BC26

AT Commands Manual

NB-IoT Module Series

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About the Document

History

Revision	Date	Author	Description
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1 Introduction

This document gives details of the AT Command Set supported by Quectel NB-IoT BC26 module.

In default, module is in auto-baud mode. When power on the module, MCU needs to send AT prefix command (such as AT) to synchronization with module. After synchronized with MCU, MCU can send AT+IPR = xxx command to fix the communication baud rate afterwards. If baud rate is not fixed, re-synchronization should be executed in the next restart .

1.1. Definitions

- <CR>: Carriage return character;
- <LF>: Line feed character;
- <..>: Parameter name. Angle brackets do not appear on command line;
- [..]: Optional parameter. Square brackets do not appear on the command line.

1.2. AT Command Syntax

The "**AT**" or "**at**" prefix must be set at the beginning of each command line. To terminate a command line enter **<CR>**. Commands are usually followed by a response that includes "**<CR><LF><response><CR><LF>**". Throughout this document, only the responses are presented, "**<CR><LF>**" are omitted intentionally.

All these AT commands can be split into three categories syntactically: "**basic**", "**S parameter**", and "**extended**". They are listed as follows:

- **Basic syntax**

These AT commands have the format of "**AT<*x*><*n*>**", or "**AT&<x><n>**", where "***<x>***" is the command, and "***<n>***" is/are the argument(s) for that command. An example of this is "**ATE<*n*>**", which tells the DCE whether received characters should be echoed back to the DTE according to the value of "***<n>***". "***<n>***" is optional and a default will be used if it is missing.

- **S parameter syntax**

These AT commands have the format of "**ATS<*n*>=<*m*>**", where "**<*n*>**" is the index of the **S** register to set, and "**<m>**" is the value to assign to it. "**<*m*>**" is optional; if it is missing, then a default value is assigned.

- **Extended syntax**

These commands can be operated in several modes, as following table:

Table 1: Types of AT Commands and Responses

Test Command	**AT+<*x*>=?**	This command returns the list of parameters and value ranges set by the corresponding Write Command or internal processes.
Read Command	**AT+<*x*>?**	This command returns the currently set value of the parameter or parameters.
Write Command	**AT+<x>=<…>**	This command sets the user-definable parameter values.
Execution Command	**AT+<x>**	This command reads non-variable parameters affected by internal processes in the module.

NOTE

Each time a single AT command is supported. When execution of the previous AT command is finished, the next AT command will be executed.

1.3. 3GPP Compliance

3GPP commands are complied with the *3GPP TS 27.005，3GPP TS 27.007，ITU V.250*

2 Implementation Status

Table 2: Types of AT Commands and Implementation Status

AT Command	Description	Implementation Status
3GPP Commands (27.007)		
ATI	Display Product Identification Information	NBR01A01 or later
ATE	Set Command Echo Mode	NBR01A01 or later
AT&W	Store Current Parameters to User Defined Profile	NBR01A01 or later
AT+IPR	Set TE-A Fixed Local Rate	NBR01A01 or later
AT+CGMI	Request Manufacturer Identification	NBR01A01 or later
AT+CGMM	Request Manufacturer Model	NBR01A01 or later
AT +CGMR	Request Manufacturer Revision	NBR01A01 or later
AT+CGSN	Request Product Serial Number	NBR01A01 or later
AT+CPIN	Enter PIN	NBR01A01 or later
AT+CEREG	EPS Network Registration Status	NBR01A01 or later
AT+CSCON	Signalling Connection Status	NBR01A01 or later
AT+CSQ	Signal Quality	NBR01A01 or later
AT+CESQ	Extended Signal Quality	NBR01A01 or later
AT+CGPADDR	Show PDP Addresses	NBR01A01 or later
AT+COPS	PLMN Selection	NBR01A01 or later
AT+CGATT	PS Attach or Detach	NBR01A01 or later
AT+CGACT	Activate or Deactivate PDP Context	NBR01A01 or later
AT+CIMI	Request International Mobile Subscriber Identity	NBR01A01 or later
AT+CGDCONT	Define a PDP Context	NBR01A01 or later
AT+CFUN	Set Phone Functionality	NBR01A01 or later
AT+CMEE	Report Mobile Termination Error	NBR01A01 or later
AT+CCLK	Return Current Date & Time	NBR01A01 or later

AT+CPSMS	Power Saving Mode Setting	NBR01A01 or later
AT+CEDRXS	eDRX Setting	NBR01A01 or later
AT+CEER	Extended Error Report	NBR01A01 or later
AT+CEDRXRDP	eDRX Read Dynamic Parameters	NBR01A01 or later
AT+CTZR	Time Zone Reporting	NBR01A01 or later
AT+CIPCA	Initial PDP Context Activation	NBR01A01 or later
AT+CCIOTOPT	CIoT Optimization Configuration	NBR01A01 or later
AT+CGAPNRC	APN Rate Control	NBR01A01 or later
General Commands		
AT+QGACT	Activate/Deactivate a PDN Context	NBR01A01 or later
AT+QCCID	Card Identification	NBR01A01 or later
AT+QBAND	Query Current Operating Band	NBR01A01 or later
AT+QRST	Automatically Rest	NBR01A01 or later
AT+QSPCHSC	Set Scrambling Algorithm	NBR01A01 or later
AT+QLOCKF	Lock NB-IoT Frequency	NBR01A01 or later
AT+QCSEARFCN	Clear NB-IoT Frequency	NBR01A02 or later
AT+QCGDEFCONT	Set Default PSD Connection Settings	NBR01A01 or later
AT+QNBIOTRAI	NB-IoT Release Assistance Indication	NBR01A01 or later
AT+QNBIOTEVENT	Enable NB-IoT Related Event Report	NBR01A01 or later
AT+QATWAKEUP	Enable Deep Sleep Wakeup Indication	NBR01A01 or later
AT+QENG	Engineering Mode	NBR01A01 or later
AT+QPOWD	Power Off the Module	NBR01A03 or later
AT+QSCLK	Configure the Sleep Mode	NBR01A03 or later

3 3GPP Commands (27.007)

3.1. ATI Display Product Identification Information

The execution command returns product identification information. Please refer to ***Chapter 6*** for possible <err> values.

ATI Display Product Identification Information	
Execution Command **ATI**	Response **Quectel_Ltd** **<Object Id>** **Revision: <revision>** **OK**
Maximun Response Time	300ms

Parameter

<Object Id>	Identifier of device type
<revision>	Revision of software release

Example

```
ATI
Quectel_Ltd
Quectel_BC26
Revision: BC26NBR01A01

OK
```

3.2. ATE Set Command Echo Mode

The execution command determines whether or not the UE echoes characters received from external MCU during command state. Please refer to ***Chapter 6*** for possible <err> values.

ATE Set Command Echo Mode	
Execution Command **ATE<value>**	Response **OK**
Maximun Response Time	300ms

Parameter

<value>	0	Echo mode OFF
	1	Echo mode ON

Example

```
ATE0
OK
ATI
Quectel_Ltd
Quectel_BC26
Revision: BC26NBR01A01

OK
ATE1
OK
ATI
ATI
Quectel _Ltd
Quectel_BC26
Revision: BC26NBR01A01

OK
```

3.3. AT&W Store Current Parameters to User Defined Profile

TA stores the current parameter setting in the user defined profile. Please refer to ***Chapter 6*** for possible <err> values.

AT&W Store Current Parameters to User Defined Profile	
Execution Command **AT&W[<n>]**	Response **OK**
Maximun Response Time	300ms

Parameter

<n>	0	Profile number to store current parameters

NOTES

The profile defined by user is stored in non-volatile memory.

3.4. AT+IPR Set TE-A Fixed Local Rate

Please refer to ***Chapter 6*** for possible <err> values.

AT+IPR Set TE-A Fixed Local Rate	
Test Command **AT+IPR=?**	Response **+IPR:** (list of preferred auto baud**<rate>**s),(list of supported fixed-only**<rate>**s) **OK**
Read Command **AT+IPR?**	Response **+IPR: <rate>** **OK**
Write Command **AT+IPR=<rate>**	Response **OK** If there is any error, response: **ERROR** **+CME ERROR: <err>**
Maximun Response Time	300ms

Parameter

<rate>	Baud rate per second 0 (Auto baud) 110 300 1200 2400 4800 9600 19200 38400 57600 115200 230400 460800 921600

NOTES

1. The setting will apply to all channels routed through one connection level for UART.
2. Not applicable for USB interface.

Example

```
AT+IPR=115200
OK
AT&W
OK
AT+IPR?
+IPR: 115200

OK
AT+IPR=?
+IPR:
(4800,9600,115200),(110,300,1200,2400,4800,9600,19200,38400,57600,115200,230400,460800,921600)

OK
```

3.5. AT+CGMI Request Manufacturer Identification

The execution command returns manufacturer information. Please refer to ***Chapter 6*** for possible <err> values.

AT+CGMI Request Manufacturer Identification	
Test Command **AT+CGMI=?**	Response **OK**
Execution Command **AT+CGMI**	Response **Quectel_Ltd** **<Object Id>** **Revision: MTK_2625** **OK**
Maximun Response Time	300ms

Parameter

<Object Id>	Identifier of device type

Example

```
AT+CGMI
Quectel_Ltd
Quectel_BC26
Revision: MTK_2625

OK
```

3.6. AT+CGMM Request Manufacturer Model

The execution command returns manufacturer model information. Please refer to ***Chapter 6*** for possible <err> values.

AT+CGMM Request Manufacturer Model

Test Command **AT+CGMM=?**	Response **OK**
Execution Command **AT+CGMM**	Response **<Object Id>** **OK**
Maximun Response Time	300ms

Parameter

<Object Id>	Identifier of device type

Example

```
AT+CGMM
Quectel_BC26

OK
```

3.7. AT+CGMR Request Manufacturer Revision

The execution command returns the manufacturer revision. The text is human-readable and is not intended for microcontroller parsing. By default it will return the firmware revision.

The execution command returns one or more lines of information text <revision>. Please refer to ***Chapter 6*** for possible <err> values.

AT+CGMR Request Manufacturer Revision	
Test Command **AT+CGMR=?**	Response **OK**
Execution Command **AT+CGMR**	Response **Revision: <revision>** **OK**
Maximun Response Time	300ms

Parameter

<revision>	Revision of software release

Example

```
AT+CGMR
Revision: BC26NBR01A01

OK
```

3.8. AT+CSQ Signal Quality

The execution command returns received signal strength indication <rssi> and channel bit error rate <ber> from the MT.
The test command returns supported values as a compound value.

Please refer to ***Chapter 6*** for possible <err> values.

AT+CSQ Signal Quality	
Test Command **AT+CSQ=?**	Response **+CSQ:** (list of supported **<rssi>**s),(list of supported **<ber>**s) **OK**
Execution Command **AT+CSQ**	Response **+CSQ: <rssi>,<ber>** **OK** If there is any error, response: **ERROR** **+CME ERROR: <err>**
Maximun Response Time	300ms

Parameter

<rssi>	Integer type. Rx signal strength level 0 -113 dBm or less 1 -111 dBm 2…30 -109…-53 dBm

	31	-51 dBm or greater
	99	not known or not detectable
<ber>	Integer type; channel bit error rate (in percent)	
	0…7	as RXQUAL values RXQUAL_0…RXQUAL_7 as defined in 45.008.
	99	not known or not detectable

Example

```
AT+CSQ
+CSQ: 22,0

OK
```

3.9. AT+CESQ Extended Signal Quality

The execution command returns received signal quality parameters.

The terminal will provide a current signal strength indicator of 0 to 99 where larger is generally better. This information is based on a single measurement so can be expected to change greatly over short periods of time and may never use all (or even the majority) of the entire possible range or codes.

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

The test command returns supported values as a compound value.

Please refer to ***Chapter 6*** for possible <err> values.

AT+CESQ Extended Signal Quality	
Test Command **AT+CESQ=?**	Response **+CESQ:** (list of supported **<rxlev>**s),(list of supported **<ber>**s),(list of supported **<rscp>**s),(list of supported **<ecno>**s),(list of supported **<rsrq>**s),(list of supported **<rsrp>**s) **OK**
Execution Command **AT+CESQ**	Response **+CESQ: <rxlev>,<ber>,<rscp>,<ecno>,<rsrq>,<rsrp>**

	OK If there is any error, response: **ERROR** **+CME ERROR: <err>**
Maximun Response Time	300ms

Parameter

<rxlev>	Integer type. Rx signal strength level 0 -110 dBm or less 1 -110 dBm ≤ **<rssi>** < -109 dBm 2 -109 dBm ≤ **<rssi>** < -108 dBm ….: …. 61 -50dBm ≤ **<rssi>** < -49 dBm 62 -49dBm ≤ **<rssi>** < -48 dBm 63 -48dBm ≤ **<rssi>** 99 not known or not detectable
<ber>	Integer type; channel bit error rate (in percent) 0…7 as RXQUAL values RXQUAL_0…RXQUAL_7 as defined in 45.008. 99 not known or not detectable
<rscp>	Integer type, received signal code power (see *3GPP 25.133* and *3GPP 25.123*) 0 -120 dBm or less 1 -120 dBm ≤ **<rscp>** < -119 dBm 2 -119 dBm ≤ **<rscp>** < -118 dBm …: … 94 -27 dBm ≤ **<rscp>** < -26 dBm 95 -26 dBm ≤ **<rscp>** < -25 dBm 96 -25 dBm ≤ **<rscp>** 255 not known or not detectable
<ecno>	Integer type, Ec/No (see *3GPP 25.133*) 0 -24 dBm or less 1 -24dBm ≤ **<ecno>** < -23.5 dBm 2 -23.5dBm ≤ **<ecno>** < -23 dBm …: … 47 -1dBm ≤ **<ecno>** < -0.5 dBm 48 -0.5dBm ≤ **<ecno>** < 0 dBm 49 0 dBm ≤ **<ecno>** 255 not known or not detectable
<rsrq>	Integer type, reference signal received quality (see *3GPP 36.133*) 0 -19.5 dB or less 1 -19.5dB ≤ **<rsrq>** < -19 dB

	2 -19dB ≤ **<rsrq>** < -18.5 dB
	…: …
	32 -4 dB ≤ **<rsrq>** < -3.5 dB
	33 -3.5 dB ≤ **<rsrq>** < -3 dB
	34 -3 dB ≤ **<rsrq>**
	255 not known or not detectable
<rsrp>	Integer type, reference signal received power (see 3GPP 36.133)
	0 -140 dBm or less
	1 -140dBm ≤ **<rsrp>** < -139 dBm
	2 -139dBm ≤ **<rsrp>** < -138 dBm
	…: …
	95 -46dBm ≤ **<rsrp>** < -45 dBm
	96 -45dBm ≤ **<rsrp>** < -44 dBm
	97 -44dBm ≤ **<rsrp>**
	255 not known or not detectable

Example

```
AT+CESQ
+CESQ: 15,99,255,255,8,30

OK
```

NOTE

<rscp>,<ecno> are not applicable for NB-IoT so are set to “not known” value.

3.10. AT+CGSN Request Product Serial Number

The execution command returns the IMEI (International Mobile station Equipment Identity) number and related information. For a TA which does not support <snt>, only "OK" is returned.

Please refer to ***Chapter 6*** for possible <err> values.

AT+CGSN Request Product Serial Number	
Test Command **AT+CGSN=?**	Response When TE supports <snt> and command is executed successfully:

	+CGSN: (list of supported **<snt>**s) **OK**
Write Command **AT+CGSN=<snt>**	Response When <snt>=0 **<sn>** When <snt>=1 **+CGSN: <imei>** When <snt>=2 **+CGSN: <imeisv>** When <snt>=3 **+CGSN: <svn>** **OK** If there is any error, response: **ERROR** **+CME ERROR: <err>**
Execution Command **AT+CGSN**	Response **<sn>** **OK** If there is any error, response: **ERROR** **+CME ERROR: <err>**
Maximun Response Time	300ms

Parameter

<snt>	Integer type indicating the serial number type that has been requested 0 Returns <sn> 1 Returns the IMEI number 2 Returns the IMEISV (International Mobile station Equipment Identity and Software Version) number 3 Returns the SVN (Software Version Number)
<sn>	The 128-bit UUID of the UE. The total number of characters, including line terminators. In the information text shall not exceed 2048 characters, and shall not contain the sequence 0 <CR> or OK<CR>.
<imei>	String type in decimal format indicating the IMEI number

<imeisv>	String type in decimal format indicating the IMEISV
<svn>	String type in decimal format indicating the current SVN which is a part of IMEISV

Example

```
AT+CGSN=1                          //Request the IMEI number
+CGSN: 490154203237511

OK
```

3.11. AT+CPIN Enter PIN

Please refer to ***Chapter 6*** for possible <err> values.

AT+CPIN Enter PIN	
Test Command **AT+CPIN=?**	Response **OK**
Read Command **AT+CPIN?**	Response TA returns an alphanumeric string indicating whether or not some password is required. **+CPIN: <code>** **OK**
Write Command **AT+CPIN=<pin>[,<new pin>]**	Response TA stores a password which is necessary before it can be operated (SIM PIN, SIM PUK, PH-SIM PIN, etc.). If the PIN is to be entered twice, the TA shall automatically repeat the PIN. If no PIN request is pending, no action is taken and an error message, **+CME ERROR**, is returned to TE. If the PIN required is SIM PUK or SIM PUK2, the second pin is required. This second pin, **<new pin>**, is used to replace the old pin in the SIM. **OK**
Maximun Response Time	5s

Parameter

<code>	READY	No further entry needed
	SIM PIN	ME is waiting for SIM PIN

	SIM PUK	ME is waiting for SIM PUK
	PH_SIM PIN	ME is waiting for phone to SIM card (antitheft)
	PH_SIM PUK	ME is waiting for SIM PUK (antitheft)
	SIM PIN2	PIN 2, e.g. it is possible to edit the FDN book only if preceding command was acknowledged with **+CME ERROR:17**
	SIM PUK2	Possible only if preceding command was acknowledged with error **+CME ERROR: 18**
<pin>	String type; password	
<new pin>	String type; If the PIN required is SIM PUK or SIMPUK2: new password	

Example

```
AT+CPIN?
+CPIN: READY

OK
```

3.12. AT+CEREG EPS Network Registration Status

The set command controls the presentation of an unsolicited result code (URC) “+CEREG: <stat>” when <n>=1 and there is a change in the MT's EPS network registration status in E-UTRAN, or unsolicited result code “+CEREG: <stat>[,[<tac>],[<ci>],[<AcT>]]” when <n>=2 and there is a change of the network cell in E-UTRAN. The parameters <AcT>, <tac> and <ci> are provided only if available. The value <n>=3 further extends the unsolicited result code with [,<cause_type>,<reject_cause>], when available, when the value of <stat> changes.

If the UE requests PSM for reducing its power consumption, the set command controls the presentation of an unsolicited result code: “+CEREG: <stat>[,[<tac>],[<ci>],[<AcT>][,[<cause_type>],[<reject_cause>][,[<Active-Time>],[<Periodic-TAU>]]]]”.

When <n>=4, the unsolicited result code will provide the UE with additional information for the active time value and the extended periodic TAU value if there is a change of the network cell in E-UTRAN. The value <n>=5 further enhances the unsolicited result code with <cause_type> and <reject_cause> when 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. Location information elements <tac>, <ci> and <AcT>, if available, are returned only when <n>=2 and MT is registered on the network. The parameters [,<cause_type>,<reject_cause>], if available, are returned when <n>=3.

The test command returns supported parameter values.

Please refer to ***Chapter 6*** for possible <err> values.

AT+CEREG EPS Network Registration Status	
Test Command **AT+CEREG=?**	Response **+CEREG:** (list of supported **<n>**s) **OK**
Read Command **AT+CEREG?**	Response When <n>=0, 1, 2 or 3 and command is executed successfully: **+CEREG: <n>,<stat>[,[<tac>],[<ci>],[<AcT>[,<cause_type>,<reject_cause>]]]** When <n>=4 or 5 and command is executed successfully: **+CEREG: <n>,<stat>[,[<lac>],[<ci>],[<AcT>][,[<cause_type>],[<reject_cause>][,[<Active-Time>],[<Periodic-TAU>]]]]** **OK** If there is any error, response: **ERROR** **+CME ERROR: <err>**
Write Command **AT+CEREG=<n>**	Response **OK** If there is any error, response: **ERROR** **+CME ERROR: <err>**
Maximun Response Time	300ms

Parameter

<n>	Integer type 0 Disable network registration unsolicited result code 1 Enable network registration unsolicited result code: “+CEREG: <stat>” 2 Enable network registration and location information unsolicited result code: “+CEREG: <stat>[,[<tac>],[<ci>],[<AcT>]]”

3 Enable network registration, location information and EMM cause value information unsolicited result code:
"+CEREG: <stat>[,[<tac>],[<ci>],[<AcT>][,<cause_type>,<reject_cause>]]"
4 For a UE that requests PSM, enable network registration and location information unsolicited result code:
"+CEREG: <stat>[,[<tac>],[<ci>],[<AcT>][,,[,[<Active-Time>],[<Periodic-TAU>]]]]"
5 For a UE that requests PSM, enable network registration, location information and EMM cause value information unsolicited result code:
+CEREG: <stat>[,[<lac>],[<ci>],[<AcT>][,[<cause_type>],[<reject_cause>][,[<A c tive-Time>],[<Periodic-RAU>]]]]

<stat> Integer type, indicates the EPS registration status
0 Not registered, MT is not currently searching an operator to register to
1 Registered, home network
2 Not registered, but 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
6 Registered for "SMS only", home network (applicable only when <Act> indicates NB-IoT)
7 Registered for "SMS only", roaming (applicable only when <Act> indicates NB-IoT
8 Attached for emergency bearer services only
9 Registered for "CSFB not preferred", home network (not applicable)
10 Registered for "CSFB not preferred", roaming (not applicable)

<tac> String type; two bytes tracking area code in hexadecimal format (e.g. "00C3" equals 195 in decimal)

<ci> String type; four bytes E-UTRAN cell ID in hexadecimal format

<AcT> Integer type; access technology of the registered network
0 GSM (not applicable)
1 GSM Compact (not applicable)
2 UTRAN (not applicable)
3 GSM w/EGPRS (not applicable)
4 UTRAN w/HSDPA (not applicable)
5 UTRAN w/HSUPA (not applicable)
6 UTRAN w/HSDPA and HSUPA (not applicable)
7 E-UTRAN
8 EC-GSM-IoT (A/Gb mode) (see NOTES 5) (not applicable)
9 E-UTRAN (NB-S1 mode) (see NOTES 6)

<cause_type> Integer type; indicates the type of <reject_cause>
0 Indicates that <reject_cause> contains an EMM cause value,see 3GPP TS 24.008[8] Annex G.
1 Indicates that <reject_cause> contains a manufacturer-specific cause value

<reject_cause> Integer type; contains the cause of the failed registration. The value is of type as

defined by <cause_type>.

<Active-Time> String type; one byte in an 8-bit format. Indicates the active time value (T3324) allocated to the UE in E-UTRAN. The 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, please refer to the *GPRS Timer 2 IE in 3GPP TS 24.008 Table 10.5.163/3Gpp TS 24.008*, *3GPP TS 23.682* and *3GPP TS 23.401.*

Bits 5 to 1 represent the binary coded timer value.

Bits 6 to 8 defines the timer value unit for the GPRS timer as follows:

Bits

8 7 6

0 0 0 value is incremented in multiples of 2 seconds

0 0 1 value is incremented in multiples of 1 minute

0 1 0 value is incremented in multiples of decihours

1 1 1 value indicates that the timer is deactivated.

<Periodic-TAU> String type; one byte in an 8-bit format. Indicates the extended periodic TAU value (T3412) allocated to the UE in E-UTRAN. The 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, please refer to the *GPRS Timers 3 IE in 3GPP TS 24.008 Table 10.5.163a/3GPP TS 24.008*, *3GPP TS 23.682* and *3GPP TS 23.401*.

Bits 5 to 1 represent the binary coded timer value

Bits 6 to 8 define the timer value unit as follows:

Bits

8 7 6

0 0 0 value is incremented in multiples of 10 minutes

0 0 1 value is incremented in multiples of 1 hour

0 1 0 value is incremented in multiples of 10 hours

0 1 1 value is incremented in multiples of 2 seconds

1 0 0 value is incremented in multiples of 30 seconds

1 0 1 value is incremented in multiples of 1 minute

1 1 0 value is incremented in multiples of 320 hours

1 1 1 value indicates that the timer is deactivated

NOTES

1. If the EPS MT in GERAN/UTRAN/E-UTRAN also supports circuit mode services and/or GPRS services, the AT+CREG command and AT+CGREG command can be used to query the registration status and location information for those services.

2. *3GPP TS 24.008* and *3GPP TS 24.301* specify the condition when the MS is considered as attached for emergency bearer services.
3. *3GPP TS 44.060* specifies the system information messages which give the information about whether the serving cell supports EGPRS.
4. *3GPP TS 25.331* specifies the system information blocks which give the information about whether the serving cell supports HSDPA or HSUPA.
5. 3GPP TS 44.018 [156] specifies the EC-SCH INFORMATION message which, if present, indicates that the serving cell supports EC-GSM-IoT.
6. 3GPP TS 36.331 [86] specifies the system information blocks which give the information about whether the serving cell supports NB-IoT, which corresponds to E-UTRAN (NB-S1 mode).
7. For NB-IoT product, only <ACT> value of 9 is valid.

Example

```
AT+CEREG=1              //Enable network registration URC.
OK
AT+CEREG?
+CEREG: 1,1

OK
AT+CEREG=?
+CEREG: (0-5)

OK
```

3.13. AT+CSCON Signalling Connection Status

The command gives details of the terminal's perceived radio connection status (i.e. to the base station). It returns an indication of the current state. Please note that this state is only updated when radio events, such as sending and receiving, take place. This means that the current state may be out of date. The terminal may think it is "Connected" yet cannot currently use a base station due to a change in the link quality.

The set command controls the presentation of an unsolicited result code. If <n>=1, "+CSCON: <mode>" is sent from the MT when the connection mode of the MT is changed. If <n>=2 and there is a state within the current mode, "+CSCON: <mode>[,<state>]" is sent from the MT. If <n>=3, "+CSCON: <mode>[,<state>[,<access>]]" is sent from the MT. If setting fails, an MT error, "+CME ERROR: <err>" is returned. Please refer to ***Chapter 6*** for possible <err> values.

When the MT is in UTRAN or E-UTRAN, the mode of the MT refers to idle when no PS signaling connection and to connected mode when a PS signalling connection between UE and network is setup.

When the UE is in GERAN, the mode refers to idle when the MT is in either the idle state or the standby state and to connected mode when the MT is in ready state.

The <state> value indicates the state of the MT when the MT is in GERAN, UTRAN connected mode or E-UTRAN.

The read command returns the status of result code presentation and an integer <mode> which shows whether the MT is currently in idle mode or connected mode. State information <state> is returned only when <n>=2. Radio access type information <access> is returned only when <n>=3.

The test command returns supported values as a compound value.

Please refer to ***Chapter 6*** for possible <err> values.

AT+CSCON Signalling Connection Status	
Test Command **AT+CSCON=?**	Response **+CSCON:** (list of supported **<n>**s) **OK**
Read Command **AT+CSCON?**	Response **+CSCON: <n>,<mode>[,<state>]** **OK** If there is any error, response: **ERROR** **+CME ERROR: <err>**
Write command **AT+CSCON=<n>**	Response **OK** If there is any error, response: **ERROR** **+CME ERROR: <err>**
Maximun Response Time	300ms

Parameter

<n>	Integer type	
	0	Disable unsolicited result code
	1	Enable unsolicited result code: “+CSCON: <mode>”
	2	Enable unsolicited result code: “+CSCON: <mode>[,<state>]”
	3	Enable unsolicited result code: “+CSCON: <mode>[,<state>[,<access>]]”

<mode>	Integer type; indicates the signalling connection status
	0 Idle
	1 Connected
<state>	Integer type; indicates the CS or PS state while in GERAN and the RRC state information if the MT is in connected mode while in UTRAN and E-UTRAN
	0 UTRAN URA_PCH state
	1 UTRAN Cell_PCH state
	2 UTRAN Cell_FACH state
	3 UTRAN Cell_DCH state
	4 GERAN CS connected state
	5 GERAN PS connected state
	6 GERAN CS and PS connected state
	7 E-UTRAN connected state
<access>	Integer type; indicates the current radio access type
	0 Indicates usage of radio access type of GERAN
	1 Indicates usage of radio access type of UTRAN TDD
	2 Indicates usage of radio access type of UTRAN FDD
	3 Indicates usage of radio access type of E-UTRAN TDD
	4 Indicates usage of radio access type of E-UTRAN FDD

NOTES

1. Only <n>=0 and <n>=1 are supported.
2. <state> and <access> parameters are not supported for NB-IoT

Example

```
AT+CSCON=0
OK
AT+CSCON?
+CSCON: 0,1

OK
AT+CSCON=?
+CSCON: (0,1)

OK
AT+CSCON=1
OK
AT+CSCON?
+CSCON: 1,1

OK
```

3.14. AT+COPS Operator Selection

The set command forces an attempt to select and register the GSM/UMTS/EPS network operator using the USIM card installed in the currently selected card slot. <mode> is used to select whether the selection is done automatically by the MT or is forced by this command to operator <oper> (it shall be given in format <format>) to a certain access technology, indicated in <AcT>. If the selected operator is not available, no other operator shall be selected (except <mode>=4). If the selected access technology is not available, then the same operator shall be selected in other access technology. The selected operator name format shall also apply to further read commands (AT+COPS?). <mode>=2 forces an attempt to deregister from the network. The selected mode affects all further network registration (e.g. after <mode>=2, MT shall be unregistered until <mode>=0 or 1 is selected). This command should be abortable when registration/deregistration attempt is made. Please refer to ***Chapter 6*** for possible <err> values.

The read command returns the current mode, the currently selected operator and the current access technology. If no operator is selected, <format>, <oper> and <AcT> are omitted.

The test command returns a set of five parameters, each representing an operator present in the network. A set consists of an integer indicating the availability of the operator <stat>, long and short alphanumeric format of the operator's name, numeric format representation of the operator and access technology. Any of the formats may be unavailable and should then be an empty field. The list of operators shall be in order: home network, networks referenced in USIM or active application in the UICC (GSM or USIM) in the following order: HPLMN selector, user controlled PLMN selector, operator controlled PLMN selector and PLMN selector (in the USIM or GSM application), and other networks.

The <AcT> access technology selected parameters should only be used in terminals capable to register to more than one access technology. Selection of <AcT> does not limit the capability to cell reselections, even though an attempt is made to select an access technology, the phone may still re-select a cell in another access technology.

Please refer to ***Chapter 6*** for possible <err> values.

AT+COPS Operator Selection	
Test Command **AT+COPS=?**	Response **+COPS: [**list of supported **(<stat>,**long alphanumeric **<oper>,** short alphanumeric **<oper>,** numeric **<oper>[,<AcT>])**s**][,,**(list of supported **<mode>**s)**,**(list of supported **<format>**s)**]** **OK**

	If there is any error, response: **ERROR** **+CME ERROR: <err>**
Read Command **AT+COPS?**	Response **+COPS: <mode>[,<format>,<oper>][,<AcT>]** **OK** If there is any error, response: **ERROR** **+CME ERROR: <err>**
Write Command **AT+COPS=<mode>[,<format>[,<oper>[,<AcT>]]**	Response **OK** If there is any error, response: **ERROR** **+CME ERROR: <err>**
Maximun Response Time	75s, determined by network.

Parameter

<mode>	Integer type	
	0	Automatic mode; <oper> field is ignored
	1	Manual operator selection; <oper> field shall be present
	2	Manual deregister from network
	3	Set only <format> (for read command AT+COPS?), not shown in Read command response
	4	Manual/automatic selected; if manual selection fails, automatic mode (<mode>=0) is entered
<format>	Integer type	
	0	Long format alphanumeric <oper>; can be up to 16 characters long
	1	Short format alphanumeric <oper>
	2	Numeric <oper>; GSM Location Area Identification number
<oper>	String type; <format> indicates if the format is alphanumeric or numeric; long alphanumeric format can be up to 16 characters long and short format up to 8 characters; numeric format is the GSM location area identification number which consists of a three BCD digit ITU-T country code coded, plus a two or three BCD digit network code, which is administration specific.	
<stat>	0	Unknown
	1	Operator Available
	2	Operator Current
	3	Operator Forbidden

<AcT>	Integer type; access technology selected	
	0	GSM
	1	GSM compact
	2	UTRAN
	3	GSM w/EGPRS
	4	UTRAN w/HSDPA
	5	UTRAN w/HSUPA
	6	UTRAN w/HSDPA and HSUPA
	7	E-UTRAN
	8	EC-GSM-IoT (A/Gb mode) (see NOTES 3)
	9	E-UTRAN (NB-S1 mode) (see NOTES 4)

NOTE

1. *3GPP TS 44.060* specifies the system information messages which give the information about whether the serving cell supports EGPRS.
2. *3GPP TS 25.331* specifies the system information blocks which give the information about whether the serving cell supports HSDPA or HSUPA.
3. 3GPP TS 44.018 [156] specifies the EC-SCH INFORMATION message which, if present, indicates that the serving cell supports EC-GSM-IoT.
4. 3GPP TS 36.331 [86] specifies the system information blocks which give the information about whether the serving cell supports NB-IoT, which corresponds to E-UTRAN (NB-S1 mode).
5. <AcT> field is fixed at 9 for NB-IoT product .
6. Only <format>=2 is supported.

Example

```
AT+COPS=0
OK
AT+COPS?
+COPS: 0,2,"46000",9

OK
```

3.15. AT+CGATT GPRS/Packet Domain Attach/Detach

The execution command is used to attach the MT to, or detach the MT from, the packet domain service. After the command has completed, the MT remains in V.250 command state. If the MT is already in the requested state, the command is ignored and the “OK” response is returned. If the requested state cannot be achieved, an “ERROR” or “+CME ERROR” response is returned. Please refer to ***Chapter 6*** for possible <err> values.

Any active PDP contexts will be automatically deactivated when the attachment state changes to detached.

The read command returns the current packet domain service state.

The test command is used for requesting information on the supported packet domain service states.

Please refer to ***Chapter 6*** for possible <err> values.

AT+CGATT GPRS/Packet Domain Attach/Detach	
Test Command **AT+CGATT=?**	Response **+CGATT:** (list of supported **<state>**s) **OK**
Read Command **AT+CGATT?**	Response **+CGATT: <state>** **OK**
Write Command **AT+CGATT=<state>**	Response **OK** If there is any error, response: **ERROR** **+CME ERROR: <err>**
Maximun Response Time	75s, determined by network.

Parameter

<state>	Integer type; indicates the state of GPRS/Packet Domain attachment 0 Detached 1 Attached Other values are reserved and will result in an ERROR response to the execution command.

NOTES

1. If the initial PDP context is supported, the context with <cid>=1 is automatically defined at startup.
2. This command has the characteristics of both the V.250 action and parameter commands. Hence it has the read form in addition to the execution/set and test forms.

3. When <state>=1, AT+COPS=0 is automatically selected.
4. If AT+CGATT is in progress, further execution of this command before the finishing of attach or detach procedure will return error.

Example

```
AT+CGATT?
+CGATT: 0

OK
AT+CGATT=1
OK
AT+CGATT=?
+CGATT: (0,1)

OK
```

3.16. AT+CGDCONT Define the PDP Context

The write command specifies PDP context parameter values for a PDP context identified by the (local) context identification parameter, <cid>. It also allows the TE to specify whether security protected transmission of ESM information is requested, because the PCO can include information that requires ciphering. There can be other reasons for the UE to use security protected transmission of ESM information, e.g. if the UE needs to transfer an APN. The number of PDP contexts that may be in a defined state at the same time is given by the range returned by the test command. Please refer to ***Chapter 6*** for possible <err> values.

For EPS the PDN connection and its associated EPS default bearer is identified herewith. For EPS the <PDP_addr> shall be omitted.

A special form of the write command, +CGDCONT= <cid> causes the values for context number <cid> to become undefined.

The read command returns the current settings for each defined context.

The test command returns values supported as a compound value. If the UE supports several PDP types, <PDP_type>, the parameter value ranges for each <PDP_type> are returned on a separate line.

The feature "initial PDP context" may be supported and is a manufacturer specific option. For this option, the context with <cid>=1(context number 1) is defined upon startup and does not need to be created with the +CGDCONT command. The initial PDP context has particular manufacturer specific default settings disassociated with any other default settings of +CGDCONT. When in E-UTRAN, the initial PDP context is automatically activated by the MT following a successful registration to the network depending on the setting of AT+CIPCA command. If all active contexts are deactivated, the initial PDP context can be (re)established. This is manufacturer specific and depends on the current RAT as well as how the active contexts are deactivated.

Please refer to ***Chapter 6*** for possible <err> values.

AT+CGDCONT Define the PDP Context	
Test Command **AT+CGDCONT=?**	Response **+CGDCONT**: (list of supported **<cid>**s),(list of supported **<PDP_type>s)**,,,(list of supported **<d_comp>**s),(list of supported **<h_comp>**s),(list of supported **<IPv4AddrAlloc>**s),(list of supported **<request_type>**s),(list of supported **<P-CSCF_discovery>**s),(list of supported **<IM_CN_Signalling_Flag_Ind>**s),(list of supported **<NSLPI>**s),(list of supported **<securePCO>**s),(list of supported **<IPv4_MTU_discovery>**s),(list of supported **<Local_Addr_Ind>**s),(list of supported **<Non-IPMTUDiscovery>**s) **[<CR><LF>+CGDCONT:** (list of supported of **<cid>**s),(list of supported **<PDP_type>s)**,,,(list of supported **<d_comp>s)**,(list of supported **<h_comp>**s),(list of supported **<IPv4AddrAlloc>**s),(list of supported **<request_type>**s),(list of supported**<P-CSCF_discovery>**s),(list of supported **<IM_CN_Signalling_Flag_Ind>**s),(list of supported **<NSLPI>**s),(list of supported **<securePCO>**s,(list of supported **<IPv4_MTU_discovery>**s),(list of supported **<Local_Addr_Ind>**s),(list of supported **<Non-IPMTUDiscovery>**s)[…]] **[...]]** **OK**
Read Command **AT+CGDCONT?**	Response **[+CGDCONT:** **<cid>,<PDP_type>,<APN>,<PDP_addr>,<d_comp>,<h_co**

	mp>[,<IPv4AddrAlloc>[,<request_type>[,<P-CSCF_discovery>[,<IM_CN_Signalling_Flag_Ind>[,<NSLPI>[,<securePCO>[,<IPv4_MTU_discovery>[,<Local_Addr_Ind>[,<Non-IP_MTU_discovery>]]]]]]]]] **[<CR><LF>+CGDCONT: <cid>,<PDP_type>,<APN>,<PDP_addr>,<d_comp>,<h_comp>[,<IPv4AddrAlloc>[,<request_type>[,<P-CSCF_discovery>[,<IM_CN_Signalling_Flag_Ind>[,<NSLPI>[,<securePCO>[,<IPv4_MTU_discovery>[,<Local_Addr_Ind>[,<Non-IP_MTU_discovery>]]]]]]]]]** **[...]]** **OK**
Write Command **AT+CGDCONT=<cid>[,<PDP_type>[,<APN>[,<PDP_addr>[,<d_comp>[,<h_comp>[,<IPv4AddrAlloc>[,<request_type>[,<P-CSCF_discovery>[,<IM_CN_Signalling_Flag_Ind>[,<NSLPI>[,<securePCO>[,<IPv4_MTU_discovery>[,<Local_Addr_Ind>[,<Non-IP_MTU_discovery>]]]]]]]]]]]]]**	Response **OK** If there is any error, response: **ERROR** **+CME ERROR: <err>**
Maximun Response Time	300ms

Parameter

<cid> Integer type; a numeric parameter that specifies a particular PDP context definition. The parameter is local to the UE-TE interface and is used in other PDP context-related commands. The range of permitted values is returned by the test form of the command.

<PDP_type> String type; a string parameter which specifies the type of packet data protocol.

X.25	ITU-T/CCITT X.25 layer 3 (Obsolete)
IP	Internet Protocol (IETF STD 5 [103])
IPv6	Internet Protocol, version 6
IPv4v6	Virtual <PDP_type> introduced to handle dual IP stack UE capability
OSPIH	Internet Hosted Octect Stream Protocol (Obsolete)
PPP	Point to Point Protocol (IETF STD 51 [104]) Only IP, IPv6 and IPv4v6 values are supported for EPS services.
NONIP	None IP

<APN> String type; a logical name that is used to select the GGSN or the external packet data network. If the value is null or omitted, then the subscription value will be requested.

<PDP_addr> String type; a string parameter that identifies the UE in the address space applicable to the

PDP. If the value is null or omitted, then a value may be provided by the TE during the PDP startup procedure or, failing that, a dynamic address will be requested. The read form of the command will continue to return the null string even if an address has been allocated during the PDP startup procedure. The allocated address may be read using the +CGPADDR command.

<d_comp> Integer type; controls PDP data compression

0 Off
1 On (manufacturer preferred compression)
2 V.42bis
3 V.44bis

<h_comp> Integer type; controls PDP header compression

0 Off (default if value is omitted)
1 On (manufacturer preferred compression)
2 RFC 1144 (applicable for SNDCP only)
3 RFC 2507
4 RFC 3095[ROHC] (applicable for PDCP only)

<IPv4AddrAlloc> Integer type; controls how the MT/TA requests to get the IPv4 address information

0 IPv4 address allocation through NAS signalling
1 IPv4 address allocated through DHCP

<request_type> Integer type; indicates the type of PDP context activation request for the PDP context. Please refer to *3GPP TS 24.301 (subclause 6.5.1.2)* and *3GPP TS 24.008 (subclause 10.5.6.17)*. If the initial PDP context is supported it is not allowed to assign <cid>=0 for emergency bearer services. According to *3GPP TS 24.008 (subclause 4.2.4.2.2 and subclause 4.2.5.1.4)* and *3GPP TS 24.301 (subclause 5.2.2.3.3 and subclause 5.2.3.2.2),* a separate PDP context must be established for emergency bearer services.

If the PDP context for emergency bearer services is the only activated context, only emergency calls are allowed, refer to *3GPP TS 23.401 subclause 4.3.12.9*.

0 PDP context is for new PDP context establishment or for handover from a non-3GPP access network (how the MT decides whether the PDP context is for new PDP context establishment or for handover is implementation specific).
1 PDP context is for emergency bearer services
2 PDP context is for new PDP context establishment
3 PDP context is for handover from a non-3GPP access network

<P-CSCF_discovery> Integer type; influences how the MT/TA requests to get the P-CSCF address, refer to *3GPP TS 24.229 [89] annex B and annex L.*

0 Preference of P-CSCF address discovery not influenced by AT+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> Integer type; indicates to the network whether the PDP context is for IM CN subsystem related signalling only or not.

0 UE indicates that the PDP context is not for IM CN

	subsystem-related signalling only
	1 UE indicates that the PDP context is for IM CN subsystem-related signalling only
<NSLPI>	Integer type; indicates the NAS signalling priority requested for this PDP context
	0 Indicates that this PDP context is to be activated with the value for the low priority indicator configured in the MT.
	1 Indicates that this PDP context is to be activated with the value for the low priority indicator set to "MS is not configured for NAS signalling low priority". The MT utilizes the provided NSLPI information as specified in *3GPP TS 24.301 [83]* and *3GPP TS 24.008*.
<securePCO>	Integer type; specifies if security protected transmission of PCO is requested or not (applicable for EPS only).
	0 Security protected transmission of PCO is not requested
	1 Security protected transmission of PCO is requested
<IPv4_MTU_discovery>	Integer type; influences how the MT/TA requests to get the IPv4 MTU size, refer to *3GPP TS 24.008 subclause 10.5.6.3*.
	0 Preference of IPv4 MTU size discovery not influenced by AT+CGDCONT
	1 Preference of IPv4 MTU size discovery through NAS signaling
<Non-IP_MTU_discovery>	Integer type; influences how the MT/TA requests to get the Non-IP MTU size, refer to *3GPP TS 24.008 subclause 10.5.6.3*.
	0 Preference of Non-IP MTU size discovery not influenced by AT+CGDCONT
	2 Preference of Non-IP MTU size discovery through NAS signaling

NOTES

1. Only 3 PDP contexts can be activated.
2. For EPS, <PDP_addr> field is omitted.
3. Parameters <IPv4AddrAlloc> <request_type> <P-CSCF_discovery> <IM_CN_Signalling_Flag_Ind> <NSLPI> <securePCO> <Local_Addr_Ind> are not supported in modem protocol.

Example

```
AT+CGDCONT=?
+CGDCONT: (1-15), "IP",,,(0-2),(0-4),(0),,,,,,(0,1),,(0,1)
+CGDCONT: (1-15), "IPV6",,,(0-2),(0-4),(0),,,,,,(0,1),,(0,1)
+CGDCONT: (1-15), "IPV4V6",,,(0-2),(0-4),(0),,,,,,(0,1),,(0,1)
+CGDCONT: (1-15), "Non-IP",,,(0-2),(0-4),(0),,,,,,(0,1),,(0,1)
```

```
OK
AT+CGDCONT=1,"IP","CMNET"
OK
AT+CGDCONT?
+CGDCONT: 1,"IP","CMNET" ,"",0,0,0,,,,,,0,,0

OK
```

3.17. AT+CGACT PDP Context Activation/Deactivation

The execution command is used to activate or deactivate the specified PDP context (s). After the command has completed, the MT remains in V.250 command state. If any PDP context is already in the requested state, the state for that context remains unchanged. If the requested state for any specified context cannot be achieved, an “ERROR” or “+CME ERROR” response is returned. Extended error responses are enabled by the AT+CMEE command.

If the UE is not PS attached when the activation form of the command is executed, the UE first performs a PS attach and them attempts to activate the specified contexts. If the attach fails then the MT responds with error or, if extended error responses are enabled, with the appropriate failure-to-attach error message.

Note that in the 27.007 specification there is the following statement:

For EPS, if an attempt is made to disconnect the last PDN connection, then the UE responds with ERROR or, if extended error responses are enabled, a +CME ERROR.

This applies when use of CID0 is enabled for the PDN connection activated during attach. In fact, entering AT+CGACT=<0 or 1>,0 will generate ERROR response.

If CID0 mode is not enabled then it is possible to enter the AT+CGACT command to deactivate the last PDN connection from the point of view of the middleware. When the user uses AT+CGACT to disconnect the last PDN connection the following occurs:

- The PDN connection is preserved in the protocol stack
- The PDN connection is disconnected at the middleware, so the <cid> for the PDN connection is marked as deactivated
- OK response is returned rather than ERROR

For EPS, the activation request for an EPS bearer resource will be answered by the network by either an EPS dedicated bearer activation or EPS bearer modification request. The request must be accepted by

the UE before the PDP context can be set in to established state.

- If no <cid>s are specified the activation form of the command activates all defined contexts.
- If no <cid>s are specified the deactivation form of the command deactivates all active contexts.

The read command returns the current activation states for all the defined PDP contexts.

The test command is used for requesting information on the supported PDP context activation states.

Please refer to ***Chapter 6*** for possible <err> values.

AT+CGACT PDP Context Activation/Deactivation	
Test Command **AT+CGACT=?**	Response **+CGACT:** (list of supported **<state>**s) **OK**
Read Command **AT+CGACT?**	Response **+CGACT:<cid>,<state>** **[<CR><LF>+CGACT: <cid>,<state>** **[…]]** **OK**
Write Command **AT+CGACT=<state>[,<cid>[,<cid>[,...]]]**	Response **OK/NO CARRIER** If there is any error, response: **ERROR** **+CME ERROR: <err>**
Maximun Response Time	150s, determined by network.

Parameter

<state>	Integer type; indicates the state of PDP context activation. 0 Deactivated 1 Activated Other values are reserved and will result in an ERROR response to the execution command.
<cid>	Integer type; a numeric parameter which specifies a particular PDP context definition (see +CGDCONT command).

NOTES

1. If context is deactivated successfully, NO CARRIER is returned
2. If CID1 for PDN activated during attach is enabled, then AT+CGACT=<0 or 1>,0 will cause ERROR response.
3. If the initial PDP context is supported, the context with <cid>=1 is automatically defined at startup.
4. This command has the characteristics of both the V.250 action and parameter commands. Hence it has the read form in addition to the execution/set and test forms.

Example

```
AT+CGACT=0,1
OK
AT+CGACT?
+CGACT: 1,0

OK
AT+CGACT=?
+CGACT: (0,1)

OK
```

3.18. AT+CGPADDR Show PDP Addresses

The command returns the IP address of the device.

The execution command returns a list of PDP addresses for the specified context identifiers. If no <cid> is specified, the addresses for all defined contexts are returned. Please refer to ***Chapter 6*** for possible <err> values.

The test command returns a list of defined <cid>s. These are <cid>s that have been activated and may or may not have an IP address associated with them.

Please refer to ***Chapter 6*** for possible <err> values.

AT+CGPADDR Show PDP Addresses	
Test Command **AT+CGPADDR=?**	Response **+CGPADDR:** (list of defined **<cid>**s)

	OK
Read Command **AT+CGPADDR?**	Response **+CGPADDR: <cid>[,<PDP_addr_1>[,<PDP_addr_2>]]** **[<CR><LF>+CGPADDR:** **<cid>[,<PDP_addr_1>[,<PDP_addr_2>]]** **[...]]** **OK** IPv4: The string is given as dot-separated numeric (0-255) parameter of the form: a1.a2.a3.a4 IPv6: The string is given as colon-separated hexadecimal parameter.
Write Command **AT+CGPADDR[=<cid>[,<cid>[,...]]]**	Response **[+CGPADDR: <cid>[,<PDP_addr_1>[,<PDP_addr_2>]]]** **[<CR><LF>+CGPADDR:** **<cid>[,<PDP_addr_1>[,<PDP_addr_2>]]** **[...]]** **OK** IPv4: The string is given as dot-separated numeric (0-255) parameter of the form: a1.a2.a3.a4 IPv6: The string is given as colon-separated hexadecimal parameter.
Maximun Response Time	300ms

Parameter

<cid>	Integer type; a numeric parameter which specifies a particular PDP context definition (see AT+CGDCONT command). If no <cid> is specified, the addresses for all defined contexts are returned.
<PDP_addr_1> and **<PDP_addr_2>**	A String type that identifies the MT in the address space applicable to the PDP. The address may be static or dynamic. For a static address, it will be the one set by the AT+CGDCONT command when the context was defined. For a dynamic address it will be the one assigned during the last PDP context activation

	that used the context definition referred to by <cid>. <PDP_address> is omitted if none is available. Both <PDP_addr_1> and <PDP_addr_2> are included when both IPv4 and IPv6 addresses are assigned, with <PDP_addr_1> containing the IPv4 address and <PDP_addr_2> containing the IPv6 address. The string is given as dot-separated numeric (0-255) parameter of the form: a1.a2.a3.a4 for IPv4 and a1.a2.a3.a4.a5.a6.a7.a8.a9.a10.a11.a12.a13.a14.a15.a16 for IPv6. When AT+CGPIAF is supported, its settings can influence the format of the IPv6 address in parameter <PDP_addr_1> or <PDP_addr_2> returned with the execute form of AT+CGPADDR.

NOTES

1. In dual-stack terminals (<PDP_type>=IPv4v6), the IPv6 address will be provided in <PDP_addr_2>. For terminals with a single IPv6 stack (<PDP_type>=IPv6) or due to backwards compatibility, the IPv6 address can be provided in parameter <PDP_addr_1>.

Example

```
AT+CGPADDR=1
+CGPADDR: 1,101.43.5.1

OK
AT+CGPADDR=?
+CGPADDR: (1)

OK
```

3.19. AT+CIMI Request International Mobile Subscriber Identity

The command returns International Mobile Subscriber Identity (string without double quotes).

Execution command causes the TA to return <IMSI>, which is intended to permit the TE to identify the individual USIM card or active application in the UICC (GSM or USIM) which is attached to MT.

Please refer to ***Chapter 6*** for possible <err> values.

AT+CIMI Request International Mobile Subscriber Identity	
Test Command **AT+CIMI=?**	Response **OK**
Execution Command **AT+CIMI**	Response **<IMSI>** **OK** If there is any error, response: **ERROR** **+CME ERROR: <err>**
Maximun Response Time	300ms

Parameter

<IMSI>	International Mobile Subscriber Identity (string without double quotes)

Example

```
AT+CIMI
460001357924680

OK
```

3.20. AT+CFUN Set Phone Functionality

The set command selects the level of functionality in the MT. Level "full functionality" is where the highest level of power is drawn. "Minimum functionality" is where minimum power is drawn. Level of functionality between these may also be specified by manufacturers. When supported by manufacturers, MT resetting with <rst> parameter may be utilized. Please refer to ***Chapter 6*** for possible <err> values.

The read command returns the current setting of <fun>.

The test command returns values supported by the MT as compound values.

AT+CFUN Set Phone Functionality	
Test Command	Response

AT+CFUN=?	**+CFUN:** (list of supported **<fun>**s),(list of supported **<rst>**s) **OK**
Read Command **AT+CFUN?**	Response **+CFUN: <fun>** **OK**
Write Command **AT+CFUN=<fun>[,<rst>]**	Response **OK** If there is any error, response: **ERROR** **+CME ERROR: <err>**
Maximun Response Time	15s, determined by network.

Parameter

<fun>	Integer type 0 Minimum functionality 1 Full functionality 4 Disable phone both transmit and receive RF circuits 7 Disable phone SIM only. Transmit and receive circuits still active
<rst>	Integer type; MT resetting 0 Do not reset the MT before setting it to <fun> power level. 1 Only set to <fun> power level after MT has been reset, and for all subsequent resets. 2 Do not reset MT before setting it to <fun> power level and save <fun> value in NVRAM for all subsequent resets.

Example

```
AT+CFUN=?
+CFUN: (0,1,4,7),(0-2)

OK
AT+CFUN=1
OK
AT+CFUN?
+CFUN: 1

OK
```

3.21. AT+CMEE Report Mobile Termination Error

The set command disables or enables the use of final 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. “ERROR” is returned normally when error is related to syntax, invalid parameters or TA functionality.

The read command returns the current setting of <n>.

The test command returns values supported as a compound value.

Please refer to ***Chapter 6*** for possible <err> values.

AT+CMEE Report Mobile Termination Error	
Test Command **AT+CMEE=?**	Response **+CMEE:** (list of supported **<n>**s) **OK**
Read Command **AT+CMEE?**	Response **+CMEE: <n>** **OK**
Write Command **AT+CMEE=<n>**	Response TA disables or enables the use of result code +CME ERROR: <err> as an indication of an error relating to the functionality of the ME. **OK**
Maximun Response Time	300ms

Parameter

<n>	Integer type	
	0	Disable result code
	1	Enable result code and use numeric values
	2	Enable result code and use verbose values

Example

```
AT+CMEE?
+CMEE: 0
```

```
OK
AT+CMEE=?
+CMEE: (0-2)

OK
```

3.22. AT+CCLK Return Current Date & Time

The clock will be set automatically once the UE has connected to the network.

The read command returns the current setting of the clock.

Please refer to ***Chapter 6*** for possible <err> values.

AT+CCLK Return Current Date & Time	
Test Command **AT+CCLK=?**	Response **OK**
Read Command **AT+CCLK?**	Response **+CCLK: <time>** **OK**
Maximun Response Time	300ms

Parameter

<time>	String type; format is "yy/MM/dd,hh:mm:ss±zz", where characters indicate year (two last digits), month, day, hour, minute, second and time zone (indicates the difference, expressed in quarters of an hour, between the local time and GMT; and range is -47 ~ +48). E.g. 6th of May 1994, 22:10:00 GMT+2 hours equals "94/05/06,22:10:00+08"

NOTES

1. If MT does not support time zone information then the three last characters of <time> are not returned by AT+CCLK? command.

Example

```
AT+CCLK=?
OK
```

3.23. AT+CPSMS Power Saving Mode Setting

The write command controls the setting of the UEs power saving mode (PSM) parameters. The command controls whether the UE wants to apply PSM or not, as well as the requested extended periodic TAU value in E-UTRAN and the requested Active Time value. See the unsolicited result codes provided by commands +CEREG for the Active Time value and the extended periodic TAU value that are allocated to the UE by the network in E-UTRAN.

A special form of the command can be given as +CPSMS=2. In this form the use of PSM will be disabled and data for all parameters in the command +CPSMS will be removed or, if available, set to the manufacturer specific default values.

The read command returns the current parameter values.

The test command returns the supported <mode>s and the value ranges for the requested extended periodic TAU value in E-UTRAN and the requested Active Time value as compound values.

Please refer to ***Chapter 6*** for possible <err> values.

AT+CPSMS Power Saving Mode Setting	
Test Command **AT+CPSMS=?**	Response **+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**
Read Command **AT+CPSMS?**	Response **+CPSMS: <mode>,[<Requested_Periodic-RAU>],[<Requested_GPRS-READY-timer>],[<Requested_Periodic-TAU>],[<Requested_Active-Time>]** **OK** If there is any error, response: **ERROR**

	+CME ERROR: <err>
Write Command **AT+CPSMS=<mode>[,<Requested_Periodic-RAU>[,<Requested_GPRS-READY-timer>[,<Requested_Periodic-TAU>[,<Requested_Active-Time>]]]]**	Response **OK** If there is any error, response: **ERROR** **+CME ERROR: <err>**
Maximun Response Time	300ms

Parameter

<mode> Integer type, indicates to disable or enable the use of PSM in the UE
0 Disable the use of PSM
1 Enable the use of PSM
2 Disable the use of PSM and discard all parameters for PSM or, if available, reset to the manufacturer specific default values.

<Requested_Periodic-RAU> String type; N/A for NB-IoT

<Requested_GPRS-READY-timer> String type; N/A for NB-IoT

<Requested_Periodic-TAU> String type; one byte in an 8-bit format. Requested extended periodic TAU value (T3412) to be allocated to the UE in E-UTRAN. (e.g. "01000111" equals 70 hours).
Bits 5 to 1 represent the binary coded timer value
Bits 6 to 8 define the timer value unit as follows:
Bits
8 7 6
0 0 0 value is incremented in multiples of 10 minutes
0 0 1 value is incremented in multiples of 1 hour
0 1 0 value is incremented in multiples of 10 hours
0 1 1 value is incremented in multiples of 2 seconds
1 0 0 value is incremented in multiples of 30 seconds
1 0 1 value is incremented in multiples of 1 minute
1 1 0 value is incremented in multiples of 320 hours
1 1 1 value indicates that the timer is deactivated

<Requested_Active-Time> String type; one byte in an 8-bit format. Requested Active Time value (T3324) to be allocated to the UE.
(e.g. "00100100" equals 4 minutes).
Bits 5 to 1 represent the binary coded timer value.
Bits 6 to 8 defines the timer value unit for the GPRS timer as follows:
Bits
8 7 6
0 0 0 value is incremented in multiples of 2 seconds

0 0 1	value is incremented in multiples of 1 minute
0 1 0	value is incremented in multiples of decihours
1 1 1	value indicates that the timer is deactivated

NOTES

1. <Requested_Periodic-RAU> and <Requested_GPRS-READY-timer> are not supported by NB-IoT. No value will be output, and any input will be ignored.
2. AT+CPSMS? read command could only get mode value 0 and 1.

Example

```
AT+CPSMS=1,,,"01000011","01000011"
OK
AT+CPSMS?
+CPSMS: 1,,,"01000011","01000011"

OK
AT+CPSMS=?
+CPSMS: (0-2),,,( "00000000"-"11111111"), ("00000000"-"11111111")

OK
```

3.24. AT+CEDRXS eDRX Setting

The write command controls the setting of the UEs eDRX parameters. The command controls whether the UE wants to apply eDRX or not, as well as the requested eDRX value for each specified type of access technology.

The write command also controls the presentation of an unsolicited result code +CEDRXP: <AcT-type>[,<Requested_eDRX_value>[,<NW-provided_eDRX_value>[,<Paging_time_window>]]] when <n>=2 and there is a change in the eDRX parameters provided by the network.

A special form of the command can be given as +CEDRXS=3. In this form, eDRX will be disabled and data for all parameters in the command +CEDRXS will be removed or, if available, set to the manufacturer specific default values.

The read command returns the current settings for each defined value of <AcT-type>.

The test command returns the supported <mode>s and the value ranges for the access technology and the requested eDRX value as compound values.

Please refer to ***Chapter 6*** for possible <err> values.

AT+CEDRXS eDRX Setting	
Test Command **AT+CEDRXS=?**	Response **+CEDRXS:** (list of supported **<mode>s**),(list of supported **<AcT-type>s**),(list of supported **<Requested_eDRX_value>s**) **OK**
Read Command **AT+CEDRXS?**	Response **+CEDRXS: <AcT-type>,<Requested_eDRX_value>** **[<CR><LF>+CEDRXS:** **<AcT-type>,<Requested_eDRX_value>** **[...]]]** **OK**
Write Command **AT+CEDRXS=<mode>[,<AcT-type>[,<Requested_eDRX_value>]]**	Response **OK** If there is any error, response: **ERROR** **+CME ERROR: <err>**
Maximun Response Time	300ms

Parameter

<mode>	Integer type, indicates to disable or enable the use of eDRX in the UE. This parameter is applicable to all specified types of access technology, i.e. the most recent setting of <mode> will take effect for all specified values of <AcT>. 0 Disable the use of eDRX 1 Enable the use of eDRX 2 Enable the use of eDRX and enable the unsolicited result code +CEDRXP: <AcT-type>[,<Requested_eDRX_value>[,<NW-provided_eDRX_value>[,<Paging_time_window>]]] 3 Disable the use of eDRX and discard all parameters for eDRX or, if available, reset to the manufacturer specific default values.
<AcT-type>	Integer type; indicates the type of access technology. AT+CEDRXS? is used to specify the relationship between the type of access technology and the requested eDRX

value.

0	Access technology is not using eDRX. This parameter value is only used in the unsolicited result code.
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 type; half a byte in a 4-bit format. NB-S1 mode.

bit				
4	3	2	1	E-UTRAN eDRX cycle length duration
0	0	1	0	20.48 seconds
0	0	1	1	40.96 seconds
0	1	0	1	81.92 seconds
1	0	0	1	163.84 seconds
1	0	1	0	327.68 seconds
1	0	1	1	655.36 seconds
1	1	0	0	1310.72 seconds
1	1	0	1	2621.44 seconds
1	1	1	0	5242.88 seconds
1	1	1	1	10485.76 seconds

<NW-provided_eDRX_value> String type; half a byte in a 4-bit format. NB-S1 mode.

bit				
4	3	2	1	E-UTRAN eDRX cycle length duration
0	0	1	0	20.48 seconds
0	0	1	1	40.96 seconds
0	1	0	1	81.,92 seconds
1	0	0	1	163.84 seconds
1	0	1	0	327.68 seconds
1	0	1	1	655.36 seconds
1	1	0	0	1310.72 seconds
1	1	0	1	2621.44 seconds
1	1	1	0	5242.88 seconds
1	1	1	1	10485.76 seconds

<Paging_time_window> String type; half a byte in a 4-bit format. NB-S1 mode.

bit				
4	3	2	1	Paging Time Window length
0	0	0	0	2.56 seconds
0	0	0	1	5.12 seconds
0	0	1	0	7.68 seconds
0	0	1	1	10.24 seconds
0	1	0	0	12.8 seconds
0	1	0	1	15.36 seconds

0	1	1	0	17.92 seconds
0	1	1	1	20.48 seconds
1	0	0	0	23.04 seconds
1	0	0	1	25.6 seconds
1	0	1	0	28.16 seconds
1	0	1	1	30.72 seconds
1	1	0	0	33.28 seconds
1	1	0	1	35.84 seconds
1	1	1	0	38.4 seconds
1	1	1	1	40.96 seconds

NOTES

1. <AcT-type> value 5 is supported.
2. When set <mode> to 0 and <Requested_eDRX_value> is omitted, it will set <Requested_eDRX_value> to invalid value like 0.

Example

```
AT+CEDRXS=1,5,"0101"
OK

AT+CEDRXS?
+CEDRXS: 5,"0101"

OK
AT+CEDRXS=?
+CEDRXS: (0-3),(5),("0000"-"1111")

OK
```

3.25. AT+CEDRXRDP eDRX Read Dynamic Parameters

The execution command returns <AcT-type>, <Requested_eDRX_value>, <NW-provided_eDRX_value> and <Paging_time_window> if eDRX is used for the cell that the MS is currently registered to.

If the cell that the MS is currently registered to is not using eDRX, AcT-type=0 is returned.

Please refer to ***Chapter 6*** for possible <err> values.

AT+CEDRXRDP eDRX Read Dynamic Parameters	
Test Command **AT+CEDRXRDP=?**	Response **OK**
Execution Command **AT+CEDRXRDP**	Response **+CEDRXRDP:** **<AcT-type>[,<Requested_eDRX_value>[,<NW-provided_eDRX_value>[,<Paging_time_window>]]]** **OK**
Maximun Response Time	300ms

Parameter

<AcT-type> Integer type; indicates the type of access technology. AT+CEDRXS? is used to specify the relationship between the type of access technology and the requested eDRX value.

0	Access technology is not using eDRX. This parameter value is only used in the unsolicited result code
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 type; half a byte in a 4-bit format.

bit 4	3	2	1	E-UTRAN eDRX cycle length duration
0	0	1	0	20.48 seconds
0	0	1	1	40.96 seconds
0	1	0	1	81.92 seconds
1	0	0	1	163.84 seconds
1	0	1	0	327.68 seconds
1	0	1	1	655.36 seconds
1	1	0	0	1310.72 seconds
1	1	0	1	2621.44 seconds
1	1	1	0	5242.88 seconds
1	1	1	1	10485.76 seconds

<NW-provided_eDRX_value> String type; half a byte in a 4-bit format.

bit 4	3	2	1	E-UTRAN eDRX cycle length duration
0	0	1	0	20.48 seconds
0	0	1	1	40.96 seconds
0	1	0	1	81.92 seconds

	1	0	0	1	163.84 seconds
	1	0	1	0	327.68 seconds
	1	0	1	1	655.36 seconds
	1	1	0	0	1310.72 seconds
	1	1	0	1	2621.44 seconds
	1	1	1	0	5242.88 seconds
	1	1	1	1	10485.76 seconds
<Paging_time_window>	String type; half a byte in a 4-bit format.				
	bit				
	4	3	2	1	Paging Time Window length
	0	0	0	0	2.56 seconds
	0	0	0	1	5.12 seconds
	0	0	1	0	7.68 seconds
	0	0	1	1	10.24 seconds
	0	1	0	0	12.8 seconds
	0	1	0	1	15.36 seconds
	0	1	1	0	17.92 seconds
	0	1	1	1	20.48 seconds
	1	0	0	0	23.04 seconds
	1	0	0	1	25.6 seconds
	1	0	1	0	28.16 seconds
	1	0	1	1	30.72 seconds
	1	1	0	0	33.28 seconds
	1	1	0	1	35.84 seconds
	1	1	1	0	38.4 seconds

NOTE

<AcT-type> value 5 is supported.

Example

```
AT+CEDRXRDP
+CEDRXRDP: 5,"0010","1110","0101"

OK
AT+CEDRXRDP=?
OK
```

3.26. AT+CTZR Time Zone Reporting

This write command enables and disables the time zone change event reporting. If the reporting is enabled the MT returns the unsolicited result code +CTZV: <tz> whenever the time zone is changed. Please refer to ***Chapter 6*** for possible <err> values.

AT+CTZR Time Zone Reporting	
Test Command **AT+CTZR=?**	Response **+CTZR:** (list of supported **<onoff>**s) **OK**
Read Command **AT+CTZR?**	Response **+CTZR: <onoff>** **OK** If there is any error, response: **ERROR** **+CME ERROR: <err>**
Write Command **AT+CTZR=<onoff>**	Response **OK** If there is any error, response: **ERROR** **+CME ERROR: <err>**
Maximun Response Time	300ms

Parameter

<onoff>	0 Disable time zone change event reporting 1 Enable time zone change event reporting by unsolicited result code “+CTZV: <tz>”.
<tz>	String type; represents the sum of the local time zone (difference between the local time and GMT expressed in quarters of an hour) plus daylight saving time. The format is "±zz", expressed as a fixed width, two digits integer with the range -48 ~ +56. To maintain a fixed width, numbers in the range -9 ~ +9 are expressed with a leading zero, e.g. "-09", "+00" and "+09".

Example

```
AT+CTZR=?
+CTZR: (0,1)

OK
```

```
AT+CTZR=0
OK
AT+CTZR?
+CTZR: 0

OK
```

3.27. AT+CIPCA Initial PDP Context Activation

The set command controls whether an initial PDP context (see sub-clause 10.1.0) shall be established automatically following an attach procedure when the UE is attached to GERAN or UTRAN RATs and whether the UE is attached to E-UTRAN with or without a PDN connection.

1)For <n>≠0, deactivating the last (active) PDP context can lead to a (re)establishment of the initial PDP context. Changing setting of <n> from 0 to 1 will cause an immediate attempt to (re)establish the initial PDP context if no PDP context is active. Changing <n> from 0 to 2 will, if not roaming, cause an immediate attempt to (re)establish the initial PDP context if no other PDP context is active. The value of <n>=3 applies to E-UTRAN RATs and does not change the setting of PDP context activation in GERAN or UTRAN RATs. Changing <n> will never cause a PDP context deactivation.

2)For <AttachWithoutPDN>=1, the EPS attach is performed without a PDN connection.

The read command returns the current setting of the command.

The test command returns values supported as a compound value.

Please refer to ***Chapter 6*** for possible <err> values.

AT+CIPCA Initial PDP Context Activation	
Test Command **AT+CIPCA=?**	Response **+CIPCA: (**list of supported **<n>s),(**list of supported **<AttachWithoutPDN>s)** **OK**
Read Command **AT+CIPCA?**	Response **+CIPCA: <n>[,<AttachWithoutPDN>]** **OK** If there is any error, response: **ERROR** **+CME ERROR: <err>**

Write Command **AT+CIPCA=<n>[,<AttachWithoutPDN>]**	Response **OK** If there is any error, response: **ERROR** **+CME ERROR: <err>**
Maximun Response Time	300ms

Parameter

<n>	Integer type; activation of PDP context upon attaching 0 Do not activate 1 Always activate 2 Activate when not roaming 3 No change in current setting
<AttachWithoutPDN>	Integer type; EPS attach with or without PDN connection. 0 EPS attach with PDN connection 1 EPS attach without PDN connection

NOTES

1. For this command, the term roaming corresponds to being registered on a VPLMN which is not equivalent to HPLMN or EHPLMN.
2. Only <n>=3 is valid for NBIOT.
3. If <AttachWithoutPDN> is omitted, default value 0 will be used.
4. The write command will work at any time but will only take effect once the UE registers to on a network either for the first time or re-registers.

Example

```
AT+CIPCA=3,1
OK
AT+CIPCA?
+CIPCA: 3,1

OK
AT+CIPCA=?
+CIPCA: (3),(0,1)

OK
```

3.28. AT+CCIOTOPT CIoT Optimization Configuration

The set command controls which CIoT EPS optimizations the UE indicates as supported and preferred in the ATTACH REQUEST and TRACKING AREA UPDATE REQUEST messages. The command also allows reporting of the CIoT EPS optimizations that are supported by the network. A UE supporting CIoT functionality may support control plane CIoT EPS optimization or user plane CIoT EPS optimization or both (see 3GPP TS 24.301,sub-clause 9.9.3.34). Based on the application characteristics the UE may prefer to be registered for control plane CIoT EPS optimization or for user plane CIoT EPS optimization (see 3GPP TS 24.301,sub-clause 9.9.3.0B).

Further the network may support control plane CIoT EPS optimization or user plane CIoT EPS optimization or both (see 3GPP TS 24.301,sub-clause 9.9.3.12A).

The set command is used also to control the unsolicited result code **+CCIOTOPTI**. An unsolicited result code **+CCIOTOPTI: <supported_Network_opt>** is used indicate the supported CIoT EPS optimization by the network.

The read command returns the current settings for supported and preferred CIoT EPS optimization and the current status of unsolicited result code **+CCIOTOPTI**.

Please refer to ***Chapter 6*** for possible <err> values.

AT+CCIOTOPT CIoT Optimization Configuration	
Test Command **AT+CCIOTOPT=?**	Response **+CCIOTOPT: (**list of supported **<n>s),(**list of supported **<supported_UE_opt>s),(**list of supported **<preferred_UE_opt>s)** **OK**
Read Command **AT+CCIOTOPT?**	Response **+CCIOTOPT: <n>,<supported_UE_opt>,<preferred_UE_opt>** **OK**
Write Command **AT+CCIOTOPT =<n>[,<supported_UE_opt>[,<preferred_UE_opt>]]**	Response **OK** If there is any error, response: **ERROR** **+CME ERROR: <err>**
URC	**+CCIOTOPTI: <supported_Network_opt>**
Maximun Response Time	300ms

Parameter

<n>	Integer type, enables or disables reporting of unsolicited result code +CCIOTOPTI. 0 Disable reporting. 1 Enable reporting. 2 Disable reporting and reset the parameters for CIoT EPS optimization to the default values.
<supported_UE_opt>	Integer type, indicates the UE's support for CIoT EPS optimizations. 1 Support for control plane CIoT EPS optimization. 3 Support for both control plane CIoT EPS optimization and user plane CIoT EPS optimization.
<preferred_UE_opt>	Integer type, indicates the UE's preference for CIoT EPS optimizations. 0 No preference. 1 Preference for control plane CIoT EPS optimization. 2 Preference for user plane CIoT EPS optimization.
<supported_Network_opt>	Integer type, indicates the Network support for CIoT EPS optimizations. 0 No Support. 1 Support for control plane CIoT EPS optimization. 2 Support for user plane CIoT EPS optimization.

3.29. AT+CGAPNRC APN Rate Control

The execution command returns the APN rate control parameters (see *3GPP TS 24.008 [8]*) associated to the provided context identifier <cid>.

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

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

Please refer to ***Chapter 6*** for possible <err> values.

AT+CGAPNRC APN Rate Control	
Test Command **AT+CGAPNRC=?**	Response **+CGAPNRC:** (list of **<cid>s** associated with active contexts) **OK**
Execution Command **AT+CGAPNRC=<cid>**	Response **+CGAPNRC:**

	<cid>[,<Additional_exception_reports>[,<Uplink_time_unit>[,<Maximum_uplink_rate>]]] **[<CR><LF>+CGAPNRC:** **<cid>[,<Additional_exception_reports>[,<Uplink_time_unit>[,<Maximum_uplink_rate>]]]** **[...]]** **OK** If there is any error, response: **ERROR** **+CME ERROR: <err>**
Maximun Response Time	300ms

Parameter

<cid>	Integer type; specifies a particular PDP context definition (see the AT+CGDCONT and AT+CGDSCONT commands).
<Additional_exception_reports>	Integer type; 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 IE as specified in *3GPP TS 24.008 [8] subclause 10.5.6.3.2*. 0 Additional exception reports at maximum rate reached are not allowed to be sent. 1 Additional exception reports at maximum rate reached are allowed to be sent.
<Uplink_time_unit>	Integer type; specifies the time unit to be used for the maximum uplink rate. This refers to bits 1 to 3 of octet 1 of the APN rate control parameters IE as specified *in 3GPP TS 24.008 [8] subclause 10.5.6.3.2*. 0 Unrestricted 1 Minute 2 Hour 3 Day 4 Week
<Maximum_uplink_rate>	Integer type; 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 IE as specified in *3GPP TS 24.008 [8] subclause 10.5.6.3.2*.

3.30. AT+CEER Extended Error Report

The execution command causes the TA to return one or more lines of information text <report>, determined by the MT manufacturer, which should offer the user of the TA an extended report of the reason for the following errors:

- The failure in the last unsuccessful call setup (originating or answering) or in call modification;
- The failure in the last call release;
- The failure in the last unsuccessful GPRS attach or unsuccessful PDP context activation;
- The failure in the last GPRS detach or PDP context deactivation.

Typically, the text will consist of a single line containing the cause information given by GSM/UMTS network in textual format.

AT+CEER Extended Error Report	
Test Command **AT+CEER=?**	Response **OK**
Execution Command **AT+CEER**	Response **+CEER: <report>** **OK**
Maximun Response Time	300ms

Parameter

<report>	The total number of characters, including line terminators, in the information, text shall not exceed 2041 characters. Text shall not contain the sequence 0<CR> or OK<CR>.

Example

```
AT+CEER
+CEER: EMM_CAUSE_EPS_AND_NON_EPS_SERVICES_NOT_ALLOWED

OK
AT+CEER=?
OK
```

4 General Commands

4.1. AT+QGACT Activate/Deactivate A PDN Context

Activate or deactivate a specified PDN context.

There are three kinds of responses for both the activation requirement and the deactivation requirement. If the PDN context is active/inactive, “+QGACT: <cid>,<type>,<result>[,<activated_pdp_type>] OK” is returned immediately for activation/deactivation requirement. If not, “+QGACT: <cid> OK” is returned first and (URC) ”+QGACT: <cid>,<type>,<result>[,<activated_pdp_type>]” is reported for the activation/deactivation result later. If any error occurs, such as invalid parameter(s), “ERROR” is returned immediately. In any case, activated_pdp_type only exists for the activation requirement.

Besides, (URC) “+QGACT: <cid>,<type>” is reported when passive deactivation occurs.

For the activation requirement, the format of the QGACT is “+QGACT=<op>,<pdp_type>,<apn>, <user_name>,<pwd>[,<bearer_type>[,<sim_id>]]”, while for the deactivation requirement, the format is “+QGACT=<op>,<cid>”. For the purpose of normalization, the format of QGACT is: “+QGACT=<op>,<pdp_type/cid>[,<apn>,<user_name>,<pwd>[,<bearer_type>[,<sim_id>]]]”.

Please refer to ***Chapter 6*** for possible <err> values.

AT+QGACT Activate/Deactivate A PDN Context	
Write Command **AT+QGACT=<op>,<pdp_type/cid>,<apn>[,<user_name>,<pwd>[,<bearer_type>[,<sim_id>]]]**	Response **+QGACT: <cid>,<type>,<result>[,<activated_pdp_type>]** **OK** OR **+QGACT: <cid>** **OK** If there is any error, response: **ERROR**

	+CME ERROR: <err>
URC	**+QGACT: <cid>,<type>,<result>[,<activated_pdp_type>]**
Maximun Response Time	300ms

Parameter

<op>	Integer type; 0 Deactivation requirement 1 Activation requirement
<pdp_type>	Integer type; It is the pdp_type wanted to activate. 1 IPv4 2 IPv6 3 IPv4v6 4 Non-IP
<cid>	Integer type; It is a numeric parameter specifying a particular PDP context.
<apn>	String type; It is the access point name which is mandatory for the activation requirement and should be omitted for the deactivation requirement.
<user_name>	String type; It is the username for access to the IP network which is mandatory for the activation requirement and should be omitted for the deactivation requirement.
<pwd>	String type; It is the password for access to the IP network which is mandatory for the activation requirement and should be omitted for the deactivation requirement.
<bearer_type>	Integer type; It is the type of bearer wanted to activate which is optional for the activation requirement and should be omitted for the deactivation requirement. 1 NBIOT (Only NBIOT is supported currently)

<sim_id>	Integer type; It is the id of the SIM Card wanted to use which is optional for the activation requirement and should be omitted for the deactivation requirement. 1 SIM Card 1 (Only SIM Card 1 is supported currently).
<type>	Integer type; 0 Result/URC for deactivation requirement 1 Result/URC for activation requirement 2 URC for passive deactivation
<result>	Integer type; 0 failure 1 success
<activated_pdp_type>	Integer type; It is the pdp_type actually activated. 1 IPv4 2 IPv6 3 IPv4v6 4 Non-IP

NOTES

1. The default PDN (cid = 1) will be established automatically after module registered to network in R01A01 and later versions

Example

```
AT+QGACT=1,1,”apn”,””,””
// Activate a PDN context
+QGACT: 1

OK                          //Return OK immediately for no error

+QGACT: 1,1,1,1             //Notify activation result via URC

AT+QGACT=0,1                //Deactivate a PDN context
+QGACT: 1

OK                          //Return OK immediately for no error

+QGACT: 1,0,1               //Notify deactivation result via URC
```

4.2. AT+QBAND Get and Set Mobile Operation Band

The command is used to get the current registered band or set the bands to be locked. Please refer to ***Chapter 6*** for possible <err> values.

AT+QBAND Get and Set Mobile Operation Band	
Test Command **AT+QBAND=?**	Response **+QBAND:** (list of supported**<band number>**s)[,(list of supported **<Operating Bands>**s)] **OK**
Read Command **AT+QBAND?**	Response **+QBAND: <Operating Band>** **OK** If there is any error, response: **ERROR** **+CME ERROR: <err>**
Write Command **AT+QBAND=<band number>[,<band>[,<band>[,…]]]**	Response **OK** If there is any error, response: **ERROR** **+CME ERROR: <err>**
Maximun Response Time	300ms

Parameter

<band number>	Integer value indicating search prefer band number 0 : all bands 1-19 : number of bands to lock
<band>	Integer value indicating current search prefer NB-IOT band Valid values: 1,2,3,5,8,11,12,13,17,18,19,20,21,25,26,28,31,66,70
<Operating Band>	Integer, valid values : 1,2,3,5,8,11,12,13,17,18,19,20,21,25,26,28,31,66,70

Example

```
AT+QBAND=?                          //Query list of supported the band
+QBAND: (0-19),(1,2,3,5,8,11,12,13,17,18,19,20,21,25,26,28,31,66,70)

OK
AT+QBAND=1,5                        //Sets the bands to be used

OK

AT+QBAND?                           //Query the band
+QBAND: 5

OK
```

NOTES

1.Currently **<Operating Band>** only supported 1,3,5,8,20.

4.3. AT+QRST Automatically Reset

This command is used to reset the module immediately.

Please refer to ***Chapter 6*** for possible <err> values.

AT+QRST Automatically Reset	
Test Command **AT+QRST=?**	Response +QRST: (list of supported **<mode>**s) **OK**
Write Command **AT+QRST=<mode>**	Response Automatically Reset immediately If there is any error, response: **ERROR** **+CME ERROR: <err>**

Maximun Response Time	300ms

Parameter

<mode>	1	Automatically Reset immediately

4.4. AT+QSPCHSC Set Scrambling Algorithm

This command is used to select new or old scrambling code. This is because code has been updated by 3GPPP, and UE needs to select correct code for network.

Please refer to ***Chapter 6*** for possible <err> values.

AT+QSPCHSC Set Scrambling Algorithm	
Test Command **AT+QSPCHSC=?**	Response **+QSPCHSC:** (list of supported **<mode>**s) **OK**
Read Command **AT+QSPCHSC?**	Response **+QSPCHSC: <mode>** **OK**
Execution Command **AT+QSPCHSC=<mode>**	Response OK If there is any error, response : **ERROR** **+CME ERROR: <err>**
Maximun Response Time	300ms

Parameter

<mode>	Integer 0: Old algorithm 1: New algorithm

4.5. AT+QLOCKF Lock NB-IoT Frequency

This command is used to lock UE to specific frequency and optionally Cell ID.
Please refer to ***Chapter 6*** for possible <err> values.

AT+QLOCKF Lock NB-IoT Frequency	
Test Command **AT+QLOCKF=?**	Response **OK**
Read command **AT+QLOCKF?**	Response **OK**
Execution Command **AT+QLOCKF=<mode>[,<earfcn>,<earfcn_offset>[,<pci>]]**	Response **OK** If there is any error, response : **ERROR** **+CME ERROR: <err>**
Maximun Response Time	300ms

Parameter

<mode>	Integer value indicating whether to activate lock, or remove lock: 0 Remove lock 1 Activate lock
<earfcn>	Integer value indicating requested EARFCN on which to lock. Range 0- 262143. Value of 0 indicates to remove any lock for EARFCN and Cell
<earfcn_offset>	Integer value indicating requested EARFCN offset: 0 Offset of -2 1 Offset of -1 2 Offset of -0.5 3 Offset of 0 4 Offset of 1
<pci>	Integer value: Physical cell ID. Range: 0-503

4.6. AT+QCSEARFCN Clear NB-IoT Frequency

This command is used to clear UE to specific frequency and optionally Cell ID.
Please refer to ***Chapter 6*** for possible <err> values.

AT+ QCSEARFCN Clear NBIOT Frequency

Execution Command **AT+QCSEARFCN**	Response **+QCSEARFCN: <status>** **OK** If there is any error, response: **ERROR** **+CME ERROR: <err>**
Maximun Response Time	300ms

Parameter

<status>	Integer;	
	0	Successful
	2	Failure
	3	Not found

Example

```
AT+QCSEARFCN
+QCSEARFCN: 0

OK
```

4.7. AT+QCGDEFCONT Set Default PSD Connection Settings

This command is used to set the PSD connection settings for PDN connection on power up. In NBIOT, when you attach to the NBIOT network on power-on then you must perform a PDN connection setup. In order to allow this to happen we must store PDN connection settings in NVRAM to be used by the modem during the attach procedure.

Please refer to ***Chapter 6*** for possible <err> values.

AT+QCGDEFCONT Set Default PSD Connection Settings	
Test Command **AT+QCGDEFCONT=?**	Response **+QCGDEFCONT: (list of supported <PDP_type>s)** **OK**
Read Command **AT+QCGDEFCONT?**	Response **+QCGDEFCONT:**

	<PDP_type>,<APN>,<username>,<password> **OK**
Execution command **AT+QCGDEFCONT =<PDP_type>[,<APN>[,<username>[, password]]]**	Response **OK** If there is any error, response: **ERROR** **+CME ERROR: <err>**
Maximun Response Time	300ms

Parameter

<PDP_type>	String type. Specifies the type of packet data protocol: IP Internet Protocol (IETF STD 5) IPV6 Internet Protocol version 6 (IETF RFC 2460) IPV4V6 Dual IP stack ,UE capability (see 3GPP TS 24.301) Non-IP Transfer of Non-IP data to external packet network (see 3GPP TS 24.301)
<APN>	String type. a logical name that is used to select the GGSN or the external packet data network. If the value is null or omitted, then the subscription value will be requested.
<user_name>	String type; It is the username for access to the IP network which is mandatory for the activation requirement and should be omitted for the deactivation requirement.
<password>	String type;It is the password for access to the IP network which is mandatory for the activation requirement and should be omitted for the deactivation requirement.

NOTES

1. Need to reboot the module to take effect the new setting for default PDN connection.

4.8. AT+QNBIOTRAI NB-IoT Release Assistance Indication

This command is used to set the NB-IoT release assistance indication as follows:

- No information available
- TE will send only 1 UL packet and no DL packet is expected
- TE will send only 1 UL packet and only 1 DL packet is expected

Please refer to ***Chapter 6*** for possible <err> values.

AT+QNBIOTRAI NB-IoT Release Assistance Indication	
Test Command **AT+QNBIOTRAI=?**	Response **+QNBIOTRAI: (list of supported <rai>s)** **OK**
Read Command **AT+QNBIOTRAI?**	Response **+QNBIOTRAI**: <rai> **OK**
Execution command **AT+QNBIOTRAI=<rai>**	Response **OK** If there is any error, response: **ERROR** **+CME ERROR: <err>**
Maximun Response Time	300ms

Parameter

<rai>	Integer type. Specifies release assistance information: 0 No information available (or none of the other options apply) (default) 1 TE will send only 1 UL packet and no DL packets expected 2 TE will send only 1 UL packet and only 1 DL packet expected

4.9. AT+QNBIOTEVENT Enable/Disable NB-IoT Related Event Report

This command is used to enable/disable the specific event report.

Please refer to ***Chapter 6*** for possible <err> values.

AT+QNBIOTEVENT Enable/Disable NBIOT Related Event Report	
Test Command **AT+QNBIOTEVENT=?**	Response

	OK
Read Command **AT+QNBIOTEVENT?**	Response **OK**
Execution command **AT+QNBIOTEVENT=<enable><event>**	Response **OK** If there is any error, response: **ERROR** **+CME ERROR: <err>**
Maximun Response Time	300ms

Parameter

<enable>	Integer type. 0 disable the indication of specific event 1 enable the indication of specific event by unsolicited result code +QNBIOTEVENT: <event_value>
<event>	Integer type. Indicate the report event 1 PSM state
<event_value>	String type. When event is PSM ENTER PSM/EXIT PSM

4.10. AT+QATWAKEUP Enable Deep Sleep Wakeup Indication

This command is used to enable an unsolicited result code on a channel that indicates when the modem is fully woken up after a deep sleep.

Please refer to ***Chapter 6*** for possible <err> values.

AT+QATWAKEUP Enable Deep Sleep Wakeup Indication	
Test Command **AT+QATWAKEUP=?**	Response **+QATWAKEUP: (list of supported <enable>s)** **OK**
Read Command **AT+QATWAKEUP?**	Response **+QATWAKEUP: <enable>**

	OK
Execution Command **AT+QATWAKEUP=<enable>**	Response **OK** If there is any error, response: **ERROR** **+CME ERROR: <err>**
Maximun Response Time	300ms

Parameter

<enable>	Integer;	
	0	Disable indication on this channel when modem wakes up from deep sleep
	1	Enable indication on this channel when modem wakes up from deep sleep

Example

```
AT+QATWAKEUP=1      //Enable wakeup indication

OK
(Modem goes into deep sleep mode)
(Modem is woken up from deep sleep mode)

+QATWAKEUP          //Modem fully woken up and ready to receive AT commands/data
```

4.11. AT+QENG Engineering Mode

This command is used to query current modem status information for serving cell and current network status in Engineering Mode. Please refer to ***Chapter 6*** for possible <err> values.

AT+QENG Engineering Mode	
Test Command **AT+QENG=?**	Response **+QENG:** (list of supported **<mode>**s) **OK**
Write Command **AT+QENG=<mode>**	When <mode>=0: Response **+QENG:**

	0,<sc_earfcn>,<sc_earfcn_offset>,<sc_pci>,<sc_cellid>,[<sc_rsrp>],[<sc_rsrq>],[<sc_rssi>],[<sc_snr>],<sc_band>,<sc_tac>,[<sc_ecl>],[<sc_tx_pwr>] **[+QENG:** **1,<nc_earfcn>,<nc_earfcn_offset>,<nc_pci>,<nc_rsrp>,[…]]** **OK** When <mode>=1: Response **+QENG:** **2,<RLC_UL_BLER>,<RLC_DL_BLER>,<MAC_UL_BLER>,<MAC_DL_BLER>,<MAC_UL_total_bytes>,<MAC_DL_total_bytes>,<MAC_UL_total_HARQ_TX>,<MAC_DL_total_HARQ_TX>,<MAC_UL_HARQ_re_TX>,<MAC_DL_HARQ_re_TX>,<RLC_UL_tput>,<RLC_DL_tput>,<MAC_UL_tput>,<MAC_DL_tput>** **OK** If there is any error, response: **ERROR** **+CME ERROR: <err>**
Maximun Response Time	300ms

Parameter

<mode>	Integer value indicating requested engineering information. 0 display Radio information for serving and neighbor cells 1 display data transfer information only if modem in RRC-CONNECTED state
<sc_earfcn>	Integer value indicating the EARFCN for serving cell. Range 0-262143
<sc_earfcn_offset>	Integer value indicating the EARFCN offset for serving cell: 0 Offset of -2 1 Offset of -1 2 Offset of -0.5 3 Offset of 0 4 Offset of 1
<sc_pci>	Integer value indicating the serving cell physical cell ID. Range 0 – 503.
<sc_cellid>	String type; four byte (28 bit) cell ID in hexadecimal format for serving cell.
<sc_rsrp>	Signed integer indicating serving cell RSRP value in units of dBm (can be negative value). Available only in RRC-IDLE state.
<sc_rsrq>	Signed integer indicating serving cell RSRQ value in units of dB (can be negative

value). Available only in RRC-IDLE state.

<sc_rssi> Signed integer indicating serving cell RSSI value in units of dBm (can be negative value). Available only in RRC-IDLE state.

<sc_snr> Signed integer value. Last SNR value for serving cell in units of dB.
Available only in RRC-IDLE state.

<sc_band> Integer value; current serving cell band

<sc_tac> String type; two byte tracking area code (TAC) in hexadecimal format (e.g. "00C3" equals 195 in decimal).

<sc_ecl> Integer value. Last Enhanced Coverage Level (ECL) value for serving cell. Range 0-2.

<sc_tx_pwr> Signed integer value indicating current UE transmit power. Units of cBm Centibels relative to one milliwatt (can be negative value).

<nc_earfcn > Integer value indicating the EARFCN for neighbor cell. Range 0-262143

<nc_earfcn_offset > Integer value indicating the EARFCN offset for neighbor cell:
0 Offset of -2
1 Offset of -1
2 Offset of -0.5
3 Offset of 0
4 Offset of 1

<nc_pci > Integer value indicating the neighbor cell physical cell ID. Range 0-503.

<nc_rsrp> Signed integer indicating neighbor cell RSRP value in units of dBm (can be negative value).

<RLC_UL_BLER > Integer value. Represented in % value (range 0 to 100). UL block error rate (as per IRQ) in RLC. Calculated over all established RLC AM radio bearers.
Calculated from thebeginning of successfully established/resumed RRC connection or since previous AT+QENG query with <mode>=1, whichever is later. Only valid in RRC-CONNECTED state.

< RLC_DL_BLER > Integer value Represented in % value (range 0 to 100). DL block error rate (as per ARQ) in RLC. Calculated over all established RLC AM radio bearers. Calculated from the beginning of successfully established / resumed RRC connection, or since previous AT+QENG query with <mode>=1, whichever is later. Available only in RRC-CONNECTED state.

< MAC_UL_BLER > Integer value. Represented in % value (range 0 to 100). UL block error rate (as per HARQ) in MAC for UL-SCH. Calculated from the beginning of successfully established /resumed / re-established RRC connection, or since previous AT+QENG query with <mode>=1, whichever is later. Available only in RRC-CONNECTED state.

<MAC_DL_BLER> Integer value. Represented in % value (range 0 to 100). DL block error rate (as per HARQ) in MAC for DL-SCH, excluding BCCH. Calculated from the beginning of successfully established / resumed / re-established RRC connection, or since previous AT+QENG query with <mode>=1, whichever is later. Available only in RRC-CONNECTED state.

< MAC_UL_total_bytes> Integer value. Total number of transport block bytes (re)transmitted on UL-SCH. Calculated for UL-SCH over all HARQ transmissions and retransmissions.Calculated from the beginning of successfully established / resumed / re-established RRC connection, or since previous AT+QENG query with <mode>=1, whichever is later.Available only in RRC-CONNECTED state. Unit: bytes

<MAC_DL_total_bytes> Integer value. Total number of transport block bytes (re)transmitted on DL-SCH, excluding BCCH. Calculated from the beginning of successfully established / resumed /re-established RRC connection, or since previous AT+QENG query with <mode>=1, whichever is later. Available only in RRC-CONNECTED state. Unit: bytes

<MAC_UL_total_HARQ_TX> Integer value. Total number of HARQ (re)transmissions for transport blocks on UL-SCH. Calculated from the beginning of successfully established / resumed / re-established RRC connection, or since previous AT+QENG query with <mode>=1, whichever is later. Available only inRRC-CONNECTED state. Unit: (re)transmissions

<MAC_DL_total_HARQ_TX> Integer value. Total number of HARQ (re)transmissions for transport blocks on DL-SCH, excluding BCCH. Calculated from the beginning of successfully established / resumed / re-established RRC connection, or since previous AT+QENG query with <mode>=1, whichever is later. Available only in RRCCONNECTED state. Unit: (re)transmissions

<MAC_UL_HARQ_re_TX> Integer value. Number of HARQ retransmissions for transport blocks on UL-SCH. Calculated from the beginning of successfully established /resumed / re-established RRC connection, or since previous AT+QENG query with <mode>=1, whichever is later. Available only in RRC-CONNECTED state. Unit: retransmissions

<MAC_DL_HARQ_re_TX> Integer value. Number of HARQ retransmissions for transport blocks on DL-SCH, excluding BCCH. Calculated from the beginning of successfully established / resumed / re-established RRC connection, or since previous AT+QENG query with <mode>=1, whichever is later. Available only in RRCCONNECTED state. Unit: retransmissions.

<RLC_UL_tput> Integer value. RLC uplink throughput. Calculated over all established RLC AM radio bearers. Calculated from the beginning of successfully established / resumed RRC connection, or since previous AT+QENG query with <mode>=1, whichever is later. Available only in RRC-CONNECTED state. Unit: kbits / s

<RLC_DL_tput> Integer value. RLC downlink throughput. Calculated over all established RLC AM radio bearers Calculated from the beginning of successfully established /resumed RRC connection, or since previous AT+QENG query with <mode>=1, whichever is later. Available only in RRC-CONNECTED state. Unit: kbits / s

<MAC_UL_tput> Integer value. UL throughput in MAC for UL-SCH.
Calculated from the beginning of successfully established / resumed / re-established RRC connection, or since previous AT+QENG query with <mode>=1, whichever is later.Available only in RRC-CONNECTED state. Unit: kbits / s

<MAC_DL_tput>	Integer value. DL throughput in MAC for DL-SCH, excluding BCCH. Calculated from the beginning of successfully established / resumed / re-established RRC connection, or since previous AT+QENG query with <mode>=1, whichever is later. Available only in RRC-CONNECTED state. Unit: kbits / s

4.12. AT+QCCID Card Identification

The commands read the ICCID off the USIM card. If no USIM card is present, or the USIM card is unreadable, no data is returned.
Please refer to ***Chapter 6*** for possible <err> values.

AT+QICCID Card Identification	
Execution Command **AT+QCCID**	Response **+QCCID:<ICCID>** **OK**
Maximun Response Time	300ms

Parameter

<ICCID>	USIM card identification number

Example

```
AT+QCCID
+QCCID:89860317482035195410

OK
```

4.13. AT+QPOWD Power Off

The commands is used to power off the module.

Please refer to ***Chapter 6*** for possible <err> values.

AT+QPOWD Power Off	
Read Command **AT+QPOWD=?**	Response **+QPOWD: (0)** **OK**
Execution Command **AT+QPOWD=<op>**	Response **OK** If there is any error, response: **ERROR** **+CME ERROR: <err>**
Maximun Response Time	1s

Parameter

<op>	0	Urgent Power Off

Example

```
AT+QPOWD=0
OK
```

4.14. AT+QSCLK Configure Sleep Mode

The commands is used to configure UE sleep mode.

Please refer to ***Chapter 6*** for possible <err> values.

AT+QSCLK Configure Sleep Mode	
Test Command **AT+QSCLK=?**	Response **+QSCLK: (0-2)** **OK**
Read Command	Response

AT+QSCLK?	**+QSCLK: <n>** **OK**
Write Command **AT+QSCLK=<n>**	Response **OK** If there is any error, response: **ERROR** **+CME ERROR: <err>**
Maximun Response Time	300ms

Parameter

<n>	0	Disable Sleep Mode
	1	Enable light sleep and deep sleep , wakeup by PSM_EINT(Falling Edge)
	2	Enable light sleep only, wakeup by MAIN UART

Example

```
AT+QSCLK=1
OK
```

5 Examples

5.1. Attach Network

The module currently only support register to network after reboot automatically.

The following shows a simple example to automatically attach the network. Customers only need to query whether the module has attached network by the following commands:

```
//Power on
F1: 0000 0000
V0: 0000 0000 [0001]
00: 0006 000C
01: 0000 0000
U0: 0000 0001 [0000]
T0: 0000 00B4
Leaving the BROM

//auto-baud synchronization
AT
AT
AT                          // Successfully synchronized
OK

// Configure the APN for initial attach
// Set once and save to nvram
// Take effect on restart or re-register

AT+QCGDEFCONT="IP","spe.inetd.vodafone.nbiot"
OK

AT+QRST=1

F1: 0000 0000
V0: 0000 0000 [0001]
00: 0006 000C
01: 0000 0000
U0: 0000 0001 [0000]
T0: 0000 00B4
Leaving the BROM
```

```
//auto-baud synchronization
AT
AT
AT                    // Successfully synchronized
OK

AT+CFUN?              //Value is 1.
+CFUN:1

OK

AT+CIMI               //Query the IMSI number.
460012345678969

OK

AT+CESQ               //Query the signal strength.
+CESQ: 36,99,255,255,12,53

OK

AT+QENG=0       //Query the module current network status
+QENG: 0,2506,2,62,"6923252",-84,-10,-74,2,5,"69C9",0,90

OK

AT+CGATT?             //Query whether network is activated, 1 means attach network successfully, 0
                      means has not been attached to network.

+CGATT:1

OK
AT+CEREG?             //Query the network registration status, 1 means registered on network, 2 means
                      searching the network.
+CEREG:0,1

OK

AT+CSCON?             //Query the signal connection status, 1 means “Connected”,0
                                  means “Idle”.
+CSCON:0,1

OK
```

The following shows a simple example to automatically attach the network. Customers don't need to query whether the module has attached network always, the network attach state will be reported via URC:

```
//Power on
F1: 0000 0000
V0: 0000 0000 [0001]
00: 0006 000C
01: 0000 0000
U0: 0000 0001 [0000]
T0: 0000 00B4
Leaving the BROM

//auto-baud synchronization
AT
AT
AT                    // Successfully synchronized
OK

// Configure the APN for initial attach
// Set once and save to nvram
// Take effect on restart or re-register

AT+QCGDEFCONT="IP","spe.inetd.vodafone.nbiot"
OK

AT+QRST=1

F1: 0000 0000
V0: 0000 0000 [0001]
00: 0006 000C
01: 0000 0000
U0: 0000 0001 [0000]
T0: 0000 00B4
Leaving the BROM

//auto-baud synchronization
AT
AT
AT                    // Successfully synchronized
OK
```

```
AT+CFUN?            //Value is 1.
+CFUN:1

OK

AT+CIMI             //Query the IMSI number.
460012345678969

OK
AT+CEREG=1          //Set to automatically report network registration status, when the module is registered on the network, a URC will be reported.
OK
AT+CSCON=1          //Set to automatically report network registration status, when the module is registered on the network, a URC will be reported.
OK
+CEREG:2            //Report the URC, the MT is currently trying to attach or searching an operator to register to.

+CSCON:1            //Report the URC, the MT is connected.

+CEREG:1            //Report the URC, the MT is registered.

AT+CESQ                 //Query the signal strength.
+CESQ: 36,99,255,255,12,53

OK

AT+QENG=0       //Query the module status
+QENG: 0,2506,2,62,"6923252",-84,-10,-74,2,5,"69C9",0,90

OK

AT+CGATT?           //Query whether network is activated, 1 means attach network successfully, 0 means has not been attached to network.

+CGATT:1

OK
AT+CEREG?           //Query the network registration status, 1 means registered on network, 2 means searching the network.
+CEREG:0,1

OK
```

```
AT+CSCON?          //Query the signal connection status, 1 means “Connected”,
                                                0     means “Idle”.
+CSCON:0,1

OK
```

If the network attach process occupies for a long time. Customer can try to specify PLMN or specify dedicated EARFCN or PCI or BAND to reduce the search time. The following shows a simple example to automatically attach the network which include PLMN or EARFCN/PCI or BAND dedicating.

Specify PLMN:

```
//Power on
F1: 0000 0000
V0: 0000 0000 [0001]
00: 0006 000C
01: 0000 0000
U0: 0000 0001 [0000]
T0: 0000 00B4
Leaving the BROM

//auto-baud synchronization
AT
AT
AT                    // Successfully synchronized
OK

// Configure the APN for initial attach
// Set once and save to nvram
// Take effect on restart or re-register

AT+QCGDEFCONT="IP","spe.inetd.vodafone.nbiot"
OK

AT+QRST=1

F1: 0000 0000
V0: 0000 0000 [0001]
00: 0006 000C
01: 0000 0000
U0: 0000 0001 [0000]
T0: 0000 00B4
Leaving the BROM
```

```
//auto-baud synchronization
AT
AT
AT                    // Successfully synchronized
OK

AT+CFUN?              //Value is 1.
+CFUN:1

OK

AT+CIMI               //Query the IMSI number.
460012345678969

OK
AT+COPS=1,2,"46011"       //Specify PLMN
OK
AT+CESQ                   //Query the signal strength.
+CESQ: 36,99,255,255,12,53

OK

AT+QENG=0       //Query the module status
+QENG: 0,2506,2,62,"6923252",-84,-10,-74,2,5,"69C9",0,90

OK

AT+CGATT?             //Query whether network is activated, 1 means attach network successfully, 0
                      means has not been attached to network.

+CGATT:1

OK
AT+CEREG?             //Query the network registration status, 1 means registered on network, 2 means
                      searching the network.
+CEREG:0,1

OK

AT+CSCON?             //Query the signal connection status, 1 means "Connected",0
                                  means "Idle".
+CSCON:0,1

OK
```

Specify EARFCN/PCI:

```
//Power on
F1: 0000 0000
V0: 0000 0000 [0001]
00: 0006 000C
01: 0000 0000
U0: 0000 0001 [0000]
T0: 0000 00B4
Leaving the BROM

//auto-baud synchronization
AT
AT
AT                          // Successfully synchronized
OK

// Configure the APN for initial attach
// Set once and save to nvram
// Take effect on restart or re-register

AT+QCGDEFCONT="IP","spe.inetd.vodafone.nbiot"
OK

AT+QRST=1

F1: 0000 0000
V0: 0000 0000 [0001]
00: 0006 000C
01: 0000 0000
U0: 0000 0001 [0000]
T0: 0000 00B4
Leaving the BROM

//auto-baud synchronization
AT
AT
AT                          // Successfully synchronized
OK

AT+CFUN?                    //Value is 1.
+CFUN:1
```

```
OK

AT+CIMI                 //Query the IMSI number.
460012345678969

OK
AT+QLOCKF=1,2506,2,62     //Specify the earfcn ,offset and pci
OK
AT+CESQ                   //Query the signal strength.
+CESQ: 36,99,255,255,12,53

OK

AT+QENG=0        //Query the module status
+QENG: 0,2506,2,62,"6923252",-84,-10,-74,2,5,"69C9",0,90

OK

AT+CGATT?          //Query whether network is activated, 1 means attach network successfully, 0
                   means has not been attached to network.

+CGATT:1

OK
AT+CEREG?          //Query the network registration status, 1 means registered on network, 2 means
                   searching the network.
+CEREG:0,1

OK

AT+CSCON?          //Query the signal connection status, 1 means “Connected”,0
                                  means “Idle”.
+CSCON:0,1

OK
```

Specify BAND

```
//Power on
F1: 0000 0000
V0: 0000 0000 [0001]
00: 0006 000C
```

```
01: 0000 0000
U0: 0000 0001 [0000]
T0: 0000 00B4
Leaving the BROM

//auto-baud synchronization
AT
AT
AT                          // Successfully synchronized
OK

// Configure the APN for initial attach
// Set once and save to nvram
// Take effect on restart or re-register

AT+QCGDEFCONT="IP","spe.inetd.vodafone.nbiot"
OK

AT+QRST=1

F1: 0000 0000
V0: 0000 0000 [0001]
00: 0006 000C
01: 0000 0000
U0: 0000 0001 [0000]
T0: 0000 00B4
Leaving the BROM

//auto-baud synchronization
AT
AT
AT                          // Successfully synchronized
OK

AT+CFUN?                    //Value is 1.
+CFUN:1

OK

AT+QBAND=?                  //Query list of supported the band
+QBAND:(1,2,3,5,8,11,12,13,17,18,19,20,21,25,26,28,31,66,70)

OK
AT+QBAND=1,5                //Sets the bands to be used
```

```
OK
+IP: 10.170.235.216

AT+QBAND?                    //Query the band
+QBAND:5

OK
```

6 Error Values

The <err> error codes listed below are not implemented all , and only a subset will be implemented.

AT+CMEE command is implemented and it supports modes 0 & 1 & 2. In mode 1, a limited set of error codes are returned.

Error codes are compliant with the 3GPP specifications. Please refer to *3GPP TS 27.007 V13.5.0*, *sub-clause 9.2* for all possible <err> values. The error codes listed are those returned for the Quectel module.

Error codes 0-255 are reserved and defined in *3GPP TS 27.007* and may be used in future releases.

Table 3: General Errors (27.007)

Code of <err>	Description
3	Operation not allowed
4	Operation not supported
10	SIM not inserted
13	SIM failure
14	SIM busy
20	SIM memory full
23	Memory failure
24	Text string too long
25	Invalid characters in text string
30	No network service
31	Network timeout
32	Network not allowed – emergency calls only

50	Incorrect parameters
100	Unknown

Table 4: Specific Error Codes

Code of <err>	Description
107	PSD services not allowed
111	PLMN not allowed
112	Location area not allowed
113	Roaming not allowed in this location area
132	Service option not supported
133	Requested service option not subscribed
149	PDP authentication failure
584	Combined service not allowed
588	Feature not supported
591	Implicitly detached
592	Insufficient resources
596	Invalid cid value
598	Mode value not in range
606	Low layer failure
607	Missing or unknown failure
615	Network failure
630	Profile(cid) not defined
631	Unspecified protocol error
639	Service type not yet avaliable

675	PDN type IPV4 only allowed
676	PDN type IPV6 only allowed
692	EPS service not allowed
695	EPS tracking area not allowed
696	Roaming not allowed in TA
697	Roaming not allowed in PLMN
698	Not suitable cells in TA
700	ESM failure
703	Congestion
704	UE security capability mismatch
705	Security mode rejected
709	No EPS bearer context activated
765	Invalid input value
766	Unsupported value or mode
767	Operation failed
769	Unable to get control of required module
770	SIM Invalid – network reject
772	SIM powered down
840	No Service State
841	In cell search state
842	ERRC is deactivated
843	In cell reselection state
845	In reestablishment state
846	In PSM state
847	No data transfer in idle state

7 Appendix A Reference

Table 5: Terms and Abbreviations

Abbreviation	Description
3GPP	3rd Generation Partnership Project
BCD	Binary Coded Decimal
GSM	Global System for Mobile Communications
IMSI	International Mobile Subscriber Identity
EARFCN	E-UTRA Absolute Radio Frequency Channel Number
eDRX	Extended Discontinuous Reception
EGPRS	Enhanced General Packet Radio Service
GERAN	GSM/EDGE Radio Access Network
GMT	Greenwich Mean Time
GPRS	General Packet Radio Service
HPLMN	Home Public Land Mobile Network
HSDPA	High Speed Downlink Packet Access
HSUPA	High-Speed Uplink Packet Access
ICMP	Internet Control Messages Protocol
IMEI	International Mobile Equipment Identity
IMEISV	International Mobile Equipment Identity and Software Version
MS	Mobile Station
NB-IoT	Narrow Band Internet of Thing

PDP	Packet Data Protocol
RRC	Radio Resource Control
RTC	Real Time Clock
SVN	Software Version Number
TA	Terminal Adapter
TCP	Transmission Control Protocol
TE	Terminal Equipment
TTL	Time To Live
UDP	User Datagram Protocol
UE	User Equipment
UICC	Universal Integrated Circuit Card
URC	Unsolicited Result Code
UUID	Universally Unique Identifier