed after the end of timing advance search.

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

The 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$_{CSP}$ 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.

5.2.2 Syntax

Type	Syntax	Response	Example
Set	AT+COPS=[<mode>[, <format>[,<oper>[, <AcT>]]]]	**If <mode>=0, 1, 2, 3, 4:** OK	AT+COPS=0,0 OK
		If <mode>=5 and on GSM networks:	AT+COPS=5
		[MCC:<MCC>, MNC:<MNC>, LAC:<LAC>, CI:<CI>, BSIC:<BSIC>, Arfcn:<Arfcn>, RxLev:<RxLev>	MCC:222, MNC: 88, LAC:55fa, CI:ffff, BSIC:3f, Arfcn:00104, RxLev:037
		[MCC:<MCC>, MNC:<MNC>, LAC:<LAC>, CI:<CI>, BSIC:<BSIC>, Arfcn:<Arfcn>, RxLev:<RxLev>	MCC:222, MNC: 10, LAC:4e54, CI:ffff, BSIC:32, Arfcn:00080, RxLev:032
		[...]]]	...
		OK	... MCC:222, MNC: 88, LAC:55fa, CI:1d39, BSIC:3d, Arfcn:00756, RxLev:005
			OK
		If <mode>=5 and on UMTS networks:	AT+COPS=5
		[MCC:<MCC>, MNC:<MNC>, LAC:<LAC>, RAC:<RAC>, CI:<CI>, DLF:<dl_frequency>, ULF:<ul_frequency>, SC:<SC>, RSCP LEV:<RSCP LEV>, ECN0 LEV:<ecn0_lev>	MCC:222, MNC:10, LAC:61ef, RAC:14, CI:0 7d2088, DLF:10788, ULF: 9838, SC:81, RSCP LEV:23, ECN0 LEV:41
		[MCC:<MCC>, MNC:<MNC>, LAC:<LAC>, RAC:<RAC>, CI:<CI>, DLF:<dl_frequency>, ULF:<ul_frequency>, SC:<SC>, RSCP LEV:<rscp_ lev>, ECN0 LEV:<ecn0_lev>	MCC:222, MNC:10, LAC:61ef, RAC:14, CI:0 7d2085, DLF:10813, ULF: 9863, SC:81, RSCP LEV:26, ECN0 LEV:41
		[...]]]	...
		OK	... MCC:222, MNC:01, LAC:ef8d, RAC:0, CI:52d36fb, DLF:10688, ULF: 9738, SC:285, RSCP LEV:16, ECN0 LEV:32

Type	Syntax	Response	Example
			OK
		If <mode>=6 and on GSM networks:	AT+COPS=6
		[<AcT>,<MCC>,<MNC>,<LAC>,<CI>,<BSIC>, <Arfcn>,<RxLev>	0,222,88,55fa,ffff,3f,00104,037
			...
		[<AcT>,<MCC>,<MNC>,<LAC>,<CI>,<BSIC>, <Arfcn>,<RxLev> [...]]]	0,222,10,4e54,ffff,32,00080,032
		OK	...
			OK
		If <mode>=6 and on UMTS networks:	AT+COPS=6
		[<MCC>,<MNC>,<LAC>,<RAC>,<CI>,<dl_ frequency>,<ul_frequency>,<SC>,<RSCP LEV>, <ecn0_lev>	222,99,754f,2,03554d7,10713,9763,341,255, 14
			...
		[<MCC>,<MNC>,<LAC>,<RAC>,<CI>,<dl_ frequency>,<ul_frequency>,<SC>,<RSCP LEV>, <ecn0_lev>	222,01,ef8d,0,52d2647,10663,9713,453,4,23
		[...]]]	...
		OK	OK
		If <mode>=8 and on GSM networks:	AT+COPS=8
		[MCC:<MCC>, MNC:<MNC>, LAC:<LAC>, CI:<CI>, BSIC:<BSIC>, Arfcn:<Arfcn>, RxLev:<RxLev>, TA:<TA>	MCC:222, MNC: 10, LAC:4e54, CI:12f1, BSIC:3f, Arfcn:00104, RxLev:037, TA:3
			MCC:222, MNC: 10, LAC:4e54, CI:8841, BSIC:32, Arfcn:00080, RxLev:032, TA:5
		[MCC:<MCC>, MNC:<MNC>, LAC:<LAC>, CI:<CI>, BSIC:<BSIC>, Arfcn:<Arfcn>, RxLev:<RxLev>, TA:<TA>	MCC:222, MNC: 10, LAC:4e54, CI:1ef4, BSIC:31, Arfcn:00082, RxLev:022, TA:255
		[...]]]	...
		OK	MCC:222, MNC: 10, LAC:55fa, CI:1d39, BSIC:3d, Arfcn:00756, RxLev:005, TA:7
			OK
Read	AT+COPS?	+COPS: <mode>[,<format>,<oper>[,<AcT>]]	+COPS: 0,0,"vodafone IT"
		OK	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)	+COPS: (2,"vodafone IT","voda IT","22210"), (1,"SI vodafone","vodafone SI","29340"),(1,"I WIND","I WIND","22288"),(1,"I TIM","TIM", "22201"),(1,"MOBITEL","MOBITEL","29341"), ,(0-4),(0-2)
		OK	OK

5.2.3 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>: • 0 (default value and factory-programmed value): automatic (<oper> field is ignored) • 1: manual • 2: deregister from network • 3: set only <format> • 4: manual/automatic • 5: extended network search • 6: extended network search without the tags (e.g. MCC, RxLev will not be printed, see the syntax and the command example) • 8: network timing advance search
<format>	Number	• 0 (factory-programmed value): long alphanumeric <oper> • 1: short format alphanumeric <oper> • 2: numeric <oper>

Parameter	Type	Description
<oper>	String	Given in format <format> this field may be up to 24 characters long for long alphanumeric format, up to 10 characters for short alphanumeric format and 5 or 6 characters long for numeric format (MCC/MNC codes). The factory-programmed value is FFFF (undefined).
<stat>	Number	• 0: unknown • 1: available • 2: current • 3: forbidden
<AcT>	Number	Indicates the radio access technology: • 0: GSM • 1: GSM COMPACT • 2: UTRAN • 3: GSM with EDGE availability • 4: UTRAN with HSDPA availability • 5: UTRAN with HSUPA availability • 6: UTRAN with HSDPA and HSUPA availability • 7: LTE • 8: EC-GSM-IoT (A/Gb mode) • 9: E-UTRAN (NB-S1 mode)
<TA>	Number	Timing Advance; the range is 0-63. If the information is not known or not detectable or currently not available, the value is 255.

5.2.4 Notes

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

SARA-N2

- <mode>=3, 4, 5, 6 and 8 are not supported.
- <AcT>=0, 1, 2, 3, 4, 5, 6, 8 and 9 are not supported.
- The <AcT> parameter is not issued in the information text response to the read command.
- The <oper> parameter is not issued in the information text response to the read command if <mode>=2.
- <format>=0, 1 are not supported.
- The <TA> parameter is not supported.

5.3 Select band +UBANDSEL

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

5.3.1 Description

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

- 2G network
  - o 850 MHz
  - o 900 MHz
  - o 1800 MHz
  - o 1900 MHz
- 3G and 4G network
  - o 700 MHz (band 12, band 13, band 17, band 28)
  - o 800 MHz (band 6, band 19, band 20)
  - o 850 MHz (band 5)

- o 900 MHz (band 8)
- o 1500 MHz (band 11)
- o 1700 MHz (band 4)
- o 1800 MHz (band 3)
- o 1900 MHz (band 2)
- o 2100 MHz (band 1)
- o 2600 MHz (band 7)

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

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

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

5.3.2 Syntax

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

5.3.3 Defined values

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

5.4 Signalling connection status +CSCON

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

5.4.1 Description

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

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

5.4.2 Syntax

Type	Syntax	Response	Example
Set	AT+CSCON=[<n>]	OK	AT+CSCON=1
			OK
Read	AT+CSCON?	+CSCON: <n>,<mode>	+CSCON:1,1
		OK	OK
URC		+CSCON: <mode>	+CSCON: 0

5.4.3 Defined values

Parameter	Type	Description
<n>	Number	• 0 (default value): +CSCON URC disabled • 1: +CSCON URC enabled
<mode>	Number	Indicates the signalling connection status: • 0: idle • 1: connected

5.5 Supported bands configuration +NBAND

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

5.5.1 Description

Defines the set of bands to be used.

5.5.2 Syntax

Type	Syntax	Response	Example
Set	AT+NBAND=<n>[,<n>[,<n>[...]]]	OK	AT+NBAND=5,8
			OK
Read	AT+NBAND?	+NBAND: <n>[,<n>[,<n>[...]]]	+NBAND:5,8
		OK	OK
Test	AT+NBAND=?	+NBAND: (<n>[,<n>[,<n>[...]]])	+NBAND:(5,8,20)
		OK	OK

5.5.3 Defined values

Parameter	Type	Description
<n>	Number	Band expressed as a decimal number. The allowed values are 5, 8 and 20.

5.6 Specify search frequencies+NEARFCN

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

5.6.1 Description

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

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

5.6.2 Syntax

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

5.6.3 Defined values

Parameter	Type	Description
<search_mode>	Number	Specifies the type of search and defines the supplied parameters. Allowed value: • 0: single point EARFCN search
<earfcn>	Number	Indicates the EARFCN to search; the range is 0-65535.
<ci>	String	Four byte E-UTRAN cell ID in hexadecimal format in range 0-0x1F7.

5.7 eDRX setting +CEDRXS

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

5.7.1 Description

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

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

5.7.2 Syntax

Type	Syntax	Response	Example
Set	AT+CEDRXS=<mode>,<AcT_type>, <Requested_eDRX_value>	OK	AT+CEDRXS=1,5,"0101" OK

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

5.7.3 Defined values

Parameter	Type	Description
<mode>	Number	Indication to disable or enable the use of eDRX in the UE. Allowed values: • 0 (default value): use of eDRX disabled • 1: use of eDRX enabled • 2: enable the use of eDRX and enable the URC • 3: disable the use of eDRX and reset all parameters for eDRX to factory-programmed values
<AcT_type>	Number	Indicates the type of access technology. Allowed values: • 0: do not use eDRX, only used in URCs • 1: EC-GSM-IoT (A/Gb mode) • 2: GSM (A/Gb mode) • 3: UTRAN (Iu mode) • 4: E-UTRAN (WB-S1 mode) • 5: E-UTRAN (NB-S1 mode)
<Requested_eDRX_value>	String	Requested extended DRX parameters information element, half a byte in a 4 bit format. For the coding and the value range, see the extended DRX parameters information element in 3GPP TS 24.008 [12].
<NW_provided_eDRX_value>	String	New provided extended DRX parameters information element, half a byte in a 4 bit format. For the coding and the value range, see the extended DRX parameters information element in 3GPP TS 24.008 [12].
<Paging_time_window>	String	The paging time window refers to bit 8 to 5 of octet 3 of the extended DRX parameters information element, half a byte in a 4 bit format. For the coding and the value range, see the extended DRX parameters information element in 3GPP TS 24.008 [12].

5.8 eDRX read dynamic parameters +CEDRXRDP

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

5.8.1 Description

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

5.8.2 Syntax

Type	Syntax	Response	Example
Action	AT+CEDRXRDP	+CEDRXRDP: <AcT_type>,<Requested_eDRX_value>,<NW_provided_eDRX_value>,<Paging_time_window> OK	+CEDRXRDP: 4,"2","2","2" OK

Type	Syntax	Response	Example
Test	AT+CEDRXRDP=?	OK	

5.8.3 Defined values

Parameter	Type	Description
<AcT_type>	Number	Indicates the type of radio access technology. Allowed values: • 0: do not use eDRX • 1: EC-GSM-IoT (A/Gb mode) • 2: GSM (A/Gb mode) • 3: UTRAN (Iu mode) • 4: E-UTRAN (WB-S1 mode) • 5: E-UTRAN (NB-S1 mode)
<Requested_eDRX_value>	String	Requested extended DRX parameters information element, half a byte in a 4 bit format. For the coding and the value range, see the extended DRX parameters information element in 3GPP TS 24.008 [12].
<NW_provided_eDRX_value>	String	New provided extended DRX parameters information element, half a byte in a 4 bit format. For the coding and the value range, see the extended DRX parameters information element in 3GPP TS 24.008 [12].
<Paging_time_window>	String	The paging time window refers to bit 8 to 5 of octet 3 of the extended DRX parameters information element, half a byte in a 4 bit format. For the coding and the value range, see the extended DRX parameters information element in 3GPP TS 24.008 [12].

5.9 Paging time window value and eDRX setting +NPTWEDRXS

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

5.9.1 Description

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

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

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

5.9.2 Syntax

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

Type	Syntax	Response	Example
		OK	
URC		+NPTWEDRXS: <AcT_type>[, <Requested_paging_time_window>[, <Requested_eDRX_value>[,<NW_ provided_eDRX_value>[,<Paging_time_ window>]]]]	+NPTWEDRXS: 5,"1010","1001","110 1","1011"

5.9.3 Defined values

Parameter	Type	Description
<mode>	Number	Indication to disable or enable the use of eDRX in the UE. Allowed values: • 0 (default value): use of requested paging time window and eDRX disabled • 1: use of requested paging time window and eDRX enabled • 2: enable the use of requested paging time window and eDRX and enable the URC • 3: disable the use of requested paging time window and eDRX and reset all parameters to factory-programmed values
<AcT_type>	Number	Indicates the type of access technology. Allowed values: • 0: do not use eDRX, only used in URCs • 1: EC-GSM-IoT (A/Gb mode) • 2: GSM (A/Gb mode) • 3: UTRAN (Iu mode) • 4: E-UTRAN (WB-S1 mode) • 5 (default value): E-UTRAN (NB-S1 mode)
<Requested_paging_ time_window>	String	The requested paging time window refers to bit 8 to 5 of octet 3 of the extended DRX parameters information element, half a byte in a 4 bit format. Default value is "0111". For the coding and the value range, see the extended DRX parameters information element in 3GPP TS 24.008 [12].
<Requested_eDRX_ value>	String	Requested extended DRX parameters information element, half a byte in a 4 bit format. Default value is "0101". For the coding and the value range, see the extended DRX parameters information element in 3GPP TS 24.008 [12].
<NW_provided_eDRX_ value>	String	New provided extended DRX parameters information element, half a byte in a 4 bit format. For the coding and the value range, see the extended DRX parameters information element in 3GPP TS 24.008 [12].
<Paging_time_ window>	String	The paging time window refers to bit 8 to 5 of octet 3 of the extended DRX parameters information element, half a byte in a 4 bit format. For the coding and the value range, see the extended DRX parameters information element in 3GPP TS 24.008 [12].

5.9.4 Notes

SARA-N2

• <AcT_type>=0, 1, 2, 3, 4 are not supported.

5.10 Power class configuration +NPOWERCLASS

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

5.10.1 Description

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

5.10.2 Syntax

Type	Syntax	Response	Example
Set	AT+NPOWERCLASS=<band>,<power_ class>	OK	AT+NPOWERCLASS=8,5 OK
Read	AT+NPOWERCLASS?	+NPOWERCLASS: <band>,<power_ class>	+NPOWERCLASS: 8,5 OK

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

5.10.3 Defined values

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

6 Short Messages Service

6.1 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*.

6.1.1 Class 0 SMS

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

6.1.2 <index> parameter range

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

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

BM (Broadcast Message):

SR (Status Report)

6.1.3 Limitations

The following limitations apply related to the SMS usage:

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

Concatenated SMS (where supported) - "8-bit reference number" type
*   153 characters if <dcs>= "GSM 7 bit default alphabet data"
*   134 octets if <dcs>= "8-bit data"
*   67 UCS2 characters (2 bytes for each one) if <dcs>="16-bit uncompressed UCS2 data"

Concatenated SMS (where supported) - "16-bit reference number" type
*   The limits are the same as the "8-bit reference number" type, but are decreased by one unit.

A concatenated SMS can have as many as 255 parts.

6.2 Select message service +CSMS

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

6.2.1 Description

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

6.2.2 Syntax

Type	Syntax	Response	Example
Set	AT+CSMS=<service>	+CSMS: <mt>,<mo>,<bm>	AT+CSMS=1
		OK	+CSMS: 1,1,1
			OK
Read	AT+CSMS?	+CSMS: <service>,<mt>,<mo>,<bm>	+CSMS: 0,1,1,1

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

6.2.3 Defined values

Parameter	Type	Description
<service>	Number	• 0: see 3GPP TS 23.040 [8] and 3GPP TS 23.041 [9]; syntax of AT commands is compatible with 3GPP TS 27.005 [16] phase 2; phase 2+ features may be supported if no new command syntax is required • 1: see 3GPP TS 23.040 [8] and 3GPP TS 23.041 [9]; syntax of AT commands is compatible with 3GPP TS 27.005 [16] phase 2+
<mt>	Number	Mobile terminated messages: • 0: not supported • 1: supported
<mo>	Number	Mobile originated messages: • 0: not supported • 1: supported
<bm>	Number	Broadcast messages: • 0: not supported • 1: supported

6.3 New message acknowledgement to MT +CNMA

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

6.3.1 Description

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

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

6.3.2 Syntax

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

Type	Syntax	Response	Example
		+CNMA: (list of supported <n>s)	OK
		OK	

6.3.3 Defined values

Parameter	Type	Description
<n>	Number	• 0: the command operates similarly as defined for the text mode • 1: sends RP-ACK (or buffered result code received correctly) • 2: sends RP-ERROR (if PDU is not given, ME/TA shall send SMS-DELIVER-REPORT with 3GPP TS 23.040 [8] TP-FCS value set to 'FF' (unspecified error cause))
<length>	Number	PDU's length in octets without the Service Center's address

6.3.4 Notes

SARA-N2

- Only PDU mode (+CMGF=0) is supported.
- <n>=0 is not supported.

6.4 Send message +CMGS

+CMGS

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

6.4.1 Description

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

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

6.4.2 Syntax

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

6.4.3 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: • in text mode: number of characters • in PDU mode: PDU's length in octets without the Service Center's address. In example 0 39121430100038166F6000004E374F80D: is a PDU with Service Center's number +1234, that generates the address 03912143 (4 octets). Thus in this case <length>=13.
<PDU>	String	Protocol Data Unit: each 8-bit octet of the PDU must be written as two IRA character long hexadecimal numbers, e.g. 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

6.4.4 Notes
SARA-N2
- Only the PDU mode is supported.
- The <length> range goes from 7 to 220.

6.5 Service center address +CSCA

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

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

☞ 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.

6.5.2 Syntax

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

6.5.3 Defined values

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

6.6 Send SMS command +CMGC

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

6.6.1 Description

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

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

6.6.2 Syntax

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

6.6.3 Defined values

Parameter	Type	Description
<mr>	Number	Message reference
<length>	Number	• In PDU mode: PDU's length in octets without the Service Center's address. In example 0 39121430100038166F6000004E374F80D: is a PDU with Service Center's number +1234, that generates the address 03912143 (4 octets). Thus in this case <length>=13.
<PDU>	String	Protocol Data Unit: each 8-bit octet of the PDU must be written as two IRA character long hexadecimal numbers, e.g. octet with integer value 42 must be written as two characters 2A (IRA 50 and 65).
<ackpdu>	String	See the 3GPP TS 23.040 [8] RP-User-Data element of RP-ACK PDU; format is same as for <PDU> in case of SMS.

6.6.4 Notes
SARA-N2
• The range of <length> parameter goes from 8 to 220.

6.7 Sending of originating data via the control plane +CSODCP

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

6.7.1 Description

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

It optionally indicates that the exchange of data will be completed with:
• Current uplink data transfer
• The next received downlink data

6.7.2 Syntax

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

6.7.3 Defined values

Parameter	Type	Description
<cid>	Number	See <cid>
<cpdata_length>	Number	Size of the received data. The maximum length is 512 bytes
<cpdata>	String	User data container content (see the 3GPP TS 24.301 [88] subclause 9.9.4.24)
<RAI>	Number	Indicates the value of the release assistance indication (see the 3GPP TS 24.301 [88] subclause 9.9.4.25) • 0 (default value): no information available • 1: data exchange completed with the transmission of the ESM DATA TRANSPORT message. • 2: data exchange completed with the receipt of the ESM DATA TRANSPORT message.
<type_of_user_data>	Number	Indicates the type of user data: • 0 (default value): regular data • 1: exception data

6.8 Terminating data reporting via control plane +CRTDCP

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

6.8.1 Description

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

6.8.2 Syntax

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

6.8.3 Defined values

Parameter	Type	Description
<reporting>	Number	• 0 (default value): reporting disabled • 1: reporting enabled by means of the URC +CRTDCP
<cid>	Number	See *<cid>*
<cpdata_length>	Number	Size of the received data. The maximum length 512 bytes
<cpdata>	String	User data container content (see the 3GPP TS 24.301 [*88*] subclause 9.9.4.24)

7 V24 control and V25ter

7.1 Introduction

These commands, unless specifically stated, do not implement set syntax using "=", read ("?"), or test ("=?"). If such commands are used, the "+CME ERROR: unknown" error result code is provided (if +CMEE is set to 2).

7.2 Configure AT UART baud rate +NATSPEED

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

7.2.1 Description

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

7.2.2 Syntax

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

7.2.3 Defined values

Parameter	Type	Description
<baud_rate>	Number	Requested AT UART baud rate expressed in b/s: • The factory-programmed value is 9600. • Allowed <baud_rate> values are 4800, 9600, 57600, 115200.
<timeout>	Number	Indicates the time to wait for communication before switching back to the original speed: • Range: 0-30 s. • The default value is 3 s. • If <timeout>=0 the default value will be used
<store>	Number	Enable the <baud_rate>, <sync_mode> and <stop_bits> parameters storing in NVM: • 0 (default value): do not store to NVM • 1: store to NVM
<sync_mode>	Number	The low power UART synchronizes to each start bit that it detects and uses this to configure its optimum sampling point for each subsequent bit in a data word. The <sync_mode> parameter allows this sampling point to be modified when needed: • 0: no sampling offset • 1: sample later • 2 (factory-programmed and default value): sample earlier • 3: sample even earlier
<stop_bits>	Number	Low power UART stop-bits. Allowed values: • 1 (factory-programmed and default value): 1 stop bit • 2: 2 stop bits

7.2.4 Notes

SARA-N2

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

8 Packet switched data services

8.1 Introduction and common parameters definition

8.1.1 <APN>

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

An optional special code placed at the beginning of <APN> indicates the type of authentication handling between the module and the network and may be:
- CHAP: challenge handshake authentication protocol
- PAP: personal authentication protocol
- NOAUTH: authentication protocol not used
- code omitted: authentication protocol not used

An example for the usage of <APN> is:

AT+CGDCONT=1,"IP","CHAP:internet.t-d1.de"

☞ +CGDCONT?'s response does not include the PAP: and CHAP: prefixes in the APN string.

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

8.1.2 <cid>

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

The maximum number of definable and active PDP contexts depend(s) on the product version:

Product	Max number of definable PDP contexts	Max number of active PDP contexts
SARA-N2	10	1

☞ SARA-N2
The 7th <cid> is by default reserved to Bearer Independent Protocol (BIP). To define the <cid>=7 through *AT+CGDCONT*, disable the BIP flag by means of the *+NCONFIG* AT command (<function>="ENABLE_BIP" set to FALSE) and reboot the module.

8.1.3 <L2P>

String parameter indicating the layer 2 protocol to be used between the DTE and MT; these values are supported:
- "PPP" (default value)
- "M-HEX"
- "M-RAW_IP"
- "M-OPT-PPP"

☞ The application on the remote side must support the selected protocol as well.

8.1.4 <PDP_addr>

String parameter identifying the MT in the IP-address space applicable to the PDP service. If the value is null or omitted (dynamic IP addressing), then a value may be provided by the DTE during the PDP startup procedure or,

failing that, a dynamic address will be requested via DHCP. It can be read with the command *AT+CGPADDR* or *AT+CGDCONT* read command.

To request a static IP address, a fixed IP address shall be specified for the <PDP_addr> paramater of the *+CGDCONT* set command and the user shall not rely on PPP negotiation via IPCP CONFREQ option.

Depending on the IP-version, the <PDP_addr> consists of 4 octets (IPv4) or 16 octets (IPv6):

• IPv4: "ddd.ddd.ddd.ddd"
• IPv4v6: "ddd.ddd.ddd.ddd ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd"
• IPv6: "ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd.ddd"

☞ SARA-N2
   The IP address is not enclosed within quotation marks.

8.1.5 <PDP_type>

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

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

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

8.2 PDP context definition +CGDCONT

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

8.2.1 Description

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

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

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

8.2.2 Syntax

Type	Syntax	Response	Example
Set	AT+CGDCONT=[<cid>[,<PDP_type>[, <APN>[,<PDP_addr>[,<d_comp>[,<h_ comp>[,<IPv4AddrAlloc>[,<emergency_ indication>[,<P-CSCF_discovery>[,<IM_ CN_Signalling_Flag_Ind>[,<NSLPI>]]]]]]]]]]]	OK	**IPv4 example** AT+CGDCONT=1,"IP","APN_name", "1.2.3.4",0,0 OK **IPv4v6 example** AT+CGDCONT=1,"IPV4V6","APN","0.0 .0.0 0.0.0.0.0.0.0.0.0.0.0.0.0.0",0,0 OK **IPv6 example** AT+CGDCONT=1,"IPV6","APN","0.0.0 .0.0.0.0.0.0.0.0.0.0.0.0.0",0,0 OK
Read	AT+CGDCONT?	+CGDCONT: <cid>,<PDP_type>, <APN>,<PDP_addr>,<d_comp>,<h_	+CGDCONT: 1,"IP","web.omnitel.it", "91.80.140.199",0,0

Type	Syntax	Response	Example
		comp>[,<IPv4AddrAlloc>,<emergency_ indication>,<P-CSCF_discovery>,<IM_ CN_Signalling_Flag_Ind>[,<NSLPI>]] OK	OK
Test	AT+CGDCONT=?	+CGDCONT: (list of supported <cid>s), <PDP_type>,,,(list of supported <d_ comp>s),(list of supported <h_comp>s)[, (list of supported <IPv4AllocAddr>s),(list of supported <emergency_indication>s), (list of supported <P-CSCF_discovery>s), (list of supported <IM_CN_Signalling_ Flag_Ind>s)[,(list of supported <NSLPI>s)]] OK	+CGDCONT: (1-3),"IP",,,(0-2),(0-4) OK

8.2.3 Defined values

Parameter	Type	Description
<cid>	Number	See *<cid>*
<PDP_type>	String	See *<PDP_type>*
<APN>	String	See *<APN>*
<PDP_addr>	Number	See *<PDP_addr>*
<d_comp>	Number	PDP data compression; it can have the values: • 0 (default value): off • 1: on (predefined compression type i.e. V.42bis data compression) • 2: V.42bis data compression
<h_comp>	Number	PDP header compression; it can have the values: • 0 (default value): off • 1: on (predefined compression type, i.e. RFC1144) • 2: RFC1144 • 3: RFC2507 • 4: RFC3095 ☞ <h_comp>: the available head-compressions is depending on configuration of the stack (configured via features in the stack)
<IPv4AddrAlloc>	Number	Controls how the MT/TA requests to get the IPv4 address information: • 0 (default value): IPv4 Address Allocation through NAS Signalling • 1: IPv4 Address Allocated through DHCP
<emergency_ indication>	Number	Indicates whether the PDP context is for emergency bearer services or not: • 0 (default value): PDP context is not for emergency bearer services • 1: PDP context is for emergency bearer services
<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: • 0 (default value): preference of P-CSCF address discovery not influenced by *+CGDCONT* • 1: preference of P-CSCF address discovery through NAS Signalling • 2: preference of P-CSCF address discovery through DHCP
<IM_CN_Signalling_ Flag_Ind>	Number	Shows whether the PDP context is for IM CN subsystem-related signalling only or not: • 0: PDP context is not for IM CN subsystem-related signalling only • 1: PDP context is for IM CN subsystem-related signalling only
<NSLPI>	Number	Indicates the NAS signalling priority requested for the corresponding PDP context: • 0 (default value): indicates that the PDP context has to be activated with the value for the low priority indicator configured in the MT. • 1: indicates that the PDP context has to be activated with the value for the low priority indicator set to "MS is not configured for NAS signalling low priority". The MT utilises the provide NSLPI information as specified in 3GPP TS 24.301 [*88*] and 3GPP TS 24.008 [*12*].

8.2.4 Notes

Additional examples:

Command	Response	Description
AT+CMEE=2	OK	Use verbose <err> values
AT+CGDCONT=?	+CGDCONT: (1-3),"IP",,,(0),(0-1)	Test command
	OK	
AT+CGDCONT=4,"IP","internet"	+CME ERROR: operation not allowed	Define out of range PDP contexts
AT+CGDCONT=2,"IP","internet"	OK	Define allowed PDP contexts
AT+CGDCONT=1,"IP","STATREAL"	OK	Define allowed PDP contexts
AT+CGDCONT=3,"IP","PAP: tim.ibox.it"	OK	Define allowed PDP contexts
AT+CGDCONT=253,"IP","internet"	+CME ERROR: operation not allowed	Define out of range PDP contexts
AT+CGDCONT?	+CGDCONT: 2,"IP","internet","0.0.0.0",0,0	Read command
	+CGDCONT: 1,"IP","STATREAL","0.0.0.0",0,0	
	+CGDCONT: 3,"IP","tim.ibox.it","0.0.0.0",0,0	
	OK	

SARA-N2
- The context's setting is not permanently stored in NVM.
- <PDP_addr>, <d_comp>, <h_comp>, <IPv4AddrAlloc>, <emergency_indication>, <P-CSCF_discovery> and <IM_CN_Signalling_Flag_Ind> parameters are not supported.
- <cid>=0 is read only and is only defined when AUTOCONNECT is enabled.

8.3 GPRS attach or detach +CGATT

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

8.3.1 Description

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

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

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

8.3.2 Syntax

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

8.3.3 Defined values

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

8.3.4 Notes

SARA-N2

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

8.4 PDP context activate or deactivate +CGACT

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

8.4.1 Description

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

The maximum expected response time is different in case 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: in case a PDP context activation on a specific <cid> was requested, the PDP context deactivation is performed; if a multiple PDP context activation was requested, it is aborted after the pending PDP context activation has finished.

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

8.4.2 Syntax

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

8.4.3 Defined values

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

8.4.4 Notes

SARA-N2
- Only one <cid> parameter can be defined.
- <status> and <cid> parameters are mandatory in the set command.
- The command cannot deactivate last defined PDP context.

8.4.5 Examples

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

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

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

8.5 Show PDP address +CGPADDR

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

8.5.1 Description

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

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

8.5.2 Syntax

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

Type	Syntax	Response	Example
		OK	OK

8.5.3 Defined values

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

8.5.4 Notes

SARA-N2

- The IP address in <PDP_addr> parameter is not enclosed within quotation marks.
- Only the addresses in IPv4 format are allowed.
- When the AUTOCONNECT functionality is enabled by means of the *+NCONFIG* AT command <cid>=0 will not be listed until an IP address is acquired.

8.6 EPS network registration status +CEREG

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

8.6.1 Description

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

- +CEREG: <stat> when <n>=1 and there is a change in the MT's EPS network registration status in E-UTRAN
- +CEREG: <stat>[,[<tac>],[<ci>],[<AcT>]] when <n>=2 and there is a change of the network cell in EUTRAN
- +CEREG: <stat>[,[<tac>],[<ci>],[<AcT>][,<cause_type>,<reject_cause>]] when <n>=3 and the value of <stat> changes
- +CEREG: <stat>[,[<tac>],[<ci>],[<AcT>][,,[,[<Active_Time>],[<Periodic_TAU>]]]] when <n>=4 if there is a change of the network cell in E-UTRAN
- +CEREG: <stat>[,[<tac>],[<ci>],[<AcT>][,[<cause_type>],[<reject_cause>][,[<Active_Time>],[<Periodic_TAU>]]]] when <n>=5 and the value of <stat> changes

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

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

8.6.2 Syntax

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

8.6.3 Defined values

Parameter	Type	Description
<n>	Number	Mode configuration: • 0 (default value): network registration URC disabled • 1: network registration URC +CEREG: <stat> enabled • 2: network registration and location information URC +CEREG: <stat>[,[<tac>],[<ci>],[<AcT>]] enabled • 3: network registration, location information and EMM cause value information URC +CEREG: <stat>[,[<tac>],[<ci>],[<AcT>][,<cause_type>,<reject_cause>]] enabled • 4: PSM, network registration and location information information URC +CEREG: <stat>[, [<tac>],[<ci>],[<AcT>][,,[,[<Active-Time>],[<Periodic-TAU>]]]] enabled • 5: PSM, network registration, location information and EMM cause value information URC +CEREG: <stat>[,[<tac>],[<ci>],[<AcT>][,[<cause_type>],[<reject_cause>][, [<Active-Time>],[<Periodic-TAU>]]]] enabled
<stat>	Number	EPS registration status: • 0: not registered, the MT is not currently searching an operator to register to • 1: registered, home network • 2: not registered, but the MT is currently trying to attach or searching an operator to register to • 3: registration denied • 4: unknown (e.g. out of E-UTRAN coverage) • 5: registered, roaming • 8: attached for emergency bearer services only (see 3GPP TS 24.008 [12] and 3GPP TS 24.30 1 [88] that specify the condition when the MS is considered as attached for emergency bearer services)
<tac>	String	Two bytes tracking area code in hexadecimal format
<ci>	String	Four bytes E-UTRAN cell-id in hexadecimal format
<Act>	Number	Access technology of the service cell: • 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)
<cause_type>	Number	<reject_cause> type: • 0: indicates that <reject_cause> contains an EMM cause value, see 3GPP TS 24.301 [88] Annex A • 1: indicates that <reject_cause> contains a manufacture-specific cause
<reject_cause>	Number	Cause of the failed registration. The value is of type as defined by <cause_type>
<Active_Time>	String	Indicates the Active Time value (T3324) to be allocated to the UE, one byte in an 8-bit format. For the coding and the value range, see the GPRS Timer 2 IE in 3GPP TS 24.008 [12]
<Periodic_TAU>	String	Indicates the extended periodic TAU value (T3412) to be allocated to the UE in EUTRAN, one byte in an 8-bit format. For the coding and the value range, see the GPRS Timer 3 IE in 3GPP TS 24.0 08 [12]

8.7 Initial PDP context activation +CIPCA

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

8.7.1 Description

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

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

• Setting <n>=1 from 0 causes an immediate attempt to (re)establish the initial PDP context if no PDP context is active.

• Setting <n>=2 from 0 (if not roaming, roaming corresponds to being registered to a VPLMN which is not equivalent to HPLMN or EHPLMN) causes an immediate attempt to (re)establish the initial PDP context if no other PDP contexts are active.

- The value of <n>=3 applies to E-UTRAN RAT.

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

8.7.2 Syntax

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

8.7.3 Defined values

Parameter	Type	Description
<n>	Number	Activation of PDP context upon attach. Allowed values: • 0 (default value): do not activate • 1: always activate • 2: activate when not roaming • 3: no change in current setting
<AttachWithoutPDN>	Number	EPS attach with or without PDN connection: • 0 (default value): EPS attach with PDN connection • 1: EPS attach without PDN connection

8.8 APN rate control +CGAPNRC

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

8.8.1 Description

Returns the APN rate control parameters (see the 3GPP TS 24.008 [*12*]) associated to the corresponding <cid>.

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

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

8.8.2 Syntax

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

8.8.3 Defined values

Parameter	Type	Description
<cid>	Number	See *<cid>*
<Additional_exception_reports>	Number	Indicates whether or not additional exception reports are allowed to be sent when the maximum uplink rate is reached. This refers to bit 4 of octet 1 of the APN rate control parameters (see the 3GPP TS 24.008 [*12*] subclause 10.5.6.3.2): • 0: Additional exception reports are not allowed to be sent • 1: Additional exception reports are allowed to be sent
<Uplink_time_unit>	Number	Specifies the time unit to be used for the maximum uplink rate. This refers to bit 1 to 3 of octet 1 of the APN rate control parameters (see the 3GPP TS 24.008 [*12*] subclause 10.5.6.3.2): • 0: unrestricted • 1: minute • 2: hour • 3: day • 4: week
<Maximum_uplink_rate>	Number	Specifies the maximum number of messages the UE is restricted to send per uplink time unit. This refers to octet 2 to 4 of the APN rate control parameters (see the 3GPP TS 24.008 [*12*] subclause 10.5.6.3.2).

8.8.4 Notes
SARA-N2
- The IP address in <PDP_addr> parameter is not enclosed within quotation marks.
- Only the addresses in IPv4 format are allowed.
- When the AUTOCONNECT functionality is enabled by means of the +NCONFIG AT command <cid>=0 will not be listed until an IP address is acquired.

8.9 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.

9 System features

9.1 Firmware update Over AT (FOAT) +UFWUPD

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

9.1.1 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 u-blox Firmware Update Application Note [*86*].

9.1.2 Notes
• If <filetype>=2 make sure the file contains both the firmware and file system images.

9.2 End user test +UTEST

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

9.2.1 Description

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

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

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

9.2.2 RF test description

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

In test/non-signalling mode the module switches off the 2G/3G/4G protocol stack for performing single tests which could not be performed during signalling mode.

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

When entering the test mode, it is possible to sequentially trigger the following actions for testing purposes:
• 2G transmission of GSM burst sequence on the desired channel and power level (only one time slot configuration is available)

- 2G transmission of 8-PSK modulation burst sequence on the desired channel and power level (only one time slot configuration is available)
- 3G transmission of WCDMA signal on the desired channel and power level
- 4G transmission of LTE SC-FDMA OFDM signal (5 MHz bandwidth) in the desired channel in FDD band and power level
- Receiving signal detection and RF level measurement on the desired 2G, 3G or 4G (LTE) channel
- Receiving signal detection at diversity or secondary antenna input and RF level measurement on the desired 2G, 3G or 4G (LTE) channel

☞ SARA-N2
Only the receiving signal detection and RF level measurement is supported.

☞ The command only accepts the parameters set supported by the specific module version. When an unsupported parameter is issued an error result code will be provided ("+CME ERROR: operation not supported" if +CMEE is set to 2).

The execution of these actions is performed in non-signalling mode. In non-signalling mode:
- The module only accepts +UTEST commands

In normal mode:
- The only allowed +UTEST command is the AT+UTEST=1 used to enable testing interface
- All other +UTEST commands return an error result code ("+CME ERROR: operation not allowed" if +CMEE is set to 2)

☞ The module must not be registered with the network before entering the non-signalling mode, otherwise an error result code ("+CME ERROR: operation not allowed" if +CMEE is set to 2) is provided.

☞ The +CMEE command can only be set in normal mode.

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.

9.2.3 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>]	+UTEST: 124,250,-80,-80,-80
			OK
		OK	
Read	AT+UTEST?	+UTEST: <mode>	+UTEST: 1
		OK	OK
Test	AT+UTEST=?	+UTEST: (list of supported <mode>s)	+UTEST: (0-3)
		OK	OK

9.2.4 Defined values

Parameter	Type	Description
<mode>	Number	Test mode setting: • 0: the module returns to the module normal mode • 1: the module enters non-signalling mode

Parameter	Type	Description
		• 2: RX test mode (measuring the antenna level estimation of the received RF signal)
		• 3: TX test mode (GSMK/8-PSK burst or transmission in 3G bands)
<par1>..<par5>	Number	Parameters needed for RX and TX test mode as reported in the table below.

9.2.5 Notes

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

Parameter	Description	Range	Default	Notes
<par1>	Channel	0 ÷ 165535	32	RX channel 2G RAT: for 850, 900, 1800 bands the value corresponds to ARFCN while for 1900 band an offset of 32768 is added.

o [0-124]: GSM 900 MHz
o [128-251]: GSM 850 MHz
o [512-885]: DCS 1800 MHz
o [975-1023]: EGSM 900 MHz
o [33280-33578]: PCS 1900 MHz (corresponding to ARFCN 512-810 range in band 1900)

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.

o [1537-1738]: band 4 (1700 MHz)
o [2937-3088]: band 8 (900 MHz)
o [4357-4458]: band 5 (850 MHz)
o [4387-4413]: band 6 (800 MHz)
o [20712-20763]: band 19 (800 MHz)
o [9662-9938]: band 2 (1900 MHz)
o [10562-10838]: band 1 (2100 MHz)

RX channel 4G RAT: the value corresponds to EARFCN with an offset of 100000.

o [101950-102399]: FDD band 4 (EARFCN range 1950 - 2399)
o [105010-105179]: FDD band 12 (EARFCN range 5010 - 5179)
o [105180-105279]: FDD band 13 (EARFCN range 5180 - 5279)
o [101200-101949]: FDD band 3 (EARFCN range 1200 - 1949)
o [102750-103449]: FDD band 7 (EARFCN range 2750 - 3449)
o [106000-106149]: FDD band 19 (EARFCN range 6000 - 6149)
o [106150-106449]: FDD band 20 (EARFCN range 6150 - 6449)
o [109210-109659]: FDD band 28 (EARFCN range 9210 - 9659)
o [100000-100599]: FDD band 1 (EARFCN range 0 - 599)
o [100600-101199]: FDD band 2 (EARFCN range 600 - 1199)
o [102400-102649]: FDD band 5 (EARFCN range 2400 - 2649)
o [102650-102749]: FDD band 6 (EARFCN range 2650 - 2749)
o [103450-103799]: FDD band 8 (EARFCN range 3450 - 3799)
o [105730-105849]: FDD band 17 (EARFCN range 5730 - 5849)

☞ The "+CME ERROR: operation not supported" error result code will be provided in these cases (if +CMEE is set to 2):
  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

Parameter	Description	Range	Default	Notes
<par2>	Time	1 ÷ 600000	1000	Time interval for RX test expressed in ms
<par3>	Antenna diversity	0 ÷ 1	0	Receiver path: o 0: main / primary antenna o 1: diversity / secondary antenna The parameter is available only if supported, otherwise an error result code will be provided ("+CME ERROR: operation not supported" if +CMEE is set to 2)
<min>	Minimum antenna RF level estimation	-100 ÷ -20		Expressed in dBm, for 2G RAT ☞ In 3G / 4G RAT the range goes from -90 to -20.
<avg>	Average antenna RF level estimation	-100 ÷ -20		Expressed in dBm, for 2G RAT ☞ In 3G / 4G RAT the range goes from -90 to -20.
<max>	Maximum antenna RF level estimation	-100 ÷ -20		Expressed in dBm, for 2G RAT ☞ In 3G / 4G RAT the range goes from -90 to -20.

- **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. o [0-124]: GSM 900 MHz o [128-251]: GSM 850 MHz o [512-885]: DCS 1800 MHz o [975-1023]: EGSM 900 MHz o [33280-33578]: PCS 1900 MHz (corresponding to ARFCN 512-810 range in band 1900) 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. o [1312-1513]: band 4 (1700 MHz) o [2712-2863]: band 8 (900 MHz) o [4132-4233]: band 5 (850 MHz) o [4162-4188]: band 6 (800 MHz) o [20312-20363]: band 19 (800 MHz) o [9262-9538]: band 2 (1900 MHz) o [9612-9888]: band 1 (2100 MHz) TX channel 4G RAT: the value corresponds to EARFCN with an offset of 100000. o [118000-118599]: FDD band 1 (EARFCN range 18000 - 18599) o [118600-119199]: FDD band 2 (EARFCN range 18600 - 19199) o [119950-120399]: FDD band 4 (EARFCN range 19950 - 20399) o [119200-119949]: FDD band 3 (EARFCN range 19200 - 19949) o [120400-120649]: FDD band 5 (EARFCN range 20400 - 20649) o [120650-120749]: FDD band 6 (EARFCN range 20650 - 20749) o [120750-121449]: FDD band 7 (EARFCN range 20750 - 21449) o [121450-121799]: FDD band 8 (EARFCN range 21450 - 21799) o [123010-123179]: FDD band 12 (EARFCN range 23010 - 23179) o [123180-123279]: FDD band 13 (EARFCN range 23180 - 23279)

Parameter	Description	Range	Default	Notes
				o [123730-123849]: FDD band 17 (EARFCN range 23730 - 23849)
				o [124000-124149]: FDD band 19 (EARFCN range 24000 - 24149)
				o [124150-124449]: FDD band 20 (EARFCN range 24150 - 24449)
				o [127210-127659]: FDD band 28 (EARFCN range 27210 - 27659)
				☞ The "+CME ERROR: operation not supported" error result code will be provided in these cases (if +CMEE is set to 2):
				o A value not belonging to the above ranges is set
				o The TX channel parameter value belongs to a not supported RAT (2G or 3G or 4G RAT) or band
<par2>	Power control level	-56 ÷ 24	5	For 2G RAT: PCL (power control level). The allowed values depend on the related <par1> value: lower numbers means higher power level.
				o [0-19]: GSM 850 and 900, if <par2> is less than 5 the handling is the same for <par2>=5
				o [0-15]: DCS 1800 and PCS 1900
				In case <par4> is set to 2 (8-PSK modulation) the range is as below. Other values are valid but behave as the indicated level:
				o [0-19]: GSM 850 and 900 if <par2> is less than 8 the handling is the same for <par2>=8
				o [0-15]: DCS 1800 and PCS 1900; if <par2> is less than 2 the handling is the same for <par2>=2
				For 3G RAT: absolute output power [dBm]
				o [-56 ÷ 24] for all the bands
				For 4G RAT: absolute output power [dBm]
				o [-40 ÷ 24] for all the bands
				☞ Only the values indicated in the above ranges are valid, otherwise an error result code will be provided ("+CME ERROR: operation not supported" if +CMEE is set to 2).
<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)
				☞ In 3G / 4G RAT the values is unused.
<par4>	Modulation mode	1 ÷ 2	1	Modulation mode
				o 1: GMSK normal modulation including the training sequence
				o 2: 8-PSK normal modulation including the training sequence
				☞ In 3G / 4G RAT the parameter is ignored.
				☞ LTE SC-FDMA OFDM modulation (5 MHz bandwidth), FDD, is automatically set using for <par1> an EARFCN value.
<par5>	Time	0 ÷ 600000	1000	Time interval for TX test expressed in ms
				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.

SARA-N2

- <par3> and <par4> parameters for Tx mode are not supported.
- <par3> parameter for Rx mode is not supported.
- Only LTE RAT is supported.

9.2.6 Examples

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

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

Table 2: RX mode test command examples

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

Table 3: TX mode test command examples

9.2.7 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" (if +CMEE is set to 2) error result code 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.

☞ 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.

9.2.8 Syntax

Type	Syntax	Response	Example
Digital pins testing generic syntax			
Set	AT+UTEST=10,<op_code>[,[<bit_padding>]<pin_seq>]	OK	AT+UTEST=10,3,"0000001000000300" OK
Original configuration restoring			
Set	AT+UTEST=10,0	OK	AT+UTEST=10,0 OK
Pins set definition			
Set	AT+UTEST=10,2,[<bit_padding>]<pin_seq>	OK	AT+UTEST=10,2,"0000000C30000000 3000" OK
Pins configuration			
Set	AT+UTEST=10,3,[<bit_padding>]<pin_seq>	OK	AT+UTEST=10,3,"0000000420000000 1000" OK
Output pins definition			
Set	AT+UTEST=10,4,[<bit_padding>]<pin_seq>	OK	AT+UTEST=10,4,"0000000010000000 2000" OK
Digital testing execution			
Set	AT+UTEST=10,5	OK	AT+UTEST=10,5 OK
Digital value measurement			
Set	AT+UTEST=10,6	<bit_padding>]<pin_seq> OK	AT+UTEST=10,6 00000004100000003000 OK
Read	AT+UTEST?	+UTEST: <mode> OK	+UTEST: 1 OK
Test	AT+UTEST=?	+UTEST: (list of supported <mode>s) OK	+UTEST: (0-3) OK

9.2.9 Defined values

Parameter	Type	Description

<op_code>	Number	Test mode setting:
		
		• 0: exits the test interface and restore the pins to the original configuration
		• 2: defines a set of pins that will be tested and initialize these pins to be ready for testing. The original pins configuration is kept for final restore. See the End User Test Application Note [133] for the list of pins available for testing. In the [<bit_padding>]<pin_seq> parameter use this notation to represent each module pin with its binary digit:
		  o 0: the pin will not be tested
		  o 1: the pin will be tested (as digital input or output)

Parameter	Type	Description
		• 3: configures the logical pins previously enabled for testing as output or input; the command has effect only if AT+UTEST=10,2 has been previously issued.
		In case a not enabled pin is set as digital input or output, the command does not return an error and the setting is not applied. In the [<bit_padding>]<pin_seq> parameter use this notation to represent each module pin with its binary digit:
		o 0: the pin will be set as an output
		o 1: the pin will be set as an input
		• 4: configures the value of the output pins under testing; the command has effect only if AT+UTEST=10,3 has been previously issued; The command is not mandatory if there are not output pins to configure. In the [<bit_padding>]<pin_seq> parameter use this notation to represent each module pin with its binary digit:
		o 0: the pin will output a "low" logic level
		o 1: the pin will output a "high" logic level
		• 5: apply the setting change defined with <op_code>= 2 / 3 / 4 and triggers the execution of the digital testing. Digital testing of the pins is possible only after the execution of the AT+UTEST=10,5 command.
		• 6: returns the logic value of pins under testing (both input and output); in the [<bit_padding>]<pin_seq> parameter use this notation to represent each module pin with its binary digit:
		o 0: "low" logic digital level measured at the module pin
		o 1: "high" logic digital level measured at the module pin
[<bit_padding>]<pin_seq>	Number	Sequence of hexadecimal digits containing the pins information and the action to execute
		See the *Notes* and End User Test Application Note [*133*] for detailed number description

9.2.10 Notes

- Consider these steps to construct the [<bit_padding>]<pin_seq> sequence
    - Consider the total number of module's pins available (76 pins for LISA-U2 series, 64 pins for SARA-U2 series, 92 pins, for TOBY-L2 series)
    - See the End User Test Application Note [*133*] for the list of pins available for testing
    - In case a non-testable pin is selected, the command does not return an error result code but the value is not considered and not applied.
    - The status of the n-th pin will be represented by the corresponding n-th bit; see the <op_code> description for the notation of each mode setting
    - Convert each group of four binary digits into its hexadecimal representation
    - Add one 0 digit at the beginning of the sequence for TOBY-L2 and LISA-U2 series to complete the resulting sequence of hexadecimal values with 0 padding
- An example of AT commands sequence to test the digital pins is reported in *Table 4*.

Command	Response	Description
AT+CMEE=2	OK	Enable the verbose error result code
AT+COPS=2	OK	Deregister the module from the network
AT+UTEST=1	OK	The module enters the test mode
AT+UTEST=10,2,"000007F400C000D83F00"	OK	The command puts the module in Interface initialised state; the command saves the pins status to restore it at the end of the test.
		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:
		o DTR, RTS, GPIO3, GPIO4, I2S1_RXD/GPIO6, GPIO5, I2S1_CLK/GPIO8, SPI_MOSI/GPIO11, SPI_MRDY/GPIO14 as input
		o DSR, RI, DCD, CTS, GPIO1, GPIO2, I2S1_TXD/GPIO7, I2S1_WA/GPIO9, SPI_SCLK/GPIO10, SPI_MISO/GPIO12, SPI_SRDY/GPIO13 as output

Command	Response	Description
AT+UTEST=10,4,"0000036000800 0182700"	OK	Digital logic value of the output pins: o DSR, RI, DCD, CTS, GPIO1, GPIO2, I2S1_TXD/GPIO7, I2S1_WA/GPIO9, SPI_SCLK/GPIO10, SPI_MISO/GPIO12, SPI_SRDY/GPIO13 set to "high".
AT+UTEST=10,5	OK	Configurations made by AT+UTEST=10,2; AT+UTEST=10,3 and AT+UTEST=10,4 are executed.
AT+UTEST=10,6	000007F400C000D83F00 OK	Logic digital value measured at modules pins: o DSR, RI, DCD, DTR, RTS, CTS, GPIO1, GPIO2, GPIO3, GPIO4, I2S1_RXD/GPIO6, I2S1_TXD/GPIO7, GPIO5, I2S1_CLK/GPIO8, I2S1_WA/GPIO9, SPI_SCLK/GPIO10, SPI_MOSI/GPIO11, SPI_MISO/GPIO12, SPI_SRDY/GPIO13, SPI_MRDY/GPIO14: "high" level detected
AT+UTEST=0	OK	Module exits from the test mode and normal pins configurations is restored.

Table 4: Digital pins test command examples

- The digital pins can be configured as many times as needed by the testing process; AT+UTEST=10,2 command is not needed any more as the DUT is already in Interface initialised state:
- See the End User Test Application Note [133] for further test command examples.

9.3 RING line handling +URING

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

9.3.1 Description

Configures the RING line handling of the UART interface for other events besides the usual ones, that is the incoming call indication (RING) (linked to the "RING" URC) and the incoming SMS indication (linked to the +CMT and the +CMTI URCs).

The RING line will be asserted when one of the configured events will occur and it remains asserted for 1 s unless another configured event will happen (in this case the 1 s timer will be started again). Same behavior will be applied if the events are the incoming call or the incoming SMS.

9.3.2 Syntax

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

9.3.3 Defined values

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

9.3.4 Notes

SARA-N2

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

9.4 Debug logging level setting +NLOGLEVEL

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

9.4.1 Description

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

9.4.2 Syntax

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

9.4.3 Defined values

Parameter	Type	Description
<level>	String	Required logging level. Allowed strings: • VERBOSE • NORMAL (default value) • WARNING • ERROR • NONE
<core>	String	Allowed strings: • PROTOCOL • SECURITY • APPLICATION

9.5 Power Saving Mode Setting +CPSMS

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

9.5.1 Description

Configures the UEs power saving mode (PSM) 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 asigned 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)

9.5.2 Syntax

Type	Syntax	Response	Example
Set	AT+CPSMS=[<mode>[,<Requested_ Periodic_RAU>[,<Requested_GPRS_ READY_timer>[,<Requested_Periodic_ TAU>[,<Requested_Active_Time>]]]]]	OK	AT+CPSMS=1,,,"01000011","010000 11" OK
Read	AT+CPSMS?	+CPSMS: <mode>,[<Requested_Periodic_ RAU>],[<Requested_GPRS_READY_ timer>],[<Requested_Periodic_TAU>], [<Requested_Active_Time>] OK	+CPSMS: 1,,,"01000011","01000011" OK
Test	AT+CPSMS=?	+CPSMS: (list of supported <mode>s), (list of supported <Requested_Periodic_ RAU>s),(list of supported <Requested_ GPRS_READY_timer>s),(list of supported <Requested_Periodic_TAU>s),(list of supported <Requested_Active_Time>s) OK	+CPSMS: (0,1,2),,,("00000000 "-"11111111"),("00000000"- "11111111") OK

9.5.3 Defined values

Parameter	Type	Description
<mode>	Number	Indication to disable or enable the use of PSM in the UE. Allowed values: • 0 (default and factory-programmed value): disable the use of PSM • 1: enable the use of PSM • 2: disable the use of PSM and reset all parameters for PSM to factory-programmed values.
<Requested_Periodic_ RAU>	String	Requested extended periodic RAU (T3312) value to be allocated to the GERAN/UTRAN, one byte in an 8 bit format. For the coding and the value range, see the GPRS Timer 3 IE in 3GPP TS 24.00 8 [12].
<Requested_GPRS_ READY_timer>	String	Requested GPRS READY timer (T3314) value to be allocated to the UE in GERAN/UTRAN, one byte in an 8 bit format. For the coding and the value range, see the GPRS Timer 3 IE in 3GPP TS 24.008 [12].
<Requested_Periodic_ TAU>	String	One byte in an 8 bit format. Requested extended periodic TAU value (T3412) to be allocated to the device in E-UTRAN. The requested extended periodic TAU value is coded as one byte (octet 3) of the GPRS Timer 3 information element coded as bit format (e.g. "01000111" equals 70 hours). For the coding and the value range, see the GPRS Timer 3 IE in 3GPP TS 24.008 Table 10.5.163a/3GPP TS 24.008 [12]. See also 3GPP TS 23.682 [153] and 3GPP TS 23.401 [154]. The default value is "01100000".
<Requested_Active_ Time>	String	One byte in an 8 bit format. Requested Active Time value (T3324) to be allocated to the UE. The requested Active Time value is coded as one byte (octet 3) of the GPRS Timer 2 information element coded as bit format (e.g. "00100100" equals 4 minutes). For the coding and the value range, see the GPRS Timer 2 IE in 3GPP TS 24.008 Table 10.5.163/3GPP TS 24.008 [12]. See also 3GPP TS 23.682 [153], 3GPP TS 23.060 [10] and 3GPP TS 23.401 [154]. The default value is "00 000000".

9.5.4 Notes

SARA-N2

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

- The factory-programmed value of <Requested_Periodic_TAU> is 54 m.
- The factory-programmed value of <Requested_Active_Time> is 60 s.

9.6 Power saving mode status report +NPSMR

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

9.6.1 Description

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

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

9.6.2 Syntax

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

9.6.3 Defined values

Parameter	Type	Description
<n>	Number	Configure the corresponding URC: • 0 (default value): +NPSMR URC disabled • 1: +NPSMR URC enabled
<mode>	Number	Indicates the power mode status: • 0 (default value): normal mode • 1: power saving mode

10 GPIO

10.1 Introduction

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

10.1.1 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 5 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	I²S 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-N2			*															*		*

Table 5: GPIO custom functions overview

The configuration of the GPIO pins (i.e. the setting of the parameters of the +UGPIOC AT command) is saved in the NVM and used at the next power-on.

10.1.2 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
16	GPIO1	16	Pad disabled	Reserved for internal use
24	GPIO2	24	Pad disabled	Pin 24 can be configured for network status indication or ring indication

Table 6: SARA-N2 series GPIO mapping

☞ The "GNSS supply enable", "GNSS data ready" and "GNSS RTC sharing" custom functions can be handled by the +UGPS and the +UGPRF custom AT commands to manage the u-blox GNSS receiver connected to the cellular module and the embedded GPS aiding.

☞ The AT+UGPIOC=xx,255 or AT+UGPIOC=xx,0 or AT+UGPIOC=xx,1 commands (where xx= 55, 56, 57, 58, 59) cannot be sent over SPI interface (the "+CME ERROR: GPIO busy" error result code is reported). This is because these commands disable the SPI interface.

☞ When the GPIOs 10-14 need to be switched from tristate (<gpio_mode>=255) or GPIO output (<gpio_mode>=0) or GPIO input (<gpio_mode>=1) to SPI functionality (<gpio_mode>=13), a power cycle (reset) is required for the changes to take effect.

☞ When SIM card detection functionality is enabled, the status is reported by +CIND AT command.

☞ Both the SIM hot insertion detection feature (configurable through the +UDCONF=50 AT command where supported) and the SIM card detection feature must be enabled to allow a correct implementation of these features.

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

10.1.3 Network status indication

When a GPIO pin is configured to provide network status indication, its progress depends on the CS network registration state (see +CREG) and on the module transmission state:

- No service: indicates no network coverage or not registered state
- Registered home network 2G: indicates registered state on home network in 2G RAT
- Registered home network 3G: indicates registered state on home network in 3G RAT
- Registered home network 4G Cat M1: indicates registered state on home network in 4G Cat M1
- Registered roaming 2G: indicates registered state with visitor 2G network (roaming in 2G RAT)
- Registered roaming 3G: indicates registered state with visitor 3G network (roaming in 3G RAT)
- Registered roaming 4G Cat M1: indicates registered state with visitor 4G Cat M1 network (roaming in 4G Cat M1)
- Data transmission: indicates voice or data call active either in 2G, 3G or 4G RAT
- Data transmission roaming: indicates voice or data call active either in 2G, 3G or 4G RAT with visitor network

The following figures report the allowed progresses for GPIO pin set as network indication: V_H and V_L values are provided in the corresponding module data sheet in the "Generic Digital Interfaces pins" section.

10.1.3.1 No service (no network coverage or not registered)

- Continuous Output / Low

Figure 1: GPIO pin progress for no service

10.1.3.2 Registered home network 2G

- Cyclic Output / High for 100 ms, Output / Low for 2 s
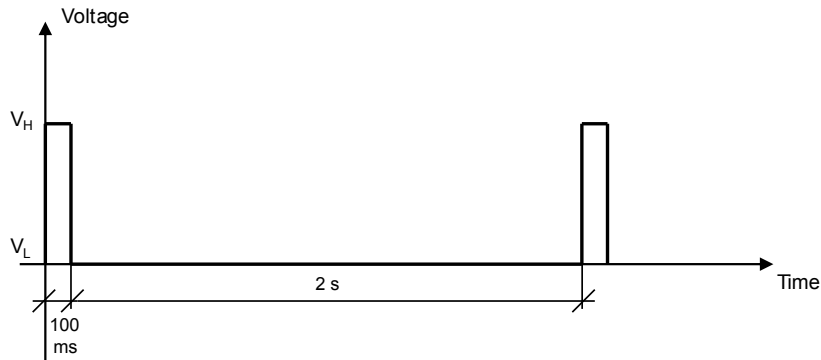
Figure 2: GPIO pin progress for registered home network 2G

10.1.3.3 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
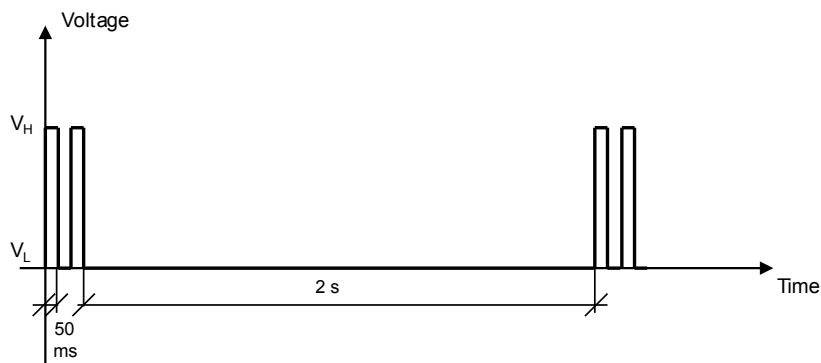
Figure 3: GPIO pin progress for registered home network 3G

10.1.3.4 Registered home network 4G Cat M1

- Cyclic Output / High for 100 ms, Output / Low for 30 s
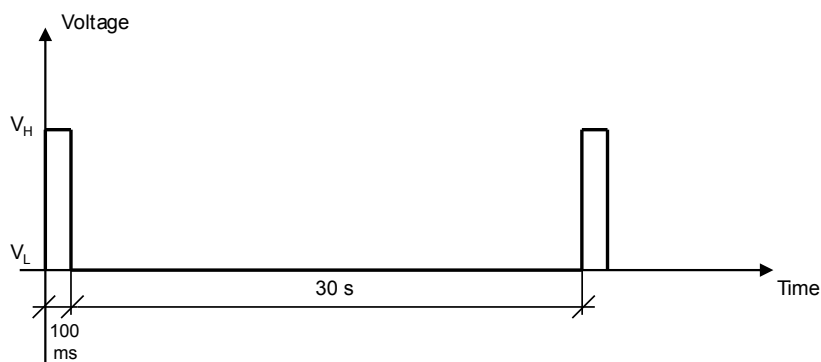
Figure 4: GPIO pin progress for registered home network 4G Cat M1

10.1.3.5 Registered roaming 2G

- Cyclic Output / High for 100 ms, Output / Low for 100 ms, Output / High for 100 ms, Output / Low for 2 s
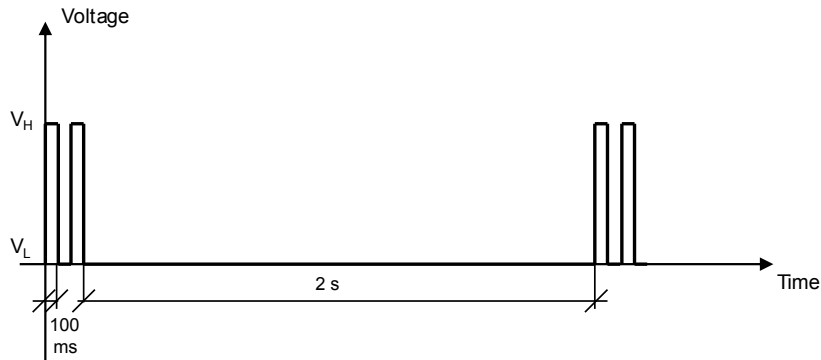
Figure 5: GPIO pin progress for registered roaming 2G

10.1.3.6 Registered roaming 3G

- Cyclic Output / High for 50 ms, Output / Low for 50 ms, Output / High for 50 ms, Output / Low for 100 ms
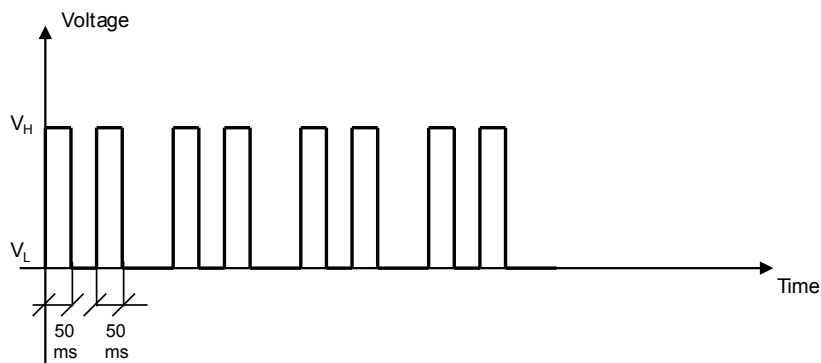
Figure 6: GPIO pin progress for registered roaming 3G

10.1.3.7 Registered roaming 4G Cat M1

- Cyclic Output / High for 100 ms, Output / Low for 100 ms, Output / High for 100 ms, Output / Low for 30 s
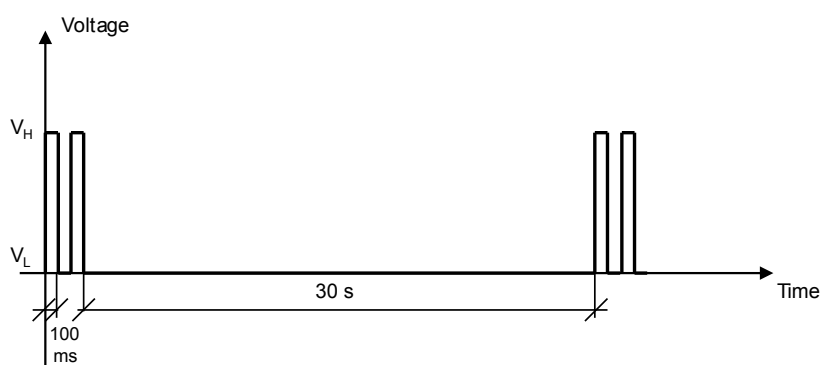
Figure 7: GPIO pin progress for registered roaming 4G Cat M1

10.1.3.8 Data transmission

- Continuous Output / High
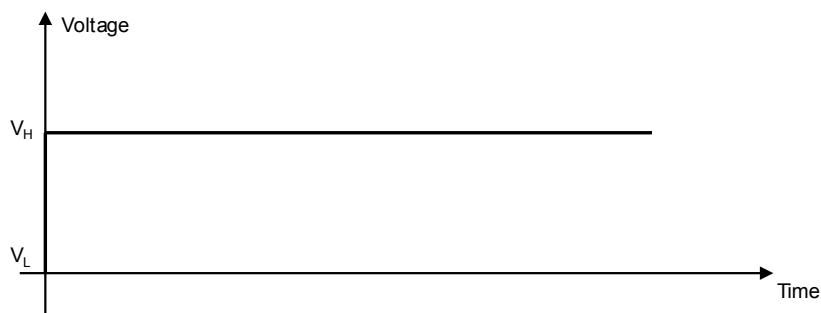
Figure 8: GPIO pin progress for data transmission

10.1.3.9 Data transmission roaming

• Cyclic Output / High for 800 ms, Output / Low for 200 ms
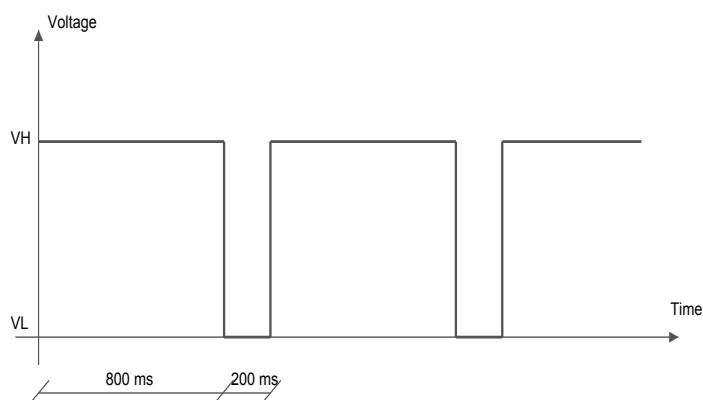
Figure 9: GPIO pin progress for data transmission roaming

10.2 GPIO select configuration command +UGPIOC

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

10.2.1 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

☞ The AT+UGPIOC=xx,255 or AT+UGPIOC=xx,0 or AT+UGPIOC=xx,1 commands (where xx= 55, 56, 57, 58, 59) cannot be sent over the SPI interface (the error result code "+CME ERROR: GPIO busy" is reported). This is because these commands disable the SPI interface.

☞ For more details regarding the custom functions supported by the u-blox cellular modules and the factory-programmed settings, see *GPIO functions* and *GPIO mapping*.

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

10.2.2 Syntax

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

10.2.3 Defined values

Parameter	Type	Description
<gpio_id>	Number	GPIO pin identifier: pin number
		See the *GPIO mapping* for the available GPIO pins, their mapping and factory-programmed values on different u-blox cellular modules series and product version.
<gpio_mode>	Number	Mode identifier: configured function
		See the *GPIO functions* for custom functions supported by different u-blox cellular modules series and product version.
		Allowed values: • 0: output • 1: input • 2: network status indication • 3: GNSS supply enable • 4: GNSS data ready • 5: GNSS RTC sharing

Parameter	Type	Description
		• 7: SIM card detection • 8: headset detection • 9: GSM Tx burst indication • 10: module operating status indication • 11: module functionality status indication • 12: I^{2}S digital audio interface • 13: SPI serial interface • 14: master clock generation • 15: UART (DSR, DTR, DCD e RI) interface • 16: Wi-Fi enable • 18: Ring indication • 19: Last gasp enable • 255: pad disabled
<gpio_out_val>	Number	GPIO output value (for output function <gpio_mode>=0 only): • 0 (default value): low • 1: high
<gpio_in_pull>	Number	GPIO input value (for input function <gpio_mode>=1 only): • 0 (default value): no resistor activated • 1: pull up resistor active • 2: pull down resistor active

10.2.4 Notes

SARA-N2
- <gpio_in_pull> and <gpio_out_val> are not supported.
- Only 4G Cat M1 home/roaming network is supported.

11 Internet protocol transport layer

11.1 Introduction

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

⚠ The UDP protocol has not any flow control mechanism and packets might be lost in the following scenarios:
- No network signal is available
- Unreliable radio interface (e.g. mobility in GPRS, where cell reselections can lead to data loss, that can be contrasted with the usage of LLC ack reliability QoS parameter

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

11.2 IPv4/IPv6 addressing

11.2.1 Introduction

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

11.2.2 IPv4

Format:

- 32 bits long in dot-decimal notation (without leading 0 notation).
- All the decimal numbers must be in range 0-255.
- The dot-octal notation is not supported.
- The dot-hexadecimal notation is not supported.

Examples:

IPv4 address	Remarks
254.254.254.254	Valid address
010.228.76.34	Invalid address; first decimal number prefixed with a leading zero
257.228.76.34	Invalid address; first decimal number greater than 255
0010.0344.0114.0042	Invalid address; dot-octal notation; decimals given as octal numbers
0x10.0xE4.0x4C.0x22	Invalid address; dot-hexadecimal notation; decimals given as hexadecimal numbers

Table 7: IPv4 address format examples

11.3 Create socket +NSOCR

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

11.3.1 Description

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

☞ A maximum of 7 sockets are supported.

11.3.2 Syntax

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

11.3.3 Defined values

Parameter	Type	Description
<type>	String	Socket type. Supported value is "DGRAM".
<protocol>	Number	Standard internet protocol definition. Allowed value: • 17: UDP
<listen_port>	Number	Local port that will be included in sent messages and on which messages will be received. The range goes from 0 to 65535 except for 5683.
<receive_control>	Number	Allowed values: • 0: incoming messages will be ignored • 1 (default value): incoming messages will trigger a +NSONMI URC
<socket>	Number	Socket identifier to be referenced by the other socket AT commands

11.3.4 Notes

SARA-N2

• A maximum of 7 sockets are supported.

11.4 SendTo command (UDP only) +NSOST

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

11.4.1 Description

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

11.4.2 Syntax

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

11.4.3 Defined values

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

11.5 SendTo command with Flags (UDP only) +NSOSTF

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

11.5.1 Description

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

11.5.2 Syntax

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

11.5.3 Defined values

Parameter	Type	Description
<socket>	Number	Socket identifier returned by *+NSOCR*.
<remote_ip_address>	String	Remote host IP address of the remote host in IPv4 format. IP addresses can be specified in decimal, octal or hexadecimal format.
<remote_port>	Number	Remote port where the messages will be received on, in range 0-65535.
<flag>	Number	Specifies the type of message transmission in hexadecimal format. Values of this argument are formed by logically OR'ing zero or more of the following flags: • 0x000: no flags are set • 0x100: exception message. Send message with high priority • 0x200: release indicator. Indicate release after next message • 0x400: release indicator. Indicate release after next message has been replied to
<length>	Number	Data size to send. The maximum length is 512 bytes.
<data>	String	Data to be sent in hexadecimal format
<sent_length>	Number	Amount of data successfully sent

11.6 Received message indication +NSONMI

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

11.6.1 Description

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

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

11.6.2 Syntax

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

11.6.3 Defined values

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

11.7 Receive command (UDP only) +NSORF

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

11.7.1 Description

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

11.7.2 Syntax

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

11.7.3 Defined values

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

11.8 Close socket +NSOCL

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

11.8.1 Description

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

11.8.2 Syntax

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

11.8.3 Defined values

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

12 Ping

12.1 IP network connectivity testing to a remote host +NPING

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

12.1.1 Description

Sends an ICMP packet to the specified host address.

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

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

12.1.2 Syntax

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

12.1.3 Defined values

Parameter	Type	Description
<remote_addr>	String	Address of system sending the message in IPv4 format. IP addresses can be specified in decimal, octal or hexadecimal notation.
<p_size>	Number	Size of echo packet payload in range 8-1460 bytes, the default value is 8 bytes.
<timeout>	Number	Maximum time to wait for an echo reply response in range 10-60000 ms, the default value is 10 000 bytes.
<retry_num>	Number	Number of packets sent before a response is received.
<ttl>	Number	TTL in the response packet.
<rtt>	Number	RTT value, the time elapsed in milliseconds before receiving the echo reply response from the remote host.
<err>	Number	Provides some information about the ping request failure: • 1: no response from remote host within timeout period • 2: failed to send ping request

13 Datagram messages

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

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

☞ The +NCDP AT command specifies the MNO NB-IoT platform.

13.1 Get message +NMGR

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

13.1.1 Description

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

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

13.1.2 Syntax

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

13.1.3 Defined values

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

13.2 Send message +NMGS

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

13.2.1 Description

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

13.2.2 Syntax

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

13.2.3 Defined values

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

13.3 New message indications +NNMI

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

13.3.1 Description

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

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

13.3.2 Syntax

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

13.3.3 Defined values

Parameter	Type	Description
<indication>	Number	Allowed values: • 0 (default value): indications disabled • 1: indications enabled including the received message • 2: only the indications are enabled; retrieve the message by means of *+NMGR* AT command
<length>	Number	Number of bytes of the data in range 0-512
<data>	String	Data to be transmitted in hexadecimal format

13.4 Query received messages +NQMGR

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

13.4.1 Description

Queries the status of the received downstream messages.

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

13.4.2 Syntax

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

13.4.3 Defined values

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

13.5 Query sent messages +NQMGS

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

13.5.1 Description

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

13.5.2 Syntax

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

13.5.3 Defined values

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

13.6 Send message indications +NSMI

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

13.6.1 Description

Enables and disables indications when an upstream message is sent.

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

13.6.2 Syntax

Type	Syntax	Response	Example
Set	AT+NSMI=\<indication>	+NSMI: OK OK	AT+NSMI=1 +NSMI: OK

Type	Syntax	Response	Example
			OK
Read	AT+NSMI?	+NSMI: <indication>	+NSMI: 1
		OK	OK
URC		+NSMI: <status>	

13.6.3 Defined values

Parameter	Type	Description
<indication>	Number	• 0 (default value): indications disabled • 1: indications enabled
<status>	String	Allowed values: • "SENT" • "DISCARDED"

13.7 Chipset vendor CDP IP address +NCDP

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

13.7.1 Description

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

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

13.7.2 Syntax

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

13.7.3 Defined values

Parameter	Type	Description
<IPv4_address>	String	CDP destination IPv4 address. IP addresses can be specified in decimal, octal or hexadecimal notation.
<port>	Number	CDP destination port number: • If <port>= 0 is provided, the default port (5683) will be used. • If no port is specified the previously set port will be used. • If no port is specified and no port was previously set, the default port will be used.

13.7.4 Notes

SARA-N2
- Put the MT to the minimum cellular functionality (*AT+CFUN=0*) before issuing this command.
- The changes are effective after the module reboot.

13.8 Message registration status +NMSTATUS

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

13.8.1 Description

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

13.8.2 Syntax

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

13.8.3 Defined values

Parameter	Type	Description
<registration_status>	String	Current registration status. Allowed values: • "UNINITIALISED" • "MISSING_CONFIG" • "INIT_FAILED" • "INITALISED" • "REGISTERING" • "REREGISTERING" • "REGISTERED" • "REREGISTERED" • "SEND_ENABLED" • "NO_UE_IP" • "MEMORY_ERROR" • "COAP_ERROR" • "MSG_SEND_FAILED" • "REJECTED_BY_SERVER" • "TIMEOUT_AND_RETRYING" • "TIMEOUT_AND_FAILED"

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	Not found
23	Memory failure
24	Text string too long
25	Invalid characters in text string
26	Dial string too long
27	Invalid characters in dial string
30	No network service
31	Network timeout
32	Network not allowed - emergency calls only
40	Network personalisation PIN required
41	Network personalisation PUK required
42	Network subset personalisation PIN required
43	Network subset personalisation PUK required
44	Service provider personalisation PIN required
45	Service provider personalisation PUK required
46	Corporate personalisation PIN required
47	Corporate personalisation PUK required
50	Incorrect parameters
51	Command implemented but currently disabled
52	Command aborted by user
100	Unknown
103	Illegal MS
106	Illegal ME
107	GPRS services not allowed
108	GPRS and non GPRS services not allowed
111	PLMN not allowed
112	Location area not allowed
113	Roaming not allowed in this location area
126	Insufficient resources
132	Service option not supported
133	Requested service option not subscribed
134	Service option temporarily out of order

Numeric error code	Description
135	NS-api already used
140	Feature not supported
141	Semantic error in the TFT operation
142	Syntactical error in the TFT operation
143	Unknown PDP context
144	Semantic errors in packet filter(s)
145	Syntactical errors in packet filter(s)
146	PDP context without TFT already activated
148	Unspecified GPRS error
149	PDP authentication failure
150	Invalid mobile class
156	User Busy
159	Uplink Busy/ Flow Control
254	Invalid error mapping
255	Internal error
300	ME failure
301	SMS service of ME reserved
302	Operation not allowed
303	Operation not supported
304	Invalid PDU mode parameter
305	Invalid text mode parameter
310	(U)SIM not inserted
311	(U)SIM PIN required
312	PH-(U)SIM PIN required
313	(U)SIM failure
314	(U)SIM busy
315	(U)SIM wrong
316	(U)SIM PUK required
317	(U)SIM PIN2 required
318	(U)SIM PUK2 required
320	Memory failure
321	Invalid memory index
322	Memory full
330	SMSC address unknown
331	No network service
332	Network timeout
340	No +CNMA acknowledgement expected
500	Unknown error
512	Required parameter not configured
513	TUP not registered
514	AT internal error
515	CID is active
516	Incorrect state for command
701	Incorrect security code
702	Max attempts reached
1001	Unassigned (unallocated) number
1003	No route to destination
1006	Channel unacceptable
1008	Operator determined barring
1016	Normal call clearing
1017	User busy
1018	No user responding
1019	User alerting, no answer
1021	Call rejected
1022	Number changed

Numeric error code	Description
1026	Non selected user clearing
1027	Destination out of order
1028	Invalid number format (incomplete number)
1029	Facility rejected
1030	Response to STATUS ENQUIRY
1031	Normal, unspecified
1034	No circuit/channel available
1038	Network out of order
1041	Temporary failure
1042	Switching equipment congestion
1043	Access information discarded
1044	requested circuit/channel not available
1047	Resources unavailable, unspecified
1049	Quality of service unavailable
1050	Requested facility not subscribed
1055	Incoming calls barred within the CUG
1057	Bearer capability not authorized
1058	Bearer capability not presently available
1063	Service or option not available, unspecified
1065	Bearer service not implemented
1068	ACM equal to or greater than ACMmax
1069	Requested facility not implemented
1070	Only restricted digital information bearer capability is available
1079	Service or option not implemented, unspecified
1081	Invalid transaction identifier value
1087	User not member of CUG
1088	Incompatible destination
1091	Invalid transit network selection
1095	Semantically incorrect message
1096	Invalid mandatory information
1097	Message type non-existent or not implemented
1098	Message type not compatible with protocol state
1099	Information element non-existent or not implemented
1100	Conditional IE error
1101	Message not compatible with protocol state
1102	Recovery on timer expiry
1111	Protocol error, unspecified
1127	Interworking, unspecified
1279	Number not allowed
1283	CCBS possible
1500	Wrong GPIO identifier
1501	Set GPIO default error
1502	Select GPIO mode error
1503	Read GPIO error
1504	Write GPIO error
1505	GPIO busy
1520	Wrong ADC identifier
1521	Read ADC error
1530	IPv4 only allowed
1531	IPv6 only allowed
1540	Wrong ringer identifier
1542	LLC or SNDCP failure
1543	Regular deactivation
1544	Reactivation requested
1545	Single address bearers only allowed

Numeric error code	Description
1546	Invalid transaction identifier value
1547	APN restriction val incompatible with PDP context
1548	PDP activation rejected
1549	unknown PDP address or PDP type
1550	GPRS generic operation error
1551	GPRS invalid APN
1552	GPRS authentication failure
1553	GPRS QoS parameters inconsistent
1554	GPRS network failure
1555	GPRS context busy
1556	CSD generic operation error
1557	CSD undefined profile
1558	CSD context busy
1559	PLMN scan not allowed
1600	FFS error
1560	PDP type IPv4 only allowed
1561	PDP type IPv6 only allowed
1612	FILE NOT FOUND
1613	Cannot open file
1620	Buffer full
1621	FFS initializing
1622	FFS already open file
1623	FFS not open file
1624	FFS file not found
1625	FFS file already created
1626	FFS illegal id
1627	FFS illegal file handle
1628	FFS illegal type
1629	FFS illegal mode
1630	FFS file range
1631	FFS operation not possible
1632	FFS write error
1633	FFS user id error
1634	FFS internal fatal error
1635	FFS memory resource error
1636	FFS maximum number of files exceeded
1637	FFS memory not available
1638	FFS invalid filename
1639	FFS streaming not enabled
1640	FFS operation not allowed on static file
1641	FFS memory table inconsistency
1642	FFS not a factory default file
1643	FFS requested memory temporary not available
1644	FFS operation not allowed for a directory
1645	FFS directory space not available
1646	FFS too many streaming files open
1647	FFS requested dynamic memory temporary not available
1648	FFS user provided a NULL parameter instead of a suitable buffer
1649	FFS timeout
1650	Command line too long
1660	Call barred - Fixed dialing numbers only
1700	GPS GPIO not configured
1701	GPS GPIO ownership error
1702	Invalid operation with GPS ON
1703	Invalid operation with GPS OFF

Numeric error code	Description
1704	Invalid GPS aiding mode
1705	Reserved GPS aiding mode
1706	GPS aiding mode already set
1707	Invalid GPS trace mode
1708	Parameter valid only in case of GPS OTA
1709	GPS trace invalid server
1710	Invalid TimeZone
1711	Invalid value
1712	Invalid parameter
1713	Invalid operation with LOC running / GPS Busy
1801	IBM busy / eCall already armed/active
1802	IBM feature off / eCall feature off
1803	Wrong IBM requested
1804	Audio resource not available
1805	ECALL restriction
1806	eCall invalid dial number
1900	No SAP Server Connection
1901	SAP Protocol Error
1902	SAP Connection failure
1903	SAP Server Disconnection
1904	SAP Other terminal using service
1910	USECMNG import timeout expired (no input for > 20 s)
1911	USECMNG import file size exceeds limit
1912	USECMNG no memory available
1913	USECMNG invalid certificate/key format
1914	USECMNG database full
1950	CDC-ECM is not available
1951	CDC-ECM is busy
1952	No DHCP Packets received from the DTE
2000	Command timeout
3000	Command aborted
4000	APN configuration mismatch
4001	IP type configuration mismatch

A.2 Message service error result codes +CMS ERROR

Numeric error code	Description
1	Unassigned (unallocated) number
5	Delta firmware unavailable on FOTA server
8	Operator determined barring
10	Call barred
17	Network failure
21	Short message transfer rejected
22	Memory capacity exceeded
27	Destination out of service
28	Unidentified subscriber
29	Facility rejected
30	Unknown Subscriber
38	Network out of order
41	Temporary failure
42	Congestion
47	Resources unavailable, unspecified
50	Requested facility not subscribed
69	Requested facility not implemented
81	Invalid short message reference value

Numeric error code	Description
95	Invalid message, unspecified
96	invalid mandatory information
97	Message type non-existent or not implemented
98	Message not compatible with short message protocol state
99	Information element non-existent or not implemented
111	Protocol error, unspecified
127	Interworking, unspecified
128	Telematic interworking not supported
129	Short message type 0 not supported
130	Cannot replace short message
143	Unspecified TP-PID error
144	Data coding scheme (alphabet) not supported
145	Message class not supported
159	Unspecified TP-DCS error
160	Command cannot be actioned
161	Command unsupported
175	Unspecified TP-Command error
176	TPDU not supported
192	SC busy
193	No SC subscription
194	SC system failure
195	Invalid SME address
196	Destination SME barred
197	SM Rejected-Duplicate SM
198	TP-VPF not supported
199	TP-VP not supported
208	SIM SMS storage full
209	No SMS storage capability in SIM
210	Error in MS
211	Memory Capacity Exceeded
212	SIM Application Toolkit Busy
213	SIM data download error
287	Network failure unspecified
290	Network no resource
296	Radio Resources not Aailable due to DUAL SIM operation
297	Out of service due to DUAL SIM operation
300	ME failure
301	SMS service of ME reserved
302	Operation not allowed
303	operation not supported
305	Invalid Text mode parameter
310	SIM not inserted
311	SIM PIN required
312	PH-SIM PIN required
313	SIM failure
314	SIM busy
315	SIM wrong
320	memory failure
321	invalid memory index
322	memory full
330	SMSC address unknown
331	no network service
332	network timeout
340	no +CNMA acknowledgement expected
500	unknown error

Numeric error code	Description
512	Relay Protocol Acknowledgement
513	SMS timer expired
514	SMS forwarding availability failed
515	SMS forwarding availability aborted
516	MS invalid TP-Message-Type-Indicator
517	MS no TP-Status-Report in Phase 1
518	MS no TP-Reject-Duplicate in phase 1
519	MS no TP-Replay-Path in Phase 1
520	MS no TP-User-Data-Header in Phase 1
521	MS missing TP-Validity-Period
522	MS invalid TP-Service-Centre-Time-Stamp
523	MS missing TP-Destination-Address
524	MS invalid TP-Destination-Address
525	MS missing Service-Centre-Address
526	MS invalid Service-Centre-Address
527	MS invalid alphabet
528	MS invalid TP-User-Data-length
529	MS missing TP-User-Data
530	MS TP-User-Data to long
531	MS no Command-Request in Phase 1
532	MS Cmd-Req invalid TP-Destination-Address
533	MS Cmd-Req invalid TP-User-Data-Length
534	MS Cmd-Req invalid TP-User-Data
535	MS Cmd-Req invalid TP-Command-Type
536	MN MNR creation failed
537	MS CMM creation failed
538	MS network connection lost
539	MS pending MO SM transfer
540	RP-Error OK
541	RP-Error OK no icon display
542	SMS-PP Unspecified
543	SMS rejected By SMS CONTROL
544	Service Centre Address(SCA) FDN failed
545	Destination Address(DA) FDN failed
546	BDN check failed
547	Unspecified SMS PP error
548	Undefined Result
548	No Route To Destination
549	Channel Unacceptable
555	No Circuit/Channel Available
556	Access Information Discarded
557	Requested Circuit/Channel Not Available By Other Side
558	Quality Of Service Unavailable
560	Bearer Capability Not Authorized
561	Bearer Capability Not Presently Available
562	Service or Option Not Available, Unspecified
563	Bearer Service Not Implemented
564	ACM Equal to or Greater Than ACMmax
565	Only Restricted Digital Information Bearer Capability Is Available
566	Service or Option Not Implemented, Unspecified
567	User Not Member of CUG
568	Incompatible By Destination
569	Invalid Transit Network Selection
571	Message Not Compatible With Protocol State
572	Recovery On Timer Expiry

u-blox

Numeric error code	Description
576	Data Call Active
577	Speech Call Active
579	MOC Setup Rejected Due to Missing ACM Info
580	Temporary Forbidden Call Attempt
581	Called Party is Blacklisted
583	Temporary Forbidden Call Attempt No Service
584	Temporary Forbidden Call Attempt Limited Service
585	Client Temporary Barred
586	Dual Service Call Active
587	Atc Fclass Not Speech
590	Client Not Registrated
591	Active Client Gone
595	Rejected By Call Control
601	Invalid ALS Line
604	MM No Service (out of coverage)
605	MM Access Class Barred (RR_REL_IND During RR Conn. Establishment)
606	ME Busy -CM Service Request Already Pending
608	Rejected Due To SUP Timer Expiry
609	Rejected Due To USSD Busy
610	Rejected Due To SS Busy
612	SIM Toolkit Request Is Rejected, Because Another SIM Toolkit Request Is Pending
614	Rejected Because SIM Toolkit Request Is Not Yet Answered By The User
615	MN Setup SS Error
616	Call Controller Blocked (Other Call Command Pending)
618	Environment Parameter Not Set Correctly (Fclass/Cmod)
619	Other Blocking Call Present
620	Lower Layer Failure
621	The Authentication Proedure Failed
622	The Packet-Switched Registration Procedure Failed
623	CM Service Reject From The Network
624	The ABORT Message Was Received From The Network
625	Timer Expiry
626	IMSI Deatch Was Initiated
627	Normal RR Connection Release (2G)
628	Registration Failed
630	Failure Due To Handover
631	Link Establishment Failure
632	Random Access Failure
633	Radio Link Aborted
634	Lower Layer Failure in Layer 1
635	Immediate Assignment Reject
636	Failure Due To Paging
637	Abnormal Release Unspecified
638	Abnormal Release Channel Unacceptable
639	Abnormal Release Timer Expired
640	Abnormal Release No Act On Radio Path
641	Preemptive Release
642	UTRAN Configuration Unknown
643	Handover Impossible
644	Channel Mode Unacceptable
647	Lower Layer Failure From NW
649	Conditional IE Error
650	No Cell Allocation Available
653	Re Establishment Reject
654	Directed Sigconn Re Establishment

Numeric error code	Description
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 FOAT error result codes

See +UFWUPD command description.

A.3.1 SARA-N2 / LARA-R2 / TOBY-R2 / LISA-U1 / LISA-U2 / SARA-U2 / SARA-G3 / LEON-G1 error result codes

Error result code	Description
ERROR1	The operation has been interrupted and the actual FW is unchanged; the module drops out from Firmware Update Mode
ERROR2	The operation has been interrupted during FW updating; the actual firmware is corrupted and the module remains in Firmware Update Mode
ERROR3	The signature check fails
ERROR4	The module has received unexpected EOT because not all excepted bytes have been received
ERROR5	The boot does not support the selected baudrate
ERROR6	Invalid AT command sent during boot
FLS header decoding failed	An error occurs during decoding of file header
Buffer Data Overrun	The buffers are not filled at least with a 1029 packet: data comes too slowly
Timeout	The command must be re-sent: no data is coming

B Appendix: AT Commands List

AT command	Datagram messages								
	+NCDP	+NMGR	+NMGS	+NMSTATUS	+NNMI	+NQMGR	+NQMGS	+NSMI	
SARA N200-02B / N201-02B									
N210-02B / N211-02B	•	•	•	•	•	•	•	•	
N280-02B									

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

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

AT command	Internet suite	
	+NPING	
SARA	N200-02B / N201-02B	
	N210-02B / N211-02B	•
	N280-02B	

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

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

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

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

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

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

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

B.1 Parameters stored in profiles

The parameter settings of some commands can be stored in the profiles available in the memory module. To store, partially display, activate and de-activate these profiles, see the *AT&W*, *AT&V*, *AT&Y* commands description.

☞ Not all the parameter setting are displayed through *AT&V* command.

☞ Some AT commands have a unique configuration for all the AT interfaces while for other AT commands it is possible to set a different configuration for each AT interface: the "AT interface configuration sharing" column in the next table provides this information.
Some AT command interfaces have a dynamic activation, which means they are not statically activated at boot time (MUX AT channel is activated when the MUX protocol is established, USB AT channel is activated if/when the USB cable is plugged-in, deactivated when it is removed). Since the activation reloads the AT command profile from NVM for the activated interface, the shared "AT interface configurations" could be overwritten. It is suggested to reconfigure them at the requested value if an AT command interface is dynamically activated.

The following table lists the AT commands which setting can be stored in the profiles with their parameters as well as the factory-programmed values.

AT command	Description	AT interface configuration sharing	Factory-programmed value / Remarks
+COPS	Operator selection	Yes	• 0 (autoregistration enabled) • 0 (operator expressed in long alphanumeric format) • FFFF (undefined PLMN to register when COPS=1)

B.2 Parameters stored in non volatile memory

The following table lists the AT commands which setting can be stored in the non volatile memory with their parameters and the factory-programmed values.

AT command	Description	Factory-programmed value / Comment
+CCLK	Clock	04/01/01,00:00:00+00
+CGDCONT	PDP context definition	
+CTZU	Automatic time zone update	• SARA-N2 - 1 (automatic time zone via NITZ enabled)
+NATSPEED	Configure AT UART baud rate	9600 b/s (AT UART baud rate), 2 (sample earlier), 1 (1 stop bit)
+NCDP	Chipset vendor CDP IP address	
+UGPIOC	GPIO functionality setting	• SARA-N2 - 255 (<gpio2>)
+URING	RING line handling	0 (feature disabled (RING line is only asserted on incoming call and incoming SMS))
+CPSMS	Power Save Mode	

B.3 Estimated command response time

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

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

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

Category	Estimated maximum time to get response	Commands
GPIO commands	< 10 s	*+UGPIOC*

C Appendix: Glossary

2G	2nd Generation
3G	3rd Generation
3GPP	3rd Generation Partnership Project
ADC	Analog to Digital Converter
AleC	Automatically Initiated eCall
ADN	Abbreviated Dialing Numbers
AMR	Adaptive Multi Rate
AP	Access Point
APN	Access Point Name
ASCII	American Standard Code for Information Interchange
AT	AT Command Interpreter Software Subsystem, or attention
BL	Black List
BSD	Berkley Standard Distribution
CB	Cell Broadcast
CBM	Cell Broadcast Message
CLI	Calling Line Identification
CLIP	Calling Line Identification Presentation
CLIR	Calling Line Identification Restriction
COLP	Connected Line Identification Presentation
COLR	Connected Line Identification Restriction
CM	Connection Management
CPHS	Common PCN Handset Specification
CR	Carriage Return
CS	Circuit Switch
CSD	Circuit-Switched Data
CSG	Closed Subscriber Group
CTS	Clear To Send
CUG	Closed User Group
DA	Destination Address
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_{CGST}	Elementary File "Closed Subscriber Group Type"
EF_{HNBN}	Elementary File "Home Node B Number"
$EF_{PLMNwAcT}$	Elementary File "User controlled PLMN Selector with Access Technology"
eIM	eCall In-band Modem
EONS	Enhanced Operator Name from SIM-files EF_{OPL} and EF_{PNN}
EPD	Escape Prompt Delay
ETSI	European Telecommunications Standards Institute
E-UTRAN	Evolved UTRAN
FDN	Fixed Dialling Number

FOAT	Firmware Over AT
FOTA	Firmware Over The Air
FS	File System
FTP	File Transfer Protocol
FW	Firmware
FWINSTALL	Firmware Install
GAS	Grouping information Alpha String
GPIO	General Purpose Input Output
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global System for Mobile Communications
HDLC	High Level Data Link Control
HNB	Home Node B
HPLMN	Home PLMN
HTTP	HyperText Transfer Protocol
I	Information
I^{2}C	Inter-Integrated Circuit
I^{2}S	Inter IC Sound or Integrated Interchip Sound
ICCID	Integrated Circuit Card ID
ICMP	Internet Control Message Protocol
ICP	Inter Processor Communication
IMEI	International Mobile Equipment Identity
IMSI	International Mobile Station Identity
InBM	In-Band Modem (generic)
IP	Internet Protocol
IRA	International Reference Alphabet
IRC	Intermediate Result Code
ISDN	Integrated Services Digital Network
ISP	Internet Service Provider
IVS	In-Vehicle System (eCall related)
L3	Layer 3
LCP	Link Control Protocol
LF	Line Feed
LNS	Linux Network Subsystem
M2M	Machine-To-Machine
MCC	Mobile Country Code
ME	Mobile Equipment
MIeC	Manually Initiated eCall
MMI	Man Machine Interface
MN	Mobile Network Software Subsystem
MNC	Mobile Network Code
MNO	Mobile Network Operator
MO	Mobile Originated
MS	Mobile Station
MSD	Minimum Set of Data (eCall related)
MSIN	Mobile Subscriber Identification Number
MSISDN	Mobile Systems International Subscriber Identity Number
MSPR	Multi-Slot Power Reduction
MT	Mobile Terminated
MWI	Message Waiting Indication
NITZ	Network Identity and Time Zone
NVM	Non-Volatile Memory
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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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
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29. 3GPP TS 22.087 - User-to-User Signalling (UUS)
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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
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101. 3GPP TS 24.173 IMS Multimedia telephony communication service and supplementary services; Stage 3

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107. 3GPP TS 22.071 Location Services (LCS); Service description

108. IEC 61162 Digital interfaces for navigational equipment within a ship

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110. 3GPP TS 24.167 3GPP IMS Management Object (MO); Stage 3

111. ITU-T E.212 - Series E: Overall network operation, telephone service, service operation and human factors

112. RFC 793 - Transmission Control Protocol (TCP) Protocol Specification (*https://www.rfc-editor.org/rfc/rfc793.txt*)

113. 3GPP TS 26.201 Speech codec speech processing functions; Adaptive Multi-Rate - Wideband (AMR-WB) speech codec; Frame structure

114. 3GPP TS 24.216 Communication Continuity Management Object (MO)

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147. RFC 1519 - Classless Inter-Domain Routing (CIDR): an Address Assignment and Aggregation Strategy (*https://tools.ietf.org/html/rfc1519*)

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151. 3GPP TS 24.237 - Technical Specification Group Core Network and Terminals; IP Multimedia (IM) Core Network (CN) subsystem IP Multimedia Subsystem (IMS) Service Continuity; Stage 3

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153. 3GPP TS 23.682 - Architecture enhancements to facilitate communications with packet data networks and applications

154. 3GPP TS 23.401 - General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access

155. GSMA TS.34 - IoT Device Connection Efficiency Guidelines

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Revision history

Revision	Date	Name	Comments
R01	22-Aug-2016	sfal	Initial release
R02	23-Dec-2016	lpah	New commands: *+NRB*, *+NCDP*, *+NUESTATS*, *+CSCON*, *+NBAND*, *+NEARFCN*, *+NMGR*, *+NMGS*, *+NQMGR*, *+NQMGS*, *+NNMI*, *+NSMI*, *+NLOGLEVEL*, *+NSOCR*, *+NSOCL*, *+NSOST*, *+NSONMI*, *+NSORF*, *+NPING*, *+NCONFIG*
			Modified commands: *+CGSN*, *+CIMI*, *+CMEE*, *+CFUN*, *+COPS*, *+CGDCONT*, *+CEREG*, *+CGATT*
			Review the command applicability for these commands: *+CGMM*, *+CGMR*, *+CGMI*, *+CGSN*, *+CIMI*, *+CLAC*, *+CFUN*, *+CMEE*, *+CSQ*, *+COPS*, *+CGDCONT*, *+CGPADDR*, *+CEREG*, *+CGATT*
R03	30-Jan-2017	lpah	New commands: *+NCONFIG*
			Modified commands: *+CIMI*, *+CSCON*, *+NCDP*, *+NUESTATS*, *+NBAND*, *+COPS*, *+CGPADDR*, *+CEREG*, *+NSOCR*, *+NSONMI*, *+NPING*, *+NMGR*, *+NMGS*, *+NQMGR*, *+NSMI*, *+NSORF*, *+NQMGS*
R04	24-Mar-2017	lpah	Document aligned to FW V100R100C10B655SP2
			Modified commands: *+NUESTATS*, *+NSOCR*, *+NSOST*, *+NPING*
R05	24-Apr-2017	lpah	Document aligned to FW V100R100C10B656
			New commands: *+NSOSTF*
			Modified commands: *AT command settings*, *+CGSN*, *+CCLK*, *+NRB*, *+CSQ*, *+NEARFCN*, *<PDP_addr>*, *+CGPADDR*, *+CEREG*, *+NSOCR*, *CME error result codes*
R06	06-Jun-2017	lpah	Extended the document applicability to SARA-N200-02B, SARA-N201-02B, SARA-N210-02B, SARA-N211-02B, SARA-N280-02B
			New commands: *+CPSMS*
			Modified commands: *AT command settings*, *General operation*, *I*, *+CCLK*, *+NUESTATS*, *+CGDCONT*, *+URING*, *+UTEST*, *Internet protocol transport layer*, *+NSOCR*, *+NPING*
			Review the command applicability for these commands: *I*, *+CCID*, *+CTZU*, *+UFWUPD*, *+URING*, *+UTEST*
R07	27-Jul-2017	lpah	New commands: *+CEDRXS*, *+CEDRXRDP*, *+CMGC*, *+CRTDCP*, *+CSODCP*, *+NATSPEED*, *+NMSTATUS*
			Modified commands: *+CGMR*, *+CFUN*, *+CTZR*, *+NUESTATS*, *+NCONFIG*, *+COPS*, *+NEARFCN*, *+CSMS*, *+CNMA*, *+CMGS*, *+CGDCONT*, *+CGATT*, *+CGACT*, *+CEREG*, *+CPSMS*, *+NLOGLEVEL*, *GPIO introduction*, *+UGPIOC*, *+NSOCR*, *Datagram introduction*, *+NNMI*, *+NCDP*, *Mobile termination error result codes +CME ERROR*
			Review the command applicability for these commands: *I*, *+CCID*, *+CTZU*, *+CTZR*, *+UBANDSEL*, *+CNMA*, *+CSCA*, *+CMGS*, *+CSMS*, *+CGACT*, *+UFWUPD*, *+URING*, *+UTEST*, *+CPSMS*, *+UGPIOC*
R08	12-Sep-2017	lpah	New commands: *+NPOWERCLASS*, *+NPTWEDRXS*, *+CIPCA*, *+CGAPNRC*, *+NPSMR*
			Modified commands: *+CGSN*, *+CIMI*, *+NCONFIG*, *+NUESTATS*, *+COPS*, *+NEARFCN*, *+NATSPEED*, *<cid>*, *<PDP_Type>*, *+CGACT*, *GPIO introduction*, *+NSOCR*, *+NSOST*, *+NSOSTF*, *+NSORF*, *+NPING*, *+NMGR*, *+NMGS*, *+NSMI*, *+NCDP*
R09	03-Oct-2017	lpah	Modified commands: *AT command settings*, *+CMGS*, *+CMGC*, *+CGACT*, *+NSOCR*, *+NCDP*, *+NMSTATUS*

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