FM350
AT Commands User Manual

V2.10

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Do not operate wireless communication products in areas where the use of radio is not recommended without proper equipment certification. These areas include environments that may generate radio interference, such as flammable and explosive environments, medical devices, aircraft or any other equipment that may be subject to any form of radio interference.

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Wireless communication devices do not guarantee effective connection under any circumstances, such as when the (U) SIM card is invalid or the device is in arrears. In an emergency, please use the emergency call function when the device is turned on, and ensure that the device is located in an area with sufficient signal strength

Contents

Change History

V2.10 (2023-07-04)	Updated the Defined Values description <rat> and <ant_bitmap> in AT+BODYSARCFG and AT+GTTASCFG
V2.9 (2023-06-13)	Modify AT+GTTASSTATE Defined Values
V2.8 (2022-05-23)	Add +GTLOCKCAR
	Add +GTESIMCFG
	Add +GTSAR3DBFB
	Add Carrier ID
V2.7 (2022-02-24)	Change +CESQ
	Add +CEMODE description
	Add +GTTASPLMN
	Modify +GTCAINFO/+GTTASEN/+GTTASRULE/
	+GTTASON
V2.6 (2021-07-23)	Update +CPBS
V2.5(2021-06-28)	Add SAR Debugging Note
V2.4 (2021-06-11)	Change TA-SAR commands
V2.3 (2021-05-26)	Change AT+GTSENRDTEMP
V2.2 (2021-02-22)	Change the version to V2.2.
V2.1 (2021-02-03)	Update at+cops=3,3 for mantis:0069249
V2.0 (2021-01-26)	CSCON add <state> 0xff as Unknown
V1.9 (2021-01-18)	Add at commands for new function TA-SAR .
V1.8 (2021-01-13)	Add ss_rsrq/ss_rsrp/ss_sinr for 5G in +CESQ
V1.7 (2020-12-24)	ADD FCC lock commands, Tunable Antenna commands,

thermal commands and TX power command

V1.6 (2020-12-08)   Update +CSCON as latest 27007

V1.5 (2020-11-20)   Modify +GTFMODE and ADD +GTTHERMAL

V1.4 (2020-11-19)   Add +GTACT/ +GTCCINFO/ +GTCAINFO/ +GTDNS

V1.3 (2020-09-24)   Modify as the reviewer's suggestion

V1.2 (2020-09-24)   Add the hardware and platform AT commands

V1.1 (2020-09-15)   Modify as the reviewer's suggestion

V1.0 (2020-09-10)   Initial version

1 Preface

1.1 Manual Scope

This manual introduces the AT commands set of Fibocom family products, and describes how the users can communicate with the devices using these commands. It describes the specification of syntax and parameters of the listed AT commands.

1.2 Target Audience

This manual is intended for the developers who need to communicate with the Fibocom family devices using the AT commands.

2 Introduction to AT Commands

2.1 AT Commands Overview

AT commands are sets of commands used for communication with the cellular modem. AT commands are comprised of assemblies of ASCII characters which start with the "AT" prefix (except the commands A/ and +++). The AT prefix is derived from the word Attention, which asks the modem to pay attention to the current request (command).

AT commands are used to request services from the cellular modem, such as:

1.   Call services: dial, answer and hang up

2.   Cellular utilities: send/receive SMS

3.   Modem profiles: Auto Answer

4.   Cellular Network queries: GSM signal quality

2.2 General System Abbreviations

The basic system configuration contains a modem and a terminal.

The Fibocom family is the modem unit and may be referred to as the DCE or TA, such as the phone, the mobile or the radio.

The terminal (PC or MCU) may be referred to as the DTE or the TE.

2.3 AT Commands Protocol

The AT commands interface is basically a Modem Services upon Request.

Communication (almost) always begins from the TE side. This means that any service should be requested from the TE. Thus, a request is called a "Command".

Each command must be answered by a "Results code" from the TA. The results code reports the command status to the TE. Some commands may include several "Results code"

to send data back to the TE. Some commands may initiate a mode in which, when specified events are generated in the modem, "Indicator" messages are sent data asynchronously. The "indicators" can be called "Unsolicited results code".

The Modem can echo characters received from the TE (commands) back to the TE.

TE   TA
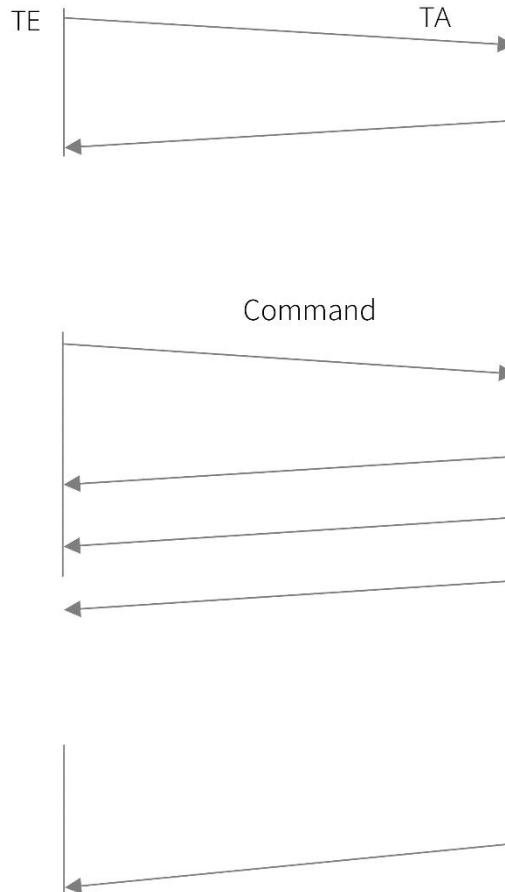
Command

2.4 AT Commands Structure

2.4.1 General Symbols Used in AT Commands Description

The following syntax definitions apply in this chapter:

Syntax	Definition
<CR>	Carriage returns character, specified by the value of the S3-register.
<LF>	Line-feed character, specified by the value of the S4-register.

<…>	Name enclosed in angle brackets is a syntax element. The brackets themselves do not appear in the command line.
[...]	Optional sub-parameter of a command or an optional part of terminal information response, enclosed in square brackets. The brackets themselves do not appear in the command line. When the sub-parameter is not provided in the parameter type commands, the new value equals its previous value. In action type commands, the action should be performed on the basis of the recommended default setting of the sub-parameter.
//	Denotes a comment, and should not be included in the command.

2.4.2 Command Structure

Each AT command has the "AT" or "at" prefix string (except the commands A/ and +++).

Each AT command has the suffix <CR> (except the commands A/ and +++).

Example:

```
AT+CSQ<CR>
ATS24?<CR>
```

An AT command line may contain one or more commands. Delimiters are used to separate the commands from each other. The delimiter is either a semicolon ";" or none, meaning space (basic commands).

Example:

```
ATS0=1V1Q0E0<CR>
AT+IFC=0,0;+ICF=3,4;+CNMI=2,1,0,0,0<CR>
```

2.4.3 Results Code Structure

By default, the Modem responds with verbose response codes. The results code prefix is

<CR><LF>. The results code suffix is <CR><LF>.

Example:

```
<CR><LF>+CSQ: 99,99<CR><LF>

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

The unsolicited results code is same as the Results code.

> **i** The <CR> and <LF> characters are not explicitly presented in the response format in this document.
>
> To reduce the print length the empty line in actual response may be removed in the examples.

2.5 Command Syntax

Execute command syntax	AT+xxx
	ATxxx
	ATxxx;
Parameter set command syntax	AT+xxx=<Value>
	ATxxx=<Value>
Parameter read Command syntax	AT+xxx?
	ATxxx?
Parameter test Command syntax	AT+xxx=?
	ATxxx=?

<Value> consists of either a numeric constant or a string constant. <compound_value> consist of several <value> parameters separated by commas.

Example of compound_value: <value1>, <value2>,…,<valueN>

Numeric Constants

Numeric constants are expressed in decimal, hexadecimal, or binary form. In the Modem, the definition of each command specifies which form is used for values associated with that command.

String Constants

String constants consist of a sequence of characters, bounded at the beginning and end by the double-quote character (").

3 Modem Information

These commands allow user to query the type of device that is attached, the technology used in the device, as well as basic operating information about the modem unit.

3.1 +CGMI, Request Manufacturer ID

Description

This command displays the manufacturer identification. The modem unit outputs a string containing manufacturer identification information.

Syntax

Command	Possible Response
+CGMI	\<manufacturer\> OK
+CGMI?	+CGMI: "\<manufacturer\>" OK
+CGMI=?	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

\<manufacturer\>: One or more lines of information text related to the manufacturer.

3.2 +GMI, Request Manufacturer ID

Description

This command displays manufacturer identification. The modem unit outputs a string containing manufacturer identification information.

Syntax

Command	Possible Response
+GMI	\<manufacturer\> OK
+GMI?	+GMI: "\<manufacturer\>" OK
+GMI=?	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

\<manufacturer\>: One or more lines of information text related to the manufacturer.

3.3 +CGMM, Request Model ID

Description

This command requests the model identification. The modem outputs a string containing information about the specific model, including a list of the supported technology used, and the particular model number.

Syntax

Command	Possible Response
+CGMM	\<model\>

	OK
+CGMM?	+CGMM: "<model>","<model abrev>" OK
+CGMM=?	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<model>: Information text related to the model identification.

<model abrev>: Short name related to the model identification.

3.4 +GMM, Request Model ID

Description

This command requests the model identification. The modem outputs a string containing information about the specific model, including a list of the supported technology used, and the particular model number.

Syntax

Command	Possible Response
+GMM	<model> OK
+GMM?	+GMM: "<model>","<model abrev>" OK
+GMM=?	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<model>: Information text related to the model identification.

<model abrev>: Short name related to the model identification.

3.5 +CGMR, Request Revision

Description

This command requests the revision identification. The modem outputs a string containing the revision identification information of the software running in the device.

Syntax

Command	Possible Response
+CGMR	<revision> OK
+CGMR?	+ CGMR: "<revision>" OK
+CGMR=?	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<revision>: One or more lines of information text related to the software revision.

3.6 +GMR, Request Revision

Description

These commands request the revision identification. The modem outputs a string containing the revision identification information of the software version contained within the device.

Syntax

Command	Possible Response
+GMR	<revision> OK
+GMR?	+ CGMR: "<revision>" OK
+GMR=?	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<revision>: One or more lines of information text related to the software revision.

3.7 +CGSN, Request Product Serial Number Identification

Description

This command displays the product serial number identification IMEI (International Mobile Equipment Identification). It can be used even when the SIM card is not inserted.

Syntax

Command	Possible Response
+CGSN[=<snt>]	When <snt>=0 (or omitted) and command successful: <imei> When <snt>=1 and command successful: +CGSN: <imei> When <snt>=2 and command successful: +CGSN: <imeisv> When <snt>=3 and command successful: +CGSN: <svn> Or +CME ERROR: <err>
+CGSN?	+CGSN: "<imei>" OK
+CGSN=?	When TE supports <snt> and command successful: +CGSN: (list of supported <snt>s) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

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

0   returns the IMEI (International Mobile station Equipment Identity)

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)

<imei>: Decimal format indicating the IMEI; IMEI is composed of Type Allocation Code (TAC) (8 digits), Serial Number (SNR) (6 digits) and the Check Digit (CD) (1 digit). Character set used in <imei> is as specified by command Select TE Character Set +CSCS.

<imeisv>: Decimal format indicating the IMEISV; The 16 digits of IMEISV are composed of Type Allocation Code (TAC) (8 digits), Serial Number (SNR) (6 digits) and the software version (SVN) (2 digits).

<svn>: Decimal format indicating the current SVN which is a part of IMEISV; This allows identifying different software versions of a given mobile.

3.8 +GSN, Request Product Serial Number Identification

Description

This command displays the product serial number identification IMEI (International Mobile Equipment Identification). It can be used even when the SIM card is not inserted.

Syntax

Command	Possible Response
+GSN[=<snt>]	When <snt>=0 (or omitted) and command successful: <imei> When <snt>=1 and command successful: +CGSN: <imei> When <snt>=2 and command successful: +CGSN: <imeisv>

	When <snt>=3 and command successful:
	+CGSN: <svn>
	Or
	+CME ERROR: <err>
+GSN?	+CGSN: "<imei>"
	OK
+GSN=?	When TE supports <snt> and command successful:
	+CGSN: (list of supported <snt>s)
	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

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

0   returns the IMEI (International Mobile station Equipment Identity)

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)

<imei>: Decimal format indicating the IMEI; IMEI is composed of Type Allocation Code (TAC) (8 digits), Serial Number (SNR) (6 digits) and the Check Digit (CD) (1 digit). Character set used in <imei> is as specified by command Select TE Character Set +CSCS.

<imeisv>: Decimal format indicating the IMEISV; The 16 digits of IMEISV are composed of

Type Allocation Code (TAC) (8 digits), Serial Number (SNR) (6 digits) and the software version (SVN) (2 digits).

<svn>: Decimal format indicating the current SVN which is a part of IMEISV; This allows identifying different software versions of a given mobile.

3.9 +CIMI, Request IMSI

Description

This command displays the International Mobile Subscriber Identity number.

Syntax

Command	Possible Response
+CIMI	<IMSI> OK or: ERROR
+CIMI?	+CIMI: <IMSI> OK or: ERROR

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
Yes	No	Yes	Yes	< 1s

Defined Values

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

e.g. 314566320021400

3.10 +CNUM, Request MSISDN(s)

Description

This command displays up to 2 strings of text information that identify the modem. The output string contains double quotes. On SIM cards that have EFmsisdn file, the string(s) returned are the MSISDN numbers and their associated data. On SIM cards that don't have EFmsisdn file, the strings returned are the MSISDN numbers and their associated data stored in Modem NVM.

Syntax

Command	Possible Response
+CNUM	+CNUM: [<alpha1>],<number1>,<type1>[,<speed>,<service>[,<itc>]] [<CR><LF>+CNUM: [<alpha2>],<number2>,<type2>[,<speed>,<service>[,<itc>]] [...]] or ERROR
+CNUM?	+CNUM: [<alpha1>],<number1>,<type1>[,<speed>,<service>[,<itc>]] [<CR><LF>+CNUM: [<alpha2>],<number2>,<type2>[,<speed>,<service>[,<itc>]] [...]] or ERROR
+CNUM=?	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
Yes	No	Yes	Yes	< 1s

Defined Values

<alphax>: optional alphanumeric string associated with <numberx>; used character set should be the one selected with command Select TE Character Set +CSCS

<numberx>: string type phone number of format specified by <typex>; e.g. 19912345011

<typex>:   integer type;

129 ISDN / telephony numbering plan, national / international unknown

145   ISDN / telephony numbering plan, international number

161 ISDN / telephony numbering plan, national number

128 – 255 Other values refer 3GPP TS 24.008 subclause 10.5.4.7

<speed>: integer type, same as <speed> defined in CBST commands

<service>: integer type (service related to the phone number)

0   asynchronous modem

1   synchronous modem

2   PAD Access (asynchronous)

3   Packet Access (synchronous)

4   voice

5   fax

all other values below 128 are reserved by the present document

<itc>: integer type (information transfer capability)

0   3,1 kHz

1   UDI

3.11 +CCID, Request Integrate Circuit Card Identity

Description

This command returns the card identification number in SIM (SIM file EFICCID, see GSM 11.11 Chap.10.1.1) as string type.

Syntax

Command	Possible Response
+CCID	+CCID: <ID> OK or ERROR
+CCID?	+CCID: <ID> OK or ERROR
+CCID=?	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<ID>: string type; Integrate Circuit Card Identity (string without double quotes); e.g.

89860018190839008096

3.12 +ICCID, Request Integrate Circuit Card Identity

Description

This command returns the card identification number in SIM (SIM file EFICCID, see GSM 11.11 Chap.10.1.1) as string type.

Syntax

Command	Possible Response
+ICCID	+ICCID: <ID> OK or ERROR
+ICCID?	+ICCID: <ID> OK or ERROR
+ICCID=?	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<ID>: string type; Integrate Circuit Card Identity (string without double quotes); e.g. 89860018190839008096

3.13 +EID, Query the EID

Description

This command is used for querying the EID value of eSIM.

1)The EXCUTE and READ command is for retrieving the EID information cached by the modem.

> Note: The EID is the eUICC identifier used in the context of Remote Provisioning and Management of the eUICC. The EID shall always be 32 digits long and defined in SGP.02.

Syntax

	Command	Possible Response
EXCUTE command	+EID	+EID: <slot#_eid> OK or ERROR
READ command	+EID?	+EID: <slot#_eid> OK or ERROR
TEST command	+EID=?	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration

Yes	No	Yes	Yes	< 1s

Defined Values

<slot#_eid> :

String type - Decimalism representation of the EID content. For any reason this information is not available, the modem will return the empty string.

Example:

```
AT+EID

+EID: "89033023425110000000000970924933"

OK

AT+EID?

+EID: "89033023425110000000000970924933"

OK

AT+EID=?

OK
```

3.14 +CLAC, List of All Available AT Commands

Description

This command prints out all AT Commands supported by the Modem.

Syntax

Command	Possible Response
+CLAC	<ATx> OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 2s

Defined Values

<ATx>: Available AT commands; e.g. ATS or ATD or ATA and so on

3.15 +SIMTYPE, Read Current SIM Type

Description

This command is used to read sim type, which is Identify ESIM or USIM.

Syntax

Command	Possible Response
+SIMTYPE?	+SIMTYPE: <value> OK or ERROR

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	Yes	< 1s

Defined Values

<value>: integer type;

0: USIM(default value)

1: ESIM

3.16 +CFSN, Request Factory Serial Number

Description

This command is used to read the factory serial number.

Syntax

Command	Possible Response
+CFSN	+CFSN: "<FSN>" OK or ERROR
+CFSN?	+CFSN: "<FSN>" OK
+CFSN=?	ERROR

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	Yes	< 1s

Defined Values

<FSN>: string type;

10-char string that can be <A-Z> or <0-9> characters or both; e,g. "1234567890"

3.17 +GTGATR, Get Answer to Reset (ATR) Info

Description

This command retrieve the ATR information cached by the modem, If SIM is not present, the modem will return the corresponding +CME ERROR. For other Sim errors, the modem should yet send the ATR information, if available.

Note:

The ATR is information presented by the SIM to the ME at the beginning of the card session and gives operational requirements. The ATR is the first string of bytes sent from the UICC to the terminal after a reset has been performed. The ATR is defined in ISO/IEC 7816-3 [11]. The Answer to Reset consists of at most 33 characters. The card session is the link between the card and the external world starting with the ATR and ending with a subsequent reset or a deactivation of the card. Procedures can be initiated by terminal based on the operational requirements received in ATR.

Syntax

Command	Possible Response
+GTGATR	+GTGATR: "<ATRInfo>" OK or ERROR
+GTGATR?	+GTGATR: "<ATRInfo>" OK or ERROR
+GTGATR=?	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<ATRInfo> :String type;

Hexadecimal representation of the ATR content. For any reason this information is not available, the modem will return the empty string.

3.18 I, Request Identification Information

Description

This command displays various FM350 information items.

Syntax

Command	Possible Response
ATI[<n>]	<information item n> OK or ERROR

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

\<n\> : integer type

0:     software build time

1:     "Reserve"

2:     "Reserve"

3:     Product name

4:     "Reserve"

5:     Platform name

6:     "Reserve"

7:     Product name

8:     software version

9:     hardware version

3.19 +GTAPPVER, Query sAP Firmware Version

Description

This command is used to query sAP firmware version.

Syntax

Command	Possible Response
+GTAPPVER	\<Ver_info\> OK
+GTAPPVER?	+GTAPPVER: "\<Ver_info\>" OK
+GTAPPVER=?	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

< Ver_info >: string type;

Example: FM350.0000.01.01.01

3.20 +GTBASELINEVER, Request Baseline Version

Description

This command requests the baseline version information. The modem outputs a string containing the baseline version information of the software running in the device.

Syntax

Command	Possible Response
+GTBASELINEVER	<AP_baseline version> <MD_baseline version> OK
+GTBASELINEVER?	+GTBASELINEVER: "<AP_baseline version>" +GTBASELINEVER: "<MD_baseline version>" OK
+GTBASELINEVER=?	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration

Yes	No	Yes	Yes	< 1s

Defined Values

< AP_baseline version>: string type;

Example: gem-dev-17.01-m70_20200612_070102_45

< MD_baseline version>: string type;

Example:MOLY.VMOLY.M70.19NOV.DEV.W20.24.P3

3.21 +GTPKGVER, Request Firmware Package Version

Description

This command requests the firmware package revision identification. The modem outputs a string containing the revision identification information of the release package version contained within the device. The package contains one or more firmware; they have their own version number. Each firmware supports one or more operators.

Syntax

Command	Possible Response
+GTPKGVER	<package version> OK
+GTPKGVER?	+GTPKGVER: "<package version>" OK
+GTPKGVER=?	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<package vision>: string type

A string of the release firmware package version, it's different from the version requested by +CGMR.

3.22 +GTMCFWVER, Request Firmware Original Version

Description

This command requests the revision identification. The modem outputs a string containing the original revision identification information of the software running in the device.

Syntax

Command	Possible Response
+GTMCFWVER	<original revision> OK
+GTMCFWVER?	+GTMCFWVER: "<original revision>" OK
+GTMCFWVER=?	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<original revision>: One or more lines of information text related to the software revision.

3.23 +GTCUSTPACKVER, Get Current Operator Image Version

Description

This command requests the current operator image version information of the module.

Syntax

Command	Possible Response
+GTCUSTPACKVER	<op_image version> OK
+GTCUSTPACKVER?	+GTCUSTPACKVER: "<op_image version>" OK
+GTCUSTPACKVER=?	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<op_image version>: string type

Which shows the carrier id and customized version information of the current software in the module.

This version information also represents the operator image version.

3.24 +GTCFGELEMVER, Get Current Customized Image Version

Description

This command requests the current customized image version information of the module.

Syntax

Command	Possible Response
+GTCFGELEMVER	<cust_image version> OK
+GTCFGELEMVER?	+GTCFGELEMVER: "<cust_image version>" OK
+GTCFGELEMVER=?	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<cust_image version>: string type

Which shows the customer id and customized version information of the current software in the module. This version information also represents the customized image version.

3.25 +GTCUSTDATAVER, Get Current Device Parameters Image Version

Description

This command requests the current device parameters image version information of the module.

Syntax

Command	Possible Response
+GTCUSTDATAVER	<dev_image version> OK
+GTCUSTDATAVER?	+GTCUSTDATAVER: "<dev_image version>" OK
+GTCUSTDATAVER=?	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<dev_image version>: string type

This version information represents the device parameters image version.

3.26 +GTCURCAR, Get Current Carrier ID and Carrier Name

Description

This command requests the current carrier id and carrier name.

Syntax

Command	Possible Response
+GTCURCAR	+GTCURCAR:\<carrier id>,"\<carrier name>" OK
+GTCURCAR?	+GTCURCAR:\<carrier id>,"\<carrier name>" OK
+GTCURCAR=?	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

\<carrier id>: integer type

Each network operator has a carrier id which is defined by fibocom it's self.

\<carrier name>: string type

Which shows the operator name such as "China Mobile", "China Telecom"," Verizon", etc.

3.27 +GTLOCKCAR, Configure Carrier Lock Mode

Description

This command is used to configure the carrier lock feature, read the current carrier lock feature status, and disable this feature.

The set command is used to enable or disable the carrier lock feature.

The read command returns the currently carrier lock mode and carrier ID.

The test command returns the currently available parameters and ranges.

Syntax

Command	Possible Response
+GTLOCKCAR=<lockmode>,<carrier_id>	OK or ERROR
+GTLOCKCAR?	+GTLOCKCAR: <lockmode>,<carrier_id> OK
+GTLOCKCAR=?	+GTLOCKCAR: (0,1),(1-65535) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<lockmode>: integer type

- 0: Disable carrier lock feature

- 1: Enable carrier lock feature

The carrier lock feature is disable by default.

<carrier_id>: integer type

Ranges: (1-65535). The default carrier id is 65535.

Each network operator has a carrier id which is defined by fibocom. (Refer to section 22

Carrier ID)

3.28 +GTESIMCFG, Configure ESIM Function

Description

Some operators/regulators (such as AT&T, Turkey, CMCC) restrict the ESIM function during system certification / supervision. Therefore, customers need to disable ESIM function in some operators/regulators.

This command is used to modify the function configuration of ESIM to meet the needs of customers: In some operators / regulators, disable ESIM function.

Syntax

Command	Possible Response
+GTESIMCFG=<global>,<SKU_based>, <IMSI_based>	OK Or Error
+GTESIMCFG?	+GTESIMCFG=<global>,<SKU_based>, <IMSI_based> OK
+GTESIMCFG =?	+GTESIMCFG: (0,1), (0,1), (0,1) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

Priority: Global > SKU based > IMSI based

<global>: integer type

- 0: Enable ESIM feature (default value)

- 1: Disable ESIM feature

The ESIM feature is enable by default.

<SKU_based>: integer type

- 0: Disable based on SKU ID restrict ESIM feature (default value)

- 1: Enable based on SKU ID restrict ESIM feature

<IMSI_based>: integer type

- 0: Disable based on IMSI ID restrict ESIM feature (default value)

- 1: Enable based on IMSI ID restrict ESIM feature

4 Modem Control Commands

The modem holds certain data items in selected memory space, named Software Registers (S-registers) and Modem Registers. Some of these registers are used as bitmaps, where one register holds more than one data item. All S-registers can be accessed using the S command, described in "S, Bit Map Registers". Some registers can also be accessed using dedicated commands, detailed below.

4.1 E, Command Echo

Description

This command defines whether input characters are echoed to output. If so, these characters are echoed at the same rate, parity and format at which they were received.

Syntax

Command	Possible Response
ATE<n>	OK or: +CME ERROR: <err>
ATE?	<value> OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<n>: integer type

0   Does not echo characters

1   Echoes characters

<value>: integer type

000 Does not echo characters

001 Echoes characters; Default value

Note: if without parameter, it means <value>=0.

4.2 +CFUN, Set Phone Functionality

Description

This command is used to select the level of functionality <fun> in the modem.

Syntax

Command	Possible Response
AT+CFUN=<fun>[,<rst>]	OK or: +CME ERROR: <err>
AT+CFUN?	+CFUN: <power mode>,<STK_mode> OK or +CME ERROR: <err>
AT+CFUN=?	+CFUN: (list of supported <fun>s),(list of supported<rst>s) OK or

+CME ERROR: <err>

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<fun>: integer type;

0   Minimum functionality (Switch off MS and make detach procedure).

1   Full functionality. Enable the transmit and receive RF circuits for all supported radio access technologies (Online mode).

4   Disable both MT transmit and receive RF circuits (Airplane mode).

5   Factory Test Mode

6   Enable SIM STK and Fetching of proactive Commands.

7   Disable SIM STK and enable Fetching of proactive Commands.

8   Disable Fetching of proactive Commands.

15   Reset

Note 1: <rst> is not supported when <fun> = 15

Note 2: When <fun> value is 0 or 15, the OK response may be missed due to race condition

Note 3: The <fun> value whether is persistent or not depends on the implementation of target products.

<rst>: integer type;

0   Do not reset the MT before setting it to <fun> power level

1   Reset the MT before setting it to <fun> power level

<power_mode>: integer type;

1   MS is switched on.

2   Invalid Mode.

4   Airplane Mode.

<STK_mode>: integer type

0   Inactive state (default).

6   Enable SIM STK and Fetching of proactive Commands.

7   Disable SIM STK and enable Fetching of proactive Commands

8   Disable Fetching of proactive Commands.

4.3 +GTDUALSIM, for Dual SIM Switch

Description

This command is used to switch operate SIM card.

AT+GTDUALSIM? is used to read the current operate SIM card information.

AT+GTDUALSIM is used to read all the available operate SIM card information, if device is configured as Dual SIM mode, return two sim information, else if device is configured as Single SIM mode, return one sim information.

Syntax

Command	Possible Response
AT+GTDUALSIM=<sim_app>	OK or:

	ERROR
AT+GTDUALSIM?	+GTDUALSIM:<sim_app>,<sub_app>,<sys_mode> OK
AT+GTDUALSIM	+GTDUALSIM: <sim_app>,<sub_app>,<sys_mode>[<CR><LF> +GTDUALSIM:<sim_app>,<sub_app>,<sys_mode>] OK
AT+GTDUALSIM=?	+GTDUALSIM:(list of support <sim_app>) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	Yes	< 1s

Defined Values

<sim_app>: integer type; operate sim card id, Parameter range is (0,1).

0   SIM1(default)

1   SIM2

<sub_app>: string type; display the subscribe app id.

SUB1   subscribe id 1

SUB2   subscribe id 2

<sys_mode>: string type, display the current system mode.

No Service no service

N   NR service*

L   LTE service

W   WCDMA service

*NR service only used for 5G project.

4.4 +CMEC, Mobile Termination control mode

Description

Set command selects the equipment, which operates MT keypad, writes to MT display and sets MT indicators. If operation mode is not allowed by the MT, +CME ERROR: <err> is returned. Refer subclause 9.2 for possible <err> values.

Read command returns the current settings.

Test command returns the modes supported as compound values.

Syntax

Command	Possible Response
+CMEC=[<keyp>[,<disp>[,<ind>[,<tscrn>]]]]	+CME ERROR: <err>
+CMEC?	+CMEC: <keyp>,<disp>,<ind>,<tscrn>
+CMEC=?	+CMEC: (list of supported <keyp>s),(list of supported <disp>s),(list of supported <ind>s),(list of supported <tscrn>s)

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	Yes	< 1s

Defined Values

<keyp>: integer type

0   MT can be operated only through its keypad (execute command of +CKPD cannot be used)

1   MT can be operated only from TE (with command +CKPD)

2   MT can be operated from both MT keypad and TE

<disp>: integer type

0   only MT can write to its display (command +CDIS can only be used to read the display)

1   only TE can write to MT display (with command +CDIS)

2   MT display can be written by both MT and TE

<ind>: integer type

0   only MT can set the status of its indicators (command +CIND can only be used to read the indicators)

1   only TE can set the status of MT indicators (with command +CIND)

2   MT indicators can be set by both MT and TE

<tscrn>: integer type

0   only MT can set the status of its indicators (execute command of +CTSA cannot be used)

1   only TE can set the status of MT indicators (with command +CTSA)

2   MT indicators can be set by both MT and TE

4.5 +CMER, Mobile termination event reporting

Description

Set command enables or disables sending of unsolicited result codes from TA to TE in the case of key pressings, display changes, and indicator state changes. <mode> controls the processing of unsolicited result codes specified within this command. <bfr> controls the effect on buffered codes when <mode> 1, 2 or 3 is entered. If setting is not supported by the MT, +CME ERROR: <err> is returned. Refer subclause 9.2 for possible <err> values.

Read command returns the current settings.

Test command returns the modes supported as compound values.

Syntax

Command	Possible Response
+CMER=[<mode>[,<keyp>[,<disp>[,<ind>[,<bfr> [,<tscrn>][,<orientation>]]]]]]	+CME ERROR: <err>
+CMER?	+CMER: <mode>,<keyp>,<disp>,<ind>, <bfr>,<tscrn>,<orientation>
+CMER=?	+CMER: (list of supported <mode>s) ,(list of supported <keyp>s),(list of supported <disp>s),(list of supported <ind>s), list of supported <bfr>s),(list of supported <tscrn>s),(list of supported <orientation>s)

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	Yes	< 1s

Defined Values

<mode>: integer type

0   buffer unsolicited result codes in the TA; if TA result code buffer is full, codes can be buffered in some other place or the oldest ones can be discarded

1   discard unsolicited result codes when TA TE link is reserved (e.g. in on line data mode); otherwise forward them directly to the TE

2   buffer unsolicited result codes in the TA when TA TE link is reserved (e.g. in on line data mode) and flush them to the TE after reservation; otherwise forward them directly to the TE

3   forward unsolicited result codes directly to the TE; TA TE link specific inband technique used to embed result codes and data when TA is in on line data mode

<keyp>: integer type

0   no keypad event reporting

1   keypad event reporting using unsolicited result code +CKEV: <key>,<press>. <key> indicates the key (refer IRA values defined in table 67 in subclause "Keypad control +CKPD") and <press> if the key is pressed or released (1 for pressing and 0 for releasing). Only those key pressings, which are not caused by +CKPD shall be indicated by the TA to the TE.

NOTE 1:   When this mode is enabled, corresponding result codes of all keys currently pressed are flushed to the TA regardless of <bfr> setting.

2   keypad event reporting using unsolicited result code +CKEV: <key>,<press>. All key pressings shall be directed from TA to TE.

NOTE 2:   When this mode is enabled, corresponding result codes of all keys currently pressed are flushed to the TA regardless of <bfr> setting.

<disp>: integer type

0   no display event reporting

1   display event reporting using unsolicited result code +CDEV: <elem>,<text>. <elem> indicates the element order number (as specified for +CDIS) and <text> is the new value of

text element. Only those display events, which are not caused by +CDIS shall be indicated by the TA to the TE. Character set used in <text> is as specified by command select TE character set +CSCS

2   display event reporting using unsolicited result code +CDEV: <elem>,<text>. All display events shall be directed from TA to TE. Character set used in <text> is as specified by command Select TE Character Set +CSCS

<ind>: integer type

0   no indicator event reporting

1   indicator event reporting using unsolicited result code +CIEV: <ind>,<value>. <ind> indicates the indicator order number (as specified for +CIND) and <value> is the new value of indicator. Only those indicator events, which are not caused by +CIND shall be indicated by the TA to the TE

2   indicator event reporting using unsolicited result code +CIEV: <ind>,<value>. All indicator events shall be directed from TA to TE

<bfr>: integer type

0   TA buffer of unsolicited result codes defined within this command is cleared when <mode> 1...3 is entered

1   TA buffer of unsolicited result codes defined within this command is flushed to the TE when <mode> 1...3 is entered (OK response shall be given before flushing the codes)

<tscrn>: integer type

0   no touch screen event reporting

1   touch screen event reporting using unsolicited result code +CTEV: <action>,<x>,<y>. The <x>,<y> parameters indicate the x, y coordinates on the touch screen device (as specified for +CTSA), and <action> indicates the action performed on the screen (0 for screen released, 1 for screen depressed, 2 for single tap, and 3 for double tap). Only those touch screen events, which are not caused by +CTSA shall be indicated by the TA to the TE.

NOTE 3:   When this mode is enabled, corresponding result codes of all touch screen actions are flushed to the TA regardless of <bfr> setting.

2   touch screen event reporting using unsolicited result code +CTEV: <action>,<x>,<y>. All touch screen events shall be directed from the TA to the TE.

NOTE 4:   When this mode is enabled, corresponding result codes of all touch screen actions are flushed to the TA regardless of <bfr> setting.

3   Verbose modes. Touch screen event reporting using unsolicited result code +CTEV: <action>,<x>,<y>. This is a special mode where intermediate depressed result codes (+CTEV: 1,<x>,<y>) are generated for each new <x>,<y> coordinate detected while a user is dragging a touch to a new location. All other touch screen actions shall be directed from the TA to the TE normally. Only those touch screen events which are not caused by +CTSA shall be indicated by the TA to the TE.

NOTE 5:   When this mode is enabled, corresponding result codes of all touch screen actions are flushed to the TA regardless of <bfr> setting.

4   enhanced touch screen event reporting using unsolicited result code +CTEV: <action>,<x>,<y>,<id>[,<duration>]. The <x>,<y> parameters indicate the x, y coordinates on the touch screen device (as specified for +CTSA), the <duration> parameter indicates the duration of the touch (as specified for +CTSA) and, the <id> identifies any simultaneous touch (as specified for +CTSA). Only those touch screen events, which are not caused by +CTSA shall be indicated by the TA to the TE. The <action> parameter indicates the action performed on the screen, if the <duration> parameter is:

-    0, it is valid for the <action> parameter to indicate 0 for screen released, 1 for screen depressed, 2 for single tap, and 3 for double tap;

-    a positive, non-zero integer, it is valid for the <action> parameter to indicate 0 for screen released.

NOTE 6:   When this mode is enabled, corresponding result codes of all touch screen actions are flushed to the TA regardless of <bfr> setting.

5 enhanced touch screen event reporting using unsolicited result code +CTEV: <action>,<x>,<y>,<id>[,<duration>]. See description of <tscrn> set to 4 for the valid for the <action> parameter. All touch screen events shall be directed from the TA to the TE.

NOTE 7: When this mode is enabled, corresponding result codes of all touch screen actions are flushed to the TA regardless of <bfr> setting.

6 Verbose modes. enhanced touch screen event reporting using unsolicited result code +CTEV: <action>,<x>,<y>,<id>[,<duration>]. This is a special mode where intermediate depressed result codes (+CTEV: 1,<x>,<y>,<id>[,<duration>]) are generated for each new <x>,<y> coordinate detected while a user is dragging a touch to a new location. All other touch screen actions shall be directed from the TA to the TE normally. See description of <tscrn> set to 4 for the valid for the <action> parameter. Only those touch screen events which are not caused by +CTSA shall be indicated by the TA to the TE.

NOTE 8: When this mode is enabled, corresponding result codes of all touch screen actions are flushed to the TA regardless of <bfr> setting.

<orientation>: integer type: Parameter to enable display orientation event reporting from the TA to the TE, using unsolicited result code +COEV: <CurrentTopSide>. The <CurrentTopSide> parameter indicates the top of the ME's screen (as specified for +CSO).

0 No display orientation event reporting.

1 Only those display orientation events, which are not caused by +CSO shall be indicated.

2 All display orientation events shall be indicated.

4.6 +EFUN, Set functionality for multiple SIM project

Description

Set command is used to change the dual SIM mode of modem.

Syntax

Command	Possible Response
+EFUN=<efun_state>[,<cause>]	OK /ERROR
+EFUN?	+EFUN: <efun_state> OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	Yes	< 1s

Defined Values

<efun_state>: integer type

Each bit field presents the desire radio state of each SIM slot.

If bit is TRUE (1), desire to radio on.

If bit is FALSE (0), desire to radio off

0: radio off for all the sim slot

1: radio on for sim1

2: radio on for sim2

3: radio on for sim1 and sim2

<cause>: integer type

Detach cause when perform RF off, the cause will forward to protocol layer.

0: unspecified (default value)

1: duplex mode change

2: power off

3: SIM switch

4.7 +MSMPD, Enable/Disable SIM card hot plug

Description

This command can Enable/Disable SIM card hot plug feature. The default status is enable this feature. The parameter will be saved in NVM and can restore at power cycle.

Syntax

Command	Possible Response
+MSMPD=<status>	OK Or: +CME ERROR: <err>
+MSMPD?	+MSMPD: <status> OK
+MSMPD=?	+MSMPD: (list of supported <status>s) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	No	< 30s

Defined Values

<status>: integer type;

0 Disable the SIM card hot plug feature

1 Enable the SIM card hot plug feature. Default value.

4.8 +CPWROFF, Switch off MS

Description:

This command is used to switch off the Modem and make detach procedure

Syntax

Command	Possible Response
+CPWROFF	OK Or: ERROR
+CPWROFF=?	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 2s

5 Call Control

5.1 Managing a Data Call

The AT channel of Modem has two modes of operation:

1. Data Mode: In this mode, once the MODEM has established a link with the remote modem, it does not respond to any data passing through it (except for the Escape Sequence search). The channel becomes a transparent link, connecting the terminal with the remote side.

2. Command Mode: In this mode, the Modem responds to the AT   commands issued by the terminal. This is the default working mode.

> Note:
>
> It is possible to switch the channel between the operating modes. The operating modes on different channel can operate simultaneously using the Mux or using multi-channels operation.

5.1.1 Switching from Data Mode to Command Mode

To switch the connection from Data mode to Command mode, send the Escape Sequence command (+++). If the modem responds with "OK" to the Escape command, the modem is in Command mode and the dial connection is still active, and you can use the AT command set.

> Note:
>
> 1. The character '+' in the Escape Sequence pattern can be changed using the S2 S-register.
>
> 2. Escape is detected only by the Modem and not by the remote side. The

remote side stays in the Data mode.

3. The behavior of Escape Sequence command (+++) is affected by AT&D setting. Please refer to the description of AT&D.

5.2 Data Call Control AT Commands

5.2.1 D, Dial Command

Description

This command makes a DATA call on the current network.

> **Note:**
>
> If a DATA call was originated and answered by the remote side, a "OK" notification is sent to the terminal from the Modem, and it moves to the online Data state.
>
> For more information about call failure, should use the AT+CEER command

Command	Possible Response
ATD<number>	For DATA call: OK or CONNECT or Nothing (depend on +MDC setting) is shown once CSD call is connected. If the originated call is failed, returns below causes: 1. Connection Failure - NO CARRIER or BUSY or NO ANSWER 2. General Failure - ERROR 3. Security reason (such as SIM not present) - SIM NOT INSERTED 4. Unknown reason - UNKNOWN CALLING ERROR

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
Yes	No	Yes	Yes	< 30s

Defined Values

<number>: data call number (e.g. *99# or *99***1#)

5.2.2 H, Hang-up Call

Description

This command hangs up call. The Modem terminates all call.

A NO CARRIER message is returned to the terminal after the regular OK approval.

Syntax

Command	Possible Response
ATH	OK NO CARRIER

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
Yes	No	Yes	Yes	< 30s

Defined Values

None

5.3 Supplementary Services

This set of commands enables control over supplementary service notifications, including Structured and Unstructured Supplementary Service Data (USSD) data.

5.3.1 +CUSD, Unstructured Supplementary Service Data

Description

This command allows control of Unstructured Supplementary Service Data (US SD), according to GSM 02.90.

Both network and mobile initiated operations are supported. Parameter <n> is used to disable/enable the presentation of an unsolicited result code (USSD response from the network, or network initiated operation) +CUSD: <m>[,<str>,<dcs>] to the TE. In addition, value <n>=2 is used to cancel an ongoing USSD session. When <str> is given, a mobile initiated USSD-string or a response USSD-string to a network initiated operation is sent to the network. The response USSD-string from the network is returned in a subsequent unsolicited +CUSD result code.

Syntax

Command	Possible Response
AT+CUSD=[<n>[,<str>[,<dcs>]]]	OK or: +CME ERROR: <err> Unsolicited Report: +CUSD: <m>[,<str>,<dcs>]
AT+CUSD?	+CUSD: <n> OK
AT+CUSD=?	+CUSD: (list of supported <n>s)

OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
Yes	No	Yes	Yes	< 10s

Defined Values

<n>: integer type (sets/shows the result code presentation status to the TE)

0   disable the result code presentation to the TE

1   enable the result code presentation to the TE

2   cancel session (not applicable to read command response)

<str>: string type USSD string (when <str> parameter is not given; network is not interrogated):

-    if <dcs> indicates that 3GPP TS 23.038 [25] 7 bit default alphabet is used:

-    if TE character set other than "HEX" (refer command Select TE Character Set +CSCS): MT/TA converts GSM alphabet into current TE character set according to rules of 3GPP TS 27.005 [24] Annex A

-    if TE character set is "HEX": MT/TA converts each 7 bit character of GSM alphabet into two IRA character long hexadecimal number (e.g. character   (GSM 23) is presented as 17 (IRA 49 and 55))

-if<dcs> indicates that 8-bit data coding scheme is used: MT/TA converts each 8-bit octet into two IRA character long hexadecimal number (e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65))

-if<dcs> indicates that 16-bit data coding scheme (UCS2) is used: MT/TA splits the 16 bits into two 8-bit octets. Each of those octets are converted as per the 8-bit data coding scheme, with the most significant octet first (e.g. decimal value 4906 is presented to TE as four

characters 132A (IRA 49, 51, 50 and 65))

<dcs>: integer type (shows Cell Broadcast Data Coding Scheme, see 3GPP TS 23.038 [25]). Default value is 15.

<m>: integer type (shows the USSD response from the network or the network initiated operation)

0   no further user action required (network initiated USSD Notify, or no further information needed after mobile initiated operation)

1   further user action required (network initiated USSD Request, or further information needed after mobile initiated operation)

2   USSD terminated by network

3   other local client has responded

4   operation not supported

5   network time out

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6 Phone Book and Clock

6.1 Directory Access Commands - Phone Book

This set of commands enables read/write access to the phone book contained within the Modem, including both the numeric and the alpha information contained in the location. The presentation is according to GSM 07.07.

In some cases, it may be possible to use these commands to access the dialed and received call stacks. However, as these phone books cannot be edited, the +CPBW command does not work on them.

6.1.1 +CPBS, Select Phone Book Memory

Description

This command handles the selection of the memory to be used for reading and writing entries in the Modem's phone books' memory.

Syntax

Command	Possible Response
AT+CPBS=<storage>[,<password>]	OK or: +CME ERROR: <err>
AT+CPBS?	+CPBS: <storage>[,<used>,<total>] OK
AT+CPBS=?	+CPBS: (list of supported <storage>s) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
Yes	No	Yes	Yes	< 1s

Defined Values

<storage> values reserved by the present document:

"DC"   MT dialed calls list (+CPBW may not be applicable for this storage)

"EN"   SIM/USIM (or MT) emergency number (+CPBW is not be applicable for this storage)

"FD"   SIM/USIM fix dialing phonebook. In the currently selected card slot, if a SIM card is present or if a UICC with an active GSM application is present, the information in EFFDN under DFTelecom is selected. If a UICC with an active USIM application is present, the information in EFFDN under ADFUSIM is selected.

"LD"   SIM/UICC last dialing phonebook (+CPBW may not be applicable for this storage)

"MC"   MT missed (unanswered received) calls list (+CPBW may not be applicable for this storage)

"ME"   MT phonebook

"MT"   combined MT and SIM/USIM phonebook (+CPBW may not be applicable for this storage)

"ON"   SIM (or MT) own numbers (MSISDNs) list (reading of this storage may be available through +CNUM also). When storing information in the SIM/UICC, if a SIM card is present or if a UICC with an active GSM application is present, the information in EFMSISDN under DFTelecom is selected. If a UICC with an active USIM application is present, the information in EFMSISDN under ADFUSIM is selected.

"RC"   MT received calls list (+CPBW may not be applicable for this storage)

"SM"   SIM/UICC phonebook. In the currently selected card slot, if a SIM card is present or if a UICC with an active GSM application is present, the EFADN under DFTelecom is

selected. If a UICC with an active USIM application is present, the global phonebook, DFPHONEBOOK under DFTelecom is selected.

"TA"   TA phonebook (+CPBW may not be applicable for this storage)

"AP"   Selected application phonebook. In the currently selected card slot, if a UICC with an active USIM application is present, the application phonebook, DFPHONEBOOK under ADFUSIM is selected. (+CPBW may not be applicable for this storage)

<password>: string type value representing the PIN2-code required when selecting PIN2-code locked <storage>s above, e.g. "FD" or the hidden key to be verified in order to access to the hidden phonebook entries in the UICC/USIM or any other phonebook with hidden entries. If the combined phonebook is selected, "MT", the <password> will correspond to the hidden key of the USIM phonebook.

<used>: integer type value indicating the number of used locations in selected memory

<total>: integer type value indicating the total number of locations in selected memory

> ℹ️ SM is the default storage.

6.1.2 +CPBR, Read Phone Book Entries

Description

This command recalls phone book entries from a specific entry number or from a range of entries. If only one entry is specified, and that entry is empty, OK is returned. If a range of entries is requested, all entries that contain data within that range are returned. If a listing fails in a Modem error, +CME ERROR: <err> is returned.

This command can also be used to obtain information about the number of entries and the maximum size of a phone number and alpha tag fields in the phone book.

This command acts on the currently active phone book, as selected with the +CPBS

command.

Syntax

Command	Possible Response
AT+CPBR=<index1>[,<index2>]	[+CPBR: <index1>,<number>,<type>,<text>[,<hidden>][,<group>][,<adnumber>][,<adtype>][,<secondtext>][,<email>][,<sip_uri>][,<tel_uri>]][[...][<CR><LF>+CPBR: <index2>,<number>,<type>,<text>[,<hidden>][,<group>][,<adnumber>][,<adtype>][,<secondtext>][,<email>][,<sip_uri>][,<tel_uri>]]] OK or: +CME ERROR: <err>
AT+CPBR=?	+CPBR: (listof supported <index>s),[<nlength>],[<tlength>], [<glength>],[<slength>],[<elength>],[<siplength>],[<tellength>] OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
Yes	No	Yes	Yes	< 5s

Defined Values

<index1>, <index2>, <index>: integer type values in the range of location numbers of phonebook memory

<number>: string type phone number of format <type>

<type>: type of address octet in integer format

<text>: string type field of maximum length <tlength>;

<group>: string type field of maximum length <glength>;

<adnumber>: string type phone number of format <adtype>

<adtype>: type of address octet in integer format

<secondtext>: string type field of maximum length <slength>;

<email>: string type field of maximum length <elength>;

<sip_uri>: string type field of maximum length <siplength>;

<tel_uri>: string type phone number of maximum length <tellength>;

<nlength>: integer type value indicating the maximum length of field <number>

<tlength>: integer type value indicating the maximum length of field <text>

<glength>: integer type value indicating the maximum length of field <group>

<slength>: integer type value indicating the maximum length of field <secondtext>

<elength>: integer type value indicating the maximum length of field <email>

<siplength>: integer type value indicating the maximum length of field <sip_uri>

<tellength>: integer type value indicating the maximum length of field <tel_uri>

<hidden>: integer type value indicates if the entry is hidden or not

0   phonebook entry not hidden

1   phonebook entry hidden

6.1.3 +CPBF, Find Phone Book Entries

Description

This execution command enables the user to search for a particular entry, by name, in the currently active phone book. If no matching entry is found, the command returns OK. If

multiple matches are found, all are returned.

Syntax

Command	Possible Response
AT+CPBF =<findtext >	[+CPBF: <index1>,<number>,<type>,<text>[,<hidden>][,<group>][,<adnumber>][,<adtype>][,<secondtext>][,<email>][,<sip_uri>][,<tel_uri>]][<CR><LF>+CBPF: <index2>,<number>,<type>,<text>[,<hidden>][,<group>][,<adnumber>][,<adtype>][,<secondtext>][,<email>][,<sip_uri>][,<tel_uri>][...]] OK or: +CME ERROR: <err>
AT+CPBF =?	+CPBF: [<nlength>],[<tlength>],[<glength>],[<slength>],[<elength>],[<siplength>],[<tellength>] OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
Yes	No	Yes	Yes	< 5s

Defined Values

<index1>, <index2>: integer type values in the range of location numbers of phonebook memory

<number>: string type phone number of format <type>

<type>: type of address octet in integer format

<group>: string type field of maximum length <glength>;

<adnumber>: string type phone number of format <adtype>

<adtype>: type of address octet in integer format

<secondtext>: string type field of maximum length <slength>;

<email>: string type field of maximum length <elength>;

<findtext>, <text>: string type field of maximum length <tlength>;

<sip_uri>: string type field of maximum length <siplength>;

<tel_uri>: string type phone number of maximum length <tellength>;

<nlength>: integer type value indicating the maximum length of field <number>

<tlength>: integer type value indicating the maximum length of field <text>

<glength>: integer type value indicating the maximum length of field <group>

<slength>: integer type value indicating the maximum length of field <secondtext>

<elength>: integer type value indicating the maximum length of field <email>

<siplength>: integer type value indicating the maximum length of field <sip_uri>

<tellength>: integer type value indicating the maximum length of field <tel_uri>

<hidden>: integer type value indicates if the entry is hidden or not

0   phonebook entry not hidden

1   phonebook entry hidden

6.1.4 +CPBW, Write Phone Book Entry

Description

Set command writes phone book entry in location number<index> in the current phone book memory storage selected with +CPBS. Entry fields written are phone number<number> in

format<type> and <text> associated with the number. If all fields except <index> are omitted, the corresponding entry is deleted. If the <index> is left out, but <number> is given, entry is written to the first free location in the phone book.

Read command returns the last <written_index> value, or -1 if information about previous value is not available.

Test command returns location range supported by the current storage as a compound value, the maximum length of <number> field, supported number formats of the storage, the maximum length of <text> field, the maximum length of <group>, the maximum length of <secondtext>, the maximum length of <email>, the maximum length of <sip_uri> and the maximum length of <tel_uri>.

In case of SIM storage, the lengths may not be available.

Syntax

Command	Possible Response
+CPBW=[<index>][,<number>[,<type>[,<text>[,<group>[,<adnumber>[,<adtype>[,<secondtext>[,<email>[,<sip_uri>[,<tel_uri>[,<hidden>]]]]]]]]]]]	+CPBW: <written_index> OK or: +CME ERROR: <err>
AT+CPBW?	+CPBW: <written_index> OK
AT+CPBW=?	+CPBW: (list of supported <index>s),[<nlength>], (list of supported <type>s),[<tlength>],[<

glength>],

[<slength>],[<elength>]
,[<siplength>],[<telleng
th>]

OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
Yes	No	Yes	Yes	< 2s

Defined Values

<index1>, <index2>: integer type values in the range of location numbers of phonebook memory

<number>: string type phone number of format <type>

<type>: type of address octet in integer format

<group>: string type field of maximum length <glength>;

<adnumber>: string type phone number of format <adtype>

<adtype>: type of address octet in integer format

<secondtext>: string type field of maximum length <slength>;

<email>: string type field of maximum length <elength>;

<findtext>, <text>: string type field of maximum length <tlength>;

<sip_uri>: string type field of maximum length <siplength>;

<tel_uri>: string type phone number of maximum length <tellength>;

<nlength>: integer type value indicating the maximum length of field <number>

<tlength>: integer type value indicating the maximum length of field <text>

<glength>: integer type value indicating the maximum length of field <group>

<slength>: integer type value indicating the maximum length of field <secondtext>

<elength>: integer type value indicating the maximum length of field <email>

<siplength>: integer type value indicating the maximum length of field <sip_uri>

<tellength>: integer type value indicating the maximum length of field <tel_uri>

<hidden>: integer type value indicates if the entry is hidden or not

0   phonebook entry not hidden

1   phonebook entry hidden

<written_index>: integer type value indicating the last location number <index> of the written phonebook

7 System Date and Time Access Commands

7.1 General command

7.1.1 +CCLK, Read/Set System Date and Time

Description

This command reads and sets the Modem current date, time and time zone.

Syntax

Command	Possible Response
AT+CCLK=<time>	OK or: +CME ERROR: <err>
AT+CCLK?	+CCLK: <time> OK or: +CME ERROR: <err>
AT+CCLK=?	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

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). E.g. 6th of May 1994, 22:10:00 GMT+2 hours equals to "94/05/06,22:10:00+08"

yy   2-digit year[00-99]

MM   2-digit month [01-12]

dd   2-digit day of month [00-31]

hh   2-digit hour [00-23]

mm   2-digit minute [00-59]

ss   2-digit seconds [00-59]

zz   (optional) time zone offset from GMT, in quarter-hours [-47...+48]. If this value is not specified, the time zone offset will be 0.

8 SMS

8.1 SMS Commands

Modem supports SMS PDU and SMS TEXT mode according to ETSI specifications 3GPP TS 27.005 & 3GPP TS 03.40/23.0400.

8.1.1 +CSCS, Select Terminal Character Set

Description

This command selects the Modem00 character set. The modem supports the following character sets: "IRA","GSM","UCS2","HEX". The default value is "IRA".

Syntax

Command	Possible Response
AT+CSCS=<chset>	OK
AT+CSCS?	+CSCS: <chset> OK
AT+CSCS=?	+CSCS: (list of supported <chset>s) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<chset>: string type; Character Set

"IRA"   International Reference Alphabet (ITU-T T.50)

"GSM" GSM default alphabet (GSM 03.38 subclause 6.2.1)

"UCS2" 2-byte Universal Character Set, Unicode (ISO/IEC 10646 [32])

"HEX"   Character strings consist only of hexadecimal numbers from 00 to FF

"8859-1" ISO-8859-1;   And it only be supported in G5 series products.

8.1.2 +CSMS, Select Message Service

Description

This command handles the selection of the messaging service. It returns the types of messages that are supported by the Modem.

Syntax

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

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<service>: integer type;

0   SMS AT command grammar is compatible with GSM Phase 2

1   SMS AT command grammar is compatible with GSM Phase 2+

<mt>: integer type; Mobile terminated messages

0   Not supported by the Modem

1   Supported by the Modem

<mo>: integer type; Mobile originated messages

0   Not supported by the Modem

1   Supported by the Modem

<bm>: integer type; Broadcast type messages

0   Not supported by the Modem

1   Supported by the Modem

8.1.3 +CPMS, Preferred Message Storage

Description

This command handles the selection of the preferred message storage area. The message storage area is divided into three parts, mem1, mem2 and mem3.

Syntax

Command	Possible Response
AT+CPMS=<mem1>[,<mem2>[,<mem3>]]	+CPMS: <used1>,<total1>,<used2>,<total2>,<used3>,<total3> OK or: +CMS ERROR: <err>
AT+CPMS?	+CPMS: <mem1>,<used1>,<total1>,<mem2>,<used2>,<total2>,<mem3>,<used3>,<total3> OK or: +CMS ERROR: <err>
AT+CPMS=?	+CPMS: (list of supported<mem1>s),(list of supported <mem2>s),(list of supported <mem3>s) OK or: +CMS ERROR: <err>

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
Yes	No	Yes	Yes	< 1s

Defined Values

<mem1>: string type; Memory from which messages are read and deleted.

<mem2>: string type; Memory to which writing operation is made.

<mem3>: string type; Memory to which received SMS are stored (unless forwarded directly to TE).

Note: Supported values for <mem1>,<mem2>,<mem3> may be:

"BM"   Broadcast message storage

"SM"   (U)SIM message storage

"ME"   ME message storage

"SR"   Status report storage

Note:

-    <mem1>,<mem2>,<mem3>may be restored to "SM" after power cycle device

-    L8 family products only support "SM" storage for<mem1>,<mem2>,<mem3>

-    L7 family products support as below combinations:

<mem1>: "BM","SM","SR","ME"

<mem2> and <mem3>: "SM", "ME"

8.1.4 +CMGF, Message Format

Description

This command is a basic command.

The Set command handles the selection of the message format used with send, list, read and write commands, as well as the format of unsolicited result codes resulting from message receipts.

The Modem supports both PDU mode (where entire TP data units are used) and text mode

(where the body of the message and its headers are given as separate parameters).

Syntax

Command	Possible Response
AT+CMGF=<mode>	OK or: +CME ERROR: <err>
AT+CMGF?	+CMGF: <mode> OK
AT+CMGF=?	+CMGF: (list of supported <mode>s) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
Yes	No	Yes	Yes	< 1s

Defined Values

<mode>: integer type; Message format:

0   PDU mode (default)

1   Text mode

8.1.5 +CSCA, Service Center Address

Description

This command enables to write/read SCA to/from SIM. In SMS text mode, SCA stored in

SIM is added to any stored and sent SMS. In SMS PDU mode, SCA stored in SIM is added to stored SMS and send SMS only when SCA address length coded in PDU equals zero.

Syntax

Command	Possible Response
AT+CSCA=<sca>[,<tosca>]	OK or: +CME ERROR: <err>
AT+CSCA?	+CSCA: <sca>,<tosca> OK
AT+CSCA=?	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
Yes	No	Yes	Yes	< 1s

Defined Values

<sca>: string type and range is 1-20; Service Center Address."+" character prefix of <sca> indicates <tosca> of 145. Each character is represented by semi octets (excluding '+' character). If <sca> contains an odd number of digits, bits 4 to 7 of the last octet shall be filled with an end mark coded "1111".

<tosca>: type of service center address.

<tosca> of 129 is mostly use for local number and 145 for International.

<tosca> of 129 is default value.

<tosca> values are in range of 0-255.Valid values are defined according to: GSM03.40 v7.4.0 section 9.1.2.5 as follow:

Bit 7 is 1

Bits 6,5–4 - Present Type of number as follow:

Bits 6 5 4

0 0 0 Unknown

0 0 1 International number

0 1 0 National number

0 1 1 Network specific number

1 0 0 Subscriber number

1 0 1 Alphanumeric, (coded according to GSM TS 03.38 7-bit default alphabet)

1 1 0 Abbreviated number

1 1 1 Reserved for extension

Numbering-plan-identification (applies for Type-of-number = 000,001,010)

Bits 3 2 1 0

0 0 0 0 Unknown

0 0 0 1 ISDN/telephone numbering plan (E.164/E.163)

0 0 1 1 Data numbering plan (X.121)

0 1 0 0 Telex numbering plan

1 0 0 0 National numbering plan

1 0 0 1 Private numbering plan

1 0 1 0 ERMES numbering plan (ETSI DE/PS 3 01-3)

1 1 1 1 Reserved for extension.

All other values are reserved.

8.1.6 +CSMP, Set Text Mode Parameters

Description

This command is a basic command and is used to select values for additional parameters needed when SMS is sent to the network or placed in storage when TEXT mode is selected.

Syntax

Command	Possible Response
AT+CSMP=[<fo>[,<vp>[,<pid>[,<dcs>]]]]	OK or: +CME ERROR: <err>
AT+CSMP?	+CSMP: <fo>,<vp>,<pid>,<dcs> OK
AT+CSMP=?	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
Yes	No	Yes	Yes	< 1s

Defined Values

<fo>: integer type; Depending on the command or result code: first octet of 3GPP TS 23.040 [3] SMS-DELIVER, SMS-SUBMIT(default 17), SMS-STATUS-REPORT, or SMS-COMMAND(default 2) in integer format.

<vp>: integer type; Validity Period, depending on SMS-SUBMIT <fo>, TP-Validity-Period-Format bits setting. If there is no correlation between the VPF and the VP value. an error message will be returned. Either in integer format (see Table) or in time-string format ("yy/MM/dd, hh:mm:ss±zz"). If in integer format the vp will write to SIM EF and read form SIM EF when use it.

Note: The following table shows the VP format.

<Parameter>	Description
0 to 143	(TP-VP + 1) x 5 minutes (i.e. 5 minutes intervals up to 12 hours)
144 to 167	12 hours + ((TP-VP - 143) x 30 minutes)
168 to 196	(TP-VP - 166) x 1 day
197 to 255	(TP-VP - 192) x 1 week

<pid>: integer type; Protocol-Identifier. The one octet information element by which the SM-TL either refers to the higher layer protocol being used, or indicates interworking with a certain type of telematic device.

"0 - no interworking, SME-to-SME protocol (default) "Any value between 0-255 will be accepted.

The SC may reject messages with a TP-Protocol-Identifier containing a reserved value or one, which is not supported.

<dcs>: integer type; One octet of Data Coding Scheme, indicates the data coding scheme of the DATA, and may indicate a message class; Default value is 0

8.1.7 +CSDH, Show Text Mode Parameters

Description

This command controls whether detailed header information is shown in text mode result codes.

Syntax

Command	Possible Response
AT+CSDH=[<show>]	OK or: +CME ERROR: <err>
AT+CSDH?	+CSDH: <show> OK
AT+CSDH=?	+CSDH: (list of supported <show>s) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
Yes	No	Yes	Yes	< 1s

Defined Values

<show>: integer type

0   do not show header values defined in commands +CSCA and +CSMP (<sca>, <tosca>,

<fo>, <vp>, <pid> and <dcs>) nor <length>, <toda> or <tooa> in +CMT, +CMGL, +CMGR result codes for SMS-DELIVERs and SMS-SUBMITs in text mode; for SMS-COMMANDs in +CMGR result code, do not show <pid>, <mn>, <da>, <toda>, <length> or <cdata>; Default value.

1   show the values in result codes

8.1.8 +CNMI, New Message Indications to Terminal

Description

This command handles enabling of unsolicited notifications to the terminal when an SMS is received by the Modem.

After sending an unsolicited response to the TE, the Modem will expect a +CNMA (new message acknowledgement) from the TE within a predefined timeout of 15 seconds. Within the timeout the Modem will not send another unsolicited response to the TE before the previous one is acknowledgement. If the Modem does not receive acknowledgment within the required time, CNMI parameters will NOT be reset automatically and the unsolicited response will send to the TE again.

Syntax

Command	Possible Response
AT+CNMI=[<mode>[,<mt>[,<bm>[,<ds>[,<bfr>]]]]]	OK or: +CME ERROR: <err>
AT+CNMI?	+CNMI: <mode>,<mt>,<bm>,<ds>,<bfr> OK

AT+CNMI=?	+CNMI: (list of supported <mode>s),(list of supported <mt>s),(list of supported <bm>s),(list of supported <ds>s),(list of supported <bfr>s) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
Yes	No	Yes	Yes	< 1s

Defined Values

<mode>: integer type, Default value is 0.

0   Buffer unsolicited result codes in the TA. If TA result code buffer is full, indications can be buffered in some other place or the oldest indications may be discarded and replaced with the new received indications.

1   Discard indication and reject new received message unsolicited result codes when TA-TE link is reserved (e.g. in on-line data mode). Otherwise forward them directly to the TE.

2   Buffer unsolicited result codes in the TA when TA-TE link is reserved (e.g. in on-line data mode) and flush them to the TE after reservation. Otherwise forward them directly to the TE.

<mt>: integer type (the rules for storing received SMs depend on its data coding scheme (refer 3GPP TS 23.038 [2]), preferred memory storage (+CPMS) setting and this value; refer table 8.1.8-1; Default value is 0.

0   No SMS-DELIVER indications are routed to the TE.

1   If SMS-DELIVER is stored into ME/TA, indication of the memory location is routed to the

TE using unsolicited result code:

+CMTI: <mem>,<index>

2 SMS-DELIVERs (except class 2 messages and messages in the message waiting indication group (store message)) are routed directly to the TE using unsolicited result code:

+CMT: [<alpha>],<length><CR><LF><pdu> (PDU mode enabled); or

+CMT: <oa>,[<alpha>],<scts>[,<tooa>,<fo>,<pid>,<dcs>,<sca>,<tosca>,<length>]<CR><LF><data>(text mode enabled; about parameters in italics, refer command Show Text Mode Parameters +CSDH)

If ME has its own display device then class 0 messages and messages in the message waiting indication group (discard message) may be copied to both ME display and to TE. In this case, ME shall send the acknowledgement to the network.

Class 2 messages and messages in the message waiting indication group (store message) result in indication as defined in <mt>=1.

Class 3 SMS-DELIVERs are routed directly to TE using unsolicited result codes defined in <mt>=2.

Messages of other data coding schemes result in indication as defined in <mt>=1

Table 8.1.8-1: <mt> parameter

<mt>	Receiving procedure for different message data coding schemes (refer 3GPP TS 23.038 [2])
0	no class: as in 3GPP TS 23.038 [2], but use <mem3> as preferred memory class 0: as in 3GPP TS 23.038 [2], but use <mem3> as preferred memory if message is tried to be stored class 1: as in 3GPP TS 23.038 [2], but use <mem3> as preferred memory class 2: as in 3GPP TS 23.038 [2]

	class 3: as in 3GPP TS 23.038 [2], but use <mem3> as preferred memory
	message waiting indication group (discard message): as in 3GPP TS 23.038 [2], but use <mem3> as preferred memory if message is tried to be stored
	message waiting indication group (store message): as in 3GPP TS 23.038 [2], but use <mem3> as preferred memory
1	as <mt>=0 but send indication if message stored successfully
2	no class: route message to TE
	class 0: as in 3GPP TS 23.038 [2], but also route message to TE and do not try to store it in memory
	class 1: route message to TE
	class 2: as <mt>=1
	class 3: route message to TE
	message waiting indication group (discard message): as in 3GPP TS 23.038 [2], but also route message to TE and do not try to store it in memory
	message waiting indication group (store message): as <mt>=1
3	class 3: route message to TE
	others: as <mt>=1

<bm> integer type (the rules for storing received CBMs depend on its data coding scheme (refer 3GPP TS 23.038 [2]), the setting of Select CBM Types (+CSCB) and this value; refer table 8.1.8-2); Default value is 0.

0   No CBM indications are routed to the TE.

1   If CBM is stored into ME/TA, indication of the memory location is routed to the TE using unsolicited result code:

+CBMI: <mem>,<index>

2   New CBMs are routed directly to the TE using unsolicited result code:

+CBM: <length><CR><LF><pdu> (PDU mode enabled); or

+CBM: <sn>,<mid>,<dcs>,<page>,<pages><CR><LF><data> (text mode enabled)

If ME supports data coding groups which define special routing also for messages other than class 3 (e.g. (U)SIM specific messages), ME may choose not to route messages of such data coding schemes into TE (indication of a stored CBM may be given as defined in <bm>=1).

3   Class 3 CBMs are routed directly to TE using unsolicited result codes defined in <bm>=2. If CBM storage is supported, messages of other classes result in indication as defined in <bm>=1.

Table 8.1.8-2: <bm> parameter

<bm>	Receiving procedure for different message data coding schemes (refer 3GPP TS 23.038 [2])
0	all schemes: as in 3GPP TS 23.038 [2]; if CBM storage is supported, store message to "BM" (or some manufacturer or data coding scheme specific memory)
1	all schemes: as<bm>=0 but send indication if message stored successfully
2	all schemes: route message to TE unless ME has detected a special routing to somewhere else (e.g. to (U)SIM; an indication may be sent if message stored successfully)
3	class 3: route message to TE others: as <bm>=1 (if CBM memory storage is supported)

<ds>: integer type; Default value is 0.

0   No SMS-STATUS-REPORTs are routed to the TE.

1   SMS-STATUS-REPORTs are routed to the TE using unsolicited result code:

+CDS: <length><CR><LF><pdu> (PDU mode enabled); or

+CDS: <fo>,<mr>,[<ra>],[<tora>],<scts>,<dt>,<st> (text mode enabled)

2   If SMS-STATUS-REPORT is stored into ME/TA, indication of the memory location is routed to the TE using unsolicited result code:

+CDSI: <mem>,<index>

Table 8.1.8-3: SMS-STATUS-REPORT result code and acknowledgement summary

<ds>	result codes and commands
1	+CDS&+CNMA[1)
2	+CDSI
acknowledgement command must be sent when +CSMS<service> value equals 1	

<bfr>: integer type; Default value is 0.

0   TA buffer of unsolicited result codes defined within this command is flushed to the TE when <mode> 1...3 is entered (OK response shall be given before flushing the codes).

1   TA buffer of unsolicited result codes defined within this command is cleared when <mode> 1...3 is entered.

8.1.9 +CNMA, New Message Acknowledgment

Description

This command acknowledges the receipt of a +CMT and +CDS response from the terminal to the Modem. A +CMT response receipt confirms the correct reception of a new SMS-DELIVER message, which was routed directly to the terminal. A +CDS response receipt confirms the correct reception of a new SMS-STATUS-REPORT message, which

was routed directly to the terminal.

When the Modem sends a +CDS response to the terminal, it waits a predefined timeout of 15 seconds for the +CNMA acknowledgment. The Modem will not send another +CDS result code to the terminal before the previous one is acknowledged, or the timeout expires.

When the Modem sends a +CMT response to the terminal, it waits a predefined timeout of 15 seconds for the +CNMA acknowledgment. The Modem will not send another +CMT result code to the terminal before the previous one is acknowledged, or the timeout expires. Upon receipt of the +CNMA command, the Modem sends RP-ACK to the network. The acknowledged SMS will not be saved in message storage. If the command is executed but no acknowledgment is expected, or some other Modem related error occurs, the final result code +CMS ERROR: <err> is returned.

Syntax

Command	Possible Response
For text mode (+CMGF=1) AT+CNMA For PDU mode (+CMGF=0) AT+CNMA[=<n>[,<length>[<CR>PDU<ctrl-Z/ESC>]]]	OK or: +CME ERROR: <err>
AT+CNMA=?	OK in text mode or: +CNMA: (list of supported <n>s) in PDU mode

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
Yes	No	Yes	Yes	< 1s

Defined Values

<n>: integer type

0   command operates similarly as defined for the text mode

1   send RP-ACK

2   send RP-ERROR

<length>: integer type; Length of the PDU in PDU mode

8.1.10 +CMGL, List Messages

Description

These commands display a list of all SMS with the status value <stat>, from the Modem message storage <mem1> (selected using the +CPMS command). The command returns a series of responses, one per message, each item containing the message index, status, and data. If the status of a message is "RECEIVED UNREAD", execution of the +CMGL command changes the status of the message to "RECEIVED READ".

Syntax

Command	Possible Response
	if text mode (+CMGF=1), command successful and SMS-SUBMITs and/or SMS-DELIVERs: +CMGL: <index>,<stat>,<oa/da>,[<alpha>],[<scts>][,<tooa/toda>, <length>]<CR><LF><data>[<CR><LF>
AT+CMGL[=<stat>]	+CMGL: <index>,<stat>,<da/oa>,[<alpha>],[<scts>][,<tooa/toda>, <length>]<CR><LF><data>[...]]
	if text mode (+CMGF=1), command successful and SMS-STATUS-REPORTs: +CMGL: <index>,<stat>,<fo>,<mr>,[<ra>],[<tora>],<scts>,<dt>,<st>

[<CR><LF>

+CMGL: <index>,<stat>,<fo>,<mr>,[<ra>],[<tora>],<scts>,<dt>,<st>

[...]]

if text mode (+CMGF=1), command successful and SMS-COMMANDs:

+CMGL: <index>,<stat>,<fo>,<ct>[<CR><LF>

+CMGL: <index>,<stat>,<fo>,<ct>[...]]

if text mode (+CMGF=1), command successful and CBM storage:

+CMGL: <index>,<stat>,<sn>,<mid>,<page>,<pages>

<CR><LF><data>[<CR><LF>

+CMGL: <index>,<stat>,<sn>,<mid>,<page>,<pages>

<CR><LF><data>[...]]

otherwise:

+CMS ERROR: <err>

AT+CMGL=?	+CMGL: (list of supported <stat>s)

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
Yes	No	Yes	Yes	< 5s

Defined Values

<index>   1-352 Index of message in storage.

<stat>   Status of message in memory:

PDU mode	Text mode	Description

0   "REC UNREAD"   Received unread messages (default)

1   "REC READ"   Received read messages

2   "STO UNSENT"   Stored unsent messages

3   "STO SENT"   Stored sent message

4   "ALL"   All messages

For fault tolerance, two mode can be trade off

<oa/da>   Original/destination address.

<data> Message contents in text mode

<length>   In PDU mode: Size of message, in octets, excluding SMSC data. In TEXT mode: Number of characters included in <data>.

<pdu> Message header and contents in PDU mode format. See description in "+CMGR, Read Message".

<toda/toda>   Type of origination address / destination address

<fo>   First octet of the SMS

<mr>   Message Reference

<ra>   Recipient-Address

<tora> Type of Recipient address

<scts> Service center time stamp

<ct>   Command type

<sn>   Message serial number

<mid> Message ID

<page> Current page number

<pages>   Total number of pages

<dt>   Discharge-Time

<st>   Status

8.1.11 +CMGR, Read Message

Description

These commands handle the reading of SMS. The command displays the message in location <index> of the preferred message storage <mem1> (selected using the +CPMS command). If the status of the message is "RECEIVED UNREAD", the +CMGR command changes the status to "RECEIVED READ".

Syntax

Command	Possible Response

AT+CMGR=<index>	if text mode (+CMGF=1), command successful and SMS-DELIVER:
	
	+CMGR:
	<stat>,<oa>,[<alpha>],<scts>[,<tooa>,<fo>,<pid>,<dcs>,<sca>,<tosca>,<length>]<CR><LF><data>
	
	if text mode (+CMGF=1), command successful and SMS-SUBMIT:
	
	+CMGR:
	<stat>,<da>,[<alpha>][,<toda>,<fo>,<pid>,<dcs>,[<vp>],<sca>,<tosca>,<length>]<CR><LF><data>
	
	if text mode (+CMGF=1), command successful and
	SMS-STATUS-REPORT:
	
	+CMGR: <stat>,<fo>,<mr>,[<ra>],[<tora>],<scts>,<dt>,<st>
	
	if text mode (+CMGF=1), command successful and SMS-COMMAND:
	
	+CMGR: <stat>,<fo>,<ct>[,<pid>,[<mn>],[<da>],[<toda>],<length>

<CR><LF><cdata>]

if text mode (+CMGF=1), command successful and CBM storage:

+CMGR: <stat>,<sn>,<mid>,<dcs>,<page>,<pages><CR><LF><data>

otherwise:

+CMS ERROR: <err>

AT+CMGR=?	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
Yes	No	Yes	Yes	< 2s

Defined Values

<index>   Integer type and value starts from 1; Index in storage of the message to be retrieved.

<stat>   Status of message in memory:

PDU mode	Text mode	Description
0	"REC UNREAD"	Received unread messages (default)
1	"REC READ"	Received read messages
2	"STO UNSENT"	Stored unsent messages
3	"STO SENT"	Stored sent message
4	"ALL"	All messages

<alpha>   Alpha ID of message (not present).

<length>   In PDU mode: Size of message, in octets, excluding SMSC data. In TEXT mode:

Number of characters included in <data>.

<pdu> Message header and contents in PDU mode format. See description in the table below.

<oa/da> Original/destination address.

<data> Message contents in text mode

<toda/toda> Type of origination address / destination address

<fo> First octet of the SMS

<pid> Protocol Identifier

<dcs> Data Coding Scheme

<sca> Service Center Address

<tosca> Type of Service Center Address

<vp> Validity Period. Either in integer format or in time-string format ("yy/MM/dd,hh:mm:ss±zz")

<mr> Message reference

<scts> Service center time stamp

<ct> Command type

<sn> Message serial number

<mn> Message Number

<cdata> Command-Data

<mid> Message ID

<page> Current page number

<pages> Total number of pages

<mr>   Message reference

<ra>   Message Recipient address

<tora>   Type of Recipient address

<scts>   Service center time stamp

<dt>   Discharge-Time

<st>   Status

8.1.12 +CMSS, Send Message from Storage

Description

This command sends a pre-stored message, written previously using the +CMGW command. The <da>, <toda> parameters are optional. If a DA is given, the message is sent to that address. Otherwise the message is sent to the DA it was stored with (if any was entered). If no DA is found, an error occurs.

When the given index is an incoming message index the header settings will be as follows:

- <first-octet> will be SMS-SUBMIT and VPF - relative.

- The TP-RP and TP-UDHI settings will be taken from the incoming message's first octet.

- <vp> - will be set to the default value -167 - as defined in 03.40.

- <sca>,<tosca>, <pid> and <dcs> will be set according the incoming message parameters.

- If <da> and/or <toda> are not given by the command, the <oa> and <tooa> will be set instead.

Syntax

Command	Possible Response
AT+CMSS=<index>[,<da>[,<toda>]]	+CMSS: <mr>

	or:
	+CMS ERROR: <err>
AT+CMSS=?	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
Yes	No	Yes	Yes	< 60s

Defined Values

<index>: integer type; Index in storage of the message to be sent.

<da>: string type; Destination address in quoted string. This field contains a single phone number.

<toda>: string type; Type of DA. Value between 128-255 (according to GSM 03.40, 9.1.2.5). If this field is not given and first character of <da> is '+' , <toda> will be 145, otherwise 129.

<mr>: integer type; Sent message reference number.

8.1.13 +CMGW, Write Message to Memory

Description

This command sends a pre-stored message, written previously using the +CMGW command. The <da>, <toda> parameters are optional. If a DA is given, the message is sent to that address. Otherwise the message is sent to the DA it was stored with (if any was entered). If no DA is found, an error occurs.

When the given index is an incoming message index the header settings will be as follows:

- <first-octet> will be SMS-SUBMIT and VPF - relative.

- The TP-RP and TP-UDHI settings will be taken from the incoming message's first octet.

- <vp> - will be set to the default value -167 - as defined in 03.40.

- <sca>,<tosca>, <pid> and <dcs> will be set according the incoming message parameters.

- If <da> and/or <toda> are not given by the command, the <oa> and <tooa> will be set instead.

Syntax

Command	Possible Response
If text mode (+CMGF=1): AT+CMGW[=<da>[,<toda>[,<stat>]]]<CR>text is entered<ctrl-Z/ESC> if PDU mode (+CMGF=0): AT+CMGW=<length>[,<stat>]<CR> PDU is given<ctrl-Z/ESC>	+CMGW: <index> or: +CMS ERROR: <err>

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
Yes	No	Yes	Yes	< 2s

Defined Values

<da>: string type; destination address, string type represented in the currently selected character set.

<toda>: integer type; type of destination address.

129   number in national format

145   number in international format (contains the "+")

<stat>:string type; message status.

"REC UNREAD"   new received message unread (default for DELIVER messages)

"REC READ"   received message read

"STO UNSENT"   message stored not yet sent (default for SUBMIT messages)

"STO SENT"   message stored already sent

8.1.14 +CMGD, Delete Message

Description

This command handles deletion of a single message from memory location <index>, or multiple messages according to <delflag>. If the optional parameter <delflag> is entered, and is greater than 0, the <index> parameter is practically ignored. If deletion fails, result code +CMS ERROR: <err> is returned.

Syntax

Command	Possible Response
AT+CMGD=<index>[,<delflag>]	OK or: +CME ERROR: <err>
AT+CMGD=?	+CMGD:(list of valid<index>s),(list of valid<delflag>s) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
Yes	No	Yes	Yes	< 5s

Defined Values

<index>: integer type; Index in the SMS memory of the message to be deleted.

<delflag>: integer type, indicating multiple message deletion request as follows:

0   Delete the message specified in <index>

1   Delete all read messages from preferred message storage, leaving unread messages and stored mobile originated messages (whether sent or not) untouched

2   Delete all read messages from preferred message storage and sent mobile originated messages, leaving unread messages and unsent mobile originated messages untouched

3   Delete all read messages from preferred message storage, sent and unsent mobile originated messages leaving unread messages untouched.

4   Delete all messages from preferred message storage including unread messages.

8.1.15 +CGSMS, Select Service for MO SMS Messages

Description

This command handles the selection of the service or service preference used by the Modem to send mobile-originated SMS messages.

Syntax

Command	Possible Response
AT+CGSMS=[<service>]	OK or:

	+CME ERROR: <err>
AT+CGSMS?	+CGSMS: <service> OK
AT+CGSMS=?	+CGSMS: (list of currently available <service>s) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
Yes	No	Yes	Yes	< 1s

Defined Values

<service>: integer type; indicates the service or service preference to be used. The default value is manufacturer specific.

0   Packet Domain

1   Circuit switched; Note: Suggest use this one as Default setting

2   Packet Domain preferred (use circuit switched if GPRS not available)

3   Circuit switched preferred (use Packet Domain if circuit switched not available)

8.1.16 +CMGS, Send SMS to Network

Description

This command sends an SMS from the Modem to the network. The message reference value <mr> is returned to the Modem upon successful delivery of the message.

Valid <toda> will be any value between 128-255.

The header parameters in TEXT mode will be set according to CSMP settings.

Syntax

Command	Possible Response

If text mode (+CMGF=1):
 	
AT+CMGS=<da>[,<toda>]<CR>text is entered<ctrl-Z/ESC>
 	
If PDU mode (+CMGF=0):
 	
AT+CMGS=<length><CR>
 	
PDU is entered<ctrl-Z/ESC>
	if text mode (+CMGF=1) and sending successful:
	
	+CMGS: <mr>[,<scts>]
	
	OK
	
	if PDU mode (+CMGF=0) and sending successful:
	
	+CMGS: <mr>
	
	OK
	
	if sending fails:
	
	+CMS ERROR: <err>

AT+CMGS=?	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
Yes	No	Yes	Yes	< 60s

Defined Values

<da>: string type; Destination address in quoted string. This field contains a single MIN number.

<toda>: integer type; Type of DA. Value between 128-255 (according to GSM 03.40, 9.1.2.5). If this field is not given and first character of <da> is '+' , <toda> will be 145, otherwise 129.

<length>: integer type; Size of message in PDU mode format, in octets, excluding SMSC

data.

<mr>: integer type; Sent message reference number.

8.1.17 +CSAS, Save Settings

Description

Execution command saves active message service settings to a non-volatile memory. A TA can contain several profiles of settings. Settings specified in commands Service Centre Address +CSCA, Set Message Parameters +CSMP and Select Cell Broadcast Message Types +CSCB (if implemented) are saved. Certain settings may not be supported by the storage (e.g. (U)SIM SMS parameters) and therefore can not be saved. See chapter Message Service Failure Result Code for <err> values.

Test command shall display the supported profile numbers for reading and writing of settings.

Syntax

Command	Possible Response
+CSAS[=<profile>]	+CMS ERROR: <err>
+CSAS=?	+CSAS: (list of supported <profile>s)

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
Yes	No	Yes	Yes	< 60s

Defined Values

<profile>: integer type

0...255 manufacturer specific profile number where settings are to be stored

8.1.18 +CRES, Restore Settings

Description

Execution command restores message service settings from non-volatile memory to active memory. A TA can contain several profiles of settings. Settings specified in commands Service Centre Address +CSCA, Set Message Parameters +CSMP and Select Cell Broadcast Message Types +CSCB (if implemented) are restored. Certain settings may not be supported by the storage (e.g. (U)SIM SMS parameters) and therefore can not be restored. See chapter Message Service Failure Result Code for <err> values.

Syntax

Command	Possible Response
+CRES[=<profile>]	+CMS ERROR: <err>
+CRES=?	+CRES: (list of supported <profile>s)

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
Yes	No	Yes	Yes	< 60s

Defined Values

<profile>: integer type

0...255   manufacturer specific profile number from where settings are to be restored

8.1.19 +CMMS, More Messages to Send

Description

Set command controls the continuity of SMS relay protocol link. When feature is enabled (and supported by network) multiple messages can be sent much faster as link is kept open.

Test command returns supported values as a compound value..

Syntax

Command	Possible Response
+CMMS=[<n>]	
+CMMS?	+CMMS: <n>
+CMMS=?	+CMMS: (list of supported <n>s)

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
Yes	No	Yes	Yes	< 60s

Defined Values

<n>: integer type

0   disable

1   keep enabled until the time between the response of the latest message send command (+CMGS, +CMSS, etc.) and the next send command exceeds 1-5 seconds (the exact value is up to ME implementation), then ME shall close the link and TA switches <n> automatically

back to 0

2   enable (if the time between the response of the latest message send command and the next send command exceeds 1-5 seconds (the exact value is up to ME implementation), ME shall close the link but TA shall not switch automatically back to <n>=0)

8.1.20 +CSCB, Cell Broadcast Messages

Description

This command handles the selection of cell broadcast message types and data coding schemes received by the Modem.

Syntax

Command	Possible Response
AT+CSCB=[<mode>[,<mids>[,<dcss>]]]	If mode=0 and <mids>is not specified, then no channels are accepted, and the Modem channel/mid list is cleared. OK or: +CMS ERROE: <err>
AT+CSCB?	+CSCB: <mode>,<mids>,<dcss> OK
AT+CSCB=?	+CSCB: (list of supported <mode>s) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
Yes	No	Yes	Yes	< 1s

Defined Values

<mode>: integer type

0   message types specified in <mids> and <dcss> are accepted

1   message types specified in <mids> and <dcss> are not accepted; Default value

<mids>: string type and range is 0-65535; all different possible combinations of CBM message identifiers (refer <mid>) (default is empty string); e.g. "0,1,5,320-478,922"

<dcss>: string type and range is 0-255; all different possible combinations of CBM data coding schemes (refer <dcs>) (default is empty string); e.g. "0-3,5"

9 SIM TOOL KIT Raw Mode Commands

9.1 Raw Mode Commands Lists

9.1.1 +CUSATR, Read USAT Profile

Description

This command is used to read USAT profile.

Syntax

Command	Possible Response
AT+CUSATR[=<profile_storage>]	+CUSATR: <profile_storage>,<profile>[<CR><LF>+CUSATR: profile_storage>,<profile>[...]] or +CME ERROR: <err>
AT+CUSATR=?	+CUSATR: (list of supported <profile_storage>s) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
Yes	No	Yes	Yes	< 1s

Defined Values

<profile_storage>: integer type

0   TE profile that can be set with +CUSATW.

1   MT profile that can be set with +CUSATW.

2   MT default profile that reflects the inherent, default supported facilities of the MT.

3   UICC profile that reflects the currently active UICC profile that was sent to the UICC in the last TERMINAL PROFILE command

4   UICC EFUST. The elementary file that indicates services available in the USIM.

5   List of MT only facilities (facilities that are not allowed to be assigned to the TE, see 3GPP TS 31.111 [92]).

<profile>: string type with hexadecimal character format. The profile describing the supported facilities of the referenced <profile_storage> as specified for the Terminal Profile in 3GPP TS 31.111 [92] or for the related EF in 3GPP TS 31.102 [59].

9.1.2 +CUSATW, Write USAT Profile

Description

This command is used to write USAT profile.

Upon an attempt to store or reset a profile that conflicts with an already stored profile or the list of MT only facilities, the operation fails and the profile referred to by command parameter <profile_storage> remains unchanged. The MT responds with +CUSATW :<profile_storage>,<conflict_profile> where <profile_storage> refers the conflicting profile followed by the final result code +CME ERROR: 3 (Operation not allowed). The rules for detecting conflicts are defined in 3GPP TS 31.111 [92].

Successful execution of the command does not result in any information response.

Syntax

Command	Possible Response

AT+CUSATW[=<profile_storage>[,<profile>]]	+CUSATW: <profile_storage>,<conflict_profile>[<CR><LF> +CUSATW: <profile_storage>,<conflict_profile> [...]] or +CME ERROR: <err>
AT+CUSATW=?	+CUSATW: (list of supported <profile_storage>s) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
Yes	No	Yes	Yes	< 1s

Defined Values

<profile_storage>: integer type

0   TE. Refers profile storage for the facilities supported by the TE. Default value is a blank profile with all bits set to zero.

1   MT. Refers profile storage for the facilities to be supported by MT, which can be a subset of the default MT facilities (see +CUSATW). The TE can choose to register a subset of the MT default profile, typically omitting facilities also supported by the TE profile. Default value is the MT default profile.

5   Refers to a conflict between the TE profile and the list of MT only facilities.

Note: Value 5 for <profile_storage> will be supported only in response direction.

<profile>: string type with hexadecimal character format. The profile describing the supported USAT facilities of the referenced <profile_storage> as specified for the Terminal Profile in 3GPP TS 31.111 [92].

<conflict_profile>: string type with hexadecimal character format. A bitwise AND of two profiles, showing the conflicts, that is, USAT facilities supported by both profiles. See description of Terminal Profile in 3GPP TS 31.111

9.1.3 +CUSATD, Profile download upon start-up

Description

This command is used to determine to download which USAT profile during next boot up.

This command determines if, and optionally which profile should be downloaded to the UICC automatically upon startup. If, prior to a restart/start-up, the +CUSATD settings have not been altered, then the default settings determine the behavior upon start-up.

However, if the parameters of +CUSATD has been set to other than default and then a restart is performed (e.g. by +CFUN), these values determine the behavior. This is true for one restart only after altering +CUSATD parameters as they are always reset to default at the end of the next UICC start-up (i.e. when the USIM initialization as specified in 3GPP TS 31.102 [98] has been completed).

The command without parameters resets the parameters to their default values.

The command can be used if the UICC is already in active state upon +CUSATA and the UICC does not support the "Additional TERMINAL PROFILE after UICC activation" feature (see 3GPP TS 31.111 [92]).

+CUSATD=<download>,1 also enables the unsolicited result code +CUSATS: <UICC_state>. The MT uses this unsolicited result code to indicate that a profile download is performed (setting +CUSATD=0,1 or +CUSATD=1,1) or that it is ready for profile download (setting +CUSATD=2,1). In both cases, the MT also indicates the end of UICC start-up by

the unsolicited result code +CUSATS:4. If the UICC is awaiting PIN

verification during start-up, this is also reported.

When using +CUSATD=1, the +CUSATA=1 command has to be used to enable TE profile facility handling after restart. In the time between profile download and issuance of +CUSATA=1, the UICC may already attempt to issue proactive commands. The MT will not send these to the TE, but rather give the UICC the response "terminal currently unable to process command" autonomously. The UICC may implement only a limited number of retries, which can potentially leave USAT in an unwanted state if the +CUSATA=1

command arrives late.

Syntax

Command	Possible Response
AT+CUSATD=[<download>[,<reporting>]]	OK or +CME ERROR: <err>
AT+CUSATD?	+CUSATD: <download>,<reporting> OK
AT+CUSATD=?	+CUSATD: (list of supported <download>s),(list of supported <reporting>s) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
Yes	No	Yes	Yes	< 3s

Defined Values

<download>: integer type. Parameter decides when/if to perform a profile download to UICC and which profile to download. The default value is implementation specific.

0   Download MT default profile automatically during next start-up.

1   Download the combined TE and MT profile (merger of the profiles written by +CUSATW) automatically during next start-up. The rules for merging profiles are defined in 3GPP TS 31.111 [92].

2   Halt next UICC start-up when ready for profile download. Profile to download will be selected and download will be triggered by +CUSATA.

<reporting>: integer type. Parameter enables unsolicited result code +CUSATS: <UICC_state> to notify the TE about a new state during start-up.

0   Disable +CUSATS, i.e. no notification.

1   Enable +CUSATS, i.e. notify TE.

<UICC_state>: integer type. Parameter reports that the UICC entered a new state during start-up or that the UICC ended startup and entered active state.

1   UICC start-up halted and ready for profile download. This state is reached if +CUSATD=2 was issued before restart. UICC start-up will continue upon +CUSATA=2 or +CUSATA=3.

2   Profile download completed, UICC startup continuing.

3   UICC awaiting PIN verification.

4   UICC active.

9.1.4 +CUSATA, Activate USAT profile

Description

This command is used to activate USAT profile.

A positive result upon a +CUSATA=1 or +CUSATA=3 command (also) enables TE profile facility handling via unsolicited result codes +CUSATP: <proactive_command> and +CUSATEND. The MT uses the unsolicited result code +CUSATP: <proactive_command> to forward to the TE proactive commands issued by the UICC. The unsolicited result code +CUSATEND is issued by the MT when the UICC indicates that the proactive command session is terminated, i.e. in response to a USAT terminal response, the UICC indicates that no other USAT proactive command is pending. Lastly, terminal responses to the proactive commands can now be issued with +CUSATT=<terminal_response> and envelope commands can be issued with +CUSATE=<envelope_command>.

If the action requested by the +CUSATA command cannot be performed, the information response +CUSATA: <UICC_state>,[<additional_profile_support>] is returned with appropriate values, followed by the final result code +CME ERROR: 4 (Operation not supported) in case the UICC does not support USAT at all, or the final result code +CME ERROR: 3 (Operation not allowed) in all other cases.

If the UICC is already in active state and the UICC does not support the "Additional TERMINAL PROFILE after UICC activation" feature (see 3GPP TS 31.111 [92]), the TE has the option to perform a reset of the UICC or use +CFUN to get back to an initial non-active UICC state. The +CUSATD command can be used to set profile handling upon the next restart.

All USAT proactive commands that the MT does not process itself and all terminal responses from the TE are transparently forwarded by the MT. The routing mechanism for USAT commands supported by both entities is specified in 3GPP TS 31.111 [92].

Syntax

Command	Possible Response
AT+CUSATA[=<activation>]	+CUSATA: <UICC_state>[,<additional_profile_support>]

	OK
	or
	+CME ERROR: \<err>
AT+CUSATA=?	+CUSATA: (list of supported \<activation>s)
	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
Yes	No	Yes	Yes	< 3s

Defined Values

\<activation>: integer type.

0   Return   status   information   only,   in   information   response:
+CUSATA:\<UICC_state>[,\<additional_profile_support>].

1   Enable TE profile facility handling only, no profile download. This action can only be
used if the combined TE and MT profile was downloaded during start-up (setting
+CUSATD=1).

2   Download MT default profile.

3   Download the combined TE and MT profile (merger of the profiles written by +CUSATW)
an enable TE profile facility handling. The rules for merging profiles are defined in3GPP TS
31.111 [92].

\<UICC_state>: integer type. Parameter reports that the UICC entered a new state during
start-up or that the UICC ended startup and entered active state.

1   UICC start-up halted and ready for profile download. This state is reached if

+CUSATD=2 was issued before restart. UICC start-up will continue upon +CUSATA=2 or +CUSATA=3.

2   Profile download completed, UICC startup continuing.

3   UICC awaiting PIN verification.

4   UICC active.

<additional_profile_support>: integer type. Indicates whether the UICC supports the "Additional TERMINAL PROFILE after UICC activation" feature (see 3GPP TS 31.111 [92]). The value may not be available during early phases of start-up.

0   No support.

1   Supported.

<proactive_command>: string type with hexadecimal character format. Proactive command as defined in 3GPPTS 31.111 [92], consisting of the full BER-TLV data object.

9.1.5 +CUSATT, Send USAT terminal response

Description

This command is used to send Terminal Profile.

Syntax

Command	Possible Response
AT+CUSATT=<terminal_response>	OK or +CME ERROR: <err>
AT+CUSATT=?	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
Yes	No	Yes	Yes	< 2s

Defined Values

<terminal_response>: string type with hexadecimal character format. Terminal response to a proactive command as defined in 3GPP TS 31.111 [92], consisting of the full BER-TLV data object.

9.1.6 +CUSATE, Send USAT envelope command

Description

This command is used to send USAT envelope command.

Syntax

Command	Possible Response
AT+CUSATE=<envelope_command>	+CUSATE: <envelope_response>[,<busy>] OK or +CME ERROR: <err>
AT+CUSATE=?	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration

Yes	No	Yes	Yes	< 2s

Defined Values

<envelope_command>: string type with hexadecimal character format. Envelope command as defined in 3GPPTS 31.111 [92], consisting of the full BER-TLV data object.

<envelope_response>: string type in hexadecimal character format. Response to the envelope command as defined in 3GPP TS 31.111 [92], consisting of the full BER-TLV data object. Empty if the UICC does not provide response data.

<busy>: integer type.

0   UICC indicated normal ending of the command.

1   UICC responded with USAT is busy, no retry by the MT.

2   UICC responded with USAT is busy even after one or more retries by the MT.

10 Access and security

10.1 Commands

10.1.1 +CPIN, Enter PIN for Unlocking SIM or Enter PUK for Unblocking SIM

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 CME ERROR for possible <err> values.

> **Note**
>
> 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**
>
> 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.

Syntax

Command	Possible Response
AT+CPIN=<pin>[,<newpin>]	OK or +CME ERROR: <err>
AT+CPIN?	+CPIN: <code> OK or: +CME ERROR: <err>
AT+CPIN=?	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
Yes	No	Yes	Yes	< 1s

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

10.1.2 +CPWD, Change Password

Description

This command sets a new password for the facility lock. The password can only be changed once the required facility is enabled by the +CLCK command.

A password can be changed only if the provided password <oldpwd> has been verified. The entered password <newpwd> must also comply to the password rules. The facility value <fac> is not case-sensitive. In the password value, letters are not allowed.

Syntax

Command	Possible Response
AT+CPWD=<fac>,<oldpwd>,<newpwd>	OK or: +CME ERROR: <err>
AT+CPWD=?	+CPWD: list of Supported (<fac>,<pwdlength>)s OK or: +CME ERROR: <err>

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
Yes	No	Yes	Yes	< 1s

Defined Values

<fac>: string type

"SC"   SIM (lock SIM/UICC card installed in the currently selected card slot) (SIM/UICC

asks password in MT power up and when this lock command issued)

"AO"   BAOC (Barr All Outgoing Calls) (refer 3GPP TS 22.088 [6] clause 1)

"OI"   BOIC (Barr Outgoing International Calls) (refer 3GPP TS 22.088 [6] clause 1)

"OX"   BOIC exHC (Barr Outgoing International Calls except to Home Country) (refer 3GPP TS 22.088 clause 1)

"AI"BAIC (Barr All Incoming Calls) (refer 3GPP TS 22.088 [6] clause 2)

"IR"BIC Roam (Barr Incoming Calls when Roaming outside the home country) (refer 3GPP TS 22.088 clause 2)

"AB"   All Barring services (refer 3GPP TS 22.030 [19]) (applicable only for <mode>=0)

"AG"   All outGoing barring services (refer 3GPP TS 22.030 [19]) (applicable only for <mode>=0)

"AC"   All inComing barring services (refer 3GPP TS 22.030 [19]) (applicable only for <mode>=0)

"P2"   SIM PIN2

<oldpwd>, <newpwd>: string type; <oldpwd> shall be the same as password specified for the facility from the MT user interface or with command Change Password +CPWD and <newpwd> is the new password; maximum length of password can be determined with <pwdlength>

<pwdlength>: integer type maximum length of the password for the facility

10.1.3 +CLCK, Facility Lock

Description

This command locks, unlocks or interrogates a Modem or a network facility <fac> (any kind of call barring program).

A password is mandatory for performing locking and unlocking actions, but not for querying. The features of the Modem that are affected by this are fixed dialing list.

When querying the status of a single call barring program <mode>=2, the <status> for each call type will be returned.

For <fac>="SC", SIM Card PIN setting and for <fac>="FD", SIM Fixed Dialing memory setting, the <class>is irrelevant (For more information about <class>, refer to the following table shows the +CLCK parameters.). For "SC", the <passwd> is SIM PIN. For "FD", the <passwd> is SIM PIN2.

Syntax

Command	Possible Response
AT+CLCK=<fac>,<mode>[,<passwd>[,<classx>]]	+CME ERROR: <err> when <mode>=2 and command successful: +CLCK: <status>[,<class1> [<CR><LF>+CLCK: <status>,<class2> [...]] OK
AT+CLCK=?	+CLCK: (list of supported <fac>s) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
Yes	No	Yes	Yes	< 1s

Defined Values

<fac>: string type

"SC"   SIM (lock SIM/UICC card installed in the currently selected card slot) (SIM/UICC asks password in MT power up and when this lock command issued)

"AO"   BAOC (Barr All Outgoing Calls) (refer 3GPP TS 22.088 [6] clause 1)

"OI"   BOIC (Barr Outgoing International Calls) (refer 3GPP TS 22.088 [6] clause 1)

"OX"   BOIC exHC (Barr Outgoing International Calls except to Home Country) (refer 3GPP TS 22.088 clause 1)

"AI"BAIC (Barr All Incoming Calls) (refer 3GPP TS 22.088 [6] clause 2)

"IR"   BIC Roam (Barr Incoming Calls when Roaming outside the home country) (refer 3GPP TS 22.088 clause 2)

"AB"   All Barring services (refer 3GPP TS 22.030 [19]) (applicable only for <mode>=0)

"AG"   All outGoing barring services (refer 3GPP TS 22.030 [19]) (applicable only for <mode>=0)

"AC"   All inComing barring services (refer 3GPP TS 22.030 [19]) (applicable only for <mode>=0)

"PS"   PH SIM (lock PHone to SIM/UICC card installed in the currently selected card slot) (MT asks password when other than current SIM/UICC card inserted; MT may remember certain amount of previously used cards thus not requiring password when they are inserted)

"FD"   SIM card or active application in the UICC (GSM or USIM) fixed dialling memory feature (if PIN2 authentication has not been done during the current session, PIN2 is required as <passwd>)

"PN"   Network Personalization (refer 3GPP TS 22.022 [33])

"PU"   network sUbset Personalization (refer 3GPP TS 22.022 [33])

"PP"   service Provider Personalization (refer 3GPP TS 22.022 [33])

"PC"   Corporate Personalization (refer 3GPP TS 22.022 [33])

<mode>: integer type

0   unlock

1   lock

2   query status

<status>: integer type

0   not active

1   active

<passwd>: string type; shall be the same as password specified for the facility from the MT user interface or with command Change Password +CPWD

<classx> is a sum of integers each representing a class of information (default 7 - voice, data and fax):

1   voice (telephony)

2   data (refers to all bearer services; with <mode>=2 this may refer only to some bearer service if TA does not support values 16, 32, 64 and 128)

4   fax (facsimile services)

8   short message service

16   data circuit sync

32   data circuit async

64   dedicated packet access

128 dedicated PAD access

10.1.4 +CSIM, Generic SIM Access

Description

This command allows a direct control of the SIM by a distant application on the TE.

Syntax

Command	Possible Response
AT+CSIM=<length>,<command>	+CSIM: <length>,<response> OK Or +CME ERROR: <err>
AT+CSIM=?	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 2s

Defined Values

<length>: integer type; length of the characters that are sent to TE in <command> or <response> (two times the actual length of the command or response)

<command>: String type. Command passed on by the MT to the SIM in the format as described in 3GPP TS 51.011 (hexadecimal character format; refer +CSCS)

<response>: String type. Response to the command passed on by the SIM to the MT in the format as described in 3GPP TS 51.011 (hexadecimal character format; refer +CSCS)

10.1.5 +CRSM, Restricted SIM Access

Description

This command provides limited access to the Elementary Files on the SIM. Access to the SIM database is restricted to the commands which are listed at <command>. All parameters of AT+CRSM are used as specified by 3GPP TS 51.011(2G) and TS 31.101(3G). As response to the command, the Modem sends the actual SIM information parameters and response data. Error result code "+CME ERROR" may be returned if the command cannot be transferred to the SIM, e.g. if the SIM is not inserted, or defected, or PIN1/PUK authentication required, or required input parameters not present. However, failure in the execution of the command in the SIM is reported in <sw1> and <sw2> parameters.

Some of the AT+CRSM commands require PIN/PIN2 authentication.

Syntax

Command	Possible Response
AT+CRSM=<command>[,<file_id>[,<P1>,<P2>,<P3>[,<data>[,<pathid>]]]]	+CRSM: <sw1>,<sw2>[,<response>] OK or: +CME ERROR: <err>
AT+CRSM=?	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 2s

Defined Values

<command>: (command passed on by the MT to the SIM; refer 3GPP TS 51.011 [28]):

176   READ BINARY

178   READ RECORD

192   GET RESPONSE

214   UPDATE BINARY

220   UPDATE RECORD

242   STATUS

203   RETRIEVE DATA

219   SET DATA

all other values are reserved

NOTE 1: The MT internally executes all commands necessary for selecting the desired file, before performing the actual command.

<fileid>: integer type; this is the identifier of a elementary datafile on SIM. Mandatory for every command except STATUS

NOTE 2:   The range of valid file identifiers depends on the actual SIM and is defined in 3GPP TS 51.011 [28]. Optional files may not be present at all.

<P1>, <P2>, <P3>: integer type; parameters passed on by the MT to the SIM. These parameters are mandatory for every command, except GET RESPONSE and STATUS. The values are described in 3GPP TS 51.011 [28]

<data>: String type. Information which shall be written to the SIM (hexadecimal character format; refer +CSCS)

<pathid>: string type; contains the path of an elementary file on the SIM/UICC in hexadecimal format as defined in ETSI TS 102 221 [60] (e.g. "7F205F70" in SIM and UICC case). The <pathid> shall only be used in the mode "select by path from MF" as defined in ETSI TS 102 221 [60].

NOTE 3:   Since valid elementary file identifiers may not be unique over all valid dedicated file identifiers the <pathid> indicates the targeted UICC/SIM directory path in case of ambiguous file identifiers. For earlier versions of this specification or if <pathid> is omitted, it could be implementation specific which one will be selected.

<sw1>, <sw2>: integer type; information from the SIM about the execution of the actual command. They can be refer TS102.221

<response>: String type. Response of a successful completion of the command previously issued (hexadecimal character format; refer +CSCS). STATUS and GET RESPONSE return data, which gives information about the current elementary data field. This information includes the type of file and its size (refer 3GPP TS 51.011 [28]). After READ BINARY, READ RECORD or RETRIEVE DATA command the requested data will be returned. <response> is not returned after a successful UPDATE BINARY, UPDATE RECORD or SET DATA command.

11 Network

11.1 Network Commands

11.1.1 +CSQ, Signal Strength

Description

This command displays the received signal strength indication <rssi> and channel bit error rate <ber> from the Modem.

Syntax

Command	Possible Response
AT+CSQ	+CSQ: <rssi>,<ber> OK
AT+CSQ?	+CSQ: <rssi>,<ber> OK
AT+CSQ=?	+CSQ: (list of supported <rssi>s),(list of supported <ber>s) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<rssi>: integer type

0   -113 dBm or less

1   -111 dBm

2...30   -109...   53 dBm

31   -51 dBm or greater

99   not known or not detectable

<ber>: integer type; channel bit error rate (in percent)

0...7   as RXQUAL values in the table in 3GPP TS 45.008 subclause 8.2.4

99   not known or not detectable

11.1.2 +CESQ, Extended Signal Quality

Description

Execution command returns received signal quality parameters.

<ber> always return 99.

If the current serving cell is in GSM/UMTS/LTE/C2K/ENDC/NR cell， <rxlev> will return normal ,else return 99.

If the current serving cell is in UMTS cell, <rscp>, <ecno> will return normal, else return 255.

If the current serving cell is in /LTE/C2K/ENDC cell, <rsrq>, <rsrp> will return normal, else return 255.

Only the current serving cell in ENDC/NR cell, <ss_rsrq>, <ss_rsrp>and<ss_sinr> will return normal, else return 255

Syntax

Command	Possible Response

AT+CESQ	+CESQ: <rxlev>,<ber>,<rscp>,<ecno>,<rsrq>,<rsrp>, <ss_rsrq>,<ss_rsrp>,<ss_sinr> OK or +CME ERROR: <error>
AT+CESQ=?	+CESQ: (list of supported <rxlev>s),(list of supported <ber>s),(list of supported <rscp>s),(list of supported <ecno>s),(list of supported <rsrq>s),(list of supported <rsrp>s),(list of supported <ss_rsrq>s),(list of supported <ss_rsrp>s), (list of supported <ss_sinr>s) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<rxlev>: integer type, received signal strength level (see 3GPP TS 45.008 subclause 8.1.4).

0   rssi< -110 dBm

1   -110 dBm ≤rssi < -109 dBm

2   -109 dBm≤ rssi < -108 dBm

…

61   -50 dBm ≤rssi < -49 dBm

62   -49 dBm ≤rssi < -48 dBm

63   -48 dBm ≤rssi

99   not known or not detectable

<ber>: integer type; channel bit error rate (in percent)

0...7   as RXQUAL values in the table in 3GPP TS 45.008 subclause 8.2.4

99   not known or not detectable

<rscp>: integer type, received signal code power (see 3GPP TS 25.133 subclause 9.1.1.3 and 3GPP TS 25.123 subclause 9.1.1.1.3).

0   rscp < -120 dBm

1   -120 dBm≤rscp < -119 dBm

2   -119 dBm≤rscp < -118 dBm

…

94   -27 dBm≤rscp < -26 dBm

95   -26 dBm≤rscp < -25 dBm

96   -25 dBm≤rscp

255   not known or not detectable

<ecno>: integer type, ratio of the received energy per PN chip to the total received power spectral density (see 3GPP TS 25.133 subclause).

0   Ec/Io < -24 dB

1   -24 dB≤Ec/Io < -23.5 dB

2   -23.5 dB≤Ec/Io < -23 dB

…

47   -1 dB≤Ec/Io < -0.5 dB

48   -0.5 dB≤Ec/Io < 0 dB

49   0 dB≤Ec/Io

255   not known or not detectable

<rsrq>: integer type, reference signal received quality (see 3GPP TS 36.133 subclause 9.1.7).

0   rsrq < -19.5 dB

1   -19.5 dB≤rsrq < -19 dB

2   -19 dB≤rsrq < -18.5 dB

…

32   -4 dB≤rsrq < -3.5 dB

33   -3.5 dB≤rsrq < -3 dB

34   -3 dB≤rsrq

255   not known or not detectable

<rsrp>: integer type, reference signal received power (see 3GPP TS 36.133 subclause 9.1.4).

0   rsrp < -140 dBm

1   -140 dBm≤rsrp < -139 dBm

2   -139 dBm≤rsrp < -138 dBm

…

95   -46 dBm≤rsrp < -45 dBm

96   -45 dBm≤rsrp < -44 dBm

97   -44 dBm≤rsrp

255   not known or not detectable

<ss_rsrq>: integer type, synchronization signal based reference signal received quality (see 3GPP TS 38.133 [169] subclause 10.1.11).

0   ss_rsrq < -43 dB

1   -43 dB≤ss_rsrq < -42.5 dB

2   -42.5 dB≤ss_rsrq < -42 dB

…

124   18.5 dB≤ss_rsrq < 19 dB

125   19 dB≤ss_rsrq < 19.5 dB

126   19.5 dB≤ss_rsrq < 20 dB

255   not known or not detectable

<ss_rsrp>: integer type, synchronization signal based reference signal received power (see 3GPP TS 38.133 [169] subclause 10.1.6).

0   ss_rsrp < -156 dBm

1   -156 dBm≤ss_rsrp < -155 dBm

2   -155 dBm≤ss_rsrp < -154 dBm

…

125   -32 dBm≤ss_rsrp < -31 dBm

126   -31 dBm≤ss_rsrp

255   not known or not detectable

<ss_sinr>: integer type, synchronization signal based signal to noise and interference ratio (see 3GPP TS 38.133 [169] subclause 10.1.16).

0   ss_sinr < -23 dB

1   -23 dB ≤ ss_sinr < -22.5 dB

2   -22.5 dB ≤ ss_sinr < -22 dB

…

125   39 dBss_sinr < 39.5 dBm

126   39.5 dB ≤ ss_sinr < 40 dB

127   40 dB ≤ ss_sinr

255   not known or not detectable

11.1.3 +CREG, Network Registration Status

Description

Set command controls the presentation of an unsolicited result code as below:

+CREG: <stat> when <n>=1 and there is a change in the MT's circuit mode network registration status in GERAN/UTRAN/E-UTRAN.

or

+CREG: <stat>[,[<lac>],[<ci>],[<AcT>]] when <n>=2 and there is a change of the network cell in GERAN/UTRAN/E-UTRAN. The parameters <AcT>, <lac> and <ci> are sent only if available.

or

+CREG: <stat> [, <lac>,<ci>[,<AcT>[,<cause_type>[,<reject_cause>]]]] when <n>=3,when available, when the value of <stat> changes.

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 <lac>, <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.

Syntax

Command	Possible Response
AT+CREG=[<n>]	OK or: +CME ERROR: <err>
AT+CREG?	+CREG: <n>,<stat> [,<lac>,<ci>[,<AcT>[,<cause_type> [,<reject_cause>]]]] OK
AT+CREG=?	+CREG: (list of supported <n>s) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<n>: integer type; It is only applicable to L850 with <n>=3

0   disable network registration unsolicited result code; Default value

1   enable network registration unsolicited result code +CREG: <stat>

2   enable network registration and location information unsolicited result code +CREG:

<stat>[,[<lac>],[<ci>],[<AcT>]]

3   enable network registration, location information and cause value information unsolicited result code +CREG: <stat>[,[<lac>],[<ci>],[<AcT>][,<cause_type>,<reject_cause>]];

<stat>: integer type; circuit mode registration status

0   not registered, MT is not currently searching a new operator to register to

1   registered, home network

2   not registered, but MT is currently searching a new operator to register to

3   registration denied

4   unknown (e.g. out of GERAN/UTRAN/E-UTRAN coverage)

5   registered, roaming

6   registered for "SMS only", home network (applicable only when <AcT> indicates E-UTRAN)

7   registered for "SMS only", roaming (applicable only when <AcT> indicates E-UTRAN)

8   attached for emergency bearer services only (see NOTE 2) (not applicable)

9   registered for "CSFB not preferred", home network (applicable only when <AcT> indicates E-UTRAN)

10 registered for "CSFB not preferred", roaming (applicable only when <AcT> indicates E-UTRAN)

<lac>: string type; two-byte location area code (when <AcT> indicates value 0 to 6), or tracking area code (when <AcT>indicates value 7). In hexadecimal format (e.g. "00C3" equals 195 in decimal).

<ci>: string type; four byte GERAN/UTRAN/E-UTRAN cell ID in hexadecimal format.

<AcT>: integer type; access technology of the serving cell

0   GSM

1   GSM Compact

2   UTRAN

3   GSM w/EGPRS (see NOTE 3)

4   UTRAN w/HSDPA (see NOTE 4)

5   UTRAN w/HSUPA (see NOTE 4)

6   UTRAN w/HSDPA and HSUPA (see NOTE 4)

7   E-UTRAN

NOTE 3:   3GPP TS 44.060 [71] specifies the System Information messages which give the information about whether the serving cell supports EGPRS.

NOTE 4:   3GPP TS 25.331 [74] specifies the System Information blocks which give the information about whether the serving cell supports HSDPA or HSUPA.

<cause_type>: integer type; indicates the type of <reject_cause>.

0   Indicates that <reject_cause> contains an MM cause value, see 3GPP TS 24.008 [8] Annex G.

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>.

11.1.4 +CGREG, GPRS Network Registration

Description

The set command controls the presentation of an unsolicited result code +CGREG: <stat> when <n>=1 and there is a change in the MT's GPRS network registration status in GERAN/UTRAN, or unsolicited result code +CGREG: <stat>[,[<lac>],[<ci>],[<AcT>],[<rac>]] when <n>=2 and there is a change of the network cell in GERAN/UTRAN. The parameters <AcT>, <lac>, <rac> 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.

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 <lac>, <ci>, <AcT> and <rac>, if available, are returnedonly when <n>=2 and MT is registered in the network.

Test command returns the range of supported network registration mode (i.e. <n>).

Syntax

Command	Possible Response
AT+CGREG=[<n>]	OK or: +CME ERROR: <err>
AT+CGREG?	+CGREG: <n>,<stat>[,[<lac>],[<ci>],[<AcT>],[<rac>][,<cause_type>,<reject_cause>]] OK
AT+CGREG=?	+CGREG: (list of supported <n>s) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration

No	No	Yes	Yes	< 1s

Defined Values

<n>: integer type

0   disable network registration unsolicited result code; Default value

1   enable network registration unsolicited result code +CGREG: <stat>

2   enable network registration and location information unsolicited result code +CGREG: <stat>[,<[lac>,]<[ci>],[<AcT>],[<rac>]]

3   enable network registration, location information and GMM cause value information unsolicited   result   code   +CGREG: <stat>[,[<lac>],[<ci>],[<AcT>],[<rac>][,<cause_type>,<reject_cause>]]

<stat>: integer type; indicates the GPRS 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 GERAN/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 (see NOTE 2) (applicable only when <AcT> indicates 2,4,5,6)

9   registered for "CSFB not preferred", home network (not applicable)

10   registered for "CSFB not preferred", roaming (not applicable)

<lac>: string type; two-byte location area code in hexadecimal format (e.g. "00C3" equals 195 in decimal)

<ci>: string type; four byte GERAN/UTRAN cell ID in hexadecimal format

<AcT>: integer type; indicates the access technology of the serving cell

0   GSM

1   GSM Compact

2   UTRAN

3   GSM w/EGPRS (see NOTE 3)

4   UTRAN w/HSDPA (see NOTE 4)

5   UTRAN w/HSUPA (see NOTE 4)

6   UTRAN w/HSDPA and HSUPA (see NOTE 4)

7   E-UTRAN (not applicable)

NOTE 3:   3GPP TS 44.060 [71] specifies the System Information messages which give the information about whether the serving cell supports EGPRS.

NOTE 4:   3GPP TS 25.331 [74] specifies the System Information blocks which give the information about whether the serving cell supports HSDPA or HSUPA.

<rac>: string type; one-byte routing area code in hexadecimal format

<cause_type>: integer type; indicates the type of <reject_cause>.

0   Indicates that <reject_cause> contains a GMM cause value, see 3GPP TS

24.008 [8] Annex G.

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>.

11.1.5 +CEREG, EPS Network Registration status

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, or code +CEREG: <stat>[,<tac>,<ci>[,<AcT>]] when <n>=2 and there is a change of the network cell, code +CEREG: <stat>[,<tac>[,<ci>[,<AcT>[,<cause_type> [,<reject_cause>]]]]] when <n>=3.

Syntax

Command	Possible Response
AT+CEREG=[<n>]	OK or: +CME ERROR: <err>
AT+CEREG?	+CEREG: <n>,<stat>[,[<tac>],[<ci>],[<AcT>[,<cause_type>,<reject_cause>]]] OK
AT+CEREG=?	+CEREG: (list of supported <n>s) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration

No	No	Yes	Yes	< 1s

Defined Values

<n>: integer type

0   disable network registration unsolicited result code; Default value

1   enable network registration unsolicited result code +CEREG: <stat>

2   enable network registration and location information unsolicited result code +CEREG: <stat>[,[<tac>],[<ci>],[<AcT>]]

3   enable network registration, location information and EMM cause value information unsolicited   result   code   +CEREG: <stat>[,[<tac>],[<ci>],[<AcT>][,<cause_type>,<reject_cause>]]

4   For a UE that wants to apply PSM, enable network registration and location information unsolicited   result   code   +CEREG: <stat>[,[<tac>],[<ci>],[<AcT>][,,[,[<Active-Time>],[<Periodic-TAU>]]]]

5   For a UE that wants to apply PSM, enable network registration, location information and EMM   cause   value   information   unsolicited   result   code   +CEREG: <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 (See NOTE 2)

9   registered for "CSFB not preferred", home network (not applicable)

10   registered for "CSFB not preferred", roaming (not applicable)

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

<ci>: string type; four-byte 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 (see NOTE 3) (not applicable)

4   UTRAN w/HSDPA (see NOTE 4) (not applicable)

5   UTRAN w/HSUPA (see NOTE 4) (not applicable)

6   UTRAN w/HSDPA and HSUPA (see NOTE 4) (not applicable)

7   E-UTRAN

> **ℹ** 3GPP TS 44.060 [71] specifies the System Information messages which give the information about whether the serving cell supports EGPRS.
>
> 3GPP TS 25.331 [74] specifies the System Information blocks which give the

information about whether the serving cell supports HSDPA or HSUPA.

<cause_type>: integer type; indicates the type of <reject_cause>.

0   Indicates that <reject_cause> contains an EMM cause value, see 3GPP TS 24.301 [83] Annex A.

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>.

11.1.6 +COPS, Operator Selection

Description

This command enables accessories to access the network registration information, and the selection and registration of the GSM/UMTS network operator.

The Modem is registered in the Home network.

The Enhanced Operator Name String (EONS) feature enables the Modem to return the operator name displayed on the handset.

This feature allows the SIM card to store a mapping of MCC/MNC code pairs to the displayed operator name. As a result, several operators can share a single network while having their handsets display their own name as the network operator.

Testing the enhanced ONS feature requires a "SIM ONS" SIM card.

Syntax

Command	Possible Response
AT+COPS=[<mode>[,<format>	OK
[,<oper>[,< AcT>]]]]	or:

	+CME ERROR: <err>
AT+COPS?	+COPS: <mode>[,<format>,<oper>[,< AcT>]] OK Or +CME ERROR: <err>
AT+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)] OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 3Min

Defined Values

<mode>: integer type

0   automatic (<oper> field is ignored); Default value

1   manual (<oper> field shall be present, and <AcT> optionally)

2   deregister from network

3   set only <format> (for read command +COPS?), do not attempt registration/deregistration (<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>; Default value

1   short format alphanumeric <oper>

2   numeric <oper>

3.   report PLMN list result with LAC in <lac>

<oper>: string type; <format> indicates if the format is alphanumeric or numeric; long alphanumeric format can be upto 16 characters long and short format up to 8 characters (refer GSM MoU SE.13 [9]); numeric format is the GSM Location Area Identification number (refer 3GPP TS 24.008 subclause 10.5.1.3) which consists of a three BCD digit country code coded as in ITU T Recommendation E.212 [10] Annex A, plus a two BCD digit network code, which is administration specific; returned <oper> shall not be in BCD format, but in IRA characters converted from BCD; hence the number has structure: (country code digit 3)(country code digit 2)(country code digit 1)(network code digit 3)(network code digit 2)(network code digit 1)

<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 (see NOTE 1)

4   UTRAN w/HSDPA (see NOTE 2)

5   UTRAN w/HSUPA (see NOTE 2)

6   UTRAN w/HSDPA and HSUPA (see NOTE 2)

7   E-UTRAN

8   CDMA

9   CDMA&EVDO

10   EVDO

11   eMTC

12   NB-IoT

NOTE 1:   3GPP TS 44.060 [71] specifies the System Information messages which give the information about whether the serving cell supports EGPRS.

NOTE 2:   3GPP TS 25.331 [74] specifies the System Information blocks which give the information about whether the serving cell supports HSDPA or HSUPA.

11.1.7 +CPOL, Preferred Operators

Description

This command is used to edit the PLMN selector lists in the SIM card or active application in the UICC (GSM or USIM).

If no list has been previously selected, the EFPLMNwAcT - user controlled PLMN selector with Access Technology list, is the one accessed by default.

Syntax

Command	Possible Response

AT+CPOL=[<index>][,<format>[,<oper >[,<GSM_AcT>,<GSM_Compact_AcT>, <UTRAN_ AcT>,<EUTRAN_AcT>]]]	OK or: +CME ERROR: <err>
AT+CPOL?	+CPOL: <index1>,<format>,<oper1>[,<GSM_AcT1>, <GSM_Compact_AcT1>,<UTRAN_AcT1>,<E-UT RAN_AcT1>] [<CR><LF>+CPOL: <index2>,<format>,<oper2>[,<GSM_AcT2>,<GS M_ Compact_AcT2>,<UTRAN_AcT2>,<E-UTRAN_Ac T2>] [...]] OK or +CME ERROR: <err>
AT+CPOL=?	+CPOL: (list of supported<index>s),(list of supported<format>s) OK or: +CME ERROR: <err>

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration

Yes	No	Yes	Yes	< 1s

Defined Values

<indexn>: integer type; the order number of operator in the SIM/USIM preferred operator list

<format>: integer type

0   long format alphanumeric <oper>; Default value

1   short format alphanumeric <oper>

2   numeric <oper>

<opern>: string type; <format> indicates if the format is alphanumeric or numeric (see +COPS)

<GSM_AcTn>: integer type; GSM access technology:

0   access technology not selected

1   access technology selected

<GSM_Compact_AcTn>: integer type; GSM compact access technology

0   access technology not selected

1   access technology selected

<UTRAN_AcTn>: integer type; UTRAN access technology

0   access technology not selected

1   access technology selected

<E-UTRAN_AcTn>: integer type; E-UTRAN access technology

0   access technology not selected

1　access technology selected

11.1.8 +COPN, Read Operator Names

Description

This Execution command returns the list of operator names from the ME. Each operator code <numeric_n> that has an alphanumeric equivalent <alpha_n> in the ME memory shall be returned.

Syntax

Command	Possible Response
AT+COPN	+COPN: <numeric1>,<alpha1> [<CR><LF>+COPN: <numeric2>,<alpha2> [...]] OK or +CME ERROR: <err>
AT+COPN=?	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
Yes	No	Yes	Yes	< 1s

Defined Values

<numericn>: string type; operator in numeric format (see +COPS)

<alphan>: string type; operator in long alphanumeric format (see +COPS)

Note: If matching PLMN name is not found then numeric PLMN id (MCCMNC) will be displayed

11.1.9 +CEMODE, UE modes of operation for EPS

Description

This command is used to set the MT to operate according to the specified mode of operation for EPS.

Syntax

Command	Possible Response
AT+CEMODE=[<mode>]	OK or +CME ERROR: <err>
AT+CEMODE?	+CEMODE: <mode> OK
AT+CEMODE=?	+CEMODE: (list of supported <mode>s) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<mode>: integer type; indicates the mode of operation. The default value is depended on the target products.

0   PS mode 2 of operation: the UE registers only to EPS services, and UE's usage setting is "data centric";

1   CS/PS mode 1 of operation: the UE registers to both EPS and non-EPS services, and UE's usage setting is "voice centric";

2   CS/PS mode 2 of operation: the UE registers to both EPS and non-EPS services, and UE's usage setting is "data centric";

3   PS mode 1 of operation: the UE registers only to EPS services, and UE's usage setting is "voice centric".

NOTE: The definition for UE modes of operation can be found in 3GPP TS 24.301 [83]

11.1.10 +PACSP, PLMN Auto mode in CSP

Description

This command is used to enable/disable +PACSPx URC.

Not support for read/active command.

Syntax

Command	Possible Response
AT+PACSP=[<mode>]	OK or +CME ERROR: <err>

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<mode>: integer type value.

0   Disable +PACSP URC

1   Enable +PACSP URC

11.1.11 +ERAT, RAT mode and GPRS/EDGE status

Description

To get RAT mode status and GPRS/EDGE status or set RAT mode of MS.

Syntax

Command	Possible Response
AT+ERAT?	+ERAT:<Act>,<GPRS status>,<RAT mode> ,<prefer_rat> or +CME ERROR: <err>
+ERAT=<RAT mode>[,<prefer_rat>[,<lock>]]	

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<Act>: Access technology of current register PLMN

2   UTRAN

4   UTRAN w/HSDPA

5   UTRAN w/HSUPA

6   UTRAN w/ HSUPA and HSUPA

7   E-UTRAN

9   E-UTRAN (NB-S1 mode)

10   E-UTRA connected to a 5GCN

11   NR connected to a 5GCN

12   NR connected to an EPS core

13   NG-RAN

14   E-UTRA-NR dual connectivity

255   unknown

<GPRS status>:

0:   GPRS

1:   EDGE

<RAT mode>: RAT mode setting of MS

1:   UMTS only

3:   LTE only

5:   UMTS + LTE

15:   NR

17:   UMTS + NR

19:   LTE + NR

21:   UMTS + LTE + NR

<prefer_rat>: ignore. the field is discarded for 3GPP RAT, please use AT+EPRTL to set prefer RAT list for 3GPP RAT.

<lock>

0: unlock ERAT(default)

1: lock ERAT, i.e. cannot set RAT

11.1.12 +EPBSEH, Band Selection

Description

To set MS bands including GSM, UMTS, LTE and NR.

Syntax

Command	Possible Response
AT+EPBSEH=<gsm_band>,<umts_ban	OK

d>,<lte _band_1_64>,<nr_band_1_128>	ERROR
AT+EPBSEH?	+EPBSEH: \<gsm_band\>,\<umts_band\>,\<lte_band_32 _1\>+\<lte_band_64_33\>…\<lte_band_xxx_max\>, \<nr_ band_32_1\>+\<nr_band_64_33\>…\<nr_band_xx x_max\>
AT+EPBSEH=?	List of supported bit mask of each band mode +EPBSEH: \<gsm_band\>,\<umts_band\>,\<lte_band_32 _1\>+\<lte_band_64_33\>…\<lte_band_xxx_max\>, \<nr_ band_32_1\>+\<nr_band_64_33\>…\<nr_band_xx x_max\>

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<GSM_band>: HEX String, not support. Can fill it as any HEX string, for example "FF".

<UMTS_band>: HEX String

bit 0:   UMTS BAND I: IMT-2000

bit 1:   UMTS BAND II: PCS-1900

bit 2:   UMTS BAND III: DCS-1800

bit 3:   UMTS BAND IV: AWS-1700

bit 4:   UMTS BAND V: CLR-850

bit 5:   UMTS BAND VI: WCDMA-800

bit 6:   UMTS BAND VII: IMT-E-2600

bit 7:   UMTS BAND VIII: GSM-900

bit 8:   UMTS BAND IX: WCDMA-1800

bit 9:   UMTS BAND X: WCDMA-1700

bit 10 ~ bit 31: also supported for extended UMTS band setting according to device capability.

0xffff   Auto selection -> select all supported bands

<lte_band_1_64>: HEX String

Bitmap for LTE band1 to band64:
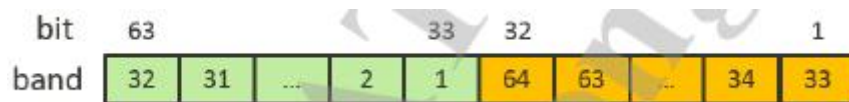
0xffffffff   Auto selection -> select all supported bands

<nr_band_1_128>: HEX String

Bitmap for NR band1 to band128:
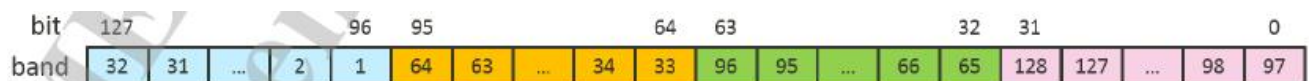
0xffffffffffffffff   Auto selection -> select all supported bands

11.1.13 +EPRATL, Set the Prefer RAT mode list

Description

To set the order of prefer RAT modes for network selection.

Syntax

Command	Possible Response
AT+EPRATL=<RATnum>,[<rat1>,<rat2>…]	OK/ERROR

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<RAT num>: the number of the inputted RAT mode list

0   No prefer

1-4   the number of prefer RAT mode

<rat>: prefer rat order setting; the priority of front rat is higher than the next rat

2:   UMTS

4:   LTE

128:   NR

11.1.14 +GTACT, Select RAT and BAND

Description

This command allows to switch between all the allowed RATs and BANDs for air interface access.

After you input this set command, the executed result will be returned immediately then device attempts to register specified RAT and bands

Syntax

Command	Possible Response
AT+GTACT=[<rat>[,[<PreferredAct1>],[<PreferredAct2>] [,<band_1>[,<band_2>[,.......[,<band_n>]]]]]]	OK or: +CME ERROR: <err>
AT+GTACT?	+GTACT: [<rat>[,[<PreferredAct1>],[<PreferredAct2>][,<band_1>[,<band_2>[,......[,<band_n>]]]]]]
AT+GTACT=?	+GTACT: (list of supported <Rat>s),(list of supported <PreferredAct1>s),(list of supported <PreferredAct2>s),(list of supported <gsm_band>s),(list of supported <umts_band>s),(list of supported <lte_band>s),(list of supported <cdma_band>s),(list of supported <evdo_band>s), (list of supported

<nr_band>s)

OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<rat>: integer type

1   UMTS

2   LTE

4   LTE/UMTS

10   Automatic

14   NR-RAN

16   NR-RAN/WCDMA

17   NR-RAN/LTE

20   NR-RAN/WCDMA/LTE

<PreferredAct1>: integer type; Selected parameter must be a part of <Act>

2   WCDMA is preferred

3   LTE is preferred

6   NR-RAN is preferred

<PreferredAct2>: integer type; Selected parameter must be a part of <Act>

    2   WCDMA is preferred

    3   LTE is preferred

    6   NR-RAN is preferred

<Band_1>,<Band_2>....<Band_n>: integer type

0   Automatic band selection for the <rat> as mentioned in the command. If no value is mentioned for <rat> then automatic band selection is sent for all the RAT's.

<umts_band>:

1   BAND_UMTS_I

2   BAND_UMTS_II

3   BAND_UMTS_III

4   BAND_UMTS_IV

5   BAND_UMTS_V

6   BAND_UMTS_VI

7   BAND_UMTS_VII

8   BAND_UMTS_VIII

9   BAND_UMTS_IX

10   BAND_UMTS_X

<lte_band>:

101   BAND_LTE_1

102   BAND_LTE_2

103   BAND_LTE_3

...

171   BAND_LTE_71s

<nr_band>:

501   BAND_NR_1

502   BAND_NR_2

...

509   BAND_NR_9

5010   BAND_NR_10

...

50512   BAND_NR_512

Note 1: This command gives a flexibility to configure Either RAT/Preferred RAT/BAND. So user can configure only RAT or Band also.

Note 2: If the RAT information is not provided then the second and third parameter will be ignored as it belongs to Preferred RAT. In case of Dual mode only one parameter (2nd parameter) is valid and third parameter will be ignored. Ex: AT+GTACT= 3, 0, 1 => here 1 will be ignored.

Note 3: For triple mode preferred act1 and preferred act2 will be taken as mentioned in the table below. All other combinations except these will be rejected.

Note 4: LTE parameters should be used only for the LTE platforms. In other cases, the behavior is not defined.

Note 5: Band changes for one particular RAT will not affect the other RAT configuration.

Ex: Setting LTE bands will not change anything on UMTS/NR bands.

Note 6: If user setting ACT value is 10, the value of first parameter is 20 when running query command.

RAT Combination Table for Triple Mode:

RAT	Preferred Act1	Preferred Act2	RAT Combination List		
20	Not stated	Not stated	RAT_NR	RAT_LTE	RAT_UMTS
20	2	Not stated	RAT_UMTS	RAT_NR	RAT_LTE
20	3	Not stated	RAT_LTE	RAT_NR	RAT_UMTS
20	6	Not stated	RAT_NR	RAT_LTE	RAT_UMTS
20	2	3	RAT_UMTS	RAT_LTE	RAT_NR
20	2	6	RAT_UMTS	RAT_NR	RAT_LTE
20	3	2	RAT_LTE	RAT_UMTS	RAT_NR
20	3	6	RAT_LTE	RAT_NR	RAT_UMTS
20	6	2	RAT_NR	RAT_UMTS	RAT_LTE
20	6	3	RAT_NR	RAT_LTE	RAT_UMTS

11.1.15 +GTCCINFO, Get Current Cell Information

Description

This command acquires the current cell information.

Syntax

Command	Possible Response
AT+GTCCINFO ?	+GTCCINFO: 1.UMTS（a maximum of ten UMTS cells are supported） UMTS service cell: <IsServiceCell>,<rat>,<mcc>,<mnc>,<lac>,<cellid>,<uarfcn>,<psc>,<band>, <ecno>,<rscp>,<rac>,<rxlev>,<reserved>,<Ec/Io_lev> UMTS neighbor cell: <IsServiceCell>,<rat>,<mcc>,<mnc>,<lac>,<cellid>,<uarfcn>,<psc>,<cell_ type>,<rank_pos>,<ranking_status>,<ecno>,<pathloss>,<rxlev>,<rscp> 2.LTE/eMTC/NB-IoT（a maximum of ten LTE cells are supported） LTE/eMTC/NB-IoT service cell: <IsServiceCell>,<rat>,<mcc>,<mnc>,<tac>,<cellid>,<earfcn>,<physicalcell Id>,<band>,<bandwidth>,<rssnr_value>,<rxlev>,<rsrp>,<rsrq> LTE/eMTC/NB-IoT neighbor cell: <IsServiceCell>,<rat>,<mcc>,<mnc>,<tac>,<cellid>,<earfcn>,<physicalcell Id>,<bandwidth>,<rxlev>,<rsrp>,<rsrq> OK 3.NR Cell（a maximum of ten NR cells are supported） NR service cell:

<IsServiceCell>,<rat>,<mcc>,<mnc>,<tac>,<cellid>,<narfcn>,<physicalcell

Id>,<band>,<bandwidth>,<ss_sinr>,<rxlev>,<ss_rsrp>,<ss_rsrq>

NR neighbor cell:

<IsServiceCell>,<rat>,<mcc>,<mnc>,<tac>,<cellid>,<narfcn>,<physicalcell

Id>,<ss_sinr>,<rxlev>,<ss_rsrp>,<ss_rsrq>

OK

4.LTE-NR ENDC（a maximum of ten LTE cells are supported）

LTE-NR EN-DC service cell:

<IsServiceCell>,<rat>,<mcc>,<mnc>,<tac>,<cellid>,<earfcn>,<physicalcell

Id>,<band>,<bandwidth>,<rssnr_value>,<rxlev>,<rsrp>,<rsrq>

<IsServiceCell>,<rat>,<mcc>,<mnc>,<tac>,<cellid>,<narfcn>,<physicalcell

Id>,<band>,<bandwidth>,<ss_sinr>,<rxlev>,<ss_rsrp>,<ss_rsrq>

LTE neighbor cell:

<IsServiceCell>,<rat>,<mcc>,<mnc>,<tac>,<cellid>,<earfcn>,<physicalcell

Id>,<bandwidth>,<rxlev>,<rsrp>,<rsrq>

OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 3s

Defined Values

<IsServiceCell>: integer type

1 Service Cell

2 Not Service Cell

<rat>: integer type; access technology

0 Invalid network

2 WCDMA

4.LTE

9 NR-RAN

<cell_id>: integer type and range is 0-0xFFFFFFFF

<mcc>: integer type; Mobile Country Code

<mnc>: integer type; Mobile Network Code

<lac>: integer type and range is 0-0xFFFF; Location Area Code

<band>: integer type. Refer to +GTACT band.

<rxlev>: integer type and range is 0-255.

For WCDMA:

0   Rscp < -120dbm

1   -120dbm <= Rscp < -119dbm

…

96   -25dbm <= Rscp

For LTE:

0   RSRP < -140dbm

1   -140dbm <= RSRP < -139dbm

…

96   - 45dbm <= RSRP < -44dbm

97   -44dbm <= RSRP

For NR:

0   SS-RSRP < -156 dBm

1   -156 dBm ≤ SS-RSRP < -155 dBm

2   -155 dBm ≤ SS-RSRP < -154 dBm

…

125   -32 dBm ≤ SS-RSRP < -31 dBm

126   -31 dBm ≤ SS-RSRP

255   not known or not detectable

<psc>: integer type and range is 0-0xFFFFFFF; Primary scrambling code

<ecno>: integer type and range is 0-255;

<rac>: integer type and range is 0-255; Route area code

<cell_type>: integer type and range is 0-255

0 Cell belongs to the Active set (CELL_DCH)

1 Cell belongs to the Virtual Active set (CELL_DCH)

2 Cells in the SIB 11/12 "BA"-list

3 Cell is a detected UMTS cell (CELL_DCH)

4 Cell is a UMTS neighbour cell in GSM mode

5 Cell is a UMTS neighbour cell (all states but CELL_DCH)

6 Cell is a UMTS neighbour cell (all states but CELL_DCH)

<rank_pos>: integer type and range is 0-255; Cell reselection ranking of the cell (0 for the best cell) and this value is used to order UMTS and GSM cells for the presentation

<ranking_status>: integer type and range is 0-255; Reason why the cell was not ranked

0 Cell is available

1 No measurement results available

2 Cell is barred

3 Wrong PLMN

4 Removed due to H criteria priority (HCS active)

5 Removed due to HCS priority

6 Removed due to cell selection criteria

<pathloss>: integer type and range is 0-0xFF and 0xFF if not Available.

<tac>: integer type and range is 0-0xFFFF; Tracking Area Code.

<earfcn>: integer type and range is 0-0xFFFFFFFF; EUTRA Absolute Radio Frequency Channel Number

<narfcn> integer type and range is 0-0xFFFFFFFF; Radio Frequency Channel Number

<physical cellId>: integer type and range is 0-0xFFFFFFFF; physical cell Id

<bandwidth>: integer type and range is 0-255;

<rssnr_value>: integer type and range is -100-100; Radio Signal Strength Noise Ratio

-100: RSSNR <= -50dB;

-99: -50dB < RSSNR <= -49.5dB;

-98: 49.5dB < RSSNR <= -49dB;

…

-1: -1dB < RSSNR <= -0.5dB;

0: -0.5dB < RSSNR <= 0dB;

1: 0dB < SSNR <= 0.5dB;

....

98: 49dB < RSSNR <= 49.5dB;

99: 49.5dB < RSSNR <= 50dB;

100: 50dB < RSSNR;

255: Invalid value. not known or not detectable

<rsrp>: integer type and range is 0-255; Reference Signal Receive Power.

Note: 0 means less than -140 dBm or not detectable

<rsrq>: integer type and range is 0-255; Reference Signal Receive Quality

0   ..   RSRQ < -19.5dB

1   ..   -19.5dB ≤ RSRQ < -19.0dB

…

33   -3.5dB ≤ RSRQ < -3.0dB

34   -3.0dB ≤ RSRQ

<ss_rsrq>: integer type, synchronization signal based reference signal received quality (see 3GPP TS 38.133 [169] subclause 10.1.11).

0   ss_rsrq < -43 dB

1   -43 dB ≤ ss_rsrq < -42.5 dB

2   -42.5 dB ≤ ss_rsrq < -42 dB

…

124   18.5 dB ≤ ss_rsrq < 19 dB

125   19 dB ≤ ss_rsrq < 19.5 dB

126   19.5 dB ≤ ss_rsrq <20 dB

255   not known or not detectable

<ss_rsrp>: integer type, synchronization signal based reference signal received power (see 3GPP TS 38.133 [169] subclause 10.1.6).

0   ss_rsrp < -156 dBm

1   -156 dBm ≤ ss_rsrp < -155 dBm

2   -155 dBm ≤ ss_rsrp < -154 dBm

…

125   -32 dBm ≤ ss_rsrp < -31 dBm

126   -31 dBm ≤ ss_rsrp

255   not known or not detectable

<ss_sinr>: integer type, synchronization signal based signal to noise and interference ratio (see 3GPP TS 38.133 [169] subclause 10.1.16).

0   ss_sinr < -23 dB

1   -23 dB ≤ ss_sinr < -22.5 dB

2   -22.5 dB ≤ ss_sinr < -22 dB

…

125   39 dB ≤ ss_sinr < 39.5 dBm

126   39.5 dB ≤ ss_sinr < 40 dB

127   40 dB ≤ ss_sinr

255   not known or not detectable

<rscp>: integer type and range is 0-255; Received Signal Code Power

Note: 0 means less than -120 dBm or not detectable.

<Ec/Io_lev>: integer type and range is 0-49; CPICH Ec/Io level

0   CPICH Ec/Io < -24dB;

1   -24dB ≤ CPICH Ec/Io < -23.5dB;

…

49   0dB ≤ CPICH Ec/Io dB;

11.1.16 +GTCAINFO, Display of CA information

Description

This command is used to query and return the current PCC Band, SCC Band, secondary cell activation status, BW and Earfcn, etc.

AT+GTCAINFO? is used to read the current CA information.

Syntax

Command	Possible Response
AT+GTCAINFO?	+GTCAINFO: 1.LTE PCC: \<band>,\<physical cellId>,\<earfcn>,\<dl_bandwidth>, \<dl_mimo>,\<ul_mimo>,\<dl_modulation>,\<ul_modulation>,\<rsrp> [SCC1:\<scell_state>,\<ul_configured>,\<band>,\<physical cellId>,\<earfcn>,\<dl_bandwidth>,\<ul_bandwidth>,\<dl_mimo>, \<ul_mimo>,\<dl_modulation>,\<ul_modulation>,\<rsrp> SCC2:\<scell_state>,\<ul_configured>,\<band>,\<physical cellId>,\<earfcn>, \<dl_bandwidth>,\<ul_bandwidth>,\<dl_mimo>,\<ul_mimo>,\<dl_modulation>,\ ul_modulation>,\<rsrp> 2.NR PCC: \<band>,\<physical cellId>,\<narfcn>, \<nr_dl_bandwidth>,\<dl_mimo>,\<ul_mimo>, \<dl_modulation>,\<ul_modulation>,\<rsrp> [SCC1:\<scell_state>,\<ul_configured>,\<band>,\<physical cellId>,\<narfcn>, \<nr_dl_bandwidth>,\<nr_ul_bandwidth>,\<dl_mimo>,\<ul_mimo>,\<dl_modulation>,\<ul_modulation>,\<rsrp> OK
AT+GTCAINFO=?	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<band>: integer type; LTE/NR band, Parameter range is (0-50512).

When register LTE:

101   BAND_LTE_1

102   BAND_LTE_2

103   BAND_LTE_3

…

171   BAND_LTE_71

When register NR:

501   BAND_NR_1

502   BAND_NR_2

…

509   BAND_NR_9

5010 BAND_NR_10

…

50512   BAND_NR_512

<scell_state>: integer type; State of the secondary cell

1   Configured and deactivated

2   Configured and activated

<physical cellId>: integer type and range is 0-503; physical cell Id

<earfcn>: integer type and range is 0-65535; EUTRA Absolute Radio Frequency Channel Number

<narfcn> integer type and range is 0-2229167; NR5G Radio Frequency Channel Number

<dl_bandwidth>, <ul_bandwidth>: integer type and range is 0-255;

6   1.4 MHz bandwidth

15   3 MHz bandwidth

25   5 MHz bandwidth

50   10 MHz bandwidth

75   15 MHz bandwidth

100   20 MHz bandwidth

<nr_dl_bandwidth><nr_ul_bandwidth>: NR5G bandwidth, integer type and range is 0-2000;

25   5 MHz bandwidth

50   10 MHz bandwidth

75   15 MHz bandwidth

100   20 MHz bandwidth

125   25 MHz bandwidth

150   30 MHz bandwidth

200   40 MHz bandwidth

250   50 MHz bandwidth

300   60 MHz bandwidth

400   80 MHz bandwidth

450   90 MHz bandwidth

500   100 MHz bandwidth

1000   200 MHz bandwidth

2000   400 MHz bandwidth

<ul_mimo>: number of MIMO layers: integer type and range is 1-4

<dl_mimo>: number of MIMO layers: integer type and range is 1-4

<ul_configured>: Indicated whether UL CA is enabled on this cell or not

0: disabled

1: enabled

<dl_modulation>, <ul_modulation>: integer type and range is 0-6;

0   BPSK

1   QPSK,

2   16QAM,

3   64QAM,

4   256QAM,

5   1024QAM

6   UNKNOWN

12 GPRS

12.1 GPRS Functionality

GSM 07.07 defines commands that a TE may use to control a GPRS ME via a non-multiplexed character-stream interface. This places certain limitations on the functionality of the interface. For example, it is not possible for the ME to send control information to the TE or for the TE to send commands to the ME whilst the interface is in the online data state, unless the layer 2 protocol itself supports this feature (GSM 07.60-12). However, Modem-specific escape mechanism (DTR) is provided to enable the TE to switch the Modem into limited online command state.

The use of a multiplexed interface, (GSM 07.10), is not considered here (See "Multiplexer Feature"). The Modem-specific escape mechanism use DTR as an escape signal (following &D parameters) and designed for limited non network related commands. This specific mechanism purpose is to give the user a way to retrieve the signal strength. The time limit of consecutive DTR toggles is a minimum of 90 seconds. The Modem-specific is not designed to support online command and data states both at the same time, therefore any wrong or extreme usage can cause unexpected behaviors. The basic GPRS concept is be "always connected" and there is no charge for being connected (only per real data transferred).

12.2 GPRS Commands

This section defines commands that a terminal may use to control a GPRS ME. GPRS MTs vary widely in functionality. A class A ME might support multiple PDP-types as well as circuit-switched data, and use multiple external networks QoS profiles. At the other extreme, a class C ME might support only a single PDP-type using a single external network, and rely on the HLR to contain the PDP context definition. A comprehensive set of GPRS-specific commands is defined below to provide the flexibility needed by the more complex ME. The commands are designed to be expandable to accommodate new PDP types and interface protocols, merely by defining new values for many of the parameters. Multiple contexts may

be activated if the interface link-layer protocol is able to support them. The commands use the extended information and error message capabilities described in this specification. For MTs of intermediate complexity, most commands have simplified forms where certain parameters may be omitted. For the simplest MTs, and for backwards compatibility with existing communications software, it is possible to control access to the GPRS using existing modem-compatible commands. This "modem compatible" mode of operation is described below.

12.2.1 +CGDCONT, Define PDP Context

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.

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.

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.

Syntax

Command	Possible Response

+CGDCONT=[<cid>[,<PDP_type>[,<APN>[,<PDP_addr>[,<d_comp>[,<h_comp>[,<IPv4AddrAlloc>[,<request_type>[,<P-CSCF_discovery>[,<IM_CN_Signalling_Flag_Ind>]]]]]]]]]]	OK or: +CME ERROR: <err>
AT+CGDCONT?	+CGDCONT: <cid>,<PDP_type>,<APN>,<PDP_addr>, <d_comp>,<h_comp>[,<IPv4AddrAlloc>[,<request_type>[,<P-CSCF_discovery>[,<IM_CN_Signalling_Flag_Ind>]]]][<CR><LF> +CGDCONT: <cid>,<PDP_type>,<APN>,<PDP_addr>,<d_comp>, <h_comp>[,<IPv4AddrAlloc>[,<request_type>[, <P-CSCF_discovery>[,<IM_CN_Signalling_Flag_Ind>]]]] [...]]
AT+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)[<C
R><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)

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	Yes	< 1s

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 is returned by the test form of the command.

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 (see RFC 2460 [106])

IPV4V6 Virtual <PDP_type> introduced to handle dual IP stack UE capability. (See 3GPP TS 24.301 [83])

OSPIH Internet Hosted Octect Stream Protocol (Obsolete)

PPP   Point to Point Protocol (IETF STD 51 [104])

NOTE 2:   Only IP, IPV6 and IPV4V6 values are supported for EPS services.

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

<PDP_addr>: string type; identifies the MT in the address space applicable to the PDP. When +CGPIAF is supported, its settings can influence the format of this parameter returned with the read form of +CGDCONT.

NOTE 3:   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 (applicable for SNDCP only) (refer 3GPP TS 44.065 [61])

0   off

1   on (manufacturer preferred compression)

2   V.42bis

3   V.44

<h_comp>: integer type; controls PDP header compression (refer 3GPP TS 44.065 [61] and 3GPP TS 25.323 [62])

0   off

1   on (manufacturer preferred compression)

2   RFC 1144 [105] (applicable for SNDCP 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, see 3GPP TS 24.301 (subclause 6.5.1.2) and 3GPP TS 24.008 (subclause 10.5.6.17). 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, see 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, see 3GPP TS 24.229 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   UE indicates that the PDP context is for IM CN subsystem-related signalling only

12.2.2 +CGATT, Packet Domain Attach or Detach

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. Extended error responses are enabled by the +CMEE command.

Syntax

Command	Possible Response
AT+CGATT=<state>	OK or: +CME ERROR: <err>
AT+CGATT?	+CGATT: <state> OK

| AT+CGATT=? | +CGATT: (list of supported <state>s) |
| | OK |

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 15s

Defined Values

<state>: integer type; indicates the state of PS attachment

0   detached

1   attached

12.2.3 D*99, Request GPRS Service "D"

Description

This command enables the ME to perform the actions necessary for establishing communication between the terminal and the external Packet Data Network (PDN).

The ITU V.25ter 'D' (Dial) command causes the ME to enter the ITU V.25ter Online Data state and together with the terminal, to start the specified layer 2 protocol. The ME returns CONNECT to confirm acceptance of the command prior to entering the ITU V.25ter Online Data state. No further commands may follow on the AT command line.

The detailed behavior after the Online Data state has been entered is dependent on the PDP type, and is described briefly. GPRS attachment and PDP context activation procedures may take place prior to, or during the PDP startup if they have not already been performed using the +CGATT and +CGACT commands.

When the layer 2 protocols have terminated, either as a result of an orderly shutdown of the PDP or an error, the ME enters the ITU V.25ter command state and returns the NO CARRIER final result code.

If <called address> is supported and provided, the ME automatically sets up a virtual call to the specified address after the PDP context has been activated.

If <L2P> and <cid> are supported, the +CGDCONT, +CGQREQ and other such commands may then be used in the modem initialization AT command string to set values for PDP type, APN, QoS and so on.

If <L2P> is not supported, or is supported but omitted, the ME uses a layer 2 protocol appropriate to the PDP type.

If <cid> is not supported, or is supported but omitted, the ME attempts to activate the context using one of the following:

Any information provided by the terminal during the PDP start up procedure. For example, the terminal may provide a PDP type and/or PDP address to the ME.

A prior knowledge, for example, the ME may implement only one PDP type.

Using the "Empty PDP type" No PDP address or APN is sent in this case and only one PDP context subscription record is present in the HLR for this subscriber.

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

Syntax

Command	Possible Response
ATD*<GPRS_SC>[* [<called_address>] [*[<L2P>][*[<cid>]]]]#	CONNECT or: ERROR

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 30s

Defined Values

<GPRS_SC>: string type; GPRS Service Code to identify a request to use GPRS.

<called_address>: string type; to identify the called party in the address space applicable to the PDP. For communications software that does not support arbitrary characters in the dial string, a numeric equivalent may be used. Also, the comma character "," may be used as a substitute for the period character ".".

For PDP type OSP: IHOSS, the following syntax may be used for

<called_address>: string type; [<host>] [@[<port>] [@[<protocol>]]] where <host>, <port> and <protocol> are defined in "+CGDCONT, Define PDP Context".

For communications software that does not support arbitrary characters in the dial string, a numeric value equivalent to the host name may be used. However, this should be avoided if at all possible.

<L2P>: string type; to indicate the layer 2 protocol to be used.

For communications software that does not support arbitrary characters in the dial string, the following numeric equivalents are used:

0   NULL

1   PPP

2   PAD

3   X25

9   yyyy M-xxxx

Other values are reserved and result in an ERROR response to the Set command.

Note: V.250 (and certain communications software) do not permit arbitrary characters in the dial string. The <L2P> and <called_address> strings are therefore specified as containing digits (0-9) only.

<cid>: integer type; to specify a particular PDP context definition (See "+CGDCONT, Define PDP Context").

12.2.4 +CGACT, PDP Context Activate or Deactivate

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.

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.

Syntax

Command	Possible Response
AT+CGACT=[<state>[,<cid>[,<cid>[,]]]]	OK or:

	NO CARRIER or: +CME ERROR: <err>
AT+CGACT?	+CGACT: <cid>,<state><CR><LF> +CGACT: <cid>,<state><CR><LF> +CGACT: <cid>,<state> OK
AT+CGACT=?	+CGACT: (list of supported <state>s) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 30s

Defined Values

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

0   deactivated

1   activated

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

12.2.5 +CGPADDR, GPRS Addresses

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.

Syntax

Command	Possible Response
AT+CGPADDR[=<cid>[,<cid>[,]]]	+CGPADDR: <cid>[,<PDP_addr_1>[,<PDP_addr_2>]] [<CR><LF>+CGPADDR: <cid>[,<PDP_addr_1>[,<PDP_addr_2>]]][...]] OK
AT+CGPADDR=?	+CGPADDR: (list of defined <cid>s) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

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

address space applicable to the PDP. The address may be static or dynamic. For a static address, it will be the one set by the +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.

12.2.6 +CGEQREQ，3G Quality of Service Profile (Requested)

Description

This command allows the TE to specify a UMTS Quality of Service Profile that is used when the MT activates a PDP context.

Syntax

Command	Possible Response
AT+CGEQREQ=[<cid>[,<Traffic class>[,<Maximum bitrate UL>[,<Maximum bitrate DL>[,<Guaranteed bitrate UL>[,<Guaranteed bitrate DL>[,<Delivery order>[,<Maximum SDU size>[,<SDU error ratio>[,<Residual bit	OK or ERROR

error ratio>

[,<Delivery of erroneous SDUs>[,<Transfer delay>[,<Traffic handling priority>[,<Source statistics descriptor>[,<Signaling indication>]]]]]]]]]]]]]]]]

AT+CGEQREQ?	+CGEQREQ: <cid>,<Traffic class>,<Maximum bitrate UL>,<Maximum bitrate DL>,<Guaranteed bitrate UL>,<Guaranteed bitrate DL>,<Delivery order>,<Maximum SDU size>,<SDU error ratio>,<Residual bit error ratio>,<Delivery of erroneous SDUs>,<Transfer delay>,<Traffic handling priority>[,<Source statistics descriptor>,<Signaling indication>] [<CR><LF>+CGEQREQ: <cid>,<Traffic class>,<Maximum bitrate UL>,<Maximum bitrate DL>,<Guaranteed bitrate UL>,<Guaranteed bitrate DL>,<Delivery order>,<Maximum SDU size>,<SDU error ratio>,<Residual bit error ratio>,<Delivery of erroneous SDUs>,<Transfer delay>,<Traffic handling priority>[,<Source Statistics Descriptor>,<Signaling Indication>] […]]
AT+CGEQREQ=?	+CGEQREQ: <PDP_type>,(list of supported <Traffic class>s),(list of supported <Maximum bitrate UL>s),(list of supported <Maximum bitrate DL>s),(list of supported <Guaranteed bitrate UL>s),(list of supported <Guaranteed bitrate DL>s),(list of supported <Delivery order>s),(list of supported <Maximum SDU size>s),(list of

supported <SDU error ratio>s),(list of supported <Residual bit error ratio>s),(list of supported <Delivery of erroneous SDUs>s),(list of supported <Transfer delay>s),(list of supported <Traffic handling priority>s) [,(list of supported <Source statistics descriptor>s),(list of supported <Signaling indication>s)]

[<CR><LF>+CGEQREQ: <PDP_type>,(list of supported <Traffic class>s),(list of supported <Maximum bitrate UL>s),(list of supported <Maximum bitrate DL>s),(list of supported <Guaranteed bitrate UL>s),(list of supported <Guaranteed bitrate DL>s),(list of supported <Delivery order>s),(list of supported <Maximum SDU size>s),(list of supported <SDU error ratio>s),(list of supported <Residual bit error ratio>s),(list of supported <Delivery of erroneous SDUs>s),(list of supported <Transfer delay>s),(list of supported <Traffic handling priority>s)] [,(list of supported <Source statistics descriptor>s),(list of supported <Signaling indication>s)]

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

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

<PDP_type>: string type; specifies the type of packet data protocol (see the +CGDCONT command).

For the following parameters, see also 3GPP TS 23.107 [46].

<Traffic class>: integer type; indicates the type of application for which the UMTS bearer service is optimized (refer 3GPP TS 24.008 subclause 10.5.6.5).

0   conversational

1   streaming

2   interactive

3   background

4   subscribed value

If the Traffic class is specified as conversational or streaming, then the Guaranteed and Maximum bitrate parameters should also be provided.

<Maximum bitrate UL>: integer type; indicates the maximum number of kbits/s delivered to UMTS (up-link traffic) at a SAP. As an example a bit rate of 32kbit/s would be specified as '32' (e.g. AT+CGEQREQ=…,32, …). This parameter should be provided if the Traffic class is specified as conversational or streaming (refer 3GPP TS 24.008 subclause 10.5.6.5).

<Maximum bitrate DL>: integer type; indicates the maximum number of kbits/s delivered by UMTS (down-link traffic) at a SAP. As an example a bit rate of 32kbit/s would be specified as '32' (e.g. AT+CGEQREQ=…,32, …). If the parameter is set to '0' the subscribed value will be requested. This parameter should be provided if the Traffic class is specified as conversational or streaming (refer 3GPP TS 24.008 subclause 10.5.6.5).

<Guaranteed bitrate UL>: integer type; indicates the guaranteed number of kbits/s delivered to UMTS (up-link traffic) at a SAP (provided that there is data to deliver). As an example a bit

rate of 32kbit/s would be specified as '32' (e.g. AT+CGEQREQ=…,32, …). If the parameter is set to '0' the subscribed value will be requested. This parameter should be provided if the Traffic class is specified as conversational or streaming (refer 3GPP TS 24.008 subclause 10.5.6.5).

<Guaranteed bitrate DL>: integer type; indicates the guaranteed number of kbits/s delivered by UMTS (down-link traffic) at a SAP (provided that there is data to deliver). As an example a bit rate of 32kbit/s would be specified as '32' (e.g. AT+CGEQREQ=…,32, …). If the parameter is set to '0' the subscribed value will be requested. This parameter should be provided if the Traffic class is specified as conversational or streaming (refer 3GPP TS 24.008   subclause 10.5.6.5).

<Delivery order>: integer type; indicates whether the UMTS bearer shall provide in-sequence SDU delivery or not (refer 3GPP TS 24.008 subclause 10.5.6.5).

0   no

1   yes

2   subscribed value

<Maximum SDU size>: integer type; (1,2,3,…) indicates the maximum allowed SDU size in octets. If the parameter is set to '0' the subscribed value will be requested (refer 3GPP TS 24.008 subclause 10.5.6.5).

<SDU error ratio>: string type; indicates the target value for the fraction of SDUs lost or detected as erroneous. SDU error ratio is defined only for conforming traffic. The value is specified as 'mEe'. As an example a target SDU error ratio of 5•10-3 would be specified as "5E3" (e.g. AT+CGEQREQ=…,"5E3",…). "0E0" means subscribed value (refer 3GPP TS 24.008 subclause 10.5.6.5).

<Residual bit error ratio>: string type; indicates the target value for the undetected bit error ratio in the delivered SDUs. If no error detection is requested, Residual bit error ratio indicates the bit error ratio in the delivered SDUs. The value is specified as "mEe". As an example a target residual bit error ratio of 5•10-3 would be specified as "5E3" (e.g.

AT+CGEQREQ=…,"5E3",…). "0E0" means subscribed value (refer 3GPP TS 24.008 subclause 10.5.6.5).

<Delivery of erroneous SDUs>: integer type; indicates whether SDUs detected as erroneous shall be delivered or not (refer 3GPP TS 24.008 subclause 10.5.6.5).

0   no

1   yes

2   no detect

3   subscribed value

<Transfer delay>: integer type; (0,1,2,…) indicates the targeted time between request to transfer an SDU at one SAP to its delivery at the other SAP, in milliseconds. If the parameter is set to '0' the subscribed value will be requested (refer 3GPP TS 24.008 subclause 10.5.6.5).

<Traffic handling priority>: integer type; (1,2,3,…) specifies the relative importance for handling of all SDUs belonging to the UMTS bearer compared to the SDUs of other bearers. If the parameter is set to '0' the subscribed value will be requested (refer 3GPP TS 24.008 subclause 10.5.6.5).

<Source Statistics Descriptor>: integer type; specifies characteristics of the source of the submitted SDUs for a PDP context. This parameter should be provided if the Traffic class is specified as conversational or streaming (refer 3GPP TS 24.008 subclause 10.5.6.5).

0   Characteristics of SDUs is unknown

1   Characteristics of SDUs corresponds to a speech source

<Signalling Indication>: integer type; indicates signalling content of submitted SDUs for a PDP context. This parameter should be provided if the Traffic class is specified as interactive (refer 3GPP TS 24.008 subclause 10.5.6.5).

0   PDP context is not optimized for signalling

1 PDP context is optimized for signalling<PDP_type> (see +CGDCONT and +CGDSCONT commands).

12.2.7 +CGCMOD，PDP Context Modify

Description

This command is used to modify the specified PDP context (s) with respect to QoS profiles and TFTs.

Syntax

Command	Possible Response
AT+CGCMOD=[<cid>[,<cid>[,…]]]	OK Or +CME ERROR: <err>
AT+CGCMOD=?	+CGCMOD: (list of <cid>s associated with active contexts) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

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

+CGDSCONT commands).

12.2.8 +CGDATA，Enter Data State

Description

This execution command causes the MT to perform whatever actions are necessary to establish communication between the TE and the network using one or more GPRS PDP types. This may include performing a GPRS attach and one or more PDP context activation. If the parameters are accepted, MT displays the intermediate result code CONNECT on TE and enters the online data state; thereafter data transfer may proceed. No other commands following +CGDATA in the command line will be processed.

Syntax

Command	Possible Response
AT+CGDATA=[<L2P>,[<cid>[,<cid>[,…]]]]	CONNECT It follows data transfer or +CME ERROR: <err>
AT+CGDATA=?	+CGDATA: (list of supported <L2P>s) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<L2P>: string type; indicates the layer 2 protocol to be used between the TE and MT

NULL   none, for PDP type OSP: IHOSS (Obsolete)

PPP   Point-to-point protocol for a PDP such as IP

PAD   character stream for X.25 character (triple X PAD) mode (Obsolete)

X25   X.25 L2 (LAPB) for X.25 packet mode (Obsolete)

M-xxxx manufacturer-specific protocol (xxxx is an alphanumeric string)

Note: If the value is omitted, the layer 2 protocol is unspecified. Other values are reserved and will result in an ERROR response.

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

12.2.9 +CGDSCONT，Define Secondary PDP Context

Description

This command is used to define a secondary PDP context by specifying the PDP context parameter values for a <cid> (local context identification parameter). If the command is used only with the one parameter <cid>, it means that the corresponding PDP context becomes undefined.

Syntax

Command	Possible Response
AT+CGDSCONT=[<cid>,<p_cid> [,<d_comp>[,<h_comp> [,<IM_CN_Signaling_Flag_Ind>]	OK Or ERROR

]]]

AT+CGDSCONT?	+CGDSCONT: <cid>,<p_cid>,<d_comp>,<h_comp> [,<IM_CN_Signaling_Flag_Ind>] [<CR><LF>+CGDSCONT: <cid>,<p_cid>,<d_comp>,<h_comp> [,<IM_CN_Signaling_Flag_Ind>] [...]] OK
AT+CGDSCONT=?	+CGDSCONT: (range of supported <cid>s),(list of <p_cid>s for active primary contexts),(list of supported <d_comp>s),(list of supported <h_comp>s),(list of supported <IM_CN_Signalling_Flag_Ind>s) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	Yes	< 1s

Defined Values

<cid>: integer type; which 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) is returned by the test form of the command.

NOTE: 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.

<p_cid>: integer type; specifies a particular PDP context definition which has been specified by use of the +CGDCONT command. The parameter is local to the TE-MT interface. The list

of permitted values is returned by the test form of the command.

<d_comp>: integer type; controls PDP data compression (applicable for SNDCP only) (refer 3GPP TS 44.065 [61])

0   off

1   on (manufacturer preferred compression)

2   V.42bis

3   V.44

<h_comp>: integer type; controls PDP header compression (refer 3GPP TS 44.065 [61] and 3GPP TS 25.323 [62])

0   off

1   on (manufacturer preferred compression)

2   RFC 1144 [105] (applicable for SNDCP only)

3   RFC 2507 [107]

4   RFC 3095 [108] (applicable for PDCP only)

<IM_CN_Signalling_Flag_Ind>: integer type; indicates to the network whether the PDP context is for IM CN subsystem-related signalling only or not.

0   UE indicates that the PDP context is not for IM CN subsystem-related signalling only

1   UE indicates that the PDP context is for IM CN subsystem-related signalling only

12.2.10 +CGCONTRDP, PDP Context Read Dynamic Parameters

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> and <WLAN_Offload> 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 cannot 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.

Syntax

Command	Possible Response
AT+CGCONTRDP=[<cid>]	+CGCONTRDP:<cid>,<bearer_id>,<apn>[,<source_addr and subnet_mask >[,<gw_addr>[,<DNS_prim_addr>[,<DNS_sec_addr>[,<PCSCF_prim_add

r>

[,<P-CSCF_sec_addr>[,<IM_CN_Signalling_Flag>]]]]]]]]

[<CR><LF>+CGCONTRDP: <cid>,<bearer_id>,<apn> [,<source_addr and subnet

mask>[,<gw_addr>[,<DNS_prim_addr>[,<DNS_sec_addr>[,<P-CSCF_pri

m_addr>[,<P-CSCF_sec_addr>[,<IM_CN_Signalling_Flag>]]]

]]]]

[...]]

AT+CGCONT RDP=?	+CGCONTRDP: (list of <cid>s associated with active contexts)

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

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 onlyor not.

0   PDP context is not for IM CN subsystem-related signalling only

1   PDP context is for IM CN subsystem-related signalling only

12.2.11 +CGSCONTRDP, Secondary PDP Context Read Dynamic Parameters

Description

The execution command returns <p_cid>, <bearer_id>, <IM_CN_Signalling_Flag> and <WLAN_Offload> for an active secondary PDP context with the context identifier <cid>.

If the parameter <cid> is omitted, the <cid>, <p_cid>, <bearer_id> and <IM_CN_Signalling_Flag> are returned for all active secondary PDP contexts.

In EPS, the Traffic Flow parameters are returned.

NOTE: Parameters for UE initiated and network initiated PDP contexts are returned.

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

Syntax

Command	Possible Response
AT+CGSCONTRDP=[<cid>]	+CGSCONTRDP: <cid>,<p_cid>,<bearer_id>[,<IM_CN_Signalling_Flag>][<CR><LF>+CGSCONTRDP:<cid>,<p_cid>,<bearer_id>[,<IM_CN_Signalling_Flag>][...]]
AT+CGSCONTRDP=?	+CGSCONTRDP: (list of <cid>s associated with active contexts)

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<cid>: integer type; specifies a particular active secondary PDP context or Traffic Flows 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).

<p_cid>: integer type; specifies a particular PDP context definition or default EPS context Identifier which has been specified by use of the +CGDCONT command. The parameter is local to the TE-MT interface (see the +CGDSCONT command).

<bearer_id>: integer type; identifies the bearer, EPS Bearer in EPS and NSAPI in UMTS/GPRS.

<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

12.2.12 +CGTFTRDP, Traffic Flow Template Read Dynamic Parameters

Description

This command returns the relevant information about Traffic Flow Template of <cid> together with the additional network assigned values when established by the network.

Syntax

Command	Possible Response

AT+CGTFTRDP=[<cid>]	+CGTFTRDP: <cid>,<packet filter identifier>,<evaluation vailable index>,<source address and vaila mask>,<protocol vaila (ipv4) / next header(ipv6)>,<destination port range>,<source port range>,<ipsec security parameter index (spi)>,<type of service (tos) (ipv4) and mask / traffic class (ipv6) and mask>,<flow label (ipv6)>,<direction>,<NW packet filter Identifier>[<CR><LF>+CGTFTRDP: <cid>,<packet filter identifier>,<evaluation vailable index>,<source address and vaila mask>,<protocol vaila (ipv4) / next header (ipv6)>,<destination port range>,<source port range>,<ipsec security parameter index (spi)>,<type of service (tos) (ipv4) and mask / traffic class (ipv6) and mask>,<flow label (ipv6)>,<direction>,<NW packet filter Identifier> [...]]
AT+CGTFTRDP=?	+CGTFTRDP: (list of <cid>s associated with active contexts)

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<cid>: integer type; Specifies a particular secondary or non-secondary PDP context definition or Traffic Flows definition (see +CGDCONT and +CGDSCONT commands).

For the following parameters, see also 3GPP TS 23.060 [47]

<packet filter identifier>: integer type. The value range is from 1 to 16.

<evaluation precedence index>: integer type. The value range is from 0 to 255.

<remote address and subnet mask>: string type. 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 +CGTFTRDP.

<protocol number (ipv4) / next header (ipv6)>: integer type. The value range is from 0 to 255.

<local port range>: string type. The string is given as dot-separated numeric (0-65535) parameters on the form "f.t".

<remote port range>: string type. The string is given as dot-separated numeric (0-65535) parameters on the form "f.t".

<ipsec security parameter index (spi)>: numeric value in hexadecimal format. The value range is from 00000000 to FFFFFFFF.

<type of service (tos) (ipv4) and mask / traffic class (ipv6) and mask>: string type. The string is given as dot-separated numeric (0-255) parameters on the form "t.m".

<flow label (ipv6)>: numeric value in hexadecimal format. The value range is from 00000 to FFFFF. Valid for IPv6 only.

<direction> integer type. Specifies the transmission direction in which the Packet Filter shall be applied.

0   Pre Release 7 TFT Filter (see 3GPP TS 24.008 [8], table 10.5.162)

1   Uplink

2   Downlink

3   Bidirectional (Used for Uplink and Downlink)

<NW packet filter Identifier> integer type. The value range is from 1 to 16. In EPS the value is assigned by the network when established

12.2.13 +CSCON, Signaling Connection Status

Description

The set command controls the presentation of an unsolicited result code +CSCON. If <n>=1, +CSCON: <mode> is sent from the MT when the connection mode of the MT is changed. If <n>=2 and there is a state within the current mode, +CSCON: <mode>[,<state>] is sent from the MT when the connection mode or state information of the MT is changed. If <n>=3, +CSCON: <mode>[,<state>[,<access>]] is sent from the MT when the connection mode, state or access information of the MT is changed. If <n>=4, +CSCON: <mode>[,<state>[,<access>[,<coreNetwork>]]] is sent from the MT. If setting fails, an MT error, +CME ERROR: <err> is returned. Refer subclause 9.2 for possible <err> values.

When the MT is in UTRAN, E-UTRAN or NG-RAN, the <mode> refers to idle when no PS signaling connection between UE and network is setup and to connected mode when a PS signaling connection between UE and network is setup. When the UE is in GERAN, the mode refers to idle when the MT is in either the IDLE state or the STANDBY state and to connected mode when the MT is in READY state.

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

The <access> indicates the current radio access type of the MT when the MT is in GERAN, UTRAN, E-UTRAN or NG-RAN.

The <coreNetwork> indicates the core network type the MT is connected to when the MT is in E-UTRAN or NG-RAN.

The read command returns the status of result code presentation and an integer <mode> which shows whether the MT is currently in idle mode or connected mode. State information <state> is returned only when <n>=2. Radio access type information <access> is returned only when <n>=3. Core network type information <coreNetwork> is returned only when <n>=4.For Multi-RAT Dual Connectivity (MR-DC) architecture (see 3GPP TS 37.340 [162]), information is presented for the master RAT followed by optionally, information for each of

the secondary RATs on a separate line.

Test command returns supported values as a compound value.

Syntax

Command	Possible Response
AT+CSCON=[<n>]	OK or +CME ERROR: <err>
AT+CSCON?	+CSCON: <n>,<mode>[,<state>[,<access>]] [<CR><LF>+CSCON: \<n>,<mode>[,<state>[,<access>[,<coreNetwork>]]] [...]] +CME ERROR: <err>
AT+CSCON=?	+CSCON: (list of supported <n>s) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<n>: integer type

0   disable unsolicited result code

1   enable unsolicited result code +CSCON: <mode>

2   enable unsolicited result code +CSCON: <mode>[,<state>]

3   enable unsolicited result code +CSCON: <mode>[,<state>[,<access>]]

4   enable unsolicited result code +CSCON: <mode>[,<state>[,<access> [,<coreNetwork>]]]

<mode>: integer type; indicates the signalling connection status

0   idle

1   connected

<state>: integer type; indicates the CS or PS state while in GERAN and the RRC state information if the MT is in connected mode while in UTRAN, E-UTRAN and NG-RAN.

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

8   NG-RAN connected state

9   NG-RAN inactive state (see 3GPP TS 38.331 [160]).

0xff Unknown

<access>: integer type; indicates the current radio access type.

0   Indicates usage of radio access of type GERAN, see 3GPP TS 45.001 [146].

1   Indicates usage of radio access of type UTRAN TDD, see 3GPP TS 25.212 [144].

2   Indicates usage of radio access of type UTRAN FDD, see 3GPP TS 25.212 [144].

3   Indicates usage of radio access of type E-UTRA TDD, see 3GPP TS 36.300 [145].

4   Indicates usage of radio access of type E-UTRA FDD, see 3GPP TS 36.300 [145].

5   Indicates usage of radio access of type NR, see 3GPP TS 38.300 [159].

<coreNetwork>: integer type; indicates the core network type the UE is connected to.

0   Indicates MT is connected to EPC, see 3GPP TS 23.401 [82].

1   Indicates MT is connected to 5GCN, see 3GPP TS 23.501 [165].

12.2.14 +EIAAPN, Initial attach APN setting command

Description

This command is used to set Initial attach APN.

Syntax

Command	Possible Response
AT+EIAAPN=<APN_Name>,<APN_Index>,<PDP_type>	OK
,<Roaming_PDP_type>,<auth_type>,<username>,<password>	or:

	ERROR/+CME ERROR: <err>

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	Yes	< 1s

Defined Values

<apn_name>: string type; a logical name that was used to select the GGSN or the external packet data network

<apn_index>: A numeric parameter. No use, specify it as 0.

<PDP_type>: string type.

IP

IPV6

IPV4V6

<Roaming_PDP_type>: string type.

IP

IPV6

IPV4V6

<auth_type>: integer type.

0 None

1 PAP

2 CHAP

<username>: string type, user name for access to the IP network

<password>: string type, password for access to the IP network

12.2.15 +E5GOPT, 5G option configuration

Description

This command is used to set and query 5G option configuration.

Syntax

Command	Possible Response
AT+E5GOPT=<N>	OK/ERROR
AT+E5GOPT?	+E5GOPT: <5G_option>

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	Yes	< 1s

Defined Values

<N>: integer, sum of bitmap value as below.

0x01   LTE

0x02   option 2

0x05   option 3

12.2.16 +EAPNACT, PDP context activate or deactivate without the cid

Description

This command is used to activate or deactivate the specified PDP context(s).

Syntax

Command	Possible Response
AT+EAPNACT=<state>,<parameter>	OK/ERROR

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	Yes	< 1s

Defined Values

<state>: indicate the state of PDP context activation.

0   deactivated

1   activated

<parameter>

state	parameter
1	<apn_name>,<apn_type>
0	<aid>

<apn_name>: string type; a logical name that was used to select the GGSN or the external packet data network.

<apn_type>: string type. unknow/default/ims/mms/supl/dun/hipri/fota/cbs/emergency/ia/dm/wap/net/cmmail/tethering/rcse/xcap/rcs

<aid>: a numeric parameter which specifies a particular PDP context definition.

12.2.17 +GTDNS, Request DNS Addresses

Description

This command is used to obtain the primary and secondary DNS address when PDP context specified by profile id is activated.

Syntax

Command	Possible Response
AT+GTDNS=<cid>	+GTDNS: <cid>,<Primary_DNS_addr>,<Secondary_DNS_addr> OK
AT+GTDNS?	+GTDNS: <cid1>,<Primary_DNS_addr1>,<Secondary_DNS_addr1> +GTDNS: <cid2>,<Primary_DNS_addr2>,<Secondary_DNS_addr2> ….. +GTDNS: <cidn>,<Primary_DNS_addrn>,<Secondary_DNS_addrn>

	OK
AT+GTDNS=?	+GTDNS: (list of defined <cid>s) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

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

<Primary_DNS_addr>: String type. Primary DNS address

<Secondary_DNS_addr>: String type. Secondary DNS address

13 Hardware Control Commands

13.1.1 +GTUSBMODE, Set USB Configuration Profile

Description

This command changes the USB configuration profile of the module. The new profile is activated after auto-reset or power cycle.

Syntax

Command	Possible Response
+GTUSBMODE=<mode>	OK or: ERROR
+GTUSBMODE?	+GTUSBMODE: <mode> OK
+GTUSBMODE=?	+GTUSBMODE:(list of supported <mode>s) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	No	< 1s

Defined Values

<mode>: integer type and supported mode depends on the target device and they may be as below

40: RNDIS+AT+AP(GNSS)+META+DEBUG+NPT+ADB

41:RNDIS+AT+AP(GNSS)+META+DEBUG+NPT+ADB+AP(LOG)+AP(META)(default

value)

13.1.2 +GTFMODE, Hardware GNSS/Flight Mode Enable

Description

This command is used to disable or enable the WWAN radio or GNSS hardware control function.

Note:

Refer to the hardware manual of the corresponding product for the pin that controls the flight mode and GNSS.

Syntax

Command	Possible Response
+GTFMODE=<n>[,<m>]	OK or ERROR
+GTFMODE?	+GTFMODE:<n>,<m> OK
+GTFMODE=?	+GTFMODE: (list of supported<n>s, list of supported<m>s) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	No	< 1s

Defined Values

<n>: integer type and select the different value

0   Radio hardware pin operation is invalid(default value)

1   Radio hardware pin operation is valid

<m>: integer type and select the different value

0   GNSS hardware pin operation is invalid(default value)

1   GNSS hardware pin operation is valid

13.1.3 +GTDIPCMODE, Set DIPC Configuration Profile

Description

This command switches the PCIE/USB interface configuration profile of the module. The new profile is activated after auto reset or power cycle.

Syntax

Command	Possible Response
+GTDIPCMODE=<dual_ipc_mode>[,<ap_logging_interface>,<md_logging_interface>,<md_at_interface>,<ap_pcie_port_config>,<md_pcie_port_config>]	OK or: ERROR
+GTDIPCMODE?	+GTDIPCMODE: <dual_ipc_mode>,<ap_logging_interface>,<md_logging_interface>,<md_at_interface>,<ap_pcie_port_config>,<md_pcie_port_config> OK
+GTDIPCMODE=?	+GTDIPCMODE:(list of supported <dual_ipc_mode>s),(list of supported

<ap_logging_interface>s),(list of supported <md_logging_interface>s),(list of supported <md_at_interface>s),(list of supported <ap_pcie_port_config>s),(list of supported <md_pcie_port_config>s)

OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	No	< 1s

Defined Values

<dual_ipc_mode>: integer type;

1: PCIe Advance Mode

2: PCIe Only Mode

3: Dual Mode (default value)

<ap_logging_interface>: integer type;

1: Output AP log with USB interface (default value)

2: Output AP log with PCIE interface

<md_logging_interface>: integer type;

1: Output Modem log with USB interface (default value)

2: Output Modem log with PCIE interface

<md_at_interface>: integer type;

1: At port uses USB interface (default value)

2: At port uses PCIE interface

<ap_pcie_port_config>: integer type;

default value is 3:

ap_pcie_port_config is a decimal bitmask, and each bit of it represents whether a port on the AP side is enabled or not.

A bit value of 0 means that the corresponding ports will not be enumerated, a bit value of 1 means that the corresponding ports will be enumerated.

Among them, bit0 corresponds to "LoggingAP" port, Bit1 to "ADB" port, bit2 to "GNSSAT" port, and bit3 to "Meta (GPS)" port.

<md_pcie_port_config>: integer type;

default value is 15:

md_pcie_port_config is a decimal bitmask, and each bit of it represents whether a port on the Modem side is enabled or not.

A bit value of 0 means that the corresponding ports will not be enumerated, a bit value of 1 means that the corresponding ports will be enumerated.

Among them, bit0 corresponds to "LoggingMD" port, Bit1 to "Meta" port, bit2 to "BinaryTool" port, and bit3 to "AT" port.

13.1.4 +GTREGWRITE, Configure Tuner Register

Description

This command is used to configure tuner register through RFFE MIPI.

Syntax

Command	Possible Response
+GTREGWRITE=<usid>,<addr>,<value>	OK or: ERROR
+GTREGWRITE=?	+GTREGWRITE: (0-15),(0-255),(0-255) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

Parameter (integer type)	Value	Description
<usid>	0–15	Tuner usid
<addr>	0–255	Tuner Register addr
<value>	0–255	Tuner Register value

13.1.5 +GTRXPATHEN, switch the antenna

Description

1. The Execution command set the rat and antenna.

2. The READ command is used to return the current rat and antenna setting.

3. The TEST returns the list of supported each param of this command.

Syntax

	Command	Possible Response
Execution command	+GTRXPATHEN = <rat_type>,<enable_mode>	OK or ERROR
READ command	+GTRXPATHEN ?	+GTRXPATHEN: <rat_type>,<enable_mode> OK or ERROR
TEST command	+GTRXPATHEN =?	+GTRXPATHEN: (list of supported <rat_type>s),(list of supported <enable_mode>s) OK or ERROR

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<rat_type>:

Integer type .

1 UMTS

3 LTE

15 NR-RAN

<enable_mode>: Integer type. We use 4 bit to present those 4 RX path, the relation will be:

0001(1): main only

0010(2): aux only

0100(4): mimo main only

1000(8): mimo aux only

1111(15): main +aux +mimo main +mimo aux

1: main only

2: aux only

4: mimo main only

8: mimo aux only

15: main +aux +mimo main +mimo aux

For the bands only support 2RX，mimo main only and mimo aux only should be ignored.

13.1.6 +GTTXPWR Set the maximum Tx power

Description

1. The Execution command set the maximum Tx Power for the current band.

2. The READ command is used to return the current maximum Tx Power setting.

3. The TEST returns the maximum Tx power of this command.

Syntax

	Command	Possible Response
Execution command	+GTTXPWR=<rat_type>,<band_no>,<max_tx_pwr>,[<band_no>,<max_tx_pwr>,…]	OK or ERROR
READ command	+GTTXPWR?	(list of +GTTXPWR: <rat_type>s (list of set <band_no>s,<max_tx_pwr>s)s) OK or ERROR
TEST command	+GTTXPWR =?	+GTTXPWR: (list of set <rat_type>s,<band_no>s, <max_tx_pwr>s) OK or ERROR

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration	Pin Restricted
No	Yes	Yes	Yes	< 1s	No

Defined Values

<rat_type>:

Integer type - support (1,4,7).

1 UMTS

4 LTE

7 NR-RAN

<band_no>:

On FM350, list of supported bands are as below:

UMTS: 1,2,4,5,8

LTE:
1,2,3,4,5,7,8,12,13,14,17,18,19,20,25,26,28,29,30,32,34,38,39,40,41,42,43,46,48,66,71

NR5G: 1,2,3,5,7,8,20,25,28,30,38,40,41,48,66,71,77,78,79

< max_tx_pwr > (0~232)

The maximum Tx power value.

The range for power is from 0 to 232 in 0.125dB.

13.1.7 +GTSAR3DBFB, Enable or Disable Automatic Power setback of 3dB per CC

Description

This command is used to control the SAR function in inter band ENDC/LTE/NR ULCA mode, based on the power of the corresponding antenna in single Band mode, enable or disable ENDC/LTE/NR ULCA automatic power setback of 3dB per CC.

Note:

It is applicable to currently used SAR, including BODYSAR and TA-SAR.

Syntax

Command	Possible Response
+GTSAR3DBFB =<en>	OK or: ERROR
+GTSAR3DBFB?	+GTSAR3DBFB =<en> OK or: ERROR
+GTSAR3DBFB=?	+GTSAR3DBFB =(0,1) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	Yes	< 1s

Defined Values

<en>: integer type;

0   disable GTSAR3DBFB feature(default value).

1   enable GTSAR3DBFB feature.

14 Bodysar Commands

14.1 +BODYSAREN, Enable or Disable

BODYSAR

This command is used to enable or disable the functionality of BODYSAR.

Syntax

Command	Possible Response
+BODYSAREN=<en>	OK In case of related error: ERROR
+BODYSAREN?	+BODYSAREN: <en> OK In case of related error: ERROR
+BODYSAREN=?	+BODYSAREN: (0,1) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	Yes	< 1s

Defined Values

<en>: integer type;

0   disable BODYSAR feature.

1   enable BODYSAR feature(default value).

14.2 +BODYSARMODE, Select the Control Mode

Description

This command is used to select the control mode for the functionality of BODYSAR.

Note:

If the BODYSAR is disabled, then the set command will return ERROR.

Syntax

Command	Possible Response
+BODYSARMODE=<mode>	OK In case of related error: ERROR
+BODYSARMODE?	+BODYSARMODE: <mode> OK In case of related error: ERROR
+BODYSARMODE=?	+BODYSARMODE: (0-2) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	Yes	< 1s

Defined Values

<mode>: integer type;

0   HW control by DPR pin(default value).

1   SW control.

2   Mixed control.

14.3 +BODYSARRULE, Enable or Disable the Regulatory rule function

Description

This command is used to enable or disable the regulatory rule for the functionality of BODYSAR, such as FCC，CE. It is only used for HW control mode.

Note:

If the BODYSAR is disabled, then the set command will return ERROR.

Syntax

Command	Possible Response
+BODYSARRULE=<value>	OK In case of related error: ERROR
+BODYSARRULE?	+BODYSARRULE: <value> OK In case of related error: ERROR
+BODYSARRULE=?	+BODYSARRULE: (0,1) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration	Pin Restricted
No	Yes	Yes	Yes	< 1s	No

Defined Values

<value>: integer type;

0   disable regulatory rule (default value).

1   enable regulatory rule .

14.4 +BODYSARTRIGIDX, SAR Table Trigger Select Index

Description

This command is used to trigger select index for SAR Table of BODYSAR.

ℹ️   If the BODYSAR is disabled, then the set command will return ERROR.

Syntax

Command	Possible Response
+BODYSARTRIGIDX=<table_index>	OK In case of related error: ERROR
+BODYSARTRIGIDX?	+BODYSARTRIGIDX: <table_index>

	OK
	In case of related error:
	ERROR
+BODYSARTRIGIDX=?	+BODYSARTRIGIDX:(0-143)
	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	Yes	< 1s

Defined Values

<table_index>: integer type;

0   select SAR table Index 0 (default value).

1   select SAR table Index 1.

：

143 select SAR table Index 143.

14.5 +BODYSARON, Trigger SAR Coming into Effect for SW Mode

Description

This command is used to trigger the SAR algorithm to take effect in software mode for the functionality of BODYSAR.

Note:

If the BODYSAR function is disabled, then the set command will return ERROR.

Syntax

Command	Possible Response
+BODYSARON=<on>	OK In case of related error: ERROR
+BODYSARON?	+BODYSARON: <on> OK In case of related error: ERROR
+BODYSARON=?	+BODYSARON: (0,1) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration	Pin Restricted
No	No	Yes	Yes	< 1s	No

Defined Values

<on>: integer type;

0   SAR algorithm doesn't work in software mode (default).

1   SAR algorithm works in software mode.

14.6 +BODYSARPROFILE, Select the SAR Table Index to be Modified

Description

This command is used to select the SAR table to be modified for BODYSARCFG function.

Note:

If the BODYSAR is disabled, then the set command will return ERROR.

Syntax

Command	Possible Response
+BODYSARPROFILE=<profile_index>	OK In case of related error: ERROR
+BODYSARPROFILE?	+BODYSARPROFILE: <profile_index> OK In case of related error: ERROR
+BODYSARPROFILE=?	+BODYSARPROFILE: (0-143) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<profile_index>: integer type;

0   set SAR table Index 0 (default).

1   set SAR table Index 1.

:

143   set SAR table Index 143.

14.7 +BODYSARCFG, Set the Maximum TX Power Limit of Antenna Combination.

Description

The command is used to set the maximum TX power of all supported technologies、bands and antenna. The band parameter is a bit mask, so the user could use this command to set multiple bands with same power values. All power setting is absolute power value in 1/8dBm unit, and the data set by this command will be stored in NVM and will remain during power cycle and firmware updating.

Syntax

Command	Possible Response
+BODYSARCFG=<rat>,<band_bitmap>,<ant_bitmap>,<power0>[,<power1>,<power2>,<power3>[,<band_bitmap>,<ant_bitmap>,<power0>[,<power1>,<power2>,<power3>]]……]	In case of related correct: OK In case of related error: ERROR
+BODYSARCFG?	+BODYSARCFG: WCDMA/LTE List of (<rat>,<band_bitmap>,<ant_bitmap>,<power0>,<power1>)

	NR List of (<rat>,<band_bitmap>,<ant_bitmap>, <power0>,<power1>[,<power2>,<power3>])
	ENDC List of (<rat>,<band_bitmap>,<ant_bitmap>, <power0>,<power1>,<band_bitmap>, <ant_bitmap>,<power0>,<power1>[,< power2>,<power3>]) OK In case of related error: ERROR
+BODYSARCFG=?	+BODYSARCFG: (0-3),(0x0-0xFFFFFFFFFFFFFFFF),(0x0-0xF),(0x0-0xFF)[,(0x0-0xFF),(0x0 -0xFF),(0x0-0xFF)] OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	Yes	< 1s

Defined Values

<rat>: integer type;

0: WCDMA

1: LTE

2: NR (FM350-GL-16 did not support)

3: ENDC (FM350-GL-16 did not support)

<band_bitmap>: string type;

Band bit field, 128-bit integer with hexadecimal in the format of string. One bit indicates one frequency band. The bands bit definitions are shown in the following Table. This command ignore case.

The SRS only use in NR and ENDC， and support band include N41, N77, N78, N79.

Note: The parameters are adaptive. For example, the input parameter "0x1" is equal to "0x00000001".

Table 0. WCDMA

Parameters	Band
"0x1"	WCDMA_I_IMT_2000
"0x2"	WCDMA_II_PCS_1900
"0x8"	WCDMA_IV_1700
"0x10"	WCDMA_V_850
"0x80"	WCDMA_VIII_900

Table 1. LTE

Parameters	Band
"0x1"	BAND1
"0x2"	BAND2
"0x4"	BAND3
"0x8"	BAND4

"0x10"	BAND5
"0x40"	BAND7
"0x80"	BAND8
"0x800"	BAND12
"0x1000"	BAND13
"0x2000"	BAND14
"0x10000"	BAND17
"0x20000"	BAND18
"0x40000"	BAND19
"0x80000"	BAND20
"0x1000000"	BAND25
"0x2000000"	BAND26
"0x8000000"	BAND28
"0x10000000"	BAND29
"0x20000000"	BAND30
"0x80000000"	BAND32
"0x200000000"	BAND34
"0x2000000000"	BAND38
"0x4000000000"	BAND39
"0x8000000000"	BAND40
"0x10000000000"	BAND41
"0x20000000000"	BAND42
"0x40000000000"	BAND43

"0x200000000000"	BAND46
"0x800000000000"	BAND48
"0x2000000000000000"	BAND66
"0x40000000000000000"	BAND71

Table 2. 5G NR

Parameters	Band
"0x1"	N1
"0x2"	N2
"0x4"	N3
"0x10"	N5
"0x40"	N7
"0x80"	N8
"0x80000"	N20
"0x1000000"	N25
"0x8000000"	N28
"0x20000000"	N30
"0x2000000000"	N38
"0x8000000000"	N40
"0x10000000000"	N41
"0x800000000000"	N48
"0x2000000000000000"	N66
"0x40000000000000000"	N71
"0x1000000000000000000"	N77

"0x20000000000000000000"	N78
"0x40000000000000000000"	N79
"0x80000000000000000000"	N80
"0x100000000000000000000"	N81
"0x200000000000000000000"	N82
"0x400000000000000000000"	N83
"0x800000000000000000000"	N84

Table 3. ENDC

Parameters 4G	Band 4G	Parameters 5G	Parameters 4G
"0x1"	BAND1	"0x80"	"0x1"
"0x1"	BAND1	"0x80000"	"0x1"
"0x1"	BAND1	"0x8000000"	"0x1"
"0x1"	BAND1	"0x2000000000"	"0x1"
"0x1"	BAND1	"0x10000000000000000000"	"0x1"
"0x1"	BAND1	"0x20000000000000000000"	"0x1"
"0x1"	BAND1	"0x40000000000000000000"	"0x1"
"0x1"	BAND1	"0x800000000000000000000"	"0x1"
"0x02"	BAND2	"0x10"	"0x02"
"0x02"	BAND2	"0x400000000000000000"	"0x02"

"0x02"	BAND2	"0x20000000000000000000"	"0x02"
"0x04"	BAND3	"0x80"	"0x04"
"0x04"	BAND3	"0x80000"	"0x04"
"0x04"	BAND3	"0x8000000"	"0x04"
"0x04"	BAND3	"0x2000000000"	"0x04"
"0x04"	BAND3	"0x10000000000"	"0x04"
"0x04"	BAND3	"0x10000000000000000000"	"0x04"
"0x04"	BAND3	"0x20000000000000000000"	"0x04"
"0x04"	BAND3	"0x40000000000000000000"	"0x04"
"0x04"	BAND3	"0x80000000000000000000"	"0x04"
"0x10"	BAND5	"0x02"	"0x10"
"0x10"	BAND5	"0x2000000000000000"	"0x10"
"0x10"	BAND5	"0x20000000000000000000"	"0x10"
"0x40"	BAND7	"0x80"	"0x40"
"0x40"	BAND7	"0x80000"	"0x40"
"0x40"	BAND7	"0x8000000"	"0x40"
"0x40"	BAND7	"0x20000000000000000000"	"0x40"
"0x80"	BAND8	"0x1000000000000000000	"0x80"

		000"	
"0x80"	BAND8	"0x20000000000000000000"	"0x80"
"0x80"	BAND8	"0x100000000000000000000"	"0x80"
"0x800"	BAND12	"0x02"	"0x800"
"0x800"	BAND12	"0x20000000000000000"	"0x800"
"0x1000"	BAND13	"0x02"	"0x1000"
"0x1000"	BAND13	"0x20000000000000000"	"0x1000"
"0x2000"	BAND14	"0x02"	"0x2000"
"0x2000"	BAND14	"0x20000000000000000"	"0x2000"
"0x40000"	BAND19	"0x20000000000000000000"	"0x40000"
"0x40000"	BAND19	"0x40000000000000000000"	"0x40000"
"0x80000"	BAND20	"0x01"	"0x80000"
"0x80000"	BAND20	"0x04"	"0x80000"
"0x80000"	BAND20	"0x2000000000"	"0x80000"
"0x80000"	BAND20	"0x10000000000000000000"	"0x80000"
"0x80000"	BAND20	"0x20000000000000000000"	"0x80000"
"0x80000"	BAND20	"0x200000000000000000000"	"0x80000"
"0x1000000"	BAND25	"0x10000000000"	"0x1000000"

"0x2000000"	BAND26	"0x20000000000000000000"	"0x2000000"
"0x8000000"	BAND28	"0x10000000000000000000"	"0x8000000"
"0x8000000"	BAND28	"0x20000000000000000000"	"0x8000000"
"0x8000000"	BAND28	"0x400000000000000000000"	"0x8000000"
"0x20000000"	BAND30	"0x10"	"0x20000000"
"0x2000000000"	BAND38	"0x20000000000000000000"	"0x2000000000"
"0x4000000000"	BAND39	"0x10000000000"	"0x4000000000"
"0x4000000000"	BAND39	"0x40000000000000000000"	"0x4000000000"
"0x8000000000"	BAND40	"0x10000000000"	"0x8000000000"
"0x8000000000"	BAND40	"0x10000000000000000000"	"0x8000000000"
"0x10000000000"	BAND41	"0x10000000000"	"0x10000000000"
"0x10000000000"	BAND41	"0x10000000000000000000"	"0x10000000000"
"0x800000000000"	BAND48	"0x10"	"0x800000000000"
"0x800000000000"	BAND48	"0x2000000000000000"	"0x800000000000"
"0x200000000000000000"	BAND66	"0x10"	"0x200000000000000000"
"0x200000000000000000"	BAND66	"0x40000000000000000"	"0x200000000000000000"

…	…	…	…

Notes: NDC support band combination related the hardware RF platform， if updated it , it will update list.

<ant_bitmap>: integer type;

0x01, ant_bitmap.bit0   select antenna 0 configuration(default).

0x02, ant_bitmap.bit1   select antenna 1 configuration.

0x04, ant_bitmap.bit2   select antenna 2 configuration .

0x08, ant_bitmap.bit3   select antenna 3 configuration.

The <power> count must match with the <ant_bitmap> setting, otherwise report error.

Note：FM350-GL-16 project only use ANT0(M) as main antenna port for TRX. Therefore, only the configuration on 0x01, ant_bitmap.bit0 takes effect.

<power>: integer type;

The maximum TX power limit with absolute value. The default value is 188 in WCDMA, 184 in LTE， 184 in NR and 184 in ENDC，and the accuracy 1/8dBm.

In default case, The max power standard value 23.5dBm WCDMA, 23dBm LTE, 23dBm NR,23dBm ENDC and 26dBm HPUE only support band n41, n78, n79.

The <power0> to <power3> can match to antenna 0 to antenna 3 one by one.

The <power> count must match with the <ant_bitmap> setting, otherwise report error.

<profile_index>: integer type;

Indicate value from AT+BODYSARPROFILE?

0   set SAR table Index 0 (default).

1   set SAR table Index 1.

…

143   set SAR table Index 143.14.8+BODYSARCLEAR, Clear BODYSAR Configuration Parameter

Description

The command is used to clear BODYSAR configuration parameter, that is ever set by the AT+BODYSARCFG. If restart the module with default configuration, the values of the maximum TX power of all supported technologies and bands will be restored to the default.

Note:

If the BODYSAR is disabled, then the set command will return ERROR.

Syntax

Command	Possible Response
+BODYSARCLEAR[=<profile_index>]	OK or: ERROR
+BODYSARCLEAR?	+BODYSARCLEAR: <profile_index> OK or: ERROR
+BODYSARCLEAR=?	+BODYSARCLEAR: (0-143) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration

No	No	Yes	Yes	< 1s

Defined Values

clear all body sar configuration parameter without <profile_index> (default).

<profile_index>，clear body sar configuration parameter with <profile_index>:

0   set SAR table Index 0 (default).

1   set SAR table Index 1.

…

143   set SAR table Index 143.

14.8 +BODYSARVER, Set SAR NVM Version by AT+BODYSARVER

Description

This command is used to set version of SAR NVM when configure work parameter with power value.

Note:

If the BODYSAREN is disabled, then the set command will return ERROR.

Syntax

Command	Possible Response
+BODYSARVER=<version>	OK or: ERROR
+BODYSARVER?	+BODYSARVER: <version>

	OK
	In case of related error:
	ERROR
+BODYSARVER?	+BODYSARVER: (0-9, a-z, A-Z，.)
	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	Yes	< 1s

Defined Values

<maj_version>: string type;

"(0-9, a-z, A-Z，.)"

15 Tasar Commands

15.1 +GTTASEN, Enable or Disable TA-SAR

Description

This command is used to enable ISED/FCC TA-SAR or disable the functionality of TA-SAR.

Syntax

Command	Possible Response
+GTTASEN=<en>	OK In case of related error: ERROR
+GTTASEN?	+GTTASEN: <en> OK In case of related error: ERROR
+GTTASEN=?	+GTTASEN: (0,1,2,3) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	Yes	< 1s

Defined Values

<en>: integer type;

0   disable TA-SAR feature.

1   enable ISED and FCC TA-SAR feature (default).

2   enable FCC TA-SAR feature. (reserve).

3   enable ISED TA-SAR feature. (reserve)

15.2 +GTTASMODE, Select the Control Mode

Description

This command is used to select the control mode for the functionality of TA-SAR.

Note:

If the TA-SAR is disabled, then the set command will return ERROR.

Syntax

Command	Possible Response
+GTTASMODE=<mode>	OK In case of related error: ERROR
+GTTASMODE?	+GTTASMODE: <mode> OK In case of related error: ERROR
+GTTASMODE=?	+GTTASMODE: (0-2) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	Yes	< 1s

Defined Values

<mode>: integer type;

0   HW control by DPR pin(default value).

1   SW control.

2   Mixed control.

15.3 +GTTASRULE, Enable or Disable the Regulatory rule function

Description

This command is used to select which algorithm to configure parameters of the TA-SAR function, such as FCC and ISED.

Note:

If the TA-SAR is disabled, then the set command will return ERROR.

Syntax

Command	Possible Response
+GTTASRULE=<value>	OK In case of related error: ERROR
+GTTASRULE?	+GTTASRULE: <value>

	OK
	In case of related error:
	ERROR
+GTTASRULE=?	+GTTASRULE: (0,1)
	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	Yes	< 1s

Defined Values

<value>: integer type;

0 select FCC algorithm (default value).

1 select ISED algorithm.

15.4 +GTTASCTRL, TA-SAR control parameter configuration

Description

This command is used to configure TA-SAR control parameter.

Note:

If the TA-SAR is disabled, then the set command will return ERROR.

Syntax

Command	Possible Response
+GTTASCTRL	OK

=<off_offset>,<on_offset>,<check>,<roll>	In case of related error:
	ERROR
+GTTASCTRL?	+GTTASCTRL:
	<off_offset>,<on_offset>,<check>,<roll>
	OK
	In case of related error:
	ERROR
+GTTASCTRL=?	+GTTASCTRL: (0-184),(0-184),(20-1000),
	(20-65533)
	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	Yes	< 1s

Defined Values

<off_offset>:

(0-184)   dpr off offset, in 1/8dB unit.for calculate the lower threshold(recommend 8), off_offset always less than on_offset, off_offset < on_offset. Default value is 0.

<on_offset>:

(0-184)   dpr on offset, in 1/8dB unit.for calculate the dpr on TX power(recommend 24). off_offset is always less than on_offset, must off_offset < on_offset. Default value is 0.

<check>:

(20-1000)   TAS check period (recommend 1000). in 1 millisecond unit. check_period is always less than roll_period times 1000, check_period < roll_period*1000. Default value is 0.

<roll>:

(0-65533)   TAS roll period (recommend 100). , in 1 second unit. check_period(ms) is always less than roll_period×1000(ms), check_period(ms) < roll_period×1000(ms). Default value is 0.

15.5 +GTTASTRIGIDX, SAR Table Trigger Select Index

Description

This command is used to trigger select index for SAR Table of TA-SAR.

Note:

If the TA-SAR is disabled, then the set command will return ERROR.

Syntax

Command	Possible Response
+GTTASTRIGIDX=<table_index>	OK In case of related error: ERROR
+GTTASTRIGIDX?	+GTTASTRIGIDX: <table_index> OK In case of related error: ERROR
+GTTASTRIGIDX=?	+GTTASTRIGIDX:(0-119) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<table_index>: integer type;

0   select SAR table Index 0 (default value).

1   select SAR table Index 1.

:

119 select SAR table Index 119.

15.6 +GTTASON, Trigger SAR Coming into Effect for SW Mode

Description

This command is used to trigger the SAR algorithm to take effect in software mode for the functionality of TA-SAR.

Note:

If the TA-SAR function is disabled, then the set command will return ERROR.

Syntax

Command	Possible Response
+GTTASON=<on>	OK

	In case of related error:
	ERROR
+GTTASON?	+GTTASON: <on>
	OK
	In case of related error:
	ERROR
+GTTASON=?	+GTTASON: (0,1,2)
	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<on>: integer type;

0   SAR algorithm doesn't work in software mode (default).

1   FCC SAR algorithm works in software mode.

2   ISED SAR algorithm works in software mode.

15.7 +GTTASPROFILE, Select the SAR Table Index to be Modified

Description

This command is used to select the SAR table to be modified for GTTASCFG function.

Note:

If the TA-SAR is disabled, then the set command will return ERROR.

Syntax

Command	Possible Response
+GTTASPROFILE=<profile_index>	OK In case of related error: ERROR
+GTTASPROFILE?	+GTTASPROFILE: <profile_index> OK In case of related error: ERROR
+GTTASPROFILE=?	+GTTASPROFILE: (0-119) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<profile_index>: integer type;

0   set SAR table Index 0 (default).

1   set SAR table Index 1.

…

119   set SAR table Index 119.

15.8 +GTTASCFG, Set the Maximum TX Power Limit of Antenna Combination.

Description

The command is used to set the maximum TX power of all supported technologies、bands and antenna. The band parameter is a bit mask, so the user could use this command to set multiple bands with same power values. All power setting is absolute power value in 1/8dBm unit, and the data set by this command will be stored in NVM and will remain during power cycle and firmware updating.

Syntax

Command	Possible Response
+GTTASCFG=<rat>,<band_bitmap>,<ant_bitmap>,<power0>[,<power1>,<power2>,<power3>[,<band_bitmap>,<ant_bitmap>,<power0>[,<power1>,<power2>,<power3>]]……]	In case of related correct: OK In case of related error: ERROR
+GTTASCFG?	+GTTASCFG: WCDMA/LTE List of (<rat>,<band_bitmap>,<ant_bitmap>,<power0>,<power1>) NR List of (<rat>,<band_bitmap>,<ant_bitmap>,<power0>,<power1>[,<power2>,<power3>])

	ENDC List of (<rat>,<band_bitmap>,<ant_bitmap>,<power0>,<power1>,<band_bitmap>,<ant_bitmap>,<power0>,<power1>[,<power2>,<power3>]) OK In case of related error: ERROR
+GTTASCFG=?	+GTTASCFG: (0-2),(0x0-0xFFFFFFFFFFFFFFFF),(0x0-0xF),(0x0-0xD0)[,(0x0-0xD0),(0x0-0xD0),(0x0-0xD0)] OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	Yes	< 1s

Defined Values

<rat>: integer type;

0: WCDMA

1: LTE

2: NR (FM350-GL-16 did not support)

<band_bitmap>: string type;

Band bit field, 128-bit integer with hexadecimal in the format of string. One bit indicates one

frequency band. The bands bit definitions are shown in the following Table. This command ignore case.

The SRS only use in NR and ENDC， and support band include N41, N77, N78, N79.

Note: The parameters are adaptive. For example,the input parameter "0x1" is equal to "0x00000001".

Table 0. WCDMA

Parameters	Band
"0x1"	WCDMA_I_IMT_2000
"0x2"	WCDMA_II_PCS_1900
"0x8"	WCDMA_IV_1700
"0x10"	WCDMA_V_850
"0x80"	WCDMA_VIII_900

Table 1. LTE

Parameters	Band
"0x1"	BAND1
"0x2"	BAND2
"0x4"	BAND3
"0x8"	BAND4
"0x10"	BAND5
"0x40"	BAND7
"0x80"	BAND8
"0x800"	BAND12

"0x1000"	BAND13
"0x2000"	BAND14
"0x10000"	BAND17
"0x20000"	BAND18
"0x40000"	BAND19
"0x80000"	BAND20
"0x1000000"	BAND25
"0x2000000"	BAND26
"0x8000000"	BAND28
"0x10000000"	BAND29
"0x20000000"	BAND30
"0x80000000"	BAND32
"0x200000000"	BAND34
"0x2000000000"	BAND38
"0x4000000000"	BAND39
"0x8000000000"	BAND40
"0x10000000000"	BAND41
"0x20000000000"	BAND42
"0x40000000000"	BAND43
"0x200000000000"	BAND46
"0x800000000000"	BAND48
"0x2000000000000000"	BAND66
"0x40000000000000000"	BAND71

Table 2. 5G NR

Parameters	Band
"0x1"	N1
"0x2"	N2
"0x4"	N3
"0x10"	N5
"0x40"	N7
"0x80"	N8
"0x80000"	N20
"0x1000000"	N25
"0x8000000"	N28
"0x20000000"	N30
"0x2000000000"	N38
"0x8000000000"	N40
"0x10000000000"	N41
"0x800000000000"	N48
"0x2000000000000000"	N66
"0x400000000000000000"	N71
"0x1000000000000000000000"	N77
"0x2000000000000000000000"	N78
"0x4000000000000000000000"	N79
"0x8000000000000000000000"	N80
"0x10000000000000000000000"	N81

"0x200000000000000000000"	N82
"0x400000000000000000000"	N83
"0x800000000000000000000"	N84

Table 3. ENDC

Parameters 4G	Band 4G	Parameters 5G	Band 5G
"0x1"	BAND1	"0x80"	N8
"0x1"	BAND1	"0x80000"	N20
"0x1"	BAND1	"0x8000000"	N28
"0x1"	BAND1	"0x2000000000"	N38
"0x1"	BAND1	"0x1000000000000000000"	N77
"0x1"	BAND1	"0x2000000000000000000"	N78
"0x1"	BAND1	"0x4000000000000000000"	N79
"0x1"	BAND1	"0x800000000000000000000"	N84
"0x02"	BAND2	"0x10"	N5
"0x02"	BAND2	"0x400000000000000000"	N71
"0x02"	BAND2	"0x2000000000000000000"	N78
"0x04"	BAND3	"0x80"	N8
"0x04"	BAND3	"0x80000"	N20
"0x04"	BAND3	"0x8000000"	N28
"0x04"	BAND3	"0x2000000000"	N38
"0x04"	BAND3	"0x10000000000"	N41
"0x04"	BAND3	"0x1000000000000000000"	N77

"0x04"	BAND3	"0x2000000000000000000"	N78
"0x04"	BAND3	"0x4000000000000000000"	N79
"0x04"	BAND3	"0x8000000000000000000"	N80
"0x10"	BAND5	"0x02"	N2
"0x10"	BAND5	"0x20000000000000000"	N66
"0x10"	BAND5	"0x2000000000000000000"	N78
"0x40"	BAND7	"0x80"	N8
"0x40"	BAND7	"0x80000"	N20
"0x40"	BAND7	"0x8000000"	N28
"0x40"	BAND7	"0x2000000000000000000"	N78
"0x80"	BAND8	"0x1000000000000000000"	N77
"0x80"	BAND8	"0x2000000000000000000"	N78
"0x80"	BAND8	"0x100000000000000000000"	N81
"0x800"	BAND12	"0x02"	N2
"0x800"	BAND12	"0x20000000000000000"	N66
"0x1000"	BAND13	"0x02"	N2
"0x1000"	BAND13	"0x20000000000000000"	N66
"0x2000"	BAND14	"0x02"	N2
"0x2000"	BAND14	"0x20000000000000000"	N66
"0x40000"	BAND19	"0x2000000000000000000"	N78
"0x40000"	BAND19	"0x4000000000000000000"	N79
"0x80000"	BAND20	"0x01"	N1
"0x80000"	BAND20	"0x04"	N3

"0x80000"	BAND20	"0x2000000000"	N38
"0x80000"	BAND20	"0x1000000000000000000"	N77
"0x80000"	BAND20	"0x2000000000000000000"	N78
"0x80000"	BAND20	"0x20000000000000000000"	N82
"0x1000000"	BAND25	"0x10000000000"	N41
"0x2000000"	BAND26	"0x2000000000000000000"	N78
"0x8000000"	BAND28	"0x1000000000000000000"	N77
"0x8000000"	BAND28	"0x2000000000000000000"	N78
"0x8000000"	BAND28	"0x40000000000000000000"	N83
"0x20000000"	BAND30	"0x10"	N5
"0x2000000000"	BAND38	"0x2000000000000000000"	N78
"0x4000000000"	BAND39	"0x10000000000"	N41
"0x4000000000"	BAND39	"0x400000000000000000"	N79
"0x8000000000"	BAND40	"0x10000000000"	N41
"0x8000000000"	BAND40	"0x1000000000000000000"	N77
"0x10000000000"	BAND41	"0x10000000000"	N41
"0x10000000000"	BAND41	"0x1000000000000000000"	N77
"0x800000000000"	BAND48	"0x10"	N5
"0x800000000000"	BAND48	"0x20000000000000"	N66
"0x2000000000000000"	BAND66	"0x10"	N5
"0x2000000000000000"	BAND66	"0x40000000000000000"	N71
…	…	…	…

Notes: NDC support band combination related the hardware RF platform ， if updated it , it

will update list.

<ant_bitmap>: integer type;

0x01, ant_bitmap.bit0   select antenna 0 configuration(default).

0x02, ant_bitmap.bit1   select antenna 1 configuration.

0x04, ant_bitmap.bit2   select antenna 2 configuration .

0x08, ant_bitmap.bit3   select antenna 3 configuration.

The <power> count must match with the <ant_bitmap> setting, otherwise report error.

Note：FM350-GL-16 project only use ANT0(M) as main antenna port for TRX. Therefore, only the configuration on 0x01, ant_bitmap.bit0 takes effect.

<power>: integer type;

The maximum TX power limit with absolute value. The default value is 188 in WCDMA, 184 in LTE，184 in NR and 184 in ENDC，and the accuracy 1/8dBm.

In default case, The max power standard value 23.5dBm WCDMA, 23dBm LTE, 23dBm NR,23dBm ENDC and 26dBm HPUE only support band n41,n78,n79.

The <power0> to <power3> can match to antenna 0 to antenna 3 one by one.

The <power> count must match with the <ant_bitmap> setting, otherwise report error.

<profile_index>: integer type;

Indicate value from AT+GTTASPROFILE?

0   set SAR table Index 0 (default).

1   set SAR table Index 1.

…

119   set SAR table Index 119.

15.9 +GTTASCLEAR, Clear TA-SAR Configuration Parameter

Description

The command is used to clear TA-SAR configuration parameter, that is ever set by the AT+GTTASCFG. If restart the module with default configuration, the values of the maximum TX power of all supported technologies and bands will be restored to the default.

Note:

If the TA-SAR is disabled, then the set command will return ERROR.

Syntax

Command	Possible Response
+GTTASCLEAR[=<profile_index>]	OK or: ERROR
+GTTASCLEAR?	+GTTASCLEAR: <profile_index> OK or: ERROR
+GTTASCLEAR=?	+GTTASCLEAR: (0-119) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

clear all body sar configuration parameter without <profile_index> (default).

<profile_index>，clear body sar configuration parameter with <profile_index>:

0   set SAR table Index 0 (default).

1   set SAR table Index 1.

…

119 set SAR table Index 119.

15.10 +GTTASSTATE, Query Current TA-SAR working State

Description

This command is used to get current working of TA-SAR.

Syntax

Command	Possible Response
+GTTASSTAT E?	(+GTTASSTATE: <check>,<roll>,<on_offset>,<off_offset>,<profile>,<avr_pwr>,<is_enabled >,<is_running>,<is_dpr_on>,<rat>,<band>,<upper_thresh>)

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

(20-65533) TAS Check period. in 1 millisecond. If both check period are 0, it means TAS function disable.

Notice: the old version FW range of TAS check period is 0-65533(second), but the new version range of TAS check period is 20-65533(millisecond). both versions are incompatible, please configuration TAS check period again after upgrade version.

<roll>

(0-65533)TAS Roll period. in 1 second. If roll period are 0, it means TAS function disable.

<on_offset>

(0-368)   DPR on offset, in 1/8dBm, for calculate the DPR on TX power.

<off_offset>

(0-368)   DPR off offset, in 1/8dBm.for calculate the lower threshold.

<profile>

Profile index, only 0 take effect.

<avr_pwr>

The average of TAS TX power,in 1/8dBm.

<is_enabled>

Indicates TAS functionality enable state, With the wrong configuration or upper threshold Tx

power values, the functionality will not enable.

<is_running>

Indicates TAS running state. In real network, when it goes into idle state, this state change to stop.

<is_dpr_on>

Indicates TAS DPR is applied or not.

<rat>

Indicates Current RAT. If modem doesn't register network, it will return "NO_RAT".

<band>

Indicates Current Band. If modem doesn't register network, it will return "BAND_INVALID"

<upper_thresh>

Indicates Current Band upper threshold power value, in 1/8dBm.

15.11 +GTTASVER, Set SAR NVM Version by AT+GTTASVER

Description

This command is used to set version of SAR NVM when configure work parameter with power value.

Note:

If the GTTASEN is disabled, then the set command will return ERROR.

Syntax

Command	Possible Response
+GTTASVER=<version>	OK or: ERROR
+GTTASVER?	+GTTASVER: <version> OK In case of related error: ERROR
+GTTASVER?	+GTTASVER: (0-9, a-z, A-Z, .) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	Yes	< 1s

Defined Values

<maj_version>: string type;

"(0-9, a-z, A-Z, .)"

15.12 +GTTASPLMNEN, PLMN switch TA-SAR algorithm enable

Description

This command is used to enable or disable the PLMN automatic detection algorithm of TA SAR on modem side.

Note:

If the TA-SAR is disabled, then the set command will return ERROR.

Syntax

Command	Possible Response
+GTTASPLMNEN=<mode>	OK or: ERROR
+GTTASPLMNEN?	+GTTASPLMNEN: <mode> OK In case of related error: ERROR
+GTTASPLMNEN=?	+GTTASPLMNEN: (0-1) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	Yes	< 1s

Defined Values

<mode>: string type;

0   PLMN automatic detection algorithm disable (default value). When modem disable switch TASAR algorithm, the TASAR algorithm switch by Host driver.

1   PLMN automatic detection algorithm enable.

16 Tunable Antenna Commands

16.1 +GTANTTUNINGEN, Enable or Disable Tunable Antenna Function

Description

This command is used to enable or disable the antenna tuner function.

Syntax

Command	Possible Response
+GTANTTUNINGEN =\<en>	OK or: ERROR
+GTANTTUNINGEN?	+GTANTTUNINGEN: \<en> OK
+GTANTTUNINGEN=?	+GTANTTUNINGEN: (0,1) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	No	< 1s

Defined Values

\<en>: integer type;

0   disable function.

1   enable function(default value).

16.2 +GTANTTUNEMODE, Select GPO/MIPI Tuning Mode

Description

This command is used to select the GPO/MIPI tuning mode of tunable antenna.

Syntax

Command	Possible Response
+GTANTTUNEMODE=<mode>	OK or: ERROR
+GTANTTUNEMODE?	+GTANTTUNEMODE: <mode> OK
+GTANTTUNEMODE=?	+GTANTTUNEMODE: (0,1) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	No	< 1s

Defined Values

<mode>: integer type;

0   GPO mode(default value).

1   MIPI mode.

16.3 +GTANTCTRLMODE, Select SW/HW Tuning control mode

Description

This command is used to select the software or hardware tuning control mode of tunable antenna.

Syntax

Command	Possible Response
+GTANTCTRLMODE=<mode>	OK or: ERROR
+GTANTCTRLMODE?	+GTANTCTRLMODE: <mode> OK
+GTANTCTRLMODE=?	+GTANTCTRLMODE: (0,1) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	No	< 1s

Defined Values

<mode>: integer type;

0   HW mode(default value).

1   SW mode.

16.4 +GTANTPROFILE, Select Effective Profile of Software mode

Description

This command is used to select effective profile of software tuning mode.

Note:

If GTANTCTRLMODE=0 then the set command will return ERROR.

Syntax

Command	Possible Response
+GTANTPROFILE=<profile_idx>	OK or: ERROR
+GTANTPROFILE?	+GTANTPROFILE: <profile_idx> OK
+GTANTPROFILE=?	+GTANTPROFILE: (0-7) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
Yes	No	Yes	Yes	< 1s

Defined Values

<mode>: integer type;

0   (HW mode default value(PIN22 high:0,PIN22 low:1);SW mode default value:0).

1   set Tuner Table Index 1.

:

7 set Tuner Table Index 7

16.5 + GTANTGPOCFG, Configure Tuning Values of GPO Mode

Description

This command is used to configure tuning values of GPO mode.

Note:

If GTANTTUNEMODE=1 then the set command will return ERROR.

Syntax

Command	Possible Response
+GTANTGPOCFG=<profile_idx>,<x_entry_idx >,<payload>[,<x_entry_idx>,<payload>,…]	OK

	or:
	ERROR
+GTANTGPOCFG?	+GTANTGPOCFG:
	<profile_idx>,<x_entry_idx>,<payload>[,<x_entry_idx>,<payload>,…<profile_idx>
	:
	+GTANTGPOCFG:
	<profile_idx>,<x_entry_idx>,<payload>[,<x_entry_idx>,<payload>,…<profile_idx>
	OK
+GTANTGPOCFG=?	+GTANTGPOCFG: (0-7),(1-79),(0-15)
	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
Yes	Yes	Yes	No	< 1s

Defined Values

Parameter (integer type)	Value	Description
<profile_idx>	0~7	Profile index
<x_entry_idx>	1~79	Band
<payload>	0~15	GPIO Value

Table. GPO Output Value List

ANTCTL3	ANTCTL2	ANTCTL1	ANTCTL0	Payload Value
0	0	0	0	0
0	0	0	1	1
0	0	1	0	2
0	0	1	1	3
0	1	0	0	4
0	1	0	1	5
0	1	1	0	6
0	1	1	1	7
1	0	0	0	8
1	0	0	1	9
1	0	1	0	10
1	0	1	1	11
1	1	0	0	12
1	1	0	1	13
1	1	1	0	14
1	1	1	1	15

<x_entry_idx>	Band
1	1
2	2
3	3

4	4
5	5
7	7
8	8
12	12
13	13
14	14
17	17
18	18
19	19
20	20
25	25
26	26
28	28
29	29
30	30
32	32
34	34
38	38
39	39
40	40
41	41
42	42

43	43
46	46
48	48
66	66
71	71
77	77
78	78
79	79

16.6 +GTANTTUNERCFG, Set Tuner Register Value

Description

This command is used to set or get tuner register value.

Syntax

Command	Possible Response
+GTANTTUNERCFG=<tuner_idx>,<tuner_addr>,<startup_time>,<init_num>,<init_addr0>,<init_payload0>,<init_addr1>,<init_payload1>,<init_addr2>,<init_payload2>,<init_addr3>,<init_payload3>,<update_num>,<update_addr0>,<update_addr1>,<update_addr2>,<update_addr3>	OK or: ERROR
+GTANTTUNERCFG?	+GTANTTUNERCFG: <tuner_idx>,<tuner_addr>,<startup_time>, <init_num>,<init_addr0>,<init_payload0>,<

	init_addr1>,<init_payload1>,<init_addr2>, <init_payload2>,<init_addr3>,<init_payload3>,<update_num>,<update_addr0>,<update_addr1>,<update_addr2>,<update_addr3>
	OK
+GTANTTUNERCFG=?	+GTANTTUNERCFG: (0-3),(0-15),(0-255),(0-4),(0-255),(0-255),(0-255),(0-255),(0-255),(0-255),(0-255),(0-255),(0-4),(0-255),(0-255),(0-255),(0-255)
	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	No	< 1s

Defined Values

Parameter (integer type)	Value	Description
<tuner_idx>	0~3	Tuner ID
<tuner_addr>	0~15	Tuner USID
<startup_time>	0-255	Startup Time
<init_num>	0~4	Tuner Init Register Number
<init_addr[0-3]>	0~255	Tuner Init Register Addr
<init_payload[0-3]>	0~255	Tuner Init Register Data

| <update_num> | 0~4 | Tuner Control Register Number |
| <update_addr[0-3]> | 0~255 | Tuner Control Register Addr |

16.7 +GTANTMIPICFG, Configure Tuning value of MIPI Mode

Description

This command is used to configure tuning value of mipi mode

Note:

If GTANTTUNEMODE=0, then the set command will return ERROR.

Syntax

Command	Possible Response
+GTANTMIPICFG=<tuner_idx>,<updata_payloader_idx>,<profile_idx>,<x_entry_idx>,<payload>[,<x_entry_idx>,<payload>,…]	OK or: ERROR
+GTANTMIPICFG=<tuner_idx>,<updata_payloader_idx>	+GTANTMIPICFG: <tuner_idx>,<updata_payloader_idx>,<profile_idx>,<x_entry_idx>,<payload>[,<x_entry_idx>,<payload>,…] : +GTANTMIPICFG: <tuner_idx>,<updata_payloader_idx>,<profile_idx>,<x_entry_idx>,<payload>[,<x_entry_idx>,<payload>,…]

	OK
+GTANTMIPICFG=?	+GTANTMIPICFG:
	(0-3),(0-3),(0-7),(1-79),(0-40959)
	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	No	< 1s

Defined Values

Parameter (integer type)	Value	Description
<tuner_idx>	0~3	Tuner Index
<updata_payloader_idx>	0~3	Tuner Control Register Addr Index
<profile_idx>	0~7	Profile Index
<x_entry_idx>	1~79	Band
<payload>	0~40959	MIPI Data Table & MIPI Value

<x_entry_idx>	Band
1	1
2	2
3	3

4	4
5	5
7	7
8	8
12	12
13	13
14	14
17	17
18	18
19	19
20	20
25	25
26	26
28	28
29	29
30	30
32	32
34	34
38	38
39	39
40	40
41	41
42	42

43	43
46	46
48	48
66	66
71	71
77	77
78	78
79	79

17 FCC Lock Commands

17.1 +GTFCCLOCKMODE, set FCC lock/unlock mode

Description

This command is used to set and read FCC lock/unlock mode value, which is stored in NVRAM.

Syntax

Command	Possible Response
+GTFCCLOCKMODE =<value>	OK In case of related error: ERROR
+GTFCCLOCKMODE?	+GTFCCLOCKMODE: <value> OK In case of related error: ERROR
+GTFCCLOCKMODE=?	+GTFCCLOCKMODE: (0-2) OK In case of related error: ERROR

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	No	< 1s

Defined Values

<value>: string type;

0: no lock

1: one time unlock, the modem needs to unlock only ones

2: Power-up unlock, the modem needs to unlock every time after it is power on

17.2 +GTFCCLOCKSTATE, set FCC lock/unlock state

Description

This command is used to set and read FCC lock/unlock state value, which is stored in NVRAM.

Syntax

Command	Possible Response
+GTFCCLOCKSTATE=<value>	OK In case of related error: ERROR
+ GTFCCLOCKSTATE?	+ GTFCCLOCKSTATE: <value> OK In case of related error: ERROR
+ GTFCCLOCKSTATE =?	+ GTFCCLOCKSTATE: (0-1) OK In case of related error: ERROR

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	Yes	< 1s

Defined Values

<value>: string type;

0: Not yet unlocked

1: Already unlocked

17.3 +GTFCCEFFSTATUS, read current FCC status

Description

This command is used to read modem current effective mode and modem unlock status.

Syntax

Command	Possible Response
+GTFCCEFFSTATUS =<value>	ERROR
+GTFCCEFFSTATUS?	+GTFCCEFFSTATUS: <effective mode value>,<unlock status value> OK In case of related error: ERROR

+GTFCCEFFSTATUS =?	ERROR

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	Yes	< 1s

Defined Values

<effective mode value>:

0: no lock

1: one time unlock, the modem needs to unlock only ones

2: Power-up unlock, the modem needs to unlock every time after it is power on

Notice: this mode value is the effective modem FCC lock/unlock mode value

<unlock status value>:

0: modem is locked

1: modem is unlocking. when effective mode value = 0 or (effective mode value = 1 && effective state value = 1), or modem has successfully complete unlock procedure.

If the effective unlock status value equal to 1, it represents modem unlocked.

17.4 +GTFCCLOCKGEN, Read modem gen challenge

Description

This command is used to read modem gen challenge.

Syntax

Command	Possible Response
+GTFCCLOCKGEN	+GTFCCLOCKGEN: \<challenge\>
	OK
	In case of related error:
	ERROR
+GTFCCLOCKGEN?	ERROR
+GTFCCLOCKGEN=?	ERROR

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

\<challenge\>: random value of System time by HASH computations, challenge value is in <u>hexadecimal</u>.

For example, the model id in bios is "KHOIHGIUCCHHII，NVM hash value：0x3d, 0xf8, 0xc7, 0x19

17.5 +GTFCCLOCKVER, Start FCC Lock verify challenge

Description

This command is used to start FCC Lock verify challenge.

Syntax

Command	Possible Response
+GTFCCLOCKVER=<hash_challenge>	+ GTFCCLOCKVER: <verify_resault>
	OK
	In case of related error:
	ERROR
+GTFCCLOCKVER?	ERROR
+GTFCCLOCKVER=?	ERROR

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Note: Start verify challenge. Before power up, you must may sure that the model id has write to NVRAM, and hash_challenge need tool to generate.

Defined Values

< hash_challenge >: can be decimal data or hex data, if decimal data, must be big end storage mode.

< verify_result>:

0：lock (verify fail)

1：unlock (verify success)

18 Thermal Commands

18.1 +GTTHERMAL，Enable Fibocom thermal Management

Description

This command is used to enable/disable Fibocom thermal management

Syntax

Command	Possible Response
+GTTHERMAL=<on/off>	OK or ERROR
+GTTHERMAL?	+GTTHERMAL: <on/off> OK
+GTTHERMAL=?	+GTTHERMAL: (list of supported <on/off>s) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<on/off> Integer, the range is (0-1)

power_on/off-0: close thermal management (default value is 0);

power_on/off-1: open thermal management;

18.2 +GTTHMLEN，Enable Actuator Feature

Description

This command is used to enable/disable the Thermal Actuator feature.

Syntax

Command	Possible Response
+GTTHMLEN=<N>	OK or: ERROR
+GTTHMLEN?	+GTTHMLEN: N OK
+GTTHMLEN=?	+GTTHMLEN: (list of supported <N>s) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	Yes	< 1s

Defined Values

<N>: integer type; The range is 0-255

Actuator	Bit1/Act 1	Bit2/Act 2	Bit3/Act 3	Bit4/Act 4	Bit5/Act 5	Bit6/Act 6	Bit7/Act 7
N=(255)10=(11111111)2	1	1	1	1	1	1	1
N=(0)10=(00000000)	0	0	0	0	0	0	0

2	

0: Disable 1: Enable

18.3 +GTSENRDTEMP，Read Thermal Sensor Current

Description

This command is used to read the thermal sensor current temperature.

Syntax

Command	Possible Response
+GTSENRDTEMP=<sensor _id>	+GTSENRDTEMP: <sensor_id>,<current_temperature>[<CR><LF>+GTSENRD TEMP: <sensor_id>,<current_temperature><CR><LF>+GTSENRD TEMP: <sensor_id>,<current_temperature><CR><LF>+GTSENRD TEMP: <sensor_id>,<current_temperature><CR><LF>+GTSENRD TEMP: <sensor_id>,<current_temperature><CR><LF>+GTSENRD TEMP: <sensor_id>,<current_temperature><CR><LF>+GTSENRD TEMP: <sensor_id>,<current_temperature><CR><LF>+GTSENRD TEMP: <sensor_id>,<current_temperature><CR><LF>+GTSENRD TEMP: <sensor_id>,<current_temperature><CR><LF>+GTSENRD TEMP: <sensor_id>,<current_temperature><CR><LF>+GTSENRD TEMP: <sensor_id>,<current_temperature><CR><LF>+GTSENRD

TEMP:

<sensor_id>,<current_temperature><CR><LF>+GTSENRD

TEMP:

<sensor_id>,<current_temperature><CR><LF>+GTSENRD

TEMP:

<sensor_id>,<current_temperature><CR><LF>+GTSENRD

TEMP:

<sensor_id>,<current_temperature><CR><LF>+GTSENRD

TEMP:

<sensor_id>,<current_temperature><CR><LF>+GTSENRD

TEMP:

<sensor_id>,<current_temperature><CR><LF>+GTSENRD

TEMP:

<sensor_id>,<current_temperature><CR><LF>+GTSENRD

TEMP:

<sensor_id>,<current_temperature><CR><LF>+GTSENRD

TEMP:

<sensor_id>,<current_temperature><CR><LF>+GTSENRD

TEMP:

<sensor_id>,<current_temperature><CR><LF>+GTSENRD

TEMP:

<sensor_id>,<current_temperature><CR><LF>+GTSENRD

TEMP:

<sensor_id>,<current_temperature>,<CR><LF>+GTSENRD

TEMP:

<sensor_id>,<current_temperature>,<CR><LF>+GTSENRD

TEMP: <sensor_id>,<current_temperature>]

OK

or

	ERROR
+GTSENRDTEMP=?	+GTSENRDTEMP: (list of supported <sensor id>s) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<sensor id>: integer type; The range is (0-23):

0: Response all sensors current temperature

(1-23): Response corresponding sensor current temperature

Sensor id	Sensor name	Sensor id	Sensor name	Sensor id	Sensor name	Sensor id	Sensor name
1	soc_max	7	gpu1	13	soc_dram_ntc	19	pmic
2	cpu_little0	8	dramc	14	ltepa_ntc	20	pmic_vcore
3	cpu_little1	9	mmsys	15	nrpa_ntc	21	pmic_vproc
4	cpu_little2	10	md_5g	16	rf_ntc	22	pmic_vgpu
5	cpu_little3	11	md_4g	17	md_rf	23	crystal
6	gpu0	12	md_3g	18	conn_gps		

<current_temperature>: integer type,

current sensor current temperature

18.4 +GTZONERDMAXTEMP，Read Thermal Zone Current Max Temperature

Description

This command is used to read the current max temperature of the zone.

Syntax

Command	Possible Response
+GTZONERDMAXTEMP=<zone_id>	+GTZONERDMAXTEMP: <zone_id>,<current_max_temperature>[<CR><LF>+GTZONERDMAXTEMP: <zone_id>,<current_max_temperature><CR><LF>+GTZONERDMAXTEMP: <zone_id>,<current_max_temperature><CR><LF>+GTZONERDMAXTEMP: <zone_id>,<current_max_temperature><CR><LF>+GTZONERDMAXTEMP: <zone_id>,<current_max_temperature>] OK or ERROR
+GTZONERDMAXTEMP=?	+GTZONERDMAXTEMP: (list of supported <zone id>s) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<zone id>: integer type; The range is (0-5):

0: Response all zone current max temperature

(1-5): Response corresponding zone current max temperature

Zone id	1	2	3	4	5
Zone_name	CPU	PA1	PA2	Transceiver	PMIC

<current_max_temperature>: integer type;

current zone max current temperature

18.5 +GTACTRDLEVEL，Read Actuator Current Level

Description

This command is used to read the current level of the actuator.

Syntax

Command	Possible Response
+GTACTRDLEVEL=<actuator_id>	+GTACTRDLEVEL: <actuator_id>,<current_level>[<CR><LF>+GTACTRDLEVEL: <actuator_id>,<current_level><CR><LF>+GTACTRDLEVEL: <actuator_id>,<current_level><CR><LF>+GTACTRDLEVEL: <actuator_id>,<current_level><CR><LF>+GTACTRDLEVEL: <actuator _id>,<current_level><CR><LF>+GTACTRDLEVEL: <actuator _id>,<current_level><CR><LF>+GTACTRDLEVEL:

	<actuator _id>,<current_level><CR><LF>+GTACTRDLEVEL: <actuator _id>,<current_level>] OK or ERROR
+GTACTRDLEVEL=?	+GTACTRDLEVEL: (list of supported <actuator id>s) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<actuator id>: integer type; The range is (0-8)

0: Response all actuators current level

(1-5): Response corresponding actuator current level

Actuato r	Actuator 1	Actuator 2	Actuator 3	Actuator 4	Actuator 5	Actuator 6	Actuator 7	Actuator 8
Range of level	0-8	0-8	0-1	0-1	0-3	0-4	0-1	0-1

18.6 +GTTHMLTIMER，Modify Thermal Time Interval

Description

This command is used to modify the thermal management run time interval.

Syntax

Command	Possible Response
+GTTHMLTIMER=<monitor interval>	OK or ERROR
+GTTHMLTIMER?	+GTTHMLTIMER: <monitor interval> OK or ERROR
+GTTHMLTIMER=?	+GTTHMLTIMER: (list of supported <monitor interval>s) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	Yes	< 1s

Defined Values

<monitor interval>: integer type; The range is (1000-3600000) ms

Default value is 0.

Thermal management run time interval

18.7 +GTTHMLTIMES，Get Thermal Management System Running

Description

This command is used to get the thermal management system running times.

Syntax

Command	Possible Response
+GTTHMLTIMES?	+GTTHMLTIMES: <running times> OK or ERROR

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<running times>: integer type;

Thermal management function operation times

18.8 +GTZONEWRTHD，Write The Zone Threshold

Description

This command is used to write the zone threshold. There are 5 zones. Please set the threshold according to the maximum level of the zone

Syntax

Command	Possible Response
+GTZONEWRTHD=<zone_id>,<level_map>, <raising_threshold>[,<raising_threshold>...], <falling_threshold>[,<falling_threshold>...]	OK or ERROR

	+GTZONEWRTHD: (list of supported <zone_id>s),(list of supported <level_map>s), (list of supported <raising_threshold>s) [,<raising_threshold>...], (list of supported <falling_threshold>s) [,<falling_threshold>...] OK
+GTZONEWRTHD=?	

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	Yes	< 1s

Defined Values

<zone_id>: integer type; The range is (1-5)

<level_map>: integer type; The max range is (1-255)

level_map	Bit1	Bit2	Bit3	Bit4	Bit5	Bit6	Bit7	Bit8
255	1	1	1	1	1	1	1	1
1	1	0	0	0	0	0	0	0

zone_id	1	2	3	4	5
max_level_map	255	255	7	7	1

0: disable; 1: Enable;

Each zone has its own level_map;

<raising_threshold>: integer type; The range is (-40000-130000)

<falling_threshold>: integer type; The range is (-40000-130000)

We set the zone according to the byte position of level_map. If the byte position of level_map is 1, then the level is effective, and the subsequent threshold will be set at the corresponding level.

ex:

AT+GTZONEWRTHD=1,1,32000,31000

This AT command means that zone 1 has a threshold level of 1, and the following two parameters correspond to the level raising threshold and falling threshold.

AT+GTACTWRTHD=3,3,32000,34000,31000,33000

This AT command means that zone 3 has two threshold level is 1 and 2. The following 4 parameters correspond to the 2 raising thresholds and 2 falling thresholds of the level

NOTE: falling threshold cannot be greater than raising threshold

18.9 +GTZONERDTHD，Read The Zone Threshold

Description

This command is used to read the zone threshold.

Syntax

Command	Possible Response
+GTZONERDTHD=<zone_id>	+GTZONERDTHD: <zone_id>,<level_map>,<raising_threshold>[,<raising_threshold>...],<falling_threshold>[,<falling_threshold>...][<CR><LF>+GTZONERDTHD:

<zone_id>,<level_map>,<raising_threshold>[,<raising_threshold>...],<falling_threshold>[,<falling_threshold>...]<CR><LF>+GTZONERDTHD: <zone_id>,<level_map>,<raising_threshold>[,<raising_threshold>...],<falling_threshold>[,<falling_threshold>...]<CR><LF>+GTZONERDTHD: <zone_id>,<level_map>,<raising_threshold>[,<raising_threshold>...],<falling_threshold>[,<falling_threshold>...]<CR><LF>+GTZONERDTHD: <zone_id>,<level_map>,<raising_threshold>[,<raising_threshold>...],<falling_threshold>[,<falling_threshold>...]]

OK

or

ERROR

+GTZONERDTHD=?	+GTZONERDTHD: (list of supported <zone_id>s) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<zone id> integer type; The range is (0-5)

0: Response all zones current threshold

(1-5): Response corresponding zone current threshold

19 GNSS Configuration Commands

19.1 +GTGPSSWITCH, GNSS enable/disable

Description

This command is used to set GNSS enable and disable through enable or forbid GNSS AT command function. It will be stop and power down GNSS and then forbid AT command function except GTGPSSWITCH AT When disable GNSS.

Syntax

Command	Possible Response
+GTGPSSWITCH=<mode>	OK or: ERROR
+GTGPSSWITCH?	+ GTGPSSWITCH: <mode> OK
+GTGPSSWITCH=?	+ GTGPSSWITCH: (0~1) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	Yes	Yes	Yes	< 1s

Defined Values

<mode>: integer type;

0: Power down GNSS and disable AT CMD to disable GNSS. GNSS AT except GTGPSSWITCH will return ERROR.

1: Enable AT CMD to enable GNSS (default value)

19.2 +GTGPSPOWER, Control GNSS Power

Description

This command is used to control GNSS module power and start stop report NMEA and other location message.

Syntax

Command	Possible Response
+GTGPSPOWER=<mode>	OK or: ERROR
+GTGPSPOWER?	+ GTGPSPOWER: <mode> OK
+ GTGPSPOWER=?	+ GTGPSPOWER: (list of supported <mode>s) OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<mode>: integer type;

0: Stop reporting NMEA and other location message. If there is no another client is reporting NMEA，power off GNSS module(default value)

1: power on GNSS module and start reporting NMEA and other location message.

19.3 +GTGPSDELAID, Set start mode

Description

Delete aiding data to achieve cold start mode，warm start mode，hot start mode.

Syntax

Command	Possible Response
+ GTGPSDELAID =<mode>	OK or: ERROR

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<start_mode>: integer type;

0: cold start mode

1: warm start mode

2: hot start mode

20 Error Handing and Error Code

20.1 Error Handling Commands

20.1.1 +CMEE, Report Mobile Equipment Error

Description

The Set command disables or enables the use of result code +CME ERROR: <err> as an indication of an error relating to the functionality of the MODEM. When enabled, Modem -related errors cause a +CME ERROR: <err> final result code instead of the regular ERROR final result code. Usually, ERROR is returned when the error is related to syntax, invalid parameters or terminal functionality.

For all Accessory AT commands besides SMS commands, the +CMEE set command disables or enables the use of result code +CME ERROR: <err> as an indication of an error relating to the functionality of the Modem. When enabled, Modem related errors cause a +CME ERROR: <err> final result code instead of the regular ERROR result code.

For all SMS AT commands that are derived from GSM 07.05, the +CMEE Set command disables or enables the use of result code +CMS ERROR: <err> as an indication of an error relating to the functionality of the modem. When enabled, modem -related errors cause a +CMS ERROR: <err> final result code instead of the regular ERROR final result.

Syntax

Command	Possible Response
AT+CMEE=[<n>]	OK or: +CME ERROR: <err> Note: the original setting is not changed if AT+CMEE=
AT+CMEE?	+CMEE: <n>

	OK
AT+CMEE=?	+CMEE: (list of supported <n>s)
	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<n>: integer type

0   Disable the +CME ERROR: <err> result code and use ERROR. Default value

1   Enable the +CME ERROR: <err> or +CMS ERROR: <err> result codes and use numeric <err> values or

+STK ERROR: <err> result codes and use numeric <err> values.

2   Enable the +CME ERROR: <err> or +CMS ERROR: <err> result codes and use verbose <err> values or

+STK ERROR: <err> result codes and use numeric <err> values.

20.1.2 +CEER, Extended Error Report

Description

This execution command returns an extended error report containing one or more lines of information text <report>, determined by the manufacturer, providing reasons for the following errors:

1、 Failure in the last unsuccessful call setup (originating or answering) or the in-call modification.

2、Last call release.

Typically, the text consists of a single line containing the reason for the error according to information given by GSM network, in textual format.

Syntax

Command	Possible Response
AT+CEER	+CEER: <category>[,<cause>,<description>] OK
AT+CEER=?	OK

Attributes

Pin Restricted	Persistent	Sync Mode	Effect Immediately	Time of Duration
No	No	Yes	Yes	< 1s

Defined Values

<category>: string type

"No report available"

"CC setup error"

"CC modification error"

"CC release"

"SM attach error"

"SM detach"

"SM activation error"

"SM deactivation"

"SS – network error cause"

"SS – network reject cause"

"SS – network GSM cause"

<cause>: contains a digit representing the error cause sent by network or internally

<description>: string type; contains the textual representation of the Cause

20.2 CME Error

Syntax

Parameter	Possible response
<err>	0, "phone failure"
	1, "no connection to phone"
	2, "phone-adapter link reserved"
	3, "operation not allowed"
	4, "operation not supported"
	5, "PH-SIM PIN required"
	6, "PH-FSIM PIN required"
	7, "PH-FSIM PUK required"
	10, "SIM not inserted"
	11, "SIM PIN required"
	12, "SIM PUK required"
	13, "SIM failure"
	14, "SIM busy"

15, "SIM wrong"

16, "incorrect password"

17, "SIM PIN2 required"

18, "SIM PUK2 required"

19, "incorrect PUK1"

20, "memory full"

21, "invalid index"

22, "not found"

23, "memory failure"

24, "text string too long"

25, "invalid characters in text string"

26, "dial string too long"

27, "invalid characters in dial string"

30, "no network service"

31, "network timeout"

32, "network not allowed - emergency calls only"

40, "network personalization PIN required"

41, "network personalization PUK required"

42, "network subset personalization PIN required"

43, "network subset personalization PUK required"

44, "service provider personalization PIN required"

45, "service provider personalization PUK required"

46, "corporate personalization PIN required"

47, "corporate personalization PUK required"

48, "hidden key required"

> **Note**
>
> This key is required when accessing hidden phonebook entries.)

49, "EAP method not supported"

50, "Incorrect parameters"

100, "unknown"

103, "Illegal MS"

106, "Illegal ME"

107, "GPRS services not allowed"

111, "PLMN not allowed"

112, "location area not allowed"

113, "roaming not allowed in this location area"

114, "GPRS services not allowed in this PLMN"

116, "MSC temporarily not reachable"

117, "Network failure"

132, "Service not supported"

133, "Service not subscribed"

134, "service option temporarily out of order"

135, "NS-api already used"

148, "Unspecified GPRS error"

149, "PDP authentication error"

150, "invalid mobile class"

244, "Attach failure"

257, "Invalid error mapping"

258, "APN not listed in APN Control List (ACL)"

701, "incorrect security code"

702, "max attempts reached"

1001, "Unassigned (unallocated) number"

1003, "No route to destination"

1006, "Channel unacceptable"

1008, "Operator determined barring"

1016, "Normal call clearing"

1017, "User busy"

1018, "No user responding"

1019, "User alerting, no answer"

1021, "Call rejected"

1022, "Number changed"

1026, "Non selected user clearing"

1027, "Destination out of order"

1028, "Invalid number format (incomplete number)"

1029, "Facility rejected"

1030, "Response to STATUS ENQUIRY"

1031, "Normal, unspecified"

1034, "No circuit/channel available"

1038, "Network out of order"

1041, "Temporary failure"

1042, "Switching equipment congestion"

1043, "Access information discarded"

1044, "requested circuit/channel not available"

1047, "Resources unavailable, unspecified"

1049, "Quality of service unavailable"

1050, "Requested facility not subscribed"

1055, "Incoming calls barred within the CUG"

1057, "Bearer capability not authorized"

1058, "Bearer capability not presently available"

1063, "Service or option not available, unspecified"

1065, "Bearer service not implemented"

1068, "ACM equal to or greater than ACMmax"

1069, "Requested facility not implemented"

1070, "Only restr. digital information bearer capability"

1079, "Service or option not implemented, unspecified"

1081, "Invalid transaction identifier value"

1087, "User not member of CUG"

1088, "Incompatible destination"

1091, "Invalid transit network selection"

1095, "Semantically incorrect message"

1096, "Invalid mandatory information"

1097, "Message type non-existent or not implemented"

1098, "Message type not compatible with protocol state"

1099, "Information element non-existent or not implemented"

1100, "Conditional IE error"

1101, "Message not compatible with protocol state"

1102, "Recovery on timer expiry"

1111, "Protocol error, unspecified"

1127, "Interworking, unspecified"

1279, "Number not allowed"

1283, "CCBS possible"

20.3   CMS Error

Syntax

Parameter	Possible response
<err>	1, "Unassigned (unallocated) number"
	8, "Operator determined barring"
	10, "Call barred"
	17, "Network failure"
	21, "Short message transfer rejected"
	22, "Memory capacity exceeded"
	27, "Destination out of service"
	28, "Unidentified subscriber"
	29, "Facility rejected"
	30, "Unknown Subscriber"
	38, "Network out of order"
	41, "Temporary failure"
	42, "Congestion"
	47, "Resources unavailable, unspecified"
	50, "Requested facility not subscribed"
	69, "Requested facility not implemented"
	81, "Invalid short message reference value"
	95, "Invalid message, unspecified"
	96, "Invalid mandatory information"
	97, "Message type non-existent or not implemented"

98, "Message not compatible with short message protocol state"

99, "Information element non-existent or not implemented"

111, "Protocol error, unspecified"

127, "Interworking unspecified"

128, "Telematic interworking not supported"

129, "Short message type 0 not supported"

130, "Cannot replace short message"

143, "Unspecified TP-PID error"

144, "Data coding scheme (alphabet) not supported"

145, "Message class not supported"

159, "Unspecified TP-DCS error"

160, "Command cannot be action"

161, "Command unsupported"

175, "Unspecified TP-Command error"

176, "TPDU not supported"

192, "SC busy"

193, "No SC subscription"

194, "SC system failure"

195, "Invalid SME address"

196, "Destination SME barred"

197, "SM Rejected-Duplicate SM"

198, "TP-VPF not supported"

199, "TP-VP not supported"

208, "SIM SMS storage full"

209, "No SMS storage capability in SIM"

210, "Error in MS"

211, "Memory Capacity Exceeded"

212, "SIM Application Toolkit Busy"

213, "SIM data download error"

224, "TP_FCS_APPL_ERR_START"

254, "TP_FCS_APPL_ERR_STOP"

255, "TP_FCS_UNSPECIFIED"

300, "ME failure"

301, "SMS service of ME reserved"

302, "operation not allowed"

303, "operation not supported"

304, "Invalid PDU mode param"

305, "invalid text mode parameter"

310, "SIM not inserted"

311, "SIM PIN required"

312, "PH-SIM PIN necessary"

313, "SIM failure"

314, "SIM busy"

315, "SIM wrong"

317, "SIM PIN2 required"

318, "SIM PUK2 required"

319, "incorrect PUK1"

320, "memory failure"

321, "invalid memory index"

322, "memory full"

330, "SMSC address unknown"

331, "no network service"

332, "network timeout"

340, "no +CNMA acknowledgement expected"

512, "MN_SMS_RP_ACK"

513, "MN_SMS_TIMER_EXPIRED"

514, "MN_SMS_FORW_AVAIL_FAILED"

515, "MN_SMS_FORW_AVAIL_ABORTED"

516, "MS invalid TP-Message-Type-Indicator"

517, "MS no TP-Status-Report in Phase 1"

518, "MS no TP-Reject-Duplicate in Phase 1"

519, "MS no TP-Reply-Path in Phase 1"

520, "MS no TP-User-Data-Header in Phase 1"

521, "MS missing TP-Validity-Period"

522, "MS invalid TP-Service-Centre-Time-Stamp"

523, "MS missing TP-Destination-Address"

524, "MS invalid TP-Destination-Address"

525, "MS missing Service-Centre-Address"

526, "MS invalid Service-Centre-Address"

527, "MS invalid alphabet"

528, "MS invalid TP-User-Data-Length"

529, "MS missing TP-User-Data"

530, "MS TP-User-Data too long"

531, "MS no Command-Request in Phase 1"

532, "MS Cmd-Req invalid TP-Destination-Address"

533, "MS Cmd-Req invalid TP-User-Data-Length"

534, "MS Cmd-Req invalid TP-User-Data"

535, "MS Cmd-Req invalid TP-Command-Type"

536, "MN MNR creation failed"

537, "MS CMM creation failed"

538, "MS network connection lost"

539, "MS pending MO SM transfer"

540, "RP-Error OK"

541, "RP-Error OK no icon display"

542, "SMS-PP Unspecified"

543, "SMS rejected By SMS CONTROL"

21 SAR Debugging Note

21.1 SAR mechanism in UL MIMO/ULCA mode

- In UL MIMO mode, the power control used EPS mechanism, two Tx stream will have the similar Tx power and control the total max Tx power as the single band Max Tx power w/o UL MIMO.(e.g n41 HPUE max power is 26dBm w/o UL MIMO, n41 UL MIMO with HPUE total power will also be 25dBm<for UL MIMO only support CP-OFDMA, the max power will back off 1dB follow the 3Gpp, so the real max power is 25dBm>, each Tx stream actual power will be ~22dBm), so the UL MIMO will call the single band w/o UL MIMO SAR setting directly, no dedicated SAR configure for UL MIMO.

- In UL CA mode:

  ◦ For intra-band non-contiguous ULCA, module not support it , so no need configure SAR,

  ◦ For intra-band contiguous ULCA, two CC work in the same ANT and the total max Tx power is same as the single band, FW will call the single band SAR setting directly, no dedicated SAR configure

  ◦ For inter band UL CA, no dedicated SAR configure, FW have one setting to enable extra 3dB back off, so the situation is:

  a. Disable extra 3dB back off, each Tx stream will call each single band SAR configure.

  e.g.: massume single band mode, B1 SAR setting in ANT2 is 18dBm, B8 SAR setting in ANT0 is 19dBm.

  The ULCA 1A(ANT2)-8A(ANT0) SAR will be: B1 use 18dBm, B8 use 19dBm

  b. Enable extra 3dB back off, each Tx stream will call each single band SAR configure value -3dB.

  e.g : assume single band mode, B1 SAR setting in ANT2 is 18dBm, B8 SAR setting in ANT0 is 19dBm.

The ULCA 1A(ANT2)-8A(ANT0) SAR will be: B1 use 15dBm (18-3), B8 use 16dBm (19-3)

21.2 SAR Up threshold setting (Average power up limit) for TDD band

Device need use the max UL Tx slot configure to do the tuning, then set the Tx max power limitation in SAR mode:

- For Body SAR feature

  ◦ For NR, the 3Gpp defined that max UL Tx slot can reach to 100%, so the device need tune SAR based on 100% UL slots in one frame. But we cannot always configure all the slot to UL in long time, in order to tune SAR more convenient, device can use fixed UL slot configure, the calculate the target SAR setting based on the UL slot duty cycle.

a. For none HPUE band, the max Tx power have no change when UL configure change

   e.g   n40 use the 40% UL slot   to test the SAR and get the SAR limitation x dBm , consider 100% UL slot is the worst case, the target setting value should be around

   $x-10*\log10(1/0.4)$ dBm. <the final setting should be referring to the final test in the lab>

b. For HPUE band, the SAR setting is quite special, based on the 3Gpp, when the UL slot duty cycle higher than 50%, the max Tx power should back off 3dB, it means the average Tx power(PC2=26dBm) in 50% duty cycle is similar with 100% (23dBm), so the calculate solution should be referring to 50% duty cycle:

   e.g   n41 use the 40% UL slot w/ HPUE to test SAR and get the SAR limitation x dBm , consider 100% UL slot is the worst case, the target setting value should be around

   $x-10*\log10(0.5/0.4)$ dBm. <the final setting should be referring to the final test in the lab>.

◦ For LTE

a. For none HPUE band ,3Gpp defined the max UL slots is 6, so the device need tune SAR based on 60% UL slots in one frame.

b. For HPUE band, similar as NR band, when UL slots higher (or equal) than 50%, the power will back off 3dB, it means the average power w/ 4 UL slots (PC2=26dBm) will be higher than the power w/ 6 UL slots(23dBm), so should use the 4 UL slots to do the SAR tuing

● For TA-SAR feature

The SAR value setting is similar with Body SAR; the only difference is:

◦ For LTE, TA-SAR setting is the average power Up limit for SAR based on all time cycle, if we want to calculate the TA-SAR average power up limit based on above Body SAR value, we need calculate the real average power.

e.g   B40 testing and tuning UL slots is **6**, and use the target SAR power *y* dBm, because the y dBm is the max Tx power, the calculated average power should be: **y**+10*log10(**6**/10) dBm.

So the theoretical TA-SAR average power up limit should be: **y**+10*log10(**6**/10) dBm. <the final setting should be referring to the final test in the lab>.

◦ For NR, if want to calculate the target value based on above body SAR, we can use the the body SAR value directly, because the NR TDD band max UL slot is considered to 100%, and above body SAR have already considered the time slot impact.

> When do the SAR tuning and achieve the target SAR value, we need consider the Tx max power tolerance (tune up power).

22 Carrier ID

Each network operator has a carrier id which is defined by fibocom.

Carrier Name	Carrier ID
Generic (GC) (Default)	1
AT&T(AT)	201
China Mobile (CC)	211
China Telecom (CT)	117
China Unicom (CU)	108
Docomo (DO)	216
DT (DT)	119
KDDI (KD)	115
Optus AU (OP)	226
Softbank Mobile (SB)	218
Swisscom AG (SC)	210
Telefonica (TF)	205
Telstra (TE)	107
Verizon (VZ)	101
Vodafone (VF)	202
T-Mobile (TM)	203
Rakuten (RN)	235
FirstNet (FN)	240
Cricket (CK)	241
LG (LG)	231

India_JIO (IJ)	245