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CFB-609 AT Commands Manual

NB-IoT Module Series

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About the Document

History

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1.5	2018-08-30		+RI +NCALTEMPSENSOR
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1.7	2018-11-19		+RI: modify default state

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1 Introduction

This document gives details of the AT Command Set supported by Ccfrom NB-IoT CFB-609 module.

The following string will be output after booting the module:

```
<CR><LF>Neul<CR><LF>OK<CR><LF>
```

After this string has been received, the AT command processor is ready to accept AT commands.

1.1. Definitions

- <CR> carriage return character
- <LF> line feed character
- <.> parameter name. Angle brackets do not appear on command line
- [.] Option parameter. Square brackets do not appear on the command line.

1.2. AT Command Syntax

Table 1: AT Commands Syntax

Test Command	AT+<cmd>=?	Check possible sub-parameter values
Read Command	AT+<cmd>?	Check current sub-parameter values
Set Command	AT+<cmd>=p1[,p2[,p3[.....]]]	Set command
Execution Command	AT+<cmd>	Execution command

Multiple commands can be placed on a single line using a semi-colon (“;”) between commands. Only the first command should have AT prefix. Commands can be in upper or lower case.

When entering AT commands spaces are ignored except in the following cases:

- within quoted strings, where they are preserved
- within an unquoted string, numeric parameter
- within an IP address
- within the AT command name upto and including a ‘=’, ‘?’ or ‘=?’

They can be used to make the input more human-readable. On input, at least a carriage return is required. A newline character is ignored so it is permissible to use carriage return/line feed pairs on the input.

If no command is entered after the AT token, "OK" will be returned. If an invalid command is entered, "ERROR" will be returned.

Optional parameters, unless explicitly stated, need to be provided up to the last parameter being entered.

1.3. AT Command Responses

When the AT Command processor has finished processing a line, it will output either "OK" or "ERROR" indicating that it is ready to accept a new command. Solicited informational responses are sent before the final "OK" or "ERROR". Unsolicited information responses will never occur between a solicited informational response and the final "OK" or "ERROR".

For AT Commands aligned to the 3GPP 27.007 specification error codes are enabled with the CMEE command, else the ERROR message will be returned. For AT Commands aligned to the 3GPP 27.005 specification, a CMS error will be returned where specified.

Responses will be of the format:

```
<CR><LF>+CMD1:<parameters><CR><LF>  
<CR><LF>OK<CR><LF>
```

Or

```
<CR><LF><parameters><CR><LF>  
<CR><LF>OK<CR><LF>
```

1.4. 3GPP Compliance

3GPP commands are complied with the 3GPP TS 27.007 v13.5.0 (2016-06). For clarification on 3GPP commands, please refer to this document.

2 Commands(3GPP aligned to 27.007)

2.1. Request Manufacturer Identification(+CGMI)

Command	Response	Example
+CGMI	<manufacturer> +CME ERROR: <err>	AT+CGMI Ccfrom Ltd; www.ccfrom.com OK
+CGMI=?		AT+CGMI=? OK

Description

This command returns the manufacturer information. By default this will return “Ccfrom Ltd; www.ccfrom.com” on the standard platform. Refer to Chapter 6: Error Values for possible <err> values.

Defined values

<manufacturer>:The total number of characters, including line terminators. In the information text shall not exceed 2048 characters.

Text shall not contain the sequence 0<CR> or OK<CR>.

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2.2. Request Manufacturer Model(+CGMM)

Command	Response	Example
+CGMM	<model> +CME ERROR: <err>	AT+CGMM CFB-609 OK
+CGMM=?		AT+CGMM=? OK

Description

This command returns the manufacturer model information. By default this will return “CFB-609” on the standard platform. Refer to Chapter 6: Error Values for possible <err> values.

Defined values

<model>:The total number of characters, including line terminators, in the information text shall not exceed 2048 characters.

Text shall not contain the sequence 0<CR> or OK<CR>.

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2.3. Request Manufacturer Revision(+CGMR)

This 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 - release and build.

Command	Response	Example
+CGMR	<revision> +CME ERROR: <err>	AT+CGMR SSB,V150R100C10B200SP1 SECURITY_A,V150R100C20B300 PROTOCOL_A,V150R100C20B300 APPLICATION_A,ccfrom_b300 SECURITY_B,V150R100C20B300 RADIO,CFB-609_uncalibrated
+CGMR?		AT+CGMR=? OK

Description

Execution command returns one or more lines of information text <revision>. Refer to Chapter 6: Error Values for possible <err> values.

Defined values

<revision>: the total number of characters, including line terminators, in the information text shall not exceed 2048 characters.
Text shall not contain the sequence 0<CR> or OK<CR>

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- <revision> will change format over time. It should be treated as an opaque identifier.
- SECURITY PROTOCOL and APPLICATION is the core version and will update with the firmware version.
- RADIO is the specific module calibration parameter, if the module has been calibrated during the production line then we'd better not to change it during the next operation.
- SSB second stage bootloader version.

2.4. Request Product Serial Number(+CGSN)

Command	Response	Example
+CGSN[=<snt>]	when <snt>=0 (or omitted) and command successful: <sn> when <snt>=1 and command successful: +CGSN:<imei> when <snt>=2 and command successful: +CGSN:<imeisv> when <snt>=3 and command successful: +CGSN:<svn> +CME ERROR:<err>	AT+CGSN=0 123E4567-E89B-12D3-A456-426655440000 OK AT+CGSN=1 +CGSN:49015420323751 OK
+CGSN=?		AT+CGSN=? +CGSN:(0,1,2,3) OK

Description

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. Refer to Chapter 6: Error Values for possible <err> values.

Defined values

- <sn> integer type indicating the serial number type that has been requested.
 - 0 returns <sn>
 - 1 returns the IMEI (International Mobile station Equipment Identity)
 - 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. Text shall not contain the sequence 0<CR> or OK<CR>
- <imei> string type in decimal format indicating the IMEI
- <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;

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2.5. EPS Network Registration Status(+CEREG)

Command	Response	Example
+CEREG=<n>	+CME ERROR: <err>	AT+CEREG=1 OK
+CEREG?	when <n>=0, 1, 2 or 3 and command successful: +CEREG:<n>,<stat>[,<tac>],[<ci>],[<AcT>],[<cause_type>,<reject_cause>]]]	AT+CEREG? +CEREG: 1,1 OK
+CEREG=?	when <n>=4 or 5 and command successful: +CEREG:<n>,<stat>[,<lac>],[<ci>],[<AcT>],[<rac>],[<cause_type>],[<reject_cause>],[<Active-Time>],[<Periodic-TAU>]]]] +CEREG:(list of supported <n>s)	AT+CEREG=? +CEREG:(0,1,2,3,4,5) OK

Description

The set command controls the presentation of an unsolicited result code +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 wants to apply 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.

Refer to Chapter 6: Error Values for possible <err> values.

- NOTE 1: If the EPS MT in GERAN/UTRAN/E-UTRAN also supports circuit mode services and/or GPRS services, the +CREG command and +CREG: result codes and/or the +CGREG command and +CGREG: result codes apply to the registration status and location information for those services.

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 in the network. The parameters [<cause_type>,<reject_cause>], if available, are returned when <n>=3.

Test command returns supported parameter values.

Defined values

<n>	Integer type
0	Disable network registration unsolicited result code
1	Enable network registration unsolicited result code: "+CREG: <stat>"
2	Enable network registration and location information unsolicited result code: "+CREG: <stat>[,<tac>],[<ci>],[<AcT>]"
3	Enable network registration, location information and EMM cause value information unsolicited result code: "+CREG: <stat>[,<tac>],[<ci>],[<AcT>][,<cause_type>,<reject_cause>]"
4	For a UE that requests PSM, enable network registration and location information unsolicited result code: "+CREG: <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: "+CREG:<stat>[,<tac>],[<ci>],[<AcT>][,<cause_type>],[<reject_cause>][,<Active-Time>],[<Periodic-TAU>]]]"
<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 (not applicable)
7	Registered for "SMS only", roaming (not applicable)
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)

- NOTE 2: 3GPP TS 24.008 and 3GPP TS 24.301 specify the condition when the MS is considered as attached for emergency bearer services.
- <ta> 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; indicates the access technology of the serving cell
 - 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 NOTE 5) (not applicable)
 - 9 E-UTRAN (NB-S1 mode) (see NOTE 6)
- NOTE 3: 3GPP TS 44.060 specifies the System Information messages which give the information about whether the serving cell supports EGPRS.
- NOTE 4: 3GPP TS 25.331 specifies the System Information blocks which give the information about whether the serving cell supports HSDPA or HSUPA.
- NOTE 5: 3GPP TS 44.018 [156] specifies the EC-SCH INFORMATION message which, if present, indicates that the serving cell supports EC-GSM-IoT.
- NOTE 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).
- <cause_type> Integer type; indicates the type of <reject_cause>
 - 0 Indicates that <reject_cause> contains an EMM cause value
 - 1 Indicates that <reject_cause> contains a manufacturer-specific cause
- <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*.
- <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*.

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- Unsolicited result code when <stat> changes.
- <stat> return values 0-5 are supported.

2.6. Signalling connection status (+CSCON)

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 $\langle n \rangle = 1$, "+CSCON: $\langle mode \rangle$ " is sent from the MT when the connection mode of the MT is changed.

Command	Response	Example
+CSCON= $\langle n \rangle$	+CME ERROR: $\langle err \rangle$	AT+CSCON=0 OK
+CSCON?	+CSCON: $\langle n \rangle$, $\langle mode \rangle$ [, $\langle state \rangle$] +CME ERROR: $\langle err \rangle$	AT+CSCON? +CSCON:0,1 OK
+CSCON=?	+CSCON:(list of supported $\langle n \rangle$ s) +CSCON: $\langle mode \rangle$ [, $\langle state \rangle$]	AT+CSCON=? +CSCON:(0,1) OK +CSCON:1

Description

The set command controls the presentation of an unsolicited result code +CSCON.

If $\langle n \rangle = 1$, +CSCON: $\langle mode \rangle$ is sent from the MT when the connection mode of the MT is changed. If $\langle n \rangle = 2$ and there is a state within the current mode, +CSCON: $\langle mode \rangle$ [, $\langle state \rangle$] is sent from the MT. If $\langle n \rangle = 3$, +CSCON: $\langle mode \rangle$ [, $\langle state \rangle$ [, $\langle access \rangle$]] is sent from the MT. If setting fails, an MT error, +CME ERROR: $\langle err \rangle$ is returned.

Refer to Chapter 6: Error Values for possible $\langle err \rangle$ values.

When the MT is in UTRAN or E-UTRAN, the mode of the MT refers to idle when no PS signalling 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 $\langle state \rangle$ 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 $\langle mode \rangle$ which shows whether the MT is currently in idle mode or connected mode. State information $\langle state \rangle$ is returned only when $\langle n \rangle = 2$. Radio access type information $\langle access \rangle$ is returned only when $\langle n \rangle = 3$.

Test command returns supported values as a compound value.

Defined values

$\langle n \rangle$	Integer type
0	Disable unsolicited result code
1	Enable unsolicited result code "+CSCON: $\langle mode \rangle$ "
2	Enable unsolicited result code "+CSCON: $\langle mode \rangle$ [, $\langle state \rangle$]"
3	Enable unsolicited result code "+CSCON: $\langle mode \rangle$ [, $\langle state \rangle$ [, $\langle access \rangle$]]"
$\langle mode \rangle$	Integer type; indicates the signalling connection status

	0	Idle
	1	Connected
	2-255	<reserved for future use>
<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 of type GERAN
	1	Indicates usage of radio access of type UTRAN TDD
	2	Indicates usage of radio access of type UTRAN FDD
	3	Indicates usage of radio access of type E-UTRAN TDD
	4	Indicates usage of radio access of type E-UTRAN FDD

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- Only <n>=0 and <n>=1 are supported. <n>=0 is the default value.

2.7. List Available Commands(+CLAC)

This command lists the available AT commands.

Command	Response	Example
+CLAC	<AT Command> [<CR><LF><AT Command> [...]] +CME ERROR:<err>	AT+CLAC AT+GMEE AT+CGMI ... AT+CGSN
+CLAC=?	+CME ERROR:<err>	AT+CLAC=? OK

Description

Execution command causes the MT to return one or more lines of AT Commands. Refer to Chapter 6: Error Values for possible <err> values

NOTE: This command only returns the AT commands that are available for the user

Defined values

- <AT Command> Defines the AT command including the prefix AT. Text shall not contain the sequence 0<CR> or OK<CR>

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2.8. Get Signal Strength Indicator(+CSQ)

The terminal will provide a current signal strength indicator of 0 to 255 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 possible (or even the majority) of the entire possible range or codes.

Command	Response	Example
+CSQ	+CSQ:<rss>,<ber> +CME ERROR:<err>	AT+CSQ +CSQ:4,99 OK
+CSQ=?	+CSQ:(list of supported <rss>),(list of supported <ber>)	AT+CSQ=? +CSQ:(0-31,99),(99) OK

Description

Execution command returns received signal strength indication <rss> and channel bit error rate <ber> from the MT. Refer to Chapter 6: Error Values for possible <err> values

Test command returns values supported as compound values

Defined values

< rss >	Integer type
0	-113dBm or less
1	-111dBm
2...30	-109... -53dBm
31	-51dBm or greater
99	Not known or not detectable
<ber>	Integer type; channel bit error rate (in percent)
0...7	As RXQUAL values (please refer to 3GPP specifications)
99	Not known or not detectable

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- <ber> is currently not implemented, and will always be 99.

2.9. Show PDP Addresses(+CGPADDR)

This command returns the IP address of the device.

Command	Response	Example
+CGPADDR[=<cid>[,<cid> >[,...]]]	[+CGPADDR:<cid>[,<PDP_addr_1>[,<PDP_addr_2>]]] [<CR><LF>+CGPADDR:<cid>[,<PD P_addr_1>[,<PDP_addr_2>]][...]] 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	AT+CGPADDR +CGPADDR:1,101.43.5.1 +CGPADDR:2,2001:db8:85a3::8a 2e:370 +CGPADDR:3 AT+CGPADDR=1 +CGPADDR:1,101.43.5.1 OK

	colon-separated hexadecimal parameter.	
+CGPADDR=?	+CGPADDR:(list of defined <cid>s)	AT+CGPADDR=? +CGPADDR:(0,1) OK

Description

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.

Refer to Chapter 6: Error Values 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.

Defined values

<cid>: integer type; specifies a particular PDP context definition (see the +CGDCONT and +CGDSCONT commands).

<PDP_addr_1> and <PDP_addr_2>: each is a string type that identifies the MT in the addressspace applicable to the PDP. The address may be static or dynamic. For a static address, it will be the one set by the +CGDCONT and +CGDSCONT commands 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>. Both <PDP_addr_1> and <PDP_addr_2> are 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 +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 +CGPADDR.

NOTE: 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>.

CFB-609 Implementation

- <cid> values between 0 & 10 are supported.

2.10. PLMN Selection(+COPS)

Command	Response	Example
+COPS=<mode>[,<format>[,<oper>[,<AcT>]]]	+CME ERROR:<err>	AT+COPS=1,2," 320160" OK
+COPS?	+COPS:<mode>[,<format>,<oper>[,<AcT>]] +CME ERROR:<err>	AT+COPS? +COPS:1,2,"320160" OK
+COPS=?	+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)] +CME ERROR:<err>	AT+COPS=? +COPS:(2,,,"24405"),(0,,,"24491"), ,(0-2),(2) OK

Description

Set command forces an attempt to select and register the GSM/UMTS/EPS network operator using the (U)SIM 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.

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.

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.

It is recommended (although optional) that after the operator list TA returns lists of supported <mode>s and <format>s. These lists shall be delimited from the operator list by two commas.

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.

Defined values

<mode>	Integer type
0	Automatic (<oper> field is ignored)
1	Manual (<oper> field shall be present, and <AcT> is optional)
2	Deregister from network
3	Set only <format> (for read command AT+COPS?), do not attempt to register/deregister (<oper> and <AcT> fields are ignored); this value is not applicable in read command response
4	Manual/automatic (<oper> field shall be present); if manual selection fails, automatic mode (<mode>=0) is entered
<format>	Integer type
0	Long format alphanumeric <oper>
1	Short format alphanumeric <oper>

	2	Numeric <oper>
<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>		Integer type
	0	Unknown
	1	Available
	2	Current
	3	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 NOTE 3)
	9	E-UTRAN (NB-S1 mode) (see NOTE 4)
		o NOTE 1: 3GPP TS 44.060 specifies the System Information messages which give the information about whether the serving cell supports EGPRS.
		o NOTE 2: 3GPP TS 25.331 specifies the System Information blocks which give the information about whether the serving cell supports HSDPA or HSUPA.
		o NOTE 3: 3GPP TS 44.018 [156] specifies the EC-SCH INFORMATION message which, if present, indicates that the serving cell supports EC-GSM-IoT.
		o NOTE 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)

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- <Act>, if provided, must be set to 7.
- Only <format>=2 is supported.
- Only <mode>=0, <mode>=1 and <mode>=2 are supported.
- When <mode>=1, the PLMN setting will not be retained after the UE is rebooted.
- <mode>=1 is only for development use and <mode>=0 should be used in production when AUTOCONNECT is enabled.
- The test command currently returns the configured values rather than performs a PLMN search.
- Not return <ACT> for AT+COPS?
- <oper> field couldn't be present when <mode>=0;

- +COPS=? will start background plmn search when MT is idle state and wait searching result, other state will return ERROR. Return the searched plmn list in the network after searching. And could be aborted by any characters when searching. See Chapter 8 for more details about abort..

2.11.PS Attach or Detach(+CGATT)

Command	Response	Example
+CGATT=<state>	+CME ERROR:<err>	AT+CGATT=1 OK
+CGATT?	+CGATT:<state> +CME ERROR:<err>	AT+CGATT? +CGATT:0 OK
+CGATT=?	+CGATT:(list of supported <state>s) +CME ERROR:<err>	AT+CGATT=? +CGATT:(0,1) OK

Description

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.

Refer to Chapter 6: Error Values for possible <err> values.

NOTE 1: If the initial PDP context is supported, the context with <cid>=0 is automatically defined at startup. 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.

NOTE 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.

Defined values

- <state> Integer type; indicates the state of PDP context activation. The default value is manufacturer specific
- 0 Detached
 - 1 Attached
- <err> Error value

CFB-609 Implementation

- When <state>=1 is selected, +COPS=0 is automatically selected.
- If AT+CGATT command is in progress, further execution of the AT+CGATT command will return an "Uplink busy" error.

2.12. PDP context activate or deactivate(+CGACT)

Command	Response	Example
+CGACT=[<state>[,<cid>[,<cid>[, ...]]]]	+CME ERROR:<err>	AT+CGATT=1 OK

+CGATT?	[+CGACT:<cid>,<state>] [<CR><LF>+CGACT:<cid>,<state> e> [...]] +CME ERROR:<err>	AT+CGACT? +CGACT:1,0 OK
+CGATT=?	+CGACT:(list of supported <state>s) +CME ERROR:<err>	AT+CGACT=? +CGACT:(0,1) OK

Description

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 +CMEE command. If the MT is not PS attached when the activation form of the command is executed, the MT first performs a PS attach and then 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. Refer subclause 9.2 for possible <err> values.

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

NOTE: If the initial PDP context is supported, the context with <cid>=0 is automatically defined at startup, see subclause 10.1.0.

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 MT 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 non-emergency 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.

NOTE. This command has the characteristics of both the V.250 action and parameter commands.

Defined values

<state> integer type; indicates the state of PDP context activation. The default value is manufacturer specific.

0 Detached

1 Attached

<cid> integer type; specifies a particular PDP context definition (see the +CGDCONT command).

CFB-609 Implementation

- Could only activate or deactivate one cid one time.
- Could not be executed when plmn searching, attaching or detaching.
- Could disconnect the last PDN connection when MT and Core Network all support without PDN connection.

2.13. Request International Mobile Subscribe Identity(+CIMI)

Command	Response	Example
+CIMI	<IMSI> +CME ERROR:<err>	AT+CIMI 460001357924680 OK
+CIMI=?		AT+CIMI=? OK

Description

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

Refer to Chapter 6: Error Values for possible <err> values

Defined values

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

CFB-609 Implementation

- IMSI may not be displayed for a few seconds after power-on

2.14. Define a PDP Context(+CGDCONT)

Command	Response	Example
+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>]]]]]]]]]		AT+CGDCONT=1,"IP", "HUAWEI.COM" OK
+CGDCONT?	[+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>]]]]]]]]] [<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>]]]]]]]] [...]]	AT+CGDCONT? +CGDCONT:1,"IP", "HUAWEI.COM" ,,0,0,,0 OK
+CGDCONT=?	+CGDCONT:(range of supported <cid>s),<PDP_type>,,(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	AT+CGDCONT=? +CGDCONT:(0-10),("IP","NONIP","IPv6","IPV4V6"),,,(0),(0),,,(0,1) OK

	supported <securePCO>s),(list of supported <IPv4_MTU_discovery>s) [<CR><LF>+CGDCONT:(range of supported <cid>s),<PDP_type>,,(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)) [...]]	
--	--	--

Description

The set command specifies PDP context parameter values for a PDP context identified by the (local) context identification parameter, <cid> and 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. Refer to Chapter 6: Error Values for possible <err> values.

For EPS the PDN connection and its associated EPS default bearer is identified herewith.

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

If the initial PDP context is supported, the context with <cid>=0 is automatically defined at startup, see 3GPP TS 27.007 V13.5.0, subclause 10.1.0. As all other contexts, the parameters for <cid>=0 can be modified with +CGDCONT. If the initial PDP context is supported, +CGDCONT=0 resets context number 0 to its particular default settings.

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

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

Defined values

<cid> Integer type; specifies a particular PDP context definition. The parameter is local to the TE-MT interface and is used in other PDP context-related commands. The range of permitted values (minimum value=1 or if the initial PDP context is supported, minimum value=0) is returned by the test form of the command..

- o NOTE 1: The <cid>s for network-initiated PDP contexts will have values outside the ranges indicated for the <cid> in the test form of the commands +CGDCONT and +CGDSCONT.

- <PDP_type> String type; specifies the type of packet data protocol. The default value is manufacturer specific.
- | | |
|--------|---|
| 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]) |
- o NOTE 2: 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. The APN is a string of up to 82 characters.
- <PDP_addr> String type; identifies the MT in the address space applicable to the PDP. This parameter can be left blank.
- o NOTE 3 When AT+CGPIAF is supported, its settings can influence the format of this parameter returned with the read form of AT+CGDCONT.
The value of this parameter is ignored with the set command. The parameter is included in the set command for backwards compatibility reasons only.
- <d_comp> Integer type; controls PDP data compression
- | | |
|---|---|
| 0 | Off |
| 1 | On (manufacturer preferred compression) |
| 2 | V.42bis |
| 3 | V.44 |
- <h_comp> Integer type; controls PDP header compression
- | | |
|---|---|
| 0 | Off |
| 1 | On (manufacturer preferred compression) |
| 2 | RFC 1144 [105] (applicable for SNDTCP only) |
| 3 | RFC 2507 [107] |
| 4 | RFC 3095 [108] (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.
- NOTE 4: 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 +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	P UE indicates that the PDP context is for IM CN subsystem-related signalling only
< NSLPI >	Integer type; 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".
	NOTE 5: 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 Signalling

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- Only <PDP_type>="IP", "NONIP", "IPV6", "IPV4V6" are supported.
- Support AT+CGDCONT=<cid>,<PDP_type>,<APN>,,,,,<NSLPI> only.
- <cid> values of 0-10 are supported.
- Only <hcomp> and <dcomp> values of 0 are supported.
- No default <PDP_type> value specific.
- <cid> value of 7 can't be set when bip is enabled.
- Maximum <APN> string size is 63.

2.15. Change device functionality(+CFUN)

Command	Response	Example
+CFUN=<fun>[,<rst>]	+CME ERROR:<err>	AT+CFUN=1 OK
+CFUN?	+CFUN:<fun>	AT+CFUN? +CFUN:1 OK
+CFUN=?	+CFUN:(list of supported <fun>s),(list of supported <rst>s	AT+CFUN=? +CFUN:(0,1),(0,1) OK

Description

Set command selects the level of functionality <fun> 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.

Refer to Chapter 6: Error Values for possible <err> values.

NOTE 1: It is manufacturer specific if this command affects network registration. Command Operator Selection +COPS is used to force registration/deregistration.

Read command returns the current setting of <fun>.

Test command returns values supported by the MT as compound values.

Defined values

<fun>	Integer type
0	Minimum functionality
1	Full functionality. Enable MT to transmit and receive RF circuits for all supported radio access technologies. For MTs supporting AT+CSRA, this equals the RATs indicated by the response of AT+CSRA=?. Currently AT+CSRA setting is ignored. It is not required that the transmitting and receiving RF circuits are in a disabled state when this setting takes effect.
2	Disable MT to transmit RF circuits only
3	Disable MT to receive RF circuits only
4	Disable MT to transmit and receive RF circuits
5...127	Reserved for manufacturers as intermediate states between full and minimum functionality
128	Full functionality with radio access support according to the setting of AT+CSRA. Enables MT to transmit and receive RF circuits if it not already enabled. This <fun> setting is applicable for MTs supporting AT+CSRA.
129	Prepare for shutdown. This setting has its prime use when some of the MT's resources (e.g. file system) are located on a tightly integrated TE (host). The MT will execute pending actions resulting in "permanent" changes, e.g.execute pending file system operations. The MT will also

make an orderly network detachment. After this action and AT+CFUN has returned "OK", the MT can be shut down with <fun>=0, or by other means.

After setting <fun>=129, only <fun>=0 is valid. All other values will make AR+CFUN return "ERROR".

<rst> integer type
 0 Do not reset the MT before setting it to <fun> power level.
 NOTE 2: This shall be always default when <rst> is not given.
 1 Reset the MT before setting it to <fun> power level

CFB-609 Implementation

- Only <fun>=0&1 are supported.
- <rst> is not supported and will be ignored.
- DeepSleep will be entered when the system is quiescent, but only if it has been enabled by the network.

2.16. Report Mobile Termination Error(+CMEE)

Command	Response	Example
+CMEE=<n>		AT+CMEE=1 OK
+CMEE?	+CMEE:<n>	AT+CMEE? +CMEE:1 OK
+CMEE=?	+CMEE:(list of supported <n>s)	AT+CMEE=? +CMEE:(0,1) OK

Description

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.

Read command returns the current setting of <n>.

Test command returns values supported as a compound value.

Refer to Chapter 6: Error Values for possible <err> values

Defined values

<n> Integer type
 0 Disable "+CMEE ERROR: <err>" result code and use "ERROR" instead
 1 Enable "+CMEE ERROR: <err>" result code and use numeric <err> values (Please refer to Chapter 6 for possible <err> values)
 2 Enable "+CMEE ERROR: <err>" result code and use verbose <err> values

CFB-609 Implementation

- Only <n>=0 & <n>=1 are supported.

2.17. Return Current Date & Time(+CCLK)

Command	Response	Example
+CCLK=<time>	+CME ERROR:<err>	AT+NITZ=0 OK AT+CCLK="17/01/09,14:53:12+01"
+CCLK?	+CCLK:[<yy/MM/dd,hh:mm:ss>[<zz>]] +CME ERROR:<err>	AT+CCLK=? OK
+CCLK=?		

Description

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

Read command returns the current setting of the clock.

Refer to Chapter 6: Error Values for possible <err> values

Defined values

<time>: string type value; format is "yy/MM/dd,hh:mm:ss zz", where characters indicate year (two last digits), month, day, hour, minutes, seconds and time zone (indicates the difference, expressed in quarters of an hour, between the local time and GMT; range -96...+96). E.g. 6th of May 1994, 22:10:00 GMT+2 hours equals to "94/05/06,22:10:00+08"

NOTE: If MT does not support time zone information then the three last characters of <time> are not returned by +CCLK?

CFB-609 Implementation

No value will be returned before core network sent EMM INFORMATION.

Need to send AT+NITZ=0 first before set time.

2.18. Power saving mode setting(+CPSMS)

Command	Response	Example
+CPSMS=[<mode>[,<Requested_Periodic-RAU>[,<Requested_GPRS-READY-timer>[,<Requested_Periodic-TAU>[,<Requested_Active-Time>]]]]]	+CME ERROR:<err>	AT+CPSMS=1,,01000011,01000011 OK
+CPSMS?	+CPSMS:<mode>[,<Requested_Periodic-RAU>[,<Requested_GPRS-READY-timer>[,<Requested_Periodic-TAU>[,<Requested_Active-Time>]]]	AT+CPSMS? +CPSMS:1,,01000011,01000011 OK
+CPSMS=?	+CPSMS:(list of supported <mode>s),(list of supported <Requested_Periodic-RAU>s),(list of supported <Requested_GPRS-READY-timer>s),(list of supported <Requested_Periodic-TAU>s),(list	AT+CPSMS=? +CPSMS:(0,1,2),,(00000000-11111111),(00000000-11111111) OK

	of supported <Requested_Active-Time>s)	
--	--	--

Description

The set 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 RAU value and the requested GPRS READY timer value in GERAN/UTRAN, the requested extended periodic TAU value in E-UTRAN and the requested Active Time value. See the unsolicited result codes provided by command +CEREG for the Active Time value and the extended periodic TAU value that are allocated to the UE by the network in E-UTRAN.

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.

Defined values

- <mode> integer type. Indication 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; one byte in an 8 bit format. Requested extended periodic RAU value (T3312) to be allocated to the UE in GERAN/UTRAN. The requested extended periodic RAU value is coded as one byte (octet 3) of the GPRS Timer 3 information element coded as bit format (e.g. "01000111" equals 70 hours). For the coding and the value range, see the GPRS Timer 3 IE in 3GPP TS 24.008 [8] Table 10.5.163a/3GPP TS 24.008. See also 3GPP TS 23.682 [149] and 3GPP TS 23.060 [47]. The default value, if available, is manufacturer specific.
- <Requested_GPRS-READY-timer>: string type; one byte in an 8 bit format. Requested GPRS READY timer value (T3314) to be allocated to the UE in GERAN/UTRAN. The requested GPRS READY timer value is coded as one byte (octet 2) of the GPRS Timer information element coded as bitformat (e.g. "01000011" equals 3 dechours or 18 minutes). For the coding and the value range, see the GPRS Timer IE in 3GPP TS 24.008 [8] Table 10.5.172/3GPP TS 24.008. See also 3GPP TS 23.060 [47]. The default value, if available, is manufacturer specific.
- <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. The requested extended periodic TAU value is coded as one byte (octet 3) of the GPRS Timer 3 information element coded as bit format (e.g. "01000111" equals 70 hours). For the coding and the value range, see the GPRS Timer 3 IE in 3GPP TS 24.008 [8] Table 10.5.163a/3GPP TS 24.008. See also 3GPP TS 23.682 [149] and 3GPP TS 23.401 [82]. The default value, if available, is manufacturer specific.

<Requested_Active-Time>:

string type; one byte in an 8 bit format. Requested Active Time value (T3324) to be allocated to the UE. The requested Active Time value is coded as one byte (octet 3) of the GPRS Timer 2 information element coded as bit format (e.g. "00100100" equals 4 minutes). For the coding and the value range, see the GPRS Timer 2 IE in 3GPP TS 24.008 [8] Table 10.5.163/3GPP TS 24.008. See also 3GPP TS 23.682 [149], 3GPP TS 23.060 [47] and 3GPP TS 23.401 [82]. The default value, if available, is manufacturer specific.

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- RAU is not supported by NB-IOT. No value will be output, and any input will be ignored.
- <Requested_Periodic-TAU> and <Requested_Active-Time> could be quoted.

2.19. eDRX setting(+CEDRXS)

Command	Response	Example
+CEDRXS=[<mode>[,<AcT-type>[,<Requested_eDRX_value>]]]	+CME ERROR:<err>	AT+CEDRXS=1,5,0101 OK
+CEDRXS?	[+CEDRXS:<AcT-type>,<Requested_eDRX_value>[<CR><LF>+CEDRXS:<AcT-type>,<Requested_eDRX_value>[...]]]	AT+CEDRXS? +CEDRXS:5,"0101" OK
+CEDRXS=?	+CEDRXS:(list of supported <mode>s),(list of supported <AcT-type>s),(list of supported <Requested_eDRX_value>s)	AT+CEDRXS=? +CEDRXS:(0,1,2,3),(5),("0000"- "1111") OK

Description

The set 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 set 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.

Refer to Chapter 6: Error Values for possible <err> values

Defined values

- <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. This AT-command 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. The eDRX value refers to bit 4 to 1 of octet 3 of the Extended DRX parameters information element (see subclause 10.5.5.32 of 3GPP TS 24.008 [8]). For the coding and the value range, see Extended DRX parameters information element in 3GPP TS 24.008 [8] Table 10.5.5.32/3GPP TS 24.008. The default value, if available, is manufacturer specific.
- <NW-provided_eDRX_value>** string type; half a byte in a 4 bit format. The eDRX value refers to bit 4 to 1 of octet 3 of the Extended DRX parameters information element (see subclause 10.5.5.32 of 3GPP TS 24.008 [8]). For the coding and the value range, see Extended DRX parameters information element in 3GPP TS 24.008 [8] Table 10.5.5.32/3GPP TS 24.008.
- <Paging_time_window>** string type; half a byte in a 4 bit format. The paging time window refers to bit 8 to 5 of octet 3 of the Extended DRX parameters information element (see subclause 10.5.5.32 of 3GPP TS 24.008 [8]). For the coding and the value range, see the Extended DRX parameters information element in 3GPP TS 24.008 [8] Table 10.5.5.32/3GPP TS 24.008.

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- <AcT-type> value 5 is supported.

2.20. Extended Error Reporting(+ CEER)

Command	Response	Example
AT+CEER	+CEER:<report>	AT+CEER +CEER:ILLEGAL_ME OK
AT+CEER=?		AT+CEER=? OK

Description

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

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

Refer to Chapter 6: Error Values for possible <err> values.

Defined values

<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>.

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2.21. eDRX read dynamic parameters(+ CEDRXRDP)

Command	Response	Example
AT+CEDRXRDP	+CEDRXRDP: <AcT-type>[,<Requested_eDRX_value>[,<NW-provided_eDRX_value>[,<Paging_time_window>]]]	AT+CEDRXRDP +CEDRXRDP:5," 0010" ," 1110" ," 0101" OK
AT+CEDRXRDP=?		AT+CEDRXRDP=? OK

Description

The execution command returns <AcT-type> and <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.

Refer to Chapter 6: Error Values for possible <err> values.

Defined values

- <AcT-type> integer type, indicates the type of access technology. This AT-command is used to specify the relationship between the type of access technology and the requested eDRX value.
- 0 Access technology is not using eDRX
 - 1 EC-GSM-IoT (A/Gb mode)
 - 2 GSM (A/Gb mode)
 - 3 UTRAN (Iu mode)
 - 4 E-UTRAN (WB-S1 mode)
 - 5 E-UTRAN (NB-S1 mode)
- <Requested_eDRX_value> string type; half a byte in a 4 bit format. The eDRX value refers to bit 4 to 1 of octet 3 of the Extended DRX parameters information element (see subclause 10.5.5.32 of 3GPP TS 24.008 [8]). For the coding and the value range, see Extended DRX parameters information element in 3GPP TS 24.008 [8] Table 10.5.5.32/3GPP TS 24.008.
- <NW-provided_eDRX_value> string type; half a byte in a 4 bit format. The eDRX value refers to bit 4 to 1 of octet 3 of the Extended DRX parameters information element (see subclause 10.5.5.32 of 3GPP TS 24.008 [8]). For the coding and the value range, see Extended DRX parameters information element in 3GPP TS 24.008 [8] Table 10.5.5.32/3GPP TS 24.008.
- <Paging_time_window> string type; half a byte in a 4 bit format. The paging time window refers to bit 8 to 5 of octet 3 of the Extended DRX parameters information element (see subclause 10.5.5.32 of 3GPP TS 24.008 [8]). For the coding and the value range, see the Extended DRX parameters information element in 3GPP TS 24.008 [8] Table 10.5.5.32/3GPP TS 24.008.

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- <AcT-type> value 5 is supported.

2.22. Time Zone Reporting(+CTZR)

Command	Response	Example
+CTZR[=<reporting>]	+CME ERROR:<err>	AT+CTZR=1 OK
+CTZR?	+CTZR:<reporting> +CME ERROR:<err>	AT+CTZR? +CTZR:1 OK
+CTZR=?	+CTZR:(list of supported <reporting>s) +CME ERROR:<err>	AT+CTZR=? +CTZR:(0,1,2,3) OK

Description

This set command controls the time zone change event reporting. If reporting is enabled the MT returns the unsolicited result code +CTZV: <tz>, +CTZE: <tz>,<dst>,<time>], or +CTZEU: <tz>,<dst>,<time>] whenever the time zone is changed. The MT also provides the time zone upon network registration if provided by the network. If setting fails in an MT error, +CME ERROR: <err> is returned. Refer to Chapter 6: Error Values for possible <err> values.

Read command returns the current reporting settings in the MT.

Test command returns supported <reporting>-values as a compound value.

NOTE: The Time Zone reporting is not affected by the Automatic Time Zone setting command, +CTZU if implemented.

Command	Response	Example
+CTZV:	<tz>	+CTZV:4
+CTZE:	<tz>,<dst>,<time>]	+CTZE:4,0
+CTZEU:	<tz>,<dst>,<utime>]	+CTZEU:4,0

Defined values

<reporting>	integer type value indicating: 0 disable time zone change event reporting. 1 Enable time zone change event reporting by unsolicited result code +CTZV: <tz>. 2 Enable extended time zone and local time reporting by unsolicited result code +CTZE: <tz>,<dst>,<time>]. 3 Enable extended time zone and universal time reporting by unsolicited result code +CTZEU: <tz>,<dst>,<utime>].
<tz>	string type value representing 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 digit 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".
<dst>	integer type value indicating whether <tz> includes daylight savings adjustment; 0 <tz> includes no adjustment for Daylight Saving Time 1 <tz> includes +1 hour (equals 4 quarters in <tz>) adjustment for daylight saving time 2 <tz> includes +2 hours (equals 8 quarters in <tz>) adjustment for daylight saving time
<time>	string type value representing the local time. The format is "YYYY/MM/DD, hh:mm:ss", expressed as integers representing year (YYYY), month (MM), date (DD), hour (hh), minute (mm) and second (ss). The local time can be derived by the MT from information provided by the network at the time of delivering time zone information and will be present in the unsolicited result code for extended time zone and local time reporting if the universal time is provided by the network.
<utime>	string type value representing the universal time. The format is "YYYY/MM/DD, hh:mm:ss", expressed as integers representing year (YYYY), month (MM), date (DD), hour (hh), minute (mm) and second (ss). The universal time can be provided by the network at the time of delivering time zone information and will be present in the unsolicited result code for extended time zone and universal time reporting if provided by the network.

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2.23. Initial PDP context activation(+CIPCA)

Command	Response	Example
+CIPCA=[<n>,<AttachWithoutPDN>]]	+CME ERROR: <err>	AT+CIPCA=3,1 OK
+CIPCA?	+CIPCA:<n>,<AttachWithoutPDN>]	AT+CIPCA? +CIPCA:3,1 OK
+ CIPCA =?	+CIPCA:(list of supported <n>s),(list of supported <AttachWithoutPDN>s)	AT+CIPCA=? +CIPCA:(3),(0,1) OK

Description

The set command controls whether an initial PDP context (see subclause 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.

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.

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

NOTE: For this command, the term roaming corresponds to being registered to a VPLMN which is not equivalent to HPLMN or EHPLMN.

The read command returns the current setting of the command.

The test command returns values supported as a compound value.

Refer to Chapter 6: Error Values for possible <err> values

Defined values

<n>	integer type. Activation of PDP context upon attach.
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	1EPS Attach without PDN connection

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- Only <n>=3 is supported.
- If <AttachWithoutPDN> is omitted, will use the default value 0.

2.24. APN rate control(+CGAPNRC)

Command	Response	Example
+CGAPNRC[=<cid>] APN rate control (+CGAPNRC)	[+CGAPNRC: <cid>[,<Additional_exception_reports>[,<Uplink_time_unit>[,<Maximum_uplink_rate>]]] [<CR><LF>+CGAPNRC: <cid>[,<Additional_exception_reports>[,<Uplink_time_unit>[,<Maximum_uplink_rate>]]] [...]] +CME ERROR:<err>	AT+CGAPNRC +CGAPNRC=1,0,2,2 +CGAPNRC=2,1,2,3 OK
+CGAPNRC=?	+CGAPNRC: (list of <cid>s associated with active contexts) +CME ERROR:<err>	AT+CGAPNRC=? +CGAPNRC:1,2 OK

Description

This 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.

Refer to Chapter 6: Error Values for possible <err> values.

Defined values

- <cid> integer type; specifies a particular PDP context definition (see the +CGDCONT and +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.

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2.25. Sending of originating data via the control plane(+CSODCP)

Send a non-IP message

Command	Response	Example
+CSODCP=<cid>,<cpdata_length>,<cpdata>[,<RAI>[,<type_of_user_data>[,<sequence>]]]	+CME ERROR:<err>	AT+CSODCP=1,3,112233 OK
+CSODCP=?	+CSODCP:(range of supported <cid>s),(maximum number of bytes of the <cpdata_length>),(list of supported <RAI>s),(list of supported <type_of_user_data>s),(list of supported <sequence>s)	AT+CSODCP=? +CSODCP:(0-10),(1358), (0,1,2),(0,1),(1-255) OK

Description

The set command is used by the TE to transmit data over control plane to network via MT. Context identifier

<cid> is used to link the data to particular context.

This command optionally indicates that the application on the MT expects that the exchange of data:

- will be completed with this uplink data transfer; or
- will be completed with the next received downlink data.

This command also optionally indicates whether or not the data to be transmitted is an exception data.

This command causes transmission of an ESM DATA TRANSPORT message, as defined in 3GPP TS 24.301 [83].

Test command returns the maximum number of bytes of the user data container supported by the MT, supported <RAI>s and supported <type_of_user_data>s as a compound value.

If <sequence> is not omitted, when datagram is sent by rf or discard, will report the result.

Command	Response	Example
	+CSODCPR:<sequence>,<status>	+CSODCPR:2,1

Refer to Chapter 6: Error Values for possible <err> values.

Defined values

- <cid> integer type. A numeric parameter which specifies a particular PDP context or EPS bearer context definition. The <cid> parameter is local to the TE-MT interface and identifies the PDP or EPS bearer contexts which have been setup via AT command (see the +CGDCONT and +CGDSCONT commands).
- <cpdata_length> integer type. Indicates the number of bytes of the <cpdata> information element.
- <cpdata> When there is no data to transmit, the value shall be set to zero. string of octets. Contains the user data container contents (refer 3GPP TS 24.301 [83] subclause 9.9.4.24). When there is no data to transmit, the <cpdata> shall be an empty string (""). This parameter shall not be subject to conventional character conversion as per +CSCS. The coding format of the user data container and the maximum length of <cpdata> are implementation specific.
- <RAI> integer type. Indicates the value of the release assistance indication, refer 3GPP TS 24.301 [83] subclause 9.9.4.25.
- 0 No information available.
 - 1 The MT expects that exchange of data will be completed with the transmission of the ESM DATA TRANSPORT message.
 - 2 The MT expects that exchange of data will be completed with the receipt of an ESM DATA TRANSPORT message.
- <type_of_user_data> integer type. Indicates whether the user data that is transmitted is regular or exceptional.
- 0 Regular data.
 - 1 Exception data.
- <sequence>: Sequence of data, range 1-255. If omit, will not report data sent status.
- <sequence> is not defined by 3GPP but only used for HiSi.

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- Maximum data length will be 1358 bytes when non-ip is used, otherwise will be 0.
- Only one message will be buffered at any one time.

2.26. Reporting of terminating data via the control plane(+CRTDCP)

Receive a message from the CDP server.

Command	Response	Example
+CRTDCP=<reporting>	+CME ERROR:<err>	AT+CRTDCP=1 OK
+CRTDCP?	+CRTDCP:<reporting>	AT+CRTDCP? +CRTDCP:1 OK
+CRTDCP=?	+CRTDCP:(list of supported <reporting>s),(range of supported <cid>s),(maximum number of octets of user data indicated by <cpdata_length>)	AT+CRTDCP=? +CRTDCP:(0-1),(0-10),(1358) OK

Description

The set command is used to enable and disable reporting of data from the network to the MT that is transmitted via the control plane in downlink direction. If reporting is enabled, the MT returns the unsolicited result code +CRTDCP:<cid>,<cpdata_length>,<cpdata> when data is received from the network.

Read command returns the current settings.

Test command returns supported values as compound values.

Refer to Chapter 6: Error Values for possible <err> values.

Command	Response	Example
+CRTDCP:	<cid>,<cpdata_length>,<cpdata>	+CRTDCP:0,2," ab"

Defined values

- <reporting> integer type, controlling reporting of mobile terminated control plane data events
- 0 Disable reporting of MT control plane data.
 - 1 Enable reporting of MT control plane data by the unsolicited result code +CRTDCP.
- <cid> integer type. A numeric parameter which specifies a particular PDP context or EPS bearer context definition. The <cid> parameter is local to the TE-MT interface and identifies the PDP or EPS bearer contexts which have been setup via AT command (see the +CGDCONT and +CGDSCONT commands).
- < cpdata_length > integer type. Indicates the number of bytes of the <cpdata> information element.
- When there is no data to transmit, the value shall be set to zero.
- < cpdata > string of octets. Contains the user data container contents (refer 3GPP TS 24.301 [83] subclause 9.9.4.24). When there is no data to transmit, the <cpdata> shall be an empty string (""). This parameter shall not be subject to conventional character conversion as per +CSCS. The coding format of the user data container and the maximum length of <cpdata> are implementation specific.

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- Maximum data length will be 1358 bytes when non-ip is used, otherwise will be 0.
- Only one message will be buffered at any one time.
- Terminating data via the control plane before enable reporting will be discarded.

2.27. PDP context read dynamic parameters(+CGCONTRDP)

Command	Response	Example
+CGCONTRDP[=<cid>]	[+CGCONTRDP: <cid>,<bearer_id>,<apn>[,<local_addr and subnet_mask>[,<gw_addr>[,<DNS_prim_addr>[,<DNS_sec_addr>[,<P-CSCF_prim_addr>[,<P-CSCF_sec_addr>[,<IM_CN_Signalling_Flag>[,<LIPA_indication>[,<IPv4_MTU>[,<WLAN_Offload>[,<Local_Addr_Ind>[,<Non-IP_MTU>[,<Serving_PLMN_rate_control_value>[,<Reliable_Data_Service>]]]]]]]]]]] [<CR><LF>+CGCONTRDP: <cid>,<bearer_id>,<apn>[,<local_addr and subnet_mask>[,<gw_addr>[,<DNS_prim_addr>[,<DNS_sec_addr>[,<P-CSCF_prim_addr>[,<P-CSCF_sec_addr>[,<IM_CN_Signalling_Flag>[,<LIPA_indication>[,<IPv4_MTU>[,<WLAN_Offload>[,<Local_Addr_Ind>[,<Non-IP_MTU>[,<Serving_PLMN_rate_control_value>[,<Reliable_Data_Service>]]]]]]]]]]] [...]]	AT+CGCONTRDP +CGCONTRDP:0,,,,,10.121.34.2 23 +CGCONTRDP:1,,,,,10.121.34.2 24 OK AT+CGCONTRDP=1 +CGCONTRDP:1,,,,,10.121.34.2 23 OK
+CGCONTRDP=?	+CGCONTRDP: (list of <cid>s associated with active contexts)	AT+CGCONTRDP=? +CGCONTRDP:(0,1) OK

Description

The execution command returns the relevant information <bearer_id>, <apn>, <local_addr and subnet_mask>, <gw_addr>, <DNS_prim_addr>, <DNS_sec_addr>, <P-CSCF_prim_addr>, <P-CSCF_sec_addr>, <IM_CN_Signalling_Flag>, <LIPA_indication>, <IPv4_MTU>, <WLAN_Offload>, <Non-IP_MTU>, <Serving_PLMN_rate_control_value> and <Reliable_Data_Service> for an active non secondary PDP context with the context identifier <cid>. If the MT indicates more than two IP addresses of P-CSCF servers or more than two IP addresses of DNS servers, multiple lines of information per <cid> will be returned.

If the MT has dual stack capabilities, at least one pair of lines with information is returned per <cid>. First one line with the IPv4 parameters followed by one line with the IPv6 parameters. If this MT with dual stack capabilities indicates more than two IP addresses of P-CSCF servers or more than two IP addresses of DNS servers, multiple of such pairs of lines are returned.

NOTE: If the MT doesn't have all the IP addresses to be included in a line, e.g. in case the UE received four IP addresses of DNS servers and two IP addresses of P-CSCF servers, the parameter value representing an IP address that can not be populated is set to an empty string or an absent string.

If the parameter <cid> is omitted, the relevant information for all active non secondary PDP contexts is returned.

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

Defined values

- <cid>: integer type; specifies a particular non secondary PDP context definition. The parameter is local to the TE-MT interface and is used in other PDP context-related commands (see the +CGDCONT and +CGDSCONT commands).
- <bearer_id>: integer type; identifies the bearer, i.e. the EPS bearer in EPS and the NSAPI in UMTS/GPRS.
- <apn>: string type; a logical name that was used to select the GGSN or the external packet data network.
- <local_addr and subnet_mask>: string type; shows the IP address and subnet mask of the MT. The string is given as dot-separated numeric (0-255) parameters on the form:
 "a1.a2.a3.a4.m1.m2.m3.m4" for IPv4 or
 "a1.a2.a3.a4.a5.a6.a7.a8.a9.a10.a11.a12.a13.a14.a15.a16.m1.m2.m3.m4.m5.m6.m7.m8.m9.m10.m11.m12.m13.m14.m15.m16" for IPv6.
 When +CGPIAF is supported, its settings can influence the format of this parameter returned with the execute form of +CGCONTRDP.
- <gw_addr>: string type; shows the Gateway Address of the MT. The string is given as dot-separated numeric (0-255) parameters. When +CGPIAF is supported, its settings can influence the format of this parameter returned with the execute form of +CGCONTRDP.
- <DNS_prim_addr>: string type; shows the IP address of the primary DNS server.
 When +CGPIAF is supported, its settings can influence the format of this parameter returned with the execute form of +CGCONTRDP.
- <DNS_sec_addr>: string type; shows the IP address of the secondary DNS server.
 When +CGPIAF is supported, its settings can influence the format of this parameter returned with the execute form of +CGCONTRDP.
- <P_CSCF_prim_addr>: string type; shows the IP address of the primary P-CSCF server.
 When +CGPIAF is supported, its settings can influence the format of this parameter returned with the execute form of +CGCONTRDP.
- <P_CSCF_sec_addr>: string type; shows the IP address of the secondary P-CSCF server.
 When +CGPIAF is supported, its settings can influence the format of this parameter returned with the execute form of +CGCONTRDP.
- <IM_CN_Signalling_Flag>: integer type; shows whether the PDP context is for IM CN subsystem-related signalling only or not. 0 PDP context is not for IM CN subsystem-related signalling only 1 PDP context is for IM CN subsystem-related signalling only
- <LIPA_indication>: integer type; indicates that the PDP context provides connectivity using a LIPA PDN connection. This parameter cannot be set by the TE.
 0 indication not received that the PDP context provides connectivity using a LIPA PDN connection
 1 indication received that the PDP context provides connectivity using a LIPA PDN connection
- <IPv4_MTU>: integer type; shows the IPv4 MTU size in octets.
- <WLAN_Offload>: integer type; indicates whether traffic can be offloaded using the specified PDN connection via a WLAN or not. This refers to bits 1 and 2 of the WLAN offload acceptability IE as specified in 3GPP TS 24.008 [8] subclause 10.5.6.20.0 offloading the traffic of the PDN connection via a WLAN when in S1 mode or when in lu mode is not acceptable.
 1 offloading the traffic of the PDN connection via a WLAN when in S1 mode is acceptable, but not acceptable in lu mode.
 2 offloading the traffic of the PDN connection via a WLAN when in lu mode is acceptable, but not acceptable in S1 mode.
 3 offloading the traffic of the PDN connection via a WLAN when in S1 mode or when in lu mode is acceptable.
- <Local_Addr_Ind>: integer type; indicates whether or not the MS and the network support local IP address in TFTs (see 3GPP TS 24.301 [83] and 3GPP TS 24.008 [8] subclause 10.5.6.3).
 0 indicates that the MS or the network or both do not support local IP address in TFTs
 1 indicates that the MS and the network support local IP address in TFTs
- <Non-IP_MTU>: integer type; shows the Non-IP MTU size in octets.
- <Serving_PLMN_rate_control_value>: integer type; indicates the maximum number of uplink

messages the UE is allowed to send in a 6 minute interval. This refers to octet 3 to 4 of the Serving PLMN rate control IE as specified in 3GPP TS 24.301 [8] subclause 9.9.4.28.

<Reliable_Data_Service>: integer type; indicates whether the UE is using Reliable Data Service for a PDN connection or not, see 3GPP TS 24.301 [83] and 3GPP TS 24.008 [8] subclause 10.5.6.3.

0 Reliable Data Service is not being used for the PDN connection

1 Reliable Data Service is being used for the PDN connection

CFB-609 Implementation

- Only support <cid>,<apn>,<DNS_prim_addr>,<DNS_sec_addr> now.
- <DNS_prim_addr>,<DNS_sec_addr> could display only when <PDP_type> is "IP" or "IPV6"
- Could configure PDP context dynamic parameter items to read by +NCPDPR.

2.28. Define PDP context authentication parameters(+CGAUTH)

Command	Response	Example
+CGAUTH=<cid>[,<auth_prot>[,<userid>[,<password>]]]	+CME ERROR:<err>	AT+CGAUTH=1,2," 1234" ," 1234" OK
+CGAUTH?	[+CGAUTH: <cid>,<auth_prot>,<userid>,<password>] [<CR><LF>+CGAUTH: <cid>,<auth_prot>,<userid>,<password> [...]]	AT+CGAUTH? +CGAUTH:1, 1, "1234", "1234" +CGAUTH:2, 1, "1234", "1234" OK
+CGAUTH=?	+CGAUTH: (range of supported <cid>s),(list of supported <auth_prot>s),(range of supported <userid>s),(range of supported <password>s)	AT+CGAUTH=? +CGAUTH:(0-10),(0,1,2),(0-60),(0-60) OK

Description

Set command allows the TE to specify authentication parameters for a PDP context identified by the (local) context identification parameter <cid> used during the PDP context activation and the PDP context modification procedures. Since the <cid> is the same parameter that is used in the +CGDCONT and +CGDSCONT commands, +CGAUTH is effectively as an extension to these commands. Refer to Chapter 6 for possible <err> values.

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

The test command returns values supported as compound values.

Defined values

<cid>: integer type. Specifies a particular PDP context definition (see the +CGDCONT and +CGDSCONT commands).

<auth_prot>: integer type. Authentication protocol used for this PDP context.

0 None. Used to indicate that no authentication protocol is used for this PDP context. Username and password are removed if previously specified.

1 PAP

2 CHAP

<userid>: String type. User name for access to the IP network.

<password>: String type. Password for access to the IP network.

CFB-609 Implementation

- <userid> is needed when <auth_prot> is 1 or 2.
- Maximum <userid> string and <password> string length is 60.

2.29. No more PS data(+CNMPSD)

Command	Response	Example
+CNMPSD	+CME ERROR:<err>	AT+CNMPSD OK
+CNMPSD=?	OK	AT+CNMPSD=? OK

Description

This command indicates that no application on the MT is expected to exchange data.

When in UTRAN, if further conditions defined in 3GPP TS 25.331 [74] are met, this can cause transmission of a SIGNALLING CONNECTION RELEASE INDICATION message with the cause "UE Requested PS Data session end".

When in E-UTRAN, if further conditions defined in 3GPP TS 36.331 [86] are met, this can cause transmission of a UEAssistanceInformation message with powerPrefIndication set to "lowPowerConsumption" to the network.

NOTE: See subclause 10.1.38 for a command applicable to an MT using E-UTRAN, where the MT has a preference for a configuration that is not optimized for power saving.

This command may be used in both normal and modem compatibility modes.

Defined values

CFB-609 Implementation

2.30. Enter PIN(+CPIN)

Command	Response	Example
+CPIN=<pin>[,<newpin>]	+CME ERROR:<err>	AT+CPIN=" 1234" OK
+CPIN?	+CPIN:<code> +CME ERROR: <err>	AT+CPIN? +CPIN: READY OK
+CPIN?	OK	

Description

Set command sends to the MT 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 towards MT and an error message, +CME ERROR, is returned to TE. Refer to Chapter 6 for possible <err> values.

NOTE 1: SIM PIN, SIM PUK, PH-SIM PIN, PH-FSIM PIN, PH-FSIM PUK, SIM PIN2 and SIM PUK2 refer to the PIN of the selected application on the UICC. For example, in an UTRAN

context, the selected application on the currently selected UICC should be a USIM and the SIM PIN then represents the PIN of the selected USIM. See 3GPP TS 31.101 [65] for further details on application selection on the UICC.

If the PIN required is SIM PUK or SIM PUK2, the second pin is required. This second pin, <newpin>, is used to replace the old pin in the SIM.

NOTE 2: Commands which interact with MT that are accepted when MT is pending SIM PIN, SIM PUK, or PH-SIM are: +CGMI, +CGMM, +CGMR, +CGSN, D112; (emergency call), +CPAS, +CFUN, +CPIN, +CPINR, +CDIS (read and test command only), and +CIND (read and test command only). It is implementation specific whether additional commands can be accepted when MT is pending SIM PIN, SIM PUK, or PH-SIM.

Read command returns an alphanumeric string indicating whether some password is required or not.

Defined values

<pin>, <newpin>: string type values

<code> values reserved by the present document:

READY	MT is not pending for any password
SIM PIN	MT is waiting SIM PIN to be given
SIM PUK	MT is waiting SIM PUK to be given
PH-SIM PIN	MT is waiting phone-to-SIM card password to be given
PH-FSIM PIN	MT is waiting phone-to-very first SIM card password to be given
PH-FSIM PUK	MT is waiting phone-to-very first SIM card unblocking password to be given
SIM PIN2	MT is waiting SIM PIN2 to be given (this <code> is recommended to be returned only when the last executed command resulted in PIN2 authentication failure (i.e. +CME ERROR: 17); if PIN2 is not entered right after the failure, it is recommended that MT does not block its operation)
SIM PUK2	MT is waiting SIM PUK2 to be given (this <code> is recommended to be returned only when the last executed command resulted in PUK2 authentication failure (i.e. +CME ERROR: 18); if PUK2 and new PIN2 are not entered right after the failure, it is recommended that MT does not block its operation)
PH-NET PIN	MT is waiting network personalization password to be given
PH-NET PUK	MT is waiting network personalization unblocking password to be given
PH-NETSUB PIN	MT is waiting network subset personalization password to be given
PH-NETSUB PUK	MT is waiting network subset personalization unblocking password to be given
PH-SP PIN	MT is waiting service provider personalization password to be given
PH-SP PUK	MT is waiting service provider personalization unblocking password to be given
PH-CORP PIN	MT is waiting corporate personalization password to be given
PH-CORP PUK	MT is waiting corporate personalization unblocking password to be given

CFB-609 Implementation

- Set and read could execute only when power on.

- Only support <code> value of "READY", "SIM PIN", "SIM PUK", "SIM PUK BLOCKED".

2.31. Remaining PIN retries(+CPINR)

Command	Response	Example
+CPINR	+CME ERROR:<err>	AT+CPINR OK
+CPINR=?	OK	AT+CPINR=? OK

Description

Execution command cause the MT to return the number of remaining PIN retries for the MT passwords with intermediate result code +CPINR: <code>,<retries>[,<default_retries>] for standard PINs and +CPINRE: <ext_code>,<retries>[,<default_retries>] for manufacturer specific PINs. One line with one intermediate result code is returned for every <code> or <ext_code> selected by <sel_code>.

When execution command is issued without the optional parameter <sel_code>, intermediate result codes are returned for all <code>s and <ext_code>s.

In the intermediate result codes, the parameter <default_retries> is an optional (manufacturer specific) parameter, per <code> and <ext_code>.

Refer to Chapter 6 for possible <err> values.

Defined values

<retries>: integer type. Number of remaining retries per PIN.

<default_retries>: integer type. Number of default/initial retries per PIN.

<code>: Type of PIN. All values listed under the description of the AT+CPIN command, <code> parameter, except 'READY'.

<ext_code>: Extended, manufacturer specific codes.

<sel_code>: String type. Same values as for the <code> and <ext_code> parameters. These values are strings and shall be indicated within double quotes. It is optional to support wildcard match by '*', meaning match any (sub-)string.

Example: AT+CPINR="SIM*" will return the lines:

```
+CPINR: SIM-PIN,<retries>,<default_retries>
+CPINR: SIM PUK,<retries>,<default_retries>
+CPINR: SIM PIN2,<retries>,<default_retries>
+CPINR: SIM PUK2,<retries>,<default_retries>
```

Example: AT+CPINR="*SIM*" will additionally return the lines:

```
+CPINR: PH-SIM PIN,<retries>,<default_retries>
+CPINR: PH-FSIM PIN,<retries>,<default_retries>
+CPINR: PH-FSIM PUK,<retries>,<default_retries>
```

CFB-609 Implementation

Set and read could execute only when power on.

3 Commands(3GPP aligned to 27.005)

3.1. Select Message Service(+CSMS)

Command	Response	Example
+CSMS=<service>	+CSMS:<mt>,<mo>,<bm> +CMS ERROR:<err>	AT+CSMS=1 +CSMS:1,1,1 OK
+CSMS?	+CSMS:<service>,<mt>,<mo>,<bm>	AT+CSMS? +CSMS:1,1,0,1 OK
+CSMS=?	+CSMS:(list of supported <service>s)	AT+CSMS=? +CSMS:(0,1) OK

Description

Set command selects messaging service <service>. It returns the types of messages supported by the ME:

<mt> for mobile terminated messages, <mo> for mobile originated messages and <bm> for broadcast type messages. If chosen service is not supported by the ME (but is supported by the TA), final result code +CMS ERROR: <err> shall be returned.

Also read command returns supported message types along the current service setting.

Test command returns a list of all services supported by the TA.

Refer to Chapter 6: Error Values for possible <err> values

Defined values

<service>: integer type

0 3GPP TS 23.040 [3] and 3GPP TS 23.041 [4]

1 3GPP TS 23.040 [3] and 3GPP TS 23.041 [4] the requirement of <service> setting 1 is mentioned under corresponding command descriptions)

2. ...127 reserved 128... manufacturer specific

<mt>, <mo>, <bm>: integer type

0 type not supported

1 type supported

CFB-609 Implementation

MT will report to user if received SMS messages:

+CMT: [<alpha>,<length><CR><LF><pdu> (PDU mode enabled); (According to +CNMI in 3GPP TS 27005)

<alpha> Just to comply with 3GPP TS 27005, no need to care about it and always to be 0.

3.2. New Message Acknowledgement to ME/TA(+CNMA)

Command	Response	Example
+CNMA=[<n>[,<length>[<CR>PDU is given<ctrl-Z/ESC>]]]	+CMS ERROR:<err>	AT+CNMA=1 OK

+CNMA=?	+CNMA:(list of supported <n>s	AT+CNMA=? +CNMA:(1,2) OK
---------	-------------------------------	--------------------------------

Description

Execution command confirms reception of a new message (SMS-DELIVER or SMS-STATUS-REPORT) which is routed directly to the TE (refer command +CNMI table 3.4.1-3 and table 3.4.1-5). This acknowledgement command shall be used when +CSMS parameter <service> equals 1. In PDU mode, it is possible to send either positive (RPACK) or negative (RP-ERROR) acknowledgement to the network. Parameter <n> defines which one will be sent. Optionally (when <length> is greater than zero) an acknowledgement TPDU (SMS-DELIVER-REPORT for RPACK or RP-ERROR) may be sent to the network. The entering of PDU is done similarly as specified in command Send Message +CMGS, except that the format of <ackpdu> is used instead of <pdu> (i.e. SMSC address field is not present). PDU shall not be bounded by double quotes. TA shall not send another +CMT or +CDS result code to TE before previous one is acknowledged.

If ME does not get acknowledgement within required time (network timeout), ME should respond as specified in 3GPP TS 24.011 [6] to the network. ME/TA shall automatically disable routing to TE by setting both <mt> and <ds> values of +CNMI to zero.

If command is executed, but no acknowledgement is expected, or some other ME related error occurs, final result code +CMS ERROR: <err> is returned

NOTE: In case that a directly routed message must be buffered in ME/TA (possible when +CNMI parameter <mode> equals 0 or 2) or AT interpreter remains too long in a state where result codes cannot be sent to TE (e.g. user is entering a message using +CMGS), acknowledgement (RP-ACK) must be sent to the network without waiting +CNMA command from TE. Later, when buffered result codes are flushed to TE, TE must send +CNMA[=0] acknowledgement for each result code. In this way, ME/TA can determine if message should be placed in non-volatile memory and routing to TE disabled (+CNMA[=0] not received). Refer command +CNMI for more details how to use <mode> parameter reliably.

Test command returns a list of supported <n> values. If the only value supported is 0, the device does not support sending of TPDU.

Refer to Chapter 6: Error Values for possible <err> values

Defined values

<n>: integer type

0 command operates similarly as defined for the text mode
(UE don't support text mode for SMS currently)

1 send RP-ACK (or buffered result code received correctly)

2 send RP-ERROR (if PDU is not given, ME/TA shall send SMS-DELIVER-REPORT with 3GPP TS 23.040 [3] TP-FCS value set to 'FF' (unspecified error cause))

<length> integer type value indicating in the text mode (+CMGF=1) the length of the message body <data>(or <cdata>) in characters; or in PDU mode (+CMGF=0), the length of the actual TP data unit in octets (i.e. the RP layer SMSC address octets are not counted in the length)

CFB-609 Implementation

- Only <n>=1 and <n>=2 are supported.
- +CNMI is not supported now.
- Length range 0 – 232.
- MT will report to user if received SMS messages:
+CMT: [<alpha>],<length><CR><LF><pdu> (PDU mode enabled); (According to +CNMI in 3GPP TS 27005)
<alpha> Just to comply with 3GPP TS 27005, no need to care about it and always to be 0.

3.3. Service Centre Address (+CSCA)

Command	Response	Example
+CSCA=<sca>[,<tosca>]	+CMS ERROR:<err>	AT+CSCA= 358501234567,145 OK
+CSCA?	+CSCA:<sca>[,<tosca>]	AT+CSCA? +CSCA:" 358501234567" ,145 OK
+CSCA=?		AT+CSCA=? OK

Description

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

Refer to Chapter 6: Error Values for possible <err> values

Defined values

<sca> 3GPP TS 24.011 [6] RP SC address Address-Value field in string format; BCD numbers (or GSM 7 bit default alphabet characters) are converted to characters of the currently selected TE character set (refer command +CSCS in 3GPP TS 27.007 [9]); type of address given by <tosca>

<tosca> 3GPP TS 24.011 [6] RP SC address Type-of-Address octet in integer format (when First character of <da> is + (IRA 43) default is 145, otherwise default is 129)

CFB-609 Implementation

- Could get or set service centre address only when power on.
- <sca>: length range 1 – 20

3.4. Send SMS Message (+CMGS)

Command	Response	Example
+CMGS=<length><CR> PDU is given<ctrl-Z/ESC>	if successful +CMGS:<mr>[,<ackpdu>]] if fails +CMS ERROR:<err>	AT+CMGS=7 >00010000910008001A +CMGS:1 OK
+CMGS=?		AT+CMGS=? OK

Description

Execution command sends message from a TE to the network (SMS-SUBMIT). Message reference value <mr> is returned to the TE on successful message delivery. Optionally (when +CSMS <service> value is 1 and network supports) <ackpdu> is returned. Values can be used to identify message upon unsolicited delivery status report result code. If sending fails in a network or an ME error, final result code +CMS ERROR: <err> is returned. This command should be abortable.

- <length> must indicate the number of octets coded in the TP layer data unit to be given (i.e. SMSC address octets are excluded).
- the TA shall send a four character sequence <CR><LF><greater_than><space> (IRA 13, 10,62, 32) after command line is terminated with <CR>; after that PDU can be given from TE to ME/TA.
- the DCD signal shall be in ON state while PDU is given.
- the echoing of given characters back from the TA is controlled by V.25ter echo command E.
- the PDU shall be hexadecimal format (similarly as specified for <pdu>) and given in one line; ME/TA converts this coding into the actual octets of PDU.
- when the length octet of the SMSC address (given in the PDU) equals zero, the SMSC address set with command Service Centre Address +CSCA is used; in this case the SMSC Type-of-Address octet shall not be present in the PDU, i.e. TPDU starts right after SMSC length octet.
- sending can be cancelled by giving <ESC> character (IRA 27).
- <ctrl-Z> (IRA 26) must be used to indicate the ending of PDU.

Refer to Chapter 6: Error Values for possible <err> values

Defined values

<mr>	3GPP TS 23.040 [3] TP-Message-Reference in integer format
<length>	integer type value indicating in the text mode (+CMGF=1) the length of the message body <data> > (or <cdata>) in characters; or in PDU mode (+CMGF=0), the length of the actual TP data unit in octets (i.e. the RP layer SMSC address octets are not counted in the length)
<ackpdu>	3GPP TS 23.040 [3] RP-User-Data element of RP-ACK PDU; format is same as for <pdu> in case of SMS, but without 3GPP TS 24.011 [6] SC address field and parameter shall be bounded by double quote characters like a normal string type Parameter

CFB-609 Implementation

<length> range 7-164.

Don't return ackpdu now.

For address field in PDU(3GPP TS 24.011), should put the country code at the start of it (eg, China:86).

3.5. Send SMS Message (+CMGC)

Command	Response	Example
+CMGC=<length><CR> PDU is given<ctrl-Z/ESC>	if successful +CMGC:<mr>[,<ackpdu>] if fails +CMS ERROR:<err>	AT+CMGC=25 >0001000D91683143223182F000000CC 8329BFD065DDF723639041A OK
+CMGS=?		AT+CMGC=? OK

Description

Execution command sends a command message from a TE to the network (SMS-COMMAND). The entering of text (3GPP TS 23.040 [3] TP-Command-Data) is done similarly as specified in command Send Message +CMGS, but the format is fixed to be a sequence of two IRA character long hexadecimal numbers which ME/TA converts into 8-bit octets (refer +CMGS). Message reference value <mr> is returned to the TE on successful message delivery. Optionally (when +CSMS <service> value is 1 and network supports) <ackpdu> is returned. Values can be used to identify message upon unsolicited delivery status report result code. If sending fails in a network or an ME error, final result code +CMS ERROR: <err> is returned.. This command should be abortable.

Refer to Chapter 6: Error Values for possible <err> values

Defined values

<mr> 3GPP TS 23.040 [3] TP-Message-Reference in integer format
 <length> integer type value indicating in the text mode (+CMGF=1) the length of the message body <data> > (or <cdata>) in characters; or in PDU mode (+CMGF=0), the length of the actual TP data unit in octets (i.e. the RP layer SMSC address octets are not counted in the length)
 <ackpdu> 3GPP TS 23.040 [3] RP-User-Data element of RP-ACK PDU; format is same as for <pdu> in case of SMS, but without 3GPP TS 24.011 [6] SC address field and parameter shall be bounded by double quote characters like a normal string type Parameter

CFB-609 Implementation

<length> range 7-164.

Don't return ackpdu now.

For address field in PDU(3GPP TS 24.011), should put the country code at the start of it (eg, China:86).

4 Commands(General)

4.1. Reboot (+NRB)

Command	Response	Example
+NRB	REBOOTING<CR><LF>	AT+NRB REBOOTING

Description

This command reboots the terminal. There is a short delay after issuing this command before the terminal reboots. No further AT commands will be processed.

Refer to Chapter 6: Error Values for possible <err> values.

Note that there is no final OK to signal that the command line has finished processing as AT command processing terminates with this command. No confirmation messages are expected until the reboot.

Defined values

CFB-609 Implementation

+nrb has the highest priority, can be used at any time except when executing a blocking and abortable

AT command or AT command being interrupted.

4.2. Query UE Statistics(+NUESTATS)

Command	Response	Example
+NUESTATS=RADIO	Signal power:<signal power in centibels> Total power:<total power in centibels> TX power:<current Tx power level in centibels > TX time:<total Tx time since last reboot in millisecond> RX time:<total Rx time since last reboot in millisecond> Cell ID:<last cell ID> ECL:<last ECL value> SNR:< last snr value> EARFCN:< last earfcn value> PCI:< last pci value> RSRQ:<rsrq in centibels> OPERATOR MODE:<operator mode> CURRENT BAND:<current band> +CME ERROR:<err>	AT+NUESTATS=RADIO NUESTATS:RADIO,Signal power,50 NUESTATS:RADIO,Total power,500 NUESTATS:RADIO,TX power,30 NUESTATS:RADIO,TX time,1234567 NUESTATS:RADIO,RX time,12345 NUESTATS:RADIO,Cell ID,70 NUESTATS:RADIO,ECL,1 NUESTATS:RADIO,SNR,20 NUESTATS:RADIO,EARFCN,30 NUESTATS:RADIO,PCI,11 NUESTATS:RADIO,RSRQ,0 NUESTATS:RADIO,OPERATOR MODE,1 NUESTATS:RADIO,CURRENT BAND,8 OK
+NUESTATS=CELL	NUESTATS:CELL,<earfcn>,<physical cell id>,<primary cell>,<rsrp>,<rsrq>,<rssi>,<snr> [... NUESTATS:CELL,<earfcn>,<physical cell id>,<primary cell>,<rsrp>,<rsrq>,<rssi>,<snr> +CME ERROR:<err>	AT+NUESTATS=CELL NUESTATS:CELL,3569,69,1,23,-1073,-1145,5 NUESTATS:CELL,3569,69,0,23,-1073,-1145,5 NUESTATS:CELL,3569,69,0,23,-1073,-1145,5 OK
+NUESTATS=THP	NUESTATS:THP,<throughput_type>,<throughput> [... NUESTATS:THP,<throughput_type>,<throughput>] +CME ERROR:<err>	AT+NUESTATS=THP NUESTATS:THP,RLC UL,100 NUESTATS:THP,RLC DL,98 NUESTATS:THP,MAC UL,103 NUESTATS:THP,MAC DL,100 OK
+NUESTATS=BLER	NUESTATS:BLER,<block error rate type>,< block error rate > [... NUESTATS:BLER,<block error rate type>,< block error rate >] +CME ERROR:<err>	AT+NUESTATS=BLER NUESTATS:BLER,RLC UL BLER,10 NUESTATS:BLER,RLC DL BLER,5 NUESTATS:BLER,MAC UL BLER,8 NUESTATS:BLER,MAC DL BLER,3 NUESTATS:BLER,Total TX bytes,1080 NUESTATS:BLER,Total RX bytes,900 NUESTATS:BLER,Total TX blocks,80 NUESTATS:BLER,Total RX blocks,80 NUESTATS:BLER,Total RTX blocks,100 NUESTATS:BLER,Total ACK/NACK RX,100 OK

AT+NUESTATS=APPSMEM	APPSMEM:Current Allocated,<allocated> APPSMEM:Total Free,<free> APPSMEM:Max Free,<max free> APPSMEM:Num Allocs,<num allocs> APPSMEM:Num Frees,<num frees>	AT+NUESTATS=APPSMEM APPSMEM:Current Allocated,8240 APPSMEM:Total Free,198 APPSMEM:Max Free,8496 APPSMEM:Num Allocs, 300 APPSMEM:Num Frees, 240 OK
+NUESTATS=<type>	NUESTATS:<type>,<name/value>,<value>[,<value>[...]] [... NUESTATS:<type>,<name/value>,<value>[,<value>[...]] +CME ERROR:<err>	
+NUESTATS=?	NUESTATS:<supported types> +CME ERROR:<err>	AT+NUESTATS=? NUESTATS:(RADIO,CELL,BLER,THP,APPSMEM,ALL) OK

Description

This command fetches the most recent operational statistics. Refer to Chapter 6: Error Values for possible <err>values. It can take an optional parameter that allows different sets of statistics to be displayed. The <type> RADIO provides the default set of values. <type>=ALL will print all data.

Defined values

<type> Type of data to be displayed as an unquoted string.
Supported values of <type> are:
RADIO radio specific information
CELL per-cell information for the top 8 cells
BLER block error rate information
THP throughput
APPSMEM application Core dynamic memory usage
ALL all information. The value of <type> output is the correct one for each data type.

<type> = RADIO
 <signal power in centibels>
 <total power in centibels>
 <current TX power level in centibels >
 <total TX time since last reboot in millisecond>
 <total RX time since last reboot in millisecond>
 <last SIB1 cell ID>
 <last ECL value>
 < last snr value>
 < last earfcn value>
 < last pci value>
 <rsrq in centibels>
 <operator mode> operator mode for SIB1.
 0 Unknown mode.
 1 Inband different pci mode.
 2 Inband same pci mode.
 3 Guardband mode.
 4 Standalone mode.

<current band> The band of Service cell.
 <type> = CELL
 Per-cell information for the top 10 cells.
 Returned entries are of the form:

```

    <earfcn>,<physical cell id>,<primary cell>,<rsrp>,<rsrq>,<rssi>,<snr>
    <physical cell id>    physical id of the cell
    <primary cell>        1 indicates the current serving cell
                        0 indicates the neighbourhood cells searched
    <rsrp> reference signal received power
    <rsrq> reference signal received quality
    <rssi> received signal strength indicator
    <snr> signal to noise ratio
<type> = BLER
    block error rate
    <rlc_ul_bler>         RLC layer block error rate (uplink). Integer %
    <rlc_dl_bler>         RLC layer block error rate (downlink). Integer %
    <mac_ul_bler>         physical layer block error rate (uplink). Integer %
    <mac_dl_bler>         physical layer block error rate (downlink). Integer %
    <total bytes transmitted>
    <total bytes received>
    <transport blocks sent>
    <transport blocks received>
    <transport blocks retransmitted>
    <total ack/nack messages received>
<type> = THP
    throughput
    <rlc_ul>              RLC layer throughput (uplink). Integer bps
    <rlc_dl>              RLC layer throughput (downlink). Integer bps
    <mac_ul>              physical layer throughput (uplink). Integer bps
    <mac_dl>              physical layer throughput (downlink). Integer bps
<type> = APPSMEM
    Application Core dynamic memory usage
    <allocated>
    <free>
    <max free >
    <num allocs >
    <num frees>

```

CFB-609 Implementation

- The variant of NUESTATS without an argument prints out the RADIO arguments without the command and variant prefixes. This will be deprecated in a future release.
- +NUESTATS and +NUESTATS=RADIO,CELL,BLER,THP will be reset to invalid value when power off or out of service.
- +NUESTATS and +NUESTATS=RADIO have default invalid values,they are
 - Signal power:-32768
 - Total power:-32768
 - TX power:-32768
 - TX time:0
 - RX time:0
 - Cell ID:4294967295
 - ECL:255
 - SNR:-32768
 - EARFCN:4294967295
 - PCI:65535
 - RSRQ:-32768
 - OPERATOR MODE:0
 - CURRENT BAND:255.

4.3. Specify search frequencies (+NEARFCN)

Command	Response	Example
+NEARFCN=<search_mode>[,<param1>[,<param2>[,...]]]	+CME ERROR:<err>	AT+NEARFCN=0,10,10A OK
+NEARFCN=?		+NEARFCN=? OK

Description

The set command provides a mechanism to lock to a specific E-ULTRA Absolute Radio Frequency Channel Number (EARFCN) and, if desired, Physical Cell ID. All actions will be locked to this carrier until either the lock is removed or the UE is rebooted. It is not persistent over reboots.

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

Refer to Chapter 6: Error Values for possible <err> values.

Defined values

<search_mode> Specifies the type of search and defines the supplied parameters.
0 <earfcn>, <pci>
lock to a specific earfcn
<earfcn> A number in the range 0-65535 representing the earfcn to search. An <earfcn> value of 0 will remove the earfcn restriction and any associated Physical Cell ID lock.
<pci> string type;UTRAN physical cell ID in hexadecimal format. Valid range 0 - 1F7.

CFB-609 Implementation

4.4. Create Socket (+NSOCR)

Create a socket and associate with specified protocol

Command	Response	Example
+NSOCR=<type>,<protocol>[,<listenport>[,<receivecontrol>[,<af_type>[,<ipaddress>]]]]	<socket> +CME ERROR:<err>	AT+NSOCR=DGRAM,17,56,1,AF_INET 1 OK

Description

This command creates a socket on the UE. If the port is set, receiving is enabled and unsolicited +NSONMI messages will appear for any message that is received on that port. Refer to Chapter 6: Error Values for possible <err> values.

If a socket has already been created for a protocol, port combination, +NSOCR will fail if requested a second time

Defined values

<type>	Socket Type. DGRAM for UDP, STREAM for TCP
<protocol>	Standard internet protocol definition. For example, UDP is 17.
<listen port>	A number in the range 0-65535. This is the local port that will be included in sent messages and on which messages will be received. If it is 0 or omitted, LWIP will assign a random <listen port> for this socket.
<socket>	This is a reference to the created socket. It is an integer greater than or equal to 0
<receive control>	Set to 1 if incoming messages should be received, 0 if incoming messages should be ignored. Defaults to 1 (messages will be received)
<af_type>	String type, "AF_INET" for IPv4 and "AF_INET6" for IPv6. Default value "AF_INET".
<ip address>	The ip address NW assigned to MT.

CFB-609 Implementation

- A maximum of 7 sockets are supported, but other services may reduce this number.
- Only UDP(protocol 17), TCP(protocol 6) supported.
- <listen port> value of 20000 for TCP can't be set when bip is enabled

4.5. SendTo Command (UDP only) (+NSOST)

Send a UDP datagram containing length bytes of data to remote_port on remote_addr.

Command	Response	Example
+NSOST=<socket>,<remote_addr>,<remote_port>,<length>,<data>[,<sequence>]	<socket>,<length> +CME ERROR:<err>	AT+NSOST=1,192.158.5.1,1024,2,AB30,1,2 OK

Description

This command sends a UDP datagram to the specified host:port. It will return with the socket and the number of bytes of data to be sent. If the amount of data is larger than the largest datagram that can be sent, the +NSOST return value will indicate how much of the data was successfully sent.

If <sequence> is not omitted, when datagram is sent by rf or discard, will report the result.

Defined values

Command	Response	Example
	+NSOSTR:<socket>,<sequence>,<status>	+NSOSTR:1,2,1

Refer to Chapter 6: Error Values for possible <err> values.

Defined values

<socket>	Socket number returned by +NSOCR
<remote addr>	IP address
<remote port>	A number in the range 0-65535. This is the remote port that messages will be received on
<length>	Decimal length of data to be sent.
<data>	Data to be transmitted in hexstring format, or quoted string format.

<sequence> Sequence of data, range 1-255.If omit, will not report data sent status.

<status> The status of datagram.

2 Error

3 Sent

CFB-609 Implementation

- Maximum data size is 1358 bytes.
- <data> Only hexstring format is supported
- IP addresses can be specified in decimal, octal or hexadecimal notation.
- Data can't be transferred if MT don't have address (could use +cgpaddr to get).

4.6. SendTo Command with Flags (UDP only) (+NSOSTF)

Send a UDP datagram containing length bytes of data to remote_port on remote_addr and allows meta-data flags to be set.

Command	Response	Example
+NSOSTF=<socket>,<remote_addr>,<remote_port>,<flag>,<length>,<data>[,<sequence>]	<socket>,<length> +CME ERROR:<err>	AT+NSOSTF=1,192.158.5.1,1024,0x100,2,AB30,1 1,2 OK

Description

This command sends a UDP datagram to the specified host:port. It will return with the socket and the number of bytes of data to be sent. If the amount of data is larger than the largest datagram that can be sent, the

+NSOSTF return value will indicate how much of the data was successfully sent.

If <sequence>is not omitted, when datagram is sent by rf or discard, will report the result

Command	Response	Example
	+NSOSTR: <socket>,<sequence>,<status>	+NSOSTR:1,2,1

Refer to Chapter 6: Error Values for possible <err> values.

Defined values

<socket> Socket number returned by +NSOCR

<remote addr> IP address

<remote port> A number in the range 0-65535. This is the remote port that messages will be received on

<flag> Specifies the type of message transmission. Values of this argument are in hex format and are formed by logically OR'ing zero or more of the following flags:
0x100 Exception Message: Send message with high priority
0x200 Release Indicator: indicate release after next message
0x400 Release Indicator: indicate release after next message has been replied to
If no flags are set, a value of 0 should be provided.

<length> Decimal length of data to be sent.

<data> Data to be transmitted in hexstring format.

<sequence> Sequence of data, range 1-255.If omit, will not report data sent status.

<status> The status of datagram.

0 Error

1 Sent

CFB-609 Implementation

- Maximum data size is 1358 bytes.
- <data> Only hexstring format is supported
- IP addresses can be specified in decimal, octal or hexadecimal notation.
- Data can't be transferred if MT don't have address (could use +cgpaddr to get).

4.7. Query Socket Messages Sent Pending Data List (+NQSOS)

Command	Response	Example
+NQSOS=<socket>[,<socket>[,<socket>[...]]]	[+NQSOS:<socket>,<sequence><CR><LF>[+NQSO S:<socket>,<sequence>][...]]	AT+NQSOS=1,2 +NQSOS:1,2 +NQSOS:2,3 OK
+NQSOS?	[+NQSOS:<socket>,<sequence><CR><LF>[+NQSO S:<socket>,<sequence>][...]] +CME ERROR:<err>	AT+NQSOS? +NQSOS:1,2 +NQSOS:2,3 OK

Description

This command queries the list of the pending upstream message by MT.
Refer to Chapter 6: Error Values for possible <err> values.

Defined values

<socket> Socket number.
<sequence> The sequence of pending up steam message. Range 1-255.

CFB-609 Implementation

4.8. Receive Command(+NSORF)

Command	Response	Example
+NSORF=<socket>,<req_length>	<socket>,<ip_addr>,<port>,<length>,<data>,<remaining_length> +CME ERROR:<err>	AT+NSORF=1,10 1,192.168.5.1,1024,2,ABAB,0 OK

Description

Reads up to <req length> characters of data from <socket>.
Returned length is the actual number of characters returned.

Receive data on a socket. When data arrives a +NSONMI response will be generated that indicates the socket the message was received on and the amount of data. The +NSORF command takes a length, which is the maximum amount of data that will be returned.

If the requested length is larger than the actual size of the returned data, only the length of returned data is provided, and the remaining length is returned as 0. If the requested length is less than the amount of data returned, only the requested amount of data will be returned, plus

an indication of the number of bytes remaining.. Once a message has been fully read, a new +NSONMI notification will be sent if there is another message to process.

Refer to Chapter 6: Error Values for possible <err> values.

If messages arrive faster than they are read, and the internal message buffer is full, the most recent message will be discarded

Defined values

<socket>	Socket number returned by +NSOCR
<req_length>	Maximum amount of data to be returned as a decimal byte length.
<remote_addr>	Address of system sending the message
<remote port>	A number in the range 0-65535. This is the remote port that messages was sent from
<length>	Amount of data returned as a decimal byte length
<remaining_length>	Amount of data left to read for this message as a decimal byte length
<data>	Data received in hexstring format

CFB-609 Implementation

- Maximum data size is 1358 bytes.
- Remaining length is always 0. The remaining data is readable

4.9. Connect Command (TCP only) (+NSOCO)

Connect to a TCP server to remote_port on remote_addr.

Command	Response	Example
+NSOCO=<socket>,<remote_addr>,<remote_port>	+CME ERROR: <err>	AT+NSOCO=1,192.158.5.1,1024 OK

Description

This command Connect to a TCP sever to the specified host:port.

Refer to Chapter 6: Error Values for possible <err> values.

Defined values

<socket>	Socket number returned by +NSOCR
<remote_addr>	Address of system sending the message
<remote_port>	A number in the range 0-65535. This is the remote port that connect to.

CFB-609 Implementation

- IP addresses can be specified in decimal, octal or hexadecimal notation

4.10. Send Command (TCP only) (+NSOSD)

Send a TCP datagram containing length bytes of data to TCP server.

Command	Response	Example
+NSOSD=<socket>,<length>,<data>[,<flag>[,sequence]]	socket, length +CME ERROR: <err>	AT+NSOSD=1,2,AB30 1,2 OK

		AT+NSOSD=1,2,AB30,0x100 1,2 OK AT+NSOSD=1,2,AB30,0x100,255 1,2 OK
--	--	--

Description

This command sends a TCP datagram to the TCP server. It will return with the socket that it was sent on, and the number of bytes of data sent. If the amount of data is larger than the largest datagram that can be sent, the +NSOSD return value will indicate how much of the data was successfully sent.

If <sequence> is not omitted, when datagram is acked by server or discard by UE, will report the result.

Command	Response	Example
	+NSOSTR: <socket>,<sequence>,<status>	+NSOSTR:1,2,1

Refer to Chapter 6: Error Values for possible <err> values

Defined values

<socket>	Socket number returned by +NSOCR.
<length>	Decimal length of data to be sent.
<data>	Data to be transmitted in hexstring format.
<flag>	Specifies the type of message transmission. Values of this argument are in hex format and are formed by logically OR'ing zero or more of the following flags: 0x100 Exception Message: Send message with high priority 0x200 Release Indicator: indicate release after next message 0x400 Release Indicator: indicate release after next message has been replied to If no flags are set, a value of 0 should be provided.
<sequence>	Sequence of data, range 1-255. If omit, will not report data sent status.
<status>	The status of datagram. 0 Error 1 Sent

CFB-609 Implementation

- Maximum data size is 1358 bytes.
- <data> Only hexstring format is supported
- IP addresses can be specified in decimal, octal or hexadecimal notation.
- <flag> couldn't work now

4.11. Close Socket (+NSOCL)

Command	Response	Example
+NSOCL=<socket>	+CME ERROR:<err>	AT+NSOCL=1 OK

Description

Close the specified socket. If there are pending messages to be read, they will be dropped. No further unsolicited +NSONMI notifications will be generated. If the socket has already been closed, or was never created, an error will be returned. Refer to Chapter 6: Error Values for possible <err> values.

Defined values

<socket> Socket number returned by +NSOCR.

CFB-609 Implementation

4.12. Socket message arrived indicator (+NSONMI) (Response Only)

Command	Response	Example
+NSONMI:	<socket>,<length>	+NSONMI:1,10

Description

Unsolicited message to notify that data has been received on a socket and is ready to be read. Returns socket number and number of bytes of data available to read for the first message that is queued. If another message is received on the same socket, it will only be notified when the preceding message has been completely read.

Refer to Chapter 6: Error Values for possible <err> values.

Defined values

<socket> Socket on which data is received. Decimal number returned by +NSOCR
<length> Number of bytes of data in the first message.

CFB-609 Implementation

- This message can occur at any point if it is indicating a new message with no messages buffered. If there are buffered messages it will occur in the AT+NSORF command before the data is returned

4.13. Socket close indicator (+NSOCLI) (Response Only)

Command	Response	Example
+NSOCLI:	<socket>	+NSOCLI:1

Description

Unsolicited message to notify that socket has been closed by LWIP internally. Returns socket number.

Refer to Chapter 6: Error Values for possible <err> values.

Defined values

<socket> Socket on which is closed. Decimal number returned by +NSOCR.

CFB-609 Implementation

- Only TCP could report +NSOCLI.

4.14. Test IP network connectivity to a remote host (+NPING)

Command	Response	Example
+NPING=<remote_address>[,<p_size>[,<timeout>]]	+CME ERROR:<err>	AT+NPING=192.168.1.1
+NPING	+NPING:<remote_address>,<ttl>,<rtt>	OK
+NPINGERR	+NPINGERR:<err>	+NPING:192.168.1.1,20,50
		+NPINGERR:1

Description

This command sends an ICMP packet to the specified host address.

Refer to Chapter 6: Error Values for possible <err> values.

AT+NPING initiates the sending of a PING packet to the specified address. This will either cause a packet to be returned if the remote system is connected and responding to PING packets, or no response will be received. .

A maximum of 1 ping attempts will be tried. If none of the packets receive a response within the timeout period, an error will be raised.

If a response is received, the unsolicited +NPING message will be returned. If no response is received the

+NPINGERR unsolicited response will be returned with an error value.

Defined values

<remote addr>	address of system sending the message
<p_size>	size in bytes of echo packet payload. Range of 12-1500 Default 12
<timeout>	maximum time in ms to wait for an echo reply response. Range 10-600000. Default 10000
<ttl>	ttl received in the response packet
<rtt>	elapsed time in msec from packet sent to response received.
<err>	An integer value to provide some information on why the ping request failed. 1 No response from remote host within timeout period 2 Failed to send ping request

CFB-609 Implementation

IP addresses can be specified in decimal, octal or hexadecimal notation.

Data can't be transferred if MT don't have address (could use +cgpaddr to get).

4.15. Set Debug Logging Level (+NLOGLEVEL)

Command	Response	Example
+NLOGLEVEL=<core>,<level>	+CME ERROR:<err>	AT+NLOGLEVEL=PROTOCOL,ERROR
		OK

+NLOGLEVEL?	+NLOGLEVEL:<core>,<level>	AT+NLOGLEVEL? +NLOGLEVEL:PROTOCOL,ERROR +NLOGLEVEL:SECURITY,NONE +NLOGLEVEL:APPLICATION,WARNING OK
+NLOGLEVEL=?	+NLOGLEVEL:(<core>,...), (<level>,<level>,...)	AT+NLOGLEVEL=? +NLOGLEVEL:(PROTOCOL,APPLICATION,SECURITY),(VERBOSE,NORMAL,WARNING,ERROR,NONE) E) OK

Description

This command sets the logging level. It can take one of the following values: This value is persistent across reboots

Defined values

<core> Core required
 PROTOCOL
 SECURITY
 APPLICATION
 <level> Logging level required
 VERBOSE
 NORMAL
 WARNING
 ERROR
 NONE

CFB-609 Implementation

- Default logging level is NORMAL

4.16. Configure UE Behaviour (+NCONFIG)

Command	Response	Example
+NCONFIG=<function>,<value> +NCONFIG? +NLOGLEVEL=?	+CME ERROR:<err> +NCONFIG:<function>,<value> [+NCONFIG:<function>,<value> [..]]	AT+NCONFIG=AUTOCONNECT,TRUE OK AT+NCONFIG? +NCONFIG:AUTOCONNECT,FALSE +NCONFIG:CR_0354_0338_SCRAMBLING,TRUE +NCONFIG:CR_0859_SI_AVOID,TRUE +NCONFIG:COMBINE_ATTACH,FALSE +NCONFIG:CELL_RESELECTION,TRUE +NCONFIG:ENABLE_BIP,FALSE +NCONFIG:MULTITONE,TRUE +NCONFIG:NAS_SIM_POWER_SAVING_ENABLE,TRUE +NCONFIG:BARRING_RELEASE_DELAY,64 +NCONFIG:RELEASE_VERSION,13 +NCONFIG:RPM,FALSE +NCONFIG:SYNC_TIME_PERIOD,0 +NCONFIG:IPV6_GET_PREFIX_TIME,15 +NCONFIG:NB_CATEGORY,1 +NCONFIG:RAI,TRUE +NCONFIG:HEAD_COMPRESS,TRUE

+NCONFIG=?	+NLOGLEVEL:(<core>,...), (<level>,<level>,...)	+CONFIG:RLF_UPDATE,TRUE +CONFIG:CONNECTION_REESTABLISHMENT,FALSE +CONFIG:PCO_IE_TYPE,EPCO OK AT+NLOGLEVEL=? +NLOGLEVEL:(PROTOCOL,APPLICATION,SECURITY),(VERBOSE,NORMAL,WARNING,ERROR,NONE) OK AT+NCONFIG=? +NCONFIG:(AUTOCONNECT,(FALSE,TRUE)) +NCONFIG:(CR_0354_0338_SCRAMBLING,(FALSE,TRUE)) +NCONFIG:(CR_0859_SI_AVOID,(FALSE,TRUE)) +NCONFIG:(COMBINE_ATTACH,(FALSE,TRUE)) +NCONFIG:(CELL_RESELECTION,(FALSE,TRUE)) +NCONFIG:(ENABLE_BIP,(FALSE,TRUE)) +NCONFIG:(MULTITONE,(FALSE,TRUE)) +NCONFIG:(NAS_SIM_POWER_SAVING_ENABLE,(FALSE,TRUE)) +NCONFIG:(BARRING_RELEASE_DELAY,(0-1800)) +NCONFIG:(RELEASE_VERSION,(13,14)) +NCONFIG:(RPM,(FALSE,TRUE)) +NCONFIG:(SYNC_TIME_PERIOD,(0-65535)) +NCONFIG:(IPV6_GET_PREFIX_TIME,(0-65535)) +NCONFIG:(NB_CATEGORY,(1,2)) +NCONFIG:(RAI,(FALSE,TRUE)) +NCONFIG:(HEAD_COMPRESS,(FALSE,TRUE)) +NCONFIG:(RLF_UPDATE,(FALSE,TRUE)) +NCONFIG:(CONNECTION_REESTABLISHMENT,(FALSE,TRUE)) +NCONFIG:(PCO_IE_TYPE,(PCO,EPCO)) OK
------------	---	--

Description

This command allows the configuration of certain aspects of UE behaviour. It takes a function and a value that controls operation of that function.

Defined values

<function> UE function to configure
AUTOCONNECT

Control if the platform will automatically attempt to connect to the network after power-on or reboot. When enabled, will set+ CFUN=1 and read the plmn from the

SIM. It will use the APN provided by the network.

COMBINE_ATTACH
Enable/disable combine attach.

CELL_RESELECTION
Enable support for RRC cell reselection

ENABLE_BIP
Enable/disable bip.

MULTITONE
Enable/disable multitone. Need rf support multitone too if enable multitone.

NAS_SIM_POWER_SAVING_ENABLE
Enable/disable sim card power saving mode.

BARRING_RELEASE_DELAY
Time (in seconds) to delay release from barring. Value from 0-1800.
Should only be set when bar release timer not running.

RELEASE_VERSION
Release version, only 13 and 14 are supported. Could set to 13 only when MT don't use powerclass 6.

RPM
Enable/disable rpm,if RPM files present on SIM the SIM settings will have precedence

SYNC_TIME_PERIOD
The sync time period from eNB. Unit is hour, range 0-65535. 0 means close sync time.

IPV6_GET_PREFIX_TIME
Set the maximum time of getting IPV6 prefix. Unit is second, range 0-65535. 0 means to get IPV6 prefix immediately, 65535 close to get IPV6 prefix.

NB_CATEGORY
Configure the NB category. Only support 1 and 2 now.

RAI
Enable/Disable release assistance indication

HEAD_COMPRESS
Enable/Disable head compress.

RLF_UPDATE
"FALSE" represents the occurrence of radio link failure, NAS will TAU immediately.And "TRUE" representative when occurred radio link failure, ACK is expected before TAU.

CONNECTION_REESTABLISHMENT
Enable/Disable connection reestablishment.

PCO_IE_TYPE
Pco ie type. Support "PCO" and"EPCO".

CFB-609 Implementation

- CR_ functions are temporary and will be retired when no longer required.
- MULTITONE,NAS_SIM_POWER_SAVING_ENABLE,RELEASE_VERSION,SYNC_TIME_PERIOD,NB_CATEGORY, RAI,HEAD_COMPRESS, PCO_IE_TYPE could set only when MT is power off.

4.17. Set ID (+NTPERMID)

Migrate system identities into permanent storage. This is a temporary command that will be replaced with a production tool

Command	Response	Example
+NTPERMID=<sent>,<dest>	+CME ERROR:<err>	AT+NTPERMID=1,1 OK
+NTPERMID=?	+NTPERMID:(list of supported<sent>s),(list of	AT+NTPERMID=? +NTPERMID:(0,1),(1,2)

	supported<dest>s)	OK
--	-------------------	----

Description

Move serial number or IMEI into non-modifiable storage. This is either flash that can't be written or one-time-programmable storage that can never be erased.

Defined values

<snt> integer type indicating the serial number type that has been requested.

0 sets <sn>

1 sets the IMEI (International Mobile station Equipment Identity)

<dest>

1 permanent flash

2 one-time programmable storage

CFB-609 Implementation

- This command must be executed when the radio is inactive (AT+CFUN=0 will force this state).

4.18. Set ID (+NTSETID)

Set system identities. This is a temporary command that will be replaced with a production tool

Command	Response	Example
+NTSETID=<snt>,<data>	+CME ERROR:<err>	AT+NTSETID=1,123456789012345 OK

Description

Set uuid or IMEI value

Defined values

<snt> integer type indicating the serial number type that has been requested.

0 sets <sn>

1 sets the IMEI (International Mobile station Equipment Identity)

2 returns the SVN (Software Version Number)

<data>

0 <sn>

1 <imei>

2 <svn>

<sn>

The 128-bit UUID of the UE as a hexstring.

<imei>

15-character string type in decimal format

<svn>

2 digit SVN

CFB-609 Implementation

- The Serial Number and IMEI values assigned is persistent across reboots.
- SVN is not persistent and will default to 0x00.
- Need to send AT+NCDP to configure CDP Server again after set new IMEI. Otherwise, UE will use the old IMEI to connect with CDP Server.

4.19. Card Identification (+NCCID)

Command	Response	Example
+NCCID	+NCCID:<ICCID> +CME ERROR:<err>	AT+NCCID +NCCID:4412345678901234567 OK
+NCCID?	+NCCID:<ICCID> +CME ERROR:<err>	AT+NCCID? +NCCID:4412345678901234567 OK
+NCCID=?		AT+NCCID=? OK

Description

Both the execute and read commands read the ICCID off the SIM card. If no SIM card is present, or the SIM card is unreadable, no data is returned.

Refer to Chapter 6: Error Values for possible <err> values

Defined values

<ICCID> SIM Card Identification Number

CFB-609 Implementation

4.20. Set Supported Bands (+NBAND)

Command	Response	Example
+NBAND=n[,n[,n[...]]]	+CME ERROR:<err>	AT+NBAND=5,8 OK
+NBAND?	+NBAND:n[,n[,n[...]]]	AT+NBAND? +NBAND:5,8,28,3 OK
+NBAND=?	+NBAND:(n[,n[,n[...]]])	AT+NBAND=? +NBAND: (1,2,3,5,8,12,13,14,17,18,19,20,2 5,26,28,66) OK

Description

This command restricts the set of bands to be used. Refer to Chapter 6: Error Values for possible <err> values.

Defined values

<n> Band as a decimal number.

CFB-609 Implementation

- AT+NBAND=? returns the list of bands supported by the hardware
- +NBAND set could be execute only when MT is power off.

4.21. Set the mapping for band and power class (+NPOWERCLASS)

Command	Response	Example
+NPOWERCLASS =<band>,<power class>	+CME ERROR:<err>	AT+NPOWERCLASS=5,3 OK
+NPOWERCLASS?	[+NPOWERCLASS:<band> ,<power class><CR><LF>[+NPOW ERCLASS:<band>,<po wer class>][...]] +CME ERROR:<err>	AT+NPOWERCLASS? +NPOWERCLASS:5,3 OK
+NPOWERCLASS=?	+NPOWERCLASS:(list of supported <band>s),(list of supported <powerclass>s)	AT+NPOWERCLASS=? +NPOWERCLASS:(5,8,20),(3,5,6) OK

Description

Set the mapping for band and power class.

The read command list all mapping of bands and power class.

Refer to Chapter 6: Error Values for possible <err> values.

Defined values

<band> Configured band by +NBAND set.
<power class> Power class value for band.

CFB-609 Implementation

- <power class> only support 3, 5, 6 now.
- <power class> could set to 6 only when <function> "RELEASE_VERSION" in +NCONFIG is 14.
- Could set only when MT is power off.

4.22. Power saving mode status report(+NPSMR)

Command	Response	Example
+NPSMR=<n>	+CME ERROR:<err>	AT+NPSMR=0 OK
+NPSMR?	+NPSMR:<n>[,<mode>] +CME ERROR:<err>	AT+NPSMR? +NPSMR:1,1 OK
+NPOWERCLASS=?	+NPSMR:(list of supported <n>s)	AT+NPSMR=? +NPSMR:(0,1) OK

	+NPSMR:<mode>	+NPSMR:1
--	---------------	----------

Description

The set command controls the presentation of an unsolicited result code +NPSMR.

If <n>=1, +NPSMR: <mode> is sent from MT when the power mode of MT is changed.

The read command returns +NPSMR:<n> when <n> is 0, and return +NPSMR:<n>,<mode> when <n> is 1.

Test command returns supported values as a compound value.

Refer to Chapter 6: Error Values for possible <err> values.

Defined values

<n>: integer type

0 disable unsolicited result code

1 enable unsolicited result code +NPSMR: <mode>

<mode>: integer type; indicates the power mode of MT.

0 normal mode

1 power saving mode

CFB-609 Implementation

4.23. Paging time window value and eDRX setting (+NPTWEDRXS)

Command	Response	Example
+NPTWEDRXS=[<mode>,[<AcT-type>[,<Requested_Paging_time_window>[,<Requested_eDRX_value>]]]]	+CME ERROR: <err>	AT+NPTWEDRXS=1,5," 1110", " 0101" OK
+NPTWEDRXS?	[+NPTWEDRXS: <AcT-type>,<Requested_Paging_time_window>,<Requested_eDRX_value>[<CR><LF>+NPTWEDRXS: <AcT-type>,<Requested_Paging_time_window>,<Requested_eDRX_value>[...]]]	AT+NPTWEDRXS? +NPTWEDRXS:5," 1110", " 0101" OK
+NPTWEDRXS=?	+NPTWEDRXS: (list of supported <mode>s),(list of supported <AcT-type>s),(list of supported <Requested_Paging_time_window>s),(list of supported <Requested_eDRX_value>s)	AT+NPTWEDRXS=? +NPTWEDRXS:(0,1,2,3),(5), ("0000" - "1111") , ("0000" - "1111") OK

Description

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

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

A special form of the command can be given as + NPTWEDRXS =3. In this form, paging time window and eDRX will be disabled and data for all parameters in the command + NPTWEDRXS 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 paging time window and requested eDRX value as compound values.

Refer to Chapter 6: Error Values for possible <err> values

Defined values

<mode>: integer type, indicates to disable or enable the use of requested paging time window and 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 requested paging time window and eDRX

1 Enable the use of requested paging time window and eDRX

2 Enable the use of requested paging time window and eDRX and enable the unsolicited result code

+ NPTWEDRXP :<AcT-type> [,< Requested_Paging_time_window>]

[,<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. This AT-command 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_Paging_time_window>: string type; half a byte in a 4 bit format. The paging time window refers to bit 8 to 5 of octet 3 of the Extended DRX parameters information element (see subclause 10.5.5.32 of 3GPP TS 24.008 [8]). For the coding and the value range, see the Extended DRX parameters information element in 3GPP TS 24.008 [8] Table 10.5.5.32/3GPP TS 24.008.

<Requested_eDRX_value>: string type; half a byte in a 4 bit format. The eDRX value refers to bit 4 to 1 of octet 3 of the Extended DRX parameters information element (see subclause 10.5.5.32 of 3GPP TS 24.008 [8]). For the coding and the value range, see Extended DRX parameters information element in 3GPP TS 24.008 [8] Table 10.5.5.32/3GPP TS 24.008. The default value, if available, is manufacturer specific.

<NW-provided_eDRX_value>: string type; half a byte in a 4 bit format. The eDRX value refers to bit 4 to 1 of octet 3 of the Extended DRX parameters information element (see subclause 10.5.5.32 of 3GPP TS 24.008 [8]). For the coding and the value range, see Extended DRX parameters information element in 3GPP TS 24.008 [8] Table 10.5.5.32/3GPP TS 24.008.

<Paging_time_window>: string type; half a byte in a 4 bit format. The paging time window refers to bit 8 to 5 of octet 3 of the Extended DRX parameters information element (see subclause 10.5.5.32 of 3GPP TS 24.008 [8]). For the coding and the value range, see the Extended DRX parameters information element in 3GPP TS 24.008 [8] Table 10.5.5.32/3GPP TS 24.008.

CFB-609 Implementation

- <AcT-type> value 5 is supported.

4.24. Firmware Update (+NFWUPD)

Command	Response	Example
+NFWUPD=<cmd>[,<sn>,<len>,<data>,<crc>]	<result> +CME ERROR:<err>	AT+NFWUPD=0 OK
+NFWUPD=?	+NFWUPD:(list of supported <cmd>s)	AT+NFWUPD=? +NFWUPD:(0-5) OK

Description

This command supports Firmware Updating. It allows erase package zone, package download, checking package last validation result, package name and version querying and firmware upgrading.

Before upgrading firmware, it needs to erase package zone and download package first. After downloading finished, it sends firmware upgrading command. Then the system would reboot and validate the package, and if the package is legal, it would start to upgrade the firmware to new version, otherwise it would reboot and not to upgrade, then the user can check the package validation error information with corresponding AT command

Defined values

- <cmd> Package process command
- 0 Erase package zone in internal flash
 - 1 <sn>,<len>,<data>,<crc>
Download a package segment. Download a FOTA package. Package segments are continuous segments of the FOTA package. Segments should be length of 32/64/128/256/512, and must be provided in order.
 - 2 Get the package validation result of last updating
 - 3 Get package name
 - 4 Get package version
 - 5 Upgrade firmware
- <sn> Sequence number. It start with 0, and increments by one for each package segment.
- <len> Data length in bytes of data, should be 32/64/128/256/512.
- <data> Data to be transmitted in hexstring format,
- <crc> CRC of the package segment binary data. CRC is sent as a Hex String. The <crc> is an xor8 of each byte in the package segment.

CFB-609 Implementation

4.25. Configure AT Uart Baud Rate (+NATSPEED)

Command	Response	Example
+NATSPEED=<baud rate>,<timeout>,<store>,<sync mode>[,<stop bits>[,<parity>[,<xonxoff>]]]	+CME ERROR: <err>	AT+NATSPEED=9600,30,1,3,1,0,0 OK
+NATSPEED?	+NATSPEED:<baud rate>,<sync mode>,<stop bits>,<parity>,<xonoff>	AT+NATSPEED? +NATSPEED:9600,3,1,0,0 OK
+NATSPEED=?	+NATSPEED:(<baud rate>),(<timeout>),(<store>),(<sync mode>),(<stop bits>),(<parity>),(<xonxoff>)	+NATSPEED:(4800,9600,57600,115200,230400,460800),(0-30),(0,1),(0-3),(1,2),(0-2),(0,1) OK

Description

Configure AT uart baud rate.

Refer to Chapter 6: Error Values for possible <err> values

Defined values

- <baud rate> Integer type indicating the at uart baud rate that has been requested.
- <timeout> Integer type indicating the time to wait for communication before switching back to the original speed, unit second. Default value is 3 secondes. Max value is 30.
- <store> Integer type indicating parameter <baud rate> and <sync mode> store to nv or not. Default value is 0.
- 0 Do not store to nv, need configure again after reboot.
 - 1 Will store to nv, while there is interaction before timeout.
- <sync mode> The LP UART synchronises to each start bit that it detects and uses this to configure its optimum sampling point for each subsequent bit in a data word. The Sync Mode field allows this sampling point to be modified if required.
- 0 Default value for most operations

- 1 Sample later
- 2 Sample earlier
- 3 Sample even earlier
- <stop bits> The AT UART stop bits, default value is 1.
 - 1 1 stop bit
 - 2 2 stop bits
- <parity> The AT UART parity, default value is 0.
 - 0 No parity enabled
 - 1 Odd parity
 - 2 Even parity
- <xonxoff> AT UART Software (XON/XOFF) Flow Control
 - 0 Software flow control disabled
 - 1 Software flow control enabled

CFB-609 Implementation

- <baud rate> is higher than the fastest speed supported by the Low Power UART will disable Deep Sleep Low Power Operation.
- <sync mode> may be removed in a future release.
- <sync mode> don't support 3 when <baud rate> is 4800 and 57600

4.26. PIN operator (+NPIN)

Command	Response	Example
+NPIN=<command>,<parameter1>[,<parameter2>]	+CME ERROR:<err>	AT+NPIN=0,29102394 OK
	+NPIN:<npin result>	+NPIN:OK

Description

Set command is used to verify, change, enable, disable, or unblock pin. Will receive an unsolicited result when execute pin command is completed.

NOTE 1: SIM PIN, SIM PUK refer to the PIN of the selected application on the UICC. For example, in an UTRAN context, the selected application on the currently selected UICC should be a USIM and the SIM PIN then represents the PIN of the selected USIM. See 3GPP TS 31.101 [65] for further details on application selection on the UICC.

Refer to Chapter 6: Error Values for possible <err> values.

Defined values

<command>

- 0 <pin>
Verify pin.
- 1 <old pin>,<new pin>
Change pin.
- 2 <pin>
Enable pin
- 3 <pin>
Disable pin.
- 4 <puk>,<pin>
Unblock pin.

<pin>,<old pin>, <new pin> Decimal string format; <old pin> shall be the same as

password specified for the facility from the MT user interface or with command
 AT+NPIN=1,<old pin>, <new pin>
 and <new pin> is the new password; minimum length is 4, maximum length is 8.
 <puk> Decimal string format, string size is 8.
 <npin result> "OK"
 "ERROR PIN disabled"
 "ERROR PIN blocked"
 "ERROR wrong PIN <pin retries remaining>"
 "ERROR wrong format"
 "ERROR"
 <pin retries remaining> Decimal type, remaining PIN retries. If no retries left then PIN is blocked, need to input +npin=4,<puk>,<pin> to unblock pin.

CFB-609 Implementation

- Need send AT+CFUN=1 to power on MT first.

4.27. Neul Debug and Exception Log (+NXLOG)

Command	Response	Example
AT+NXLG=<Command>[, parameter]	[<report>] +CME ERROR:<err>	AT+NXLG=DUMP OK
AT+NXLG?	+NXLG:<log mode> +CME ERROR:<err>	AT+NXLG? AT+NXLG:1 OK
AT+NXLG=?	NXLG:(<list of supported commands>) +CME ERROR:<err>	AT+NXLG=? NXLG:(DUMP,DELETE,ENABLE,DISAB LE) OK

Description

NXLG provides an interface to debug and exception log. The debug log is defined for debug. The exception log stores all debug error message of verbosity ERROR. It allows the debug log to be enabled, disabled or cleared.

Refer to Chapter 6: Error Values for possible <err> values.

Defined values

<command>

DUMP <dump mode>

dump out the debug and exception log.

DELETE delete all debug and exception log data

ENABLE enable logging of debug data

DISABLE disable logging of debug data

<report> hexstring encoded debug and exception log when <dump mode> is 0.
 binary encoded debug and exception log when <dump mode> is 1.

<dump mode> dump mode, default value is 0.

0: dump over at port

1: dump over debug serial port

<log mode> log mode, default value is 0.

0: disable logging of debug data

1: enable logging of debug data

CFB-609 Implementation

<command>= DELETE / ENABLE/DISABLE and +NXLOG? could work only when using external flash.

4.28. Clear Stored Earfcn (+NCSEARFCN)

Command	Response	Example
+NCSEARFCN	+CME ERROR:<err>	AT+NCSEARFCN OK

Description

This command clear Stored Earfcn.

Refer to Chapter 6: Error Values for possible <err> values.

CFB-609 Implementation

Could execute only when MT is power off

4.29. IP address info Report(+NIPINFO)

Command	Response	Example
+NIPINFO=<n>	+CME ERROR:<err>	AT+NIPINFO=1 OK
+NIPINFO?	+NIPINFO:<n>	AT+NIPINFO? AT+NIPINFO:1 OK
+NIPINFO=?	+NIPINFO:(list of supported <n>s)	AT+NIPINFO=? +NIPINFO:(0,1) OK

Description

This command is used to report IP address information

The set command controls the presentation of an unsolicited result code .

If the IP address is obtained successfully, <failure_cause> will be omitted.

The format: +NIPINFO:<cid>,<IP_type>,<IP_addr>.

If it fails to obtain an IP address, <IP_addr> will be omitted.

The format: +NIPINFO:<cid>,<IP_type>,,<failure_cause>.

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

Test command returns supported parameter values.

Refer to Chapter 6: Error Values for possible <err> values.

Defined values

- <n>: integer type;
- 0 disable unsolicited result code (default value)
 - 1 enable unsolicited result code +NIPINFO:<cid>,<IP_type>,<IP_addr> [<failure_cause>]
- <cid>: integer type; specifies a particular PDP context definition (see the +CGDCONT and +CGDSCONT commands).
- <IP_type>: string type; specifies the type of IP address.
- IP Internet Protocol (IETF STD 5 [103])
 - IPV6 Internet Protocol, version 6
 - IPV4V6 Virtual <PDP_type> introduced to handle dual IP stack UE capability.
- <IP_addr>: string type; IP address. The IPV4 address is expressed in decimal numbers and dots, such as 100.1.0.26. IPV6 addresses are expressed in hexadecimal numbers and colon, such as 108F: 0: 0: 0: 8: 800:200C: 417A. This parameter is not displayed when the address acquisition failed
- <failure_cause>: integer type; Cause values for failed to get IP address
- 1 PDN type IPv4 only allowed
 - 2 PDN type IPv6 only allowed
 - 3 Single address bearers only allowed
 - 4 IPV6 RA timeout
 - 5 Unspecified

CFB-609 Implementation

4.30. Configure PDP context dynamic parameter items to read(+NCPCDPR)

Command	Response	Example
+NCPCDPR=<parameter>,<state>	+CME ERROR:<err>	AT+NCPCDPR=1,1 OK
+NCPCDPR	+NCPCDPR:<parameter>,<state> [+NCPCDPR:<parameter>,<state> [.]]	AT+NCPCDPR +NCPCDPR:0,1 +NCPCDPR:1,1 OK
+NCPCDPR=?	+NCPCDPR:(list of <parameter>s),(0,1)	AT+NCPCDPR=? +NCPCDPR:(0,1) OK

Description

This command allows the configuration of PDP context dynamic parameters request item. Refer to Chapter 6: Error Values for possible <err> values.

Defined values

- <parameter> Unsigned char format. Dynamic parameter to read
- 0 Get DNS Server IPv4 Address request.
 - 1 Get DNS Server IPv6 Address request.
- <state> PDP context dynamic parameter items read state.
- 0 Disable to get
 - 1 Enable to get

CFB-609 Implementation

- Could set only when power off

4.31. Query pending originating data list via the control plane (+NQPODCP)

Command	Response	Example
+NQPODCP	[+NQPODCP:[<sequence>[<sequence>...]]] +CME ERROR:<err>	AT+NQPODCP +QPODCP:1,2,3 OK
+NQPODCP=?	OK	AT+NQPODCP=? OK

Description

This command queries the pending originating data list via the control plane by MT.

Refer to Chapter 6: Error Values for possible <err> values.

Defined values

<sequence> The sequence of pending sending originating message. Range 1-255.

CFB-609 Implementation

4.32. Time update mode set (+NITZ)

Command	Response	Example
+NITZ=<mode>	+CME ERROR:<err>	AT+NITZ=1 OK
+NITZ?	+NITZ:<mode> +CME ERROR: <err>	AT+NITZ? +NITZ=1 OK
+NITZ=?	+NITZ:(list of supported <mode>s) +CME ERROR: <err>	AT+NITZ=? +NITZ:(0,1) OK

Description

Set time update mode.

If setting fails in an MT error, +CME ERROR: <err> is returned. Refer to Chapter 6 for possible <err> values.

Read command returns the current time update mode in the MT.

Test command returns supported time update modes

Defined values

<mode>: integer type value indicating
0 Update time via local.
1 Update time via NITZ.

CFB-609 Implementation

4.33. Request Manufacturer Hardware (+CGMH)

Command	Response	Example
+CGMH	CFB-609_V0.3	AT+CGMH CFB-609_V0.3 OK

Description

This command returns the manufacturer revision. The text is human-readable and is not intended for microcontroller parsing. By default it will return the hardware revision - release and build.

CFB-609 Implementation

4.34. Request Manufacturer Software (+CGMS)

Command	Response	Example
+CGMS	V150B300CTCCV0.3	AT+CGMS V150B300CTCCV0.3 OK

Description

This command returns the manufacturer revision. The text is human-readable and is not intended for microcontroller parsing. By default it will return the Software revision - release and build.

CFB-609 Implementation

4.35. Module PSM status changes or receives data notification (+RI)

Command	Response	Example
AT+RI=<status>	+CME ERROR:<err> OK	AT+RI=0 OK
AT+RI?	+RIENABLE:1 or +RIDISABLE:0 OK	AT+RI? +RIENABLE:1 OK

Description

After using RI function, RI pin(gpio15) will have a high level output of 120 ms when the module PSM has a state change or accepts downward data. Set command to control whether the RI function is enabled, 1 is enable RI function, 0 is disable RI function, Read Command to the RI function is enabled or not.

Defined values

<status> RI state 1:enable 0:disable

CFB-609 Implementation

5 Commands(Production and Configuration)

5.1. Execute a Radio Test Command (+NRDTEST)

Command	Response	Example
+NRDTEST=<len>,<data>	<response length>,<response> +CME ERROR:<err>	AT+NRDTEST=8,0000400213020000 OK
+NRDTEST=?		AT+NRDTEST=? OK

Description

This command will pass a binary encoded radio test command to the protocol core to be executed. It should only be used as instructed by HiSi.

Defined values

<length>	Decimal length of data to be sent in bytes.
<data>	Data to send in hexstring format.
<response length>	Length of response in bytes of binary data.
<response>	Data returned in hexstring format.

CFB-609 Implementation

- Couldn't use combine AT command with this command.

5.2. RF Config Control Commands (+NRDCTRL)

Command	Response	Example
+NRDCTRL=<cmd>	+CME ERROR:<err>	AT+NRDCTRL=RESET OK
+NRDCTRL=?	+NRDCTRL:(list of supported commands)	AT+NRDCTRL=? +NRDCTRL:(ACTIVATE,DEACTIVATE,RESET) OK

Description

Radio configuration control operations

Refer to Chapter 6: Error Values for possible <err> values.

Defined values

<command>	
ACTIVATE	LL1 activate
DEACTIVATE	LL1 deactivate
RESET	Reset radio configuration to idle

CFB-609 Implementation

- AT+NRDCTRL=ACTIVATE will take about 1s to complete.
- Should send AT+NRDCTRL= ACTIVATE first to activate RF

5.3. RF Config Set Command (+NRDSET)

Command	Response	Example
+NRDSET=<cmd>[,<arg1>[,<arg2>,...]]	+CME ERROR:<err>	AT+NRDSET=RIO,1,500 OK
+NRDSET?	[+NRDSET:<cmd>,<val1>[,<val2>...]]	AT+NRDSET?
+NRDSET=?	+NRDSET: {list of supported commands)	AT+NRDSET=? +NRDSET:(RIO,PIO,TONE,GAIN) OK

Description

Allow various states to be set to support Radio calibration tests. The read variant will return the current values.

Refer to Chapter 6: Error Values for possible <err> values.

Defined values

<command>	
RIO	<rio>,<mv> Set specified RIO pin to specified voltage.
PIO	<piomask> Set Radio PIOs for calibration tests
TONE	<frequency> Transmit a tone at a specific frequency for RF Transmit Calibration tests
GAIN	<tx_drive_level>,<tx_coarse_gain>,<rf_gain>,<mv> Set gain levels for RF TX configuration
<rio>	select RIO to be used This is the integer number of the RIO.
<mv>	voltage in mV. Integer value
<piomask>	bit mask specifying which PIOs are set. This is an '0x' prefixed hexstring that specifies upto 64 PIOs. Only the PIOs supported by the platform, starting at bit 0, will be used. Leading '0' characters can be omitted.
<frequency>	integer type indicating the frequency in Hz of the carrier to transmit (uint32 value)
<tx_drive_level>	Tx DAC drive level. Integer between 0 and 1023.
<tx_coarse_gain>	Coarse Analog Tx gain integer 0-3
<rf_gain>	RF gain setting interger 0-63.

CFB-609 Implementation

- AT+NRDSET? does not return values for RIO and TONE
- Should send AT+NRDCTRL= ACTIVATE first to activate RF

5.4. RF Config Execute Command (+NRDEXEC)

Command	Response	Example
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+NRDEXEC=<cmd>,<parameters>	[+NRDEXEC:<cmd>,<val1>[,<val2>.. ..]] +CME ERROR:<err>	AT+NRDEXEC=RXRSSI,1500,3,0 +NRDEXEC:RXRSSI,-32768,-32768 OK
+NRDEXEC=?	+NRDEXEC:(list of supported commands)	AT+NRDEXEC=? +NRDEXEC:(RXRSSI,TXTEST,TXVERIFY,RXVERIFY) OK

Description

Allow users to verify their design calibration and compensation tables..

Refer to Chapter 6: Error Values for possible <err> values.

Defined values

<cmd>	Command to execute
RXRSSI	Execute an RF Receive Calibration test Input: <frequency>,<gain_index>,<port> Output: <rss>,<snr>
TXTEST	Transmit a continuous test signal, either a tone (if num_sc is set to 0) or an NB-IOT signal using the specified subcarrier(s). All internal gains are set to zero, and front-end configuration is left in the idle state, ready to be set using AT+NRDSET commands. Input: <frequency>,<band>,<num_sc>[,<sc_index>] Output: OK or ERROR
TXVERIFY	Transmit a test signal, either a tone (if num_sc is set to 0) or an NB-IOT signal using the specified subcarrier(s). The gains and front-end settings used are read from the completed .cal file tables, based on the specified tx_power and band, temperature, voltage. Input: <frequency>,<band>,<temperature>,<voltage>,<tx_power>,<tx_duration>,<num_sc>[,<sc_index>] Output: OK or ERROR
RXVERIFY	verify Rx design calibration and compensation tables Input: <frequency>,<band>,<temperature>,<voltage>,<gain_index> Output: <rss>.<snr>.<cbm>
<frequency>	Integer type indicating the frequency to test at (uint32 Hz value)
<gain_index>	integer value 0-10, or 255 to let the chip's AGC select a gain setting.
<port>	Integer value 0 or 1, corresponding to the RX port.
<band>	EUTRA band number to use. Integer value 0-255
<temperature>	signed 16-bit integer, either the temperature to use in the lookup table,or -999 to use the on-chip temperature sensor.
<voltage>	signed 16-bit integer, either the battery voltage to use in the lookup table,or -999 to use the on-chip voltage measurement.

<tx_power>	TX power level in dBm. For TXTEST, the special value -99 tells the firmware not to read any power tables or FE timer tables from the calibration file, instead setting gains to zero ready to be modified by NRDSET commands.
<num_sc>	Number of subcarriers: 1, 3, 6, 12; or 0 to request a tone.
<sc_index>	Position of subcarrier (first subcarrier position if transmitting multiple carriers): 0-11 for num_sc = 1 0, 3, 6, 9 for num_sc = 3 0, 6 for num_sc = 6 0 for num_sc = 12 Ignored for num_sc = 0.
<tx_duration>	Duration of transmission in reference clock cycles
<rssi>	Gain of the receiver in centibels at the input of the DSP. Integer value.
<snr>	Signal to noise ratio in dB. Fixed point (Q7.8) value.
<cbm>	Received signal level in cBm.

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Should send AT+NRDCTRL= ACTIVATE first to activate RF

5.5. Read System Information (+NCHIPINFO)

Command	Response	Example
+NCHIPINFO=<cmd>	<result> +CME ERROR:<err>	AT+NCHIPINFO=ALL +NCHIPINFO:VBAT,1800 +NCHIPINFO:TEMP,25 OK
+NCHIPINFO=?		AT+NCHIPINFO=? +NTCHIPINFO:(ALL,VBAT,TEMP) OK

Description

Return system information, including temperature and battery voltage

Refer to Chapter 6: Error Values for possible <err> values.

Defined values

<cmd>	Command to execute ALL: return all data TEMP: current temperature in degrees C. VBAT: battery voltage in mV
<result>	Integer value corresponding to specified command.

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5.6. Calibrate Temperature Sensor (+NCALTEMPSENSOR)

Command	Response	Example
---------	----------	---------

+NCALTEMPSENSOR=<currenttemp>	+CME ERROR:<err>	AT+NCALTEMPSENSOR=32 OK
+NCALTEMPSENSOR=?		OK

Description

Calibrate temperature sensor by <current temp>.

Refer to Chapter 6: Error Values for possible <err> values.

Defined values

<current temp> current chip temperature to Calibrate in degrees C.

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6 Error Values

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

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

6.1 Overview

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 CFB-609 implementation.

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

6.2 General Errors (27.007)

Error Code	Error Text	Error Code	Error Text	Error Code	Error Text
3	Operation not allowed	4	Operation not supported	5	Need to enter PIN
23	Memory failure	30	No Network Service	50	Incorrect parameters
51	Command implemented but currently disabled	52	Command aborted by user	100	Unknown
159	Uplink Busy/Flow Control				

6.3 General Errors (27.005)

Error Code	Error Text	Error Code	Error Text	Error Code	Error Text
300	ME failure	312	PH-(U)SIM PIN required	321	invalid memory index
301	SMS service of ME reserved	313	U)SIM failure	322	memory full
302	operation not allowed	314	(U)SIM busy	330	SMSC address unknown
303	operation not supported	315	(U)SIM wrong	331	no network service
304	invalid PDU mode parameter	316	U)SIM PUK required	332	network timeout
305	invalid text mode parameter	317	U)SIM PIN2 required	340	no +CNMA acknowledgement expected
310	(U)SIM not inserted	318	U)SIM PUK2 required	311	(U)SIM PIN required
320	memory failure	340	no +CNMA acknowledgement expected	500	unknown error

6.4 specific error codes

Error Code	Error Text	Error Code	Error Text	Error Code	Error Text
512	Required parameter not configured	513	TUP not registered	514	AT Internal Error
515	CID is active	516	Incorrect State for Command	517	Cid is invalid
518	CID is not active	520	Deactive last active cid	521	Cid is not defined
522	Uart parity error	523	Uart frame error	524	Mt not power on
525	sent data sequence repeat error	526	at command abort error	527	command interrupted
528	configuration conflicts	529	FOTA is updating	530	Not the at allocated socket
531	SIM PIN is blocked	532	SIM PUK is blocked		

6.5 Possible Error Causes

Error Code	Error Text	Possible Causes
340	No +CNMA acknowledgement expected	Not support SMS when use +CNMA
512	Required parameter not configured	For AT+NCDP, if the IMEI is not set, the command will fail. AT+NTSETID=1 can be used to set IMEI.
513	TUP not registered	IMEI needs to be set. AT+NTSETID=1 can be used to set IMEI. The CDP IP address has not been set. AT+NCDP=<ip addr> to Set AT+NMSTATUS to query TUP status
515	CID is active	Disable CID prior to changing CID configuration
516	Incorrect State for Command	Some commands have to be executed in a specific order. Refer to the documentation for the specific command
517	Cid is invalid	Beyond the accepted range of cid values for +CSODCP set.
518	CID is not active	Deactivate the pdp context which is not active.
520	deactivate last active cid	For +CGACT, the protocol say: if an attempt is made to disconnect the last PDN connection, then the MT responds with error. Return this error code when deactivate last active cid,
521	Cid is not defined	Activate or deactivate cid which is not defined.
522	Uart parity error	The mismatch between setting and using for uart parity.
523	Uart frame error	Uart frame error.
524	MT not power on	Some command could only execute only when power on like +CIMI, otherwise will return ERROR:524
525	at command abort in processing	Send uart characters when MT is aborting at command
526	at command abort error	Abort blocking command error.
527	command interrupted	When start back ground search by +COPS=?, will start a protect timer. It will abort when timer timeout if back ground search not finished, then return this error code.
528	configuration conflicts	When send +NPOWERCLASS=<band>,6 to set powerclass 6 and the “RELEASE_VERSION” in +NCONFIG is 13 will return this error code because release 13 don’ t support powerclass 6
529	FOTA is updating	Send UDP/TCP data when FOTA is updating
530	not the at allocated socket	Send AT+NSOCL to close a socket which is not created.
531	SIM PIN is blocked	Continuously enter the wrong PIN 3 times.
532	SIM PUK is blocked	Continuously enter the wrong PUK 10 times.

7 Reset Reasons

If the Applications core rebooted for any reason apart from either being power cycled or being externally reset, it will return a message before the <CR><LF>Hisi<CR><LF>OK<CR><LF> message that indicates the reason for the reboot.

The list of possible reboot reasons are:

Reboot Message Displayed
REBOOT_CAUSE_SECURITY_RESET_UNKNOWN
REBOOT_CAUSE_SECURITY_SYSRESETREQ
REBOOT_CAUSE_SECURITY_WATCHDOG
REBOOT_CAUSE_SECURITY_SELF
REBOOT_CAUSE_SECURITY_ALTBOOT
REBOOT_CAUSE_SECURITY_REG_0
REBOOT_CAUSE_SECURITY_REG_3
REBOOT_CAUSE_SECURITY_STANDARD_CHIP_WATCHDOG
REBOOT_CAUSE_SECURITY_UPDATER_CHIP_WATCHDOG
REBOOT_CAUSE_SECURITY_SCAN_ENTER_EXIT
REBOOT_CAUSE_SECURITY_PMU_POWER_ON_RESET
REBOOT_CAUSE_SECURITY_RESET_PIN
REBOOT_CAUSE_SECURITY_REGIONS_UPDATED
REBOOT_CAUSE_SECURITY_FOTA_UPGRADE
REBOOT_CAUSE_PROTOCOL_SYSRESETREQ
REBOOT_CAUSE_PROTOCOL_WATCHDOG
REBOOT_CAUSE_PROTOCOL_MONITOR_REBOOT_REQ
REBOOT_CAUSE_PROTOCOL_RPC_TIMEOUT
REBOOT_CAUSE_APPLICATION_SYSRESETREQ
REBOOT_CAUSE_APPLICATION_WATCHDOG
REBOOT_CAUSE_APPLICATION_AT
REBOOT_CAUSE_APPLICATION_RPC_TIMEOUT
REBOOT_CAUSE_PROTOCOL_IMSI_UPDATE
REBOOT_CAUSE_UNKNOWN

8 Abort process

Some action commands that require time to execute may be aborted while in progress; these are explicitly noted in the description of the command. Aborting of commands is accomplished by the transmission from the DTE to the DCE of any character. A single character shall be sufficient to abort the command in progress; however, characters transmitted during the first 125 milliseconds after transmission of the termination character shall be ignored (to allow for the DTE to append additional control characters such as line feed after the command line termination character). To insure that the aborting character is recognized by the DCE, it should be sent at the same rate as the preceding command line; the DCE may ignore characters sent at other rates. When such an aborting event is recognized by the DCE, it shall terminate the command in progress and return an appropriate result code to the DTE, as specified for the particular command.

1. If command is blocking and abort is allowed.

Current command state	In 125 ms	Over 125ms	Over 125ms, current progressing command is abortable but protocol core current state is unabortable. (almost impossible)	aborting
React for sending any character	ignore	Start aborting process, return nothing	+CME ERROR:526	ignore

2. If command is blocking but abort is not allowed

	In 125 ms	Over 125ms
Send any characters	ignore	+CME ERROR:51

3. Abort return value.

Abort result	abort success	abort fail	abort when command complete
Return value	+CME ERROR: 52	+CME ERROR:526	Return origin command result

NOTE:

- Only +COPS=? is abortable now.
- If sent more than 1 character for abort over 125ms, only the first character is the abort character. Other character may treat as an at command string. So advice just send 1 character for abort character.

9 tcp and udp communication instances

9.1 udp communication instance

Step1: Create a udp client

command format: AT+NSOCR=DGRAM,17,1234

parameter: DGRAM: udp communications sockettype
17: Udp definition of standard network protocol
1234: Local listening ports, which may not be consistent with server ports but must ensure that the current port is not occupied

return value: 1 OK

return value description: 1 indicates a successful socket, not necessarily 1, but A number less than 7, used to identify the socket created this time, will be used later for sending and receiving printing

Step2: Send data to the specified udp server IP and server port

command format: AT+NSOST=1,115.28.215.130,1234,2,3031

parameter: 1: Used to indicate which socket was created (AT+NSOCR return value)
115.28.215.130: Udp server IP
1234: Udp server port
2: The length of data to be sent (in bytes)
3031: Byte stream of data to be sent (in hexadecimal form, here is the ask character 0,1)

return value: 1,2 OK

return value description: Socket 1 successfully sends 2 bytes of data

Step3: Ue receives prompt

command format: +NSONMI:1,22

parameter: 1: Socket 1 receives data
22: The data length is 22 bytes

explain: This instruction will be received in the terminal server when data is automatically printed out, prompting the user to get new data, you can call the corresponding instructions to read (didn't receive the message is don't have to call AT + NSORF print receiving data) if receive the two messages AT the same time, read only when the first message is received the second message prompt will be shown.

Step4: Ue prints the received data

command format: AT+NSORF=1,22

parameter: 1: Print the data received by socket 1
22: Print 22 bytes of data

return value:

1,115.28.215.130,1234,22,57656C636F6D65746F206D79207365727665722E0A00,0
OK

return value description: 1: Data received for socket 1
115.28.215.130: Udp server IP
1234: Udp server port
22: Number of bytes received
57656C636F6D65746F206D79207365727665722E0A00: data
0: How many bytes of data are unread in the next message

explain: The receiving data is displayed only when the terminal prompt prints a new message, and when no prompt is received, the instruction returns ok without data printing

Step5: Turn off the communication socket

command format: AT+NSOCL=1

parameter: 1: The communication socket to be closed

return value: OK

explain: To close the corresponding socket

Serial port printing for the overall process of udp instance (for reference only):

```
[16:35:25.160]发->◇at+nsocr=dgram,17,1234
□
[16:35:25.191]收<-◆
1
OK
[16:35:26.410]发->◇at+nsost=1,115.28.215.130,1234,2,3031
□
[16:35:26.481]收<-◆
1,2
OK
[16:35:30.788]收<-◆
+NSOIM:1,22
[16:35:36.289]发->◇at+nsorf=1,22
□
[16:35:36.398]收<-◆
1,115.28.215.130,1234,22,57656C636F6D65746F206D79207365727665722E0A00,0
OK
[16:35:40.024]发->◇at+nsocl=1
□
[16:35:40.039]收<-◆
OK
```

9.2 tcp communication instance

Step1: Create a tcp client

command format: AT+NSOCR=STREAM,6,19010

parameter: STREAM: tcp communications sockettype

6: tcp definition of standard network protocol

19010: Local listening ports, which may not be consistent with server ports but must ensure that the current port is not occupied

return value: 1 OK

return value description: 1 indicates a successful socket, not necessarily 1, but A number less than 7, used to identify the socket created this time, will be used later for sending and receiving printing

Step2: Establish a connection to the specified TCP server IP and port

command format: AT+NSOCO=1,116.30.220.255,19010

parameter: 1: Socket used to indicate which socket was created (the return value of AT+NSOCR)
116.30.220.255: tcp server IP
19010: tcp server port

return value: OK

description: Must fill in the correct server IP and port, or send data occurs after + NSOCLI: 1 the tip, the system will automatically close the socket, meet the print according to the back of the digital (for example, here is the 1) corresponding to the socket has been automatically closed, need to create a socket

Step3: Send data to the TCP server where the connection is established

command format: AT+NSOSD=1,3,303139

parameter: 1: Send data to socket 1
3: The length of data to be sent
303139: Byte stream of data to be sent (in hexadecimal form, here is the ask character 0,3,9)

return value: 1,3 OK

description: Socket 1 successfully sends 3 bytes of data

Step4: Ue receives prompt

command format: +NSONMI:1,20

parameter: 1: Socket 1 receives data
20: The data length is 20 bytes

explain: This instruction will be received in the terminal server when data is automatically printed out, prompting the user to get new data, you can call the corresponding instructions to read (didn't receive the message is don't have to call AT + NSORF print receiving data) if receive the two messages AT the same time, read only when the first message is received the second message prompt will be shown.

Step5: Ue prints the received data

command format: AT+NSORF=1,20

parameter: 1: Print the data received by socket 1
20: Print 20 bytes of data

return value:
1,116.30.220.255,19010,20,49204C6F7665205169516920466F726576657221,0
OK

return value description: 1: Data received for socket 1
116.30.220.255: tcp server IP
19010: tcp server port
20: Number of bytes received
49204C6F7665205169516920466F726576657221: data
0: How many bytes of data are unread in the next message

explain: The receiving data is displayed only when the terminal prompt prints a new message, and when no prompt is received, the instruction returns ok without data printing

Step6: Turn off the communication socket

command format: AT+NSOCL=1

parameter: 1: The communication socket to be closed

return value: OK

explain: To close the corresponding socket

Serial port printing for the overall process of tcp instance (for reference only):

```
[16:57:11.306]发→◇AT+NSOCR=STREAM,6,19010
□
[16:57:11.338]收←◆
1
OK
[16:57:15.416]发→◇AT+NSOCO=1,116.30.220.255,19010
□
[16:57:15.463]收←◆
OK
[16:57:21.448]发→◇AT+NSOSD=1,3,303139
□
[16:57:21.495]收←◆
1,3
OK
[16:57:30.449]收←◆
+NSONMI:1,20
[16:57:35.371]发→◇at+nsorf=1,20
□
[16:57:35.481]收←◆
1,116.30.220.255,19010,20,49204C6F7665205169516920466F726576657221,0
OK
[16:57:47.123]发→◇AT+NSOCL=1
□
[16:57:47.138]收←◆
OK
```