RYZ014 Modules

User's Manual: AT Command

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AT Command User's Manual

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1. Call Related Commands

1.1 Dial Number ATD

1.1.1 Syntax

Command	Possible Response(s)
ATD<num>[;]	<status>
ATD*99[*[<called_address>][*[<L2P>][*[<cid>]]]]#	CONNECT NO CARRIER ERROR +CME ERROR:<err>

1.1.2 Description

ATD is used to set up outgoing voice call. The syntax ATD*99# causes the MT to perform whatever actions are necessary to establish a communication between the TE and the external PDN. See also 1.2 Setup PPP Connection ATD*99 on page 2.

1.1.3 Defined Values

num

String of dialing digits and optional V.250 modifiers: 0-9, *, #, +, A, B, C, D and p.

status

String. Result of the command.

Table 1. status

Value	Description
OK	Call successfully dial and start to ring back
BUSY	MT side busy
NO CARRIER	No network

called_address

String. IP V4 address in the form w.x.y.z, which identifies the called party; if it is provided, the MT will automatically set up a virtual call to the specified address after the context has been activated. This parameter is currently not used and needs not to be specified.

L2P

String. Layer 2 protocol to be used between the TE and MT.

Table 2. L2P

Value	Description
PPP	Default value. Layer 2 protocol PPP
1	Layer 2 protocol PPP

cid

Integer. This parameter specifies a particular PDP context definition (see AT+CGDCONT and AT+CGDSCONT commands).

Note: If this parameter is omitted, `<cid>=1` (Internet PDN) is the default value.

1.1.4   Example

```
ATD
OK
```

1.2   Setup PPP Connection ATD*99

1.2.1   Syntax

Command	Possible Response(s)
ATD*99[*[<protocol>][*[<cid >]]]#	NO CARRIER ERROR +CME ERROR:**<err>**

1.2.2   Description

ATD*99 establishes a PPP connection.

After a successful LCP negotiation, the host acquires the public PDP address(es) and the AT channel switches to data mode.

The user should use the escape sequence '+++' to suspend the data mode and switch back to AT command mode. The module cannot enter Deep Sleep mode while a PPP connection is active.

1.2.3   Defined Values

protocol

String. The only supported value is "PPP".

cid

Integer in [1-8]. Internet Primary Context ID.

1.3 Hang-Up a Call: ATH

1.3.1 Syntax

Command	Possible Response(s)
ATH	OK

1.3.2 Description

This command releases all active and held calls.

Hangs up (exiting the PPP online mode). The command terminates all PPP sessions. It may be used from another AT command interface to terminate dial-up connections.

PPP will go through LCP Terminate procedure and PPP is considered ended after the NO CARRIER notification is sent.

1.3.3 Example

```
ATH
OK
```

1.4 Return to Online Data State: ATO

1.4.1 Syntax

Command	Possible Response(s)
ATO[<value>]	<result_code> OK

1.4.2 Description

Causes the DCE to switch back to data mode and issue a CONNECT or CONNECT <text> result code. This command cannot be aborted.

This command resumes the data mode that might be suspended after a +++ escape sequence.

Important: The +++ string will be interpreted as an escape sequence if it is issued at least 1 second after the last data exchange ended.

In case of PPP context, the command resumes the PPP session previously suspended by **+++**.

This command performs the same actions as AT+CGDATA without establishing the external network access.

1.4.3 Defined Values

value

 Integer. 0 represents return to data mode from command mode. Other values are reserved.

result_code

 String. Result of the command.

Table 3. result_code

Value	Description
CONNECT	If connection is successfully resumed and X0 is selected
CONNECT <text>	If connection is successfully resumed and Xn is selected where "n" is any value other than 0
NO CARRIER	If connection cannot be resumed
ERROR	If <value> is not recognized or supported

1.4.4 Example

```
ATO
OK
```

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2. Cloud Connector Commands

2.1 Generic Commands

2.1.1 Ping Echo Request: AT+PING

2.1.1.1 Syntax

Command	Possible Response(s)
AT+PING=<IPaddr>,<count>[,<len>[,<interval>[,<timeout>[,<ttl>[,<cid>]]]]]]	`+PING:<replyId>,<IPaddr>,<time>,<ttl>`
AT+PING=?	`+PING:` `<IPaddr>[,(1-64)[,(32-1400)[,(1-600)[,(1-60)[,(1-255)[,(0-8)]]]]]]`

2.1.1.2 Description

The goal of this command is to send ICMP Echo Request messages and to receive the corresponding Echo Reply.

Test command returns values supported as a compound value.

Note: When the Echo Request timeout expires (no reply within specified time), the response will contain `<time> = -1` and `<ttl> = -1`.

2.1.1.3 Defined Values

replyId

Integer type, Echo reply number.

IPaddr

String type, Remote host IP address. Any valid IPv4/v6 address or host name.

time

Integer type, maximum allowed time to receive a response (in ms).

count

Integer type in range [1-64]: Number of Ping Echo Request to send (default: 4) Ping stops after sending `<count>` ECHO_REQUEST packets. With deadline option, ping waits for `<count>` ECHO_REPLY packets, until the timeout expires.

len

Integer type in range [32-1400]: Length of ICMP Echo Request message (default: 32).

interval

Integer type in range [1-600]: Wait interval seconds between sending each ICMP Echo Request (default: 1)

timeout

Integer type in range [1-60]: Time to wait for an Echo Reply (in seconds)(default: 10). The option only concerns time-out in absence of any responses, otherwise ping waits for two RTTs.

ttl

Integer type, time to live (TTL) field of the Echo Reply message.

cid

Integer type in range [0-6]: PDP context identifier (default: Internet PDN)

2.1.1.4 Example

```
AT+CFUN=1
OK
+CEREG: 2
```

```
+CEREG: 1,"0002","01A2D002",7


AT+PING="sequans.com"
+PING: 1,184.106.55.83,210,49
+PING: 2,184.106.55.83,200,49
+PING: 3,184.106.55.83,200,49
+PING: 4,184.106.55.83,200,49
OK


AT+PING="google.com",2,1400,5,1,64,1
+PING: 1,2A00:1450:4001:816::200E,150,42
+PING: 2,2A00:1450:4001:816::200E,130,42
OK


AT+PING="8.8.4.4",2,1400,5,1,64,1
+PING: 1,8.8.4.4,300,44
+PING: 2,8.8.4.4,130,44
OK


AT+PING="2A00:1450:4001:816::200E",2
+PING: 1,2A00:1450:4001:816::200E,200,42
+PING: 2,2A00:1450:4001:816::200E,90,42
OK


AT+PING =" nobody.nowhere.com"
+CME ERROR: no network service
```

2.1.2 Configure Ping Echo Request: AT+PINGCFG
2.1.2.1 Syntax

Command	Possible Response(s)
AT+PINGCFG=<command>	OK
AT+PINGCFG=?	+PINGCFG:(0-2)
AT+PINGCFG?	+PINGCFG:<mode> [,<downcount> ,<IPaddr> ,<len> ,<interval> ,<timeout> ,<ttl> ,<cid>]

2.1.2.2 Description

This command configures an operation mode of `AT+PING`. The ICMP echo request command can operate either in synchronous or asynchronous mode. The command can also be used to abort ping requests during asynchronous mode.

Test command returns values supported as a compound value.

2.1.2.3 Defined Values

command

    Integer type in range [0-2]. Configuration command.

Table 4. command

Value	Description
0	Set Synchronous operation mode.
1	Set Asynchronous operation mode.
2	Stop pinging

mode

    Integer type in range [0-1]. Current operation mode.

Value	Description
0	Default. Synchronous mode.
1	Asynchronous mode.

downcount

    Integer type. Number of remaining ping echo requests. Applicable only for the Asynchronous mode.

IPaddr

    String type. Remote host IP Address. Applicable only for the Asynchronous mode.

len

    Integer type. Length of the ping echo request (default: 32). Applicable only for the Asynchronous mode.

interval

    Integer type. Interval (in seconds) between each ping echo request (default: 1). Applicable only for the Asynchronous mode.

timeout

    Integer type. Maximum delay of an echo reply in seconds (default: 10). Applicable only for the asynchronous mode.

ttl

    Integer type. TTL (time to live) parameter of the Echo Reply message. Applicable only for the Asynchronous mode.

cid

    Integer type. PDP context identifier (default: Internet PDN). Applicable only for the Asynchronous mode.

2.1.3   DNS Query: AT+SQNDNSLKUP
2.1.3.1   Syntax

Command	Possible Response(s)
AT+SQNDNSLKUP=<host Name>[,<ipType>]	`+SQNDNSLKUP:<hostName>,<ipAddrress>`
AT+SQNDNSLKUP=?	`+SQNDNSLKUP:<hostName>[,(0,1)]`

2.1.3.2   Description

The Write command triggers a A/AAAA query to a DNS server to resolve the host name into an IP v4/v6 address.

If the data APN is configured in dual stack IPv4/IPv6 (see `AT+CGDCONT`), then AAAA (IPv6) query is sent first. If that query fails for whatever reason, the A query is used as a failsafe.

The user can force the DNS query by setting `<ipType>` parameter. This parameter is ignored in case of single stack data APN.

In case of successful DNS query, then host IP address will be reported in result code: `+SQNDNSLKUP:<hostName>,<ipAddress>`.

If no DNS information is available, the command returns `ERROR`.

Write command returns `ERROR` if data APN is not yet activated (see `AT+CGDCONT`).

2.1.3.3   Defined Values

hostName
> String type. Domain name.

ipType
> Integer type with the range [0-1].

Table 5.   ipType

Value	Description
0	IPv4 only (A request)
1	IPv6 only (AAAA request) (default value)

ipAddress
> String type. Host IP 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. IPv6 print format can be influenced by `AT+CGPIAF` settings.

2.1.3.4 Example

```
AT+CGPIAF?
+CGPIAF: 0,0,0,0

OK
AT+SQNDNSLKUP="www.example.com"
+SQNDNSLKUP:
www.example.com,38.6.40.0.2.32.0.1.2.72.24.147.37.200.25.70

OK
AT+CGPIAF=1,0,0,0
OK
AT+SQNDNSLKUP="www.example.com",0
+SQNDNSLKUP: www.example.com,93.184.216.34

OK
AT+SQNDNSLKUP="www.example.com",1
+SQNDNSLKUP: www.example.com,2606:2800:220:1:248:1893:25c8:1946

OK
```

2.1.4   Modem Ready for Data Traffic: AT+SQNDRDY

2.1.4.1   Syntax

Command	Possible Response(s)
AT+SQNDRDY=<enable>	OK
AT+SQNDRDY=?	+SQNDRDY:(0-1) OK
AT+SQNDRDY? **(URC)**	+SQNDRDY:<enable> OK +SQNDRDY: <ready>

2.1.4.2   Description

The write command allows UE to notify the user about radio link related issues. The modem indicates whether data is ready to be sent or not.

The configuration is volatile and lost after a device reboot, but persists through Sleep mode.

The notification +SQNDRDY:0 is sent only when the RRC is in RRC connected mode, and a detection of physical layer problems in RRC_CONNECTED occurs (3GPP 36.331 5.3.11.1 - start of T310 timer)

The notification +SQNDRDY:1 is sent under recovery of physical layer problems (3GPP 36.331 5.3.11.2).

When the RRC exits the "RRC connected mode", +SQNDRDY:1 is emitted, assuming

+SQNDRDY:0 has been previously sent, when:

•   RRC performs the actions upon leaving RRC_CONNECTED as specified in 36.331 5.3.12;

•   RRC detects a radio link failure (36.331 5.3.11.3).

No notification is sent once the UE is attached or at boot time.

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2.1.4.3 Defined Values

enable

Integer in range 0-1.

Table 6. enable

Value	Description
0	Turn the +SQNDRDY notification on
1	Turn the +SQNDRDY notification off

ready

Integer in range 0-1.

Table 7. ready

Value	Description
0	The modem cannot send any data traffic (red flag)
1	The radio signal is considered good enough to enable data traffic (green flag).

2.1.5 SSL/TLS Security Profile Configuration: AT+SQNSPCFG
2.1.5.1 Syntax

Command	Possible Response(s)
AT+SQNSPCFG=*<spId>* *[,<version>,* *[<cipherSpecs>,* *[<certValidLevel>,* *[<caCertificateID>,* *[<clientCertificateID>,* *[<clientPrivateKeyID>,* *[<psk>, [<pskIdentity>,* *[<storageId>, [<resume>,* *[<lifetime>]]]]]]]]]]]*	+SQNSPCFG:*<spId>,<version>,<cipherSpecs>,<certValidLevel>,* *<caCertificateID>,* *<clientCertificateID>, <clientPrivateKeyID>, <psk>, <pskIdentity>,* *<storageId>,* *<resume>, <lifetime>* +CMEERROR:*<err>* OK
AT+SQNSPCFG	+SQNSPR:1,*<version1>, <cipherSpecs1>, <certValidLevel1>,* *<caCertificateID1>,<clientCertificateID1>, <clientPrivateKeyID1>, <psk1>,* *<pskIdentity1>, <storageId1>, <resume1>, <lifetime1><S3><S4>* ... +SQNSPR:6,*<version6>, <cipherSpecs6>, <certValidLevel6>,* *<caCertificateID6>,<clientCertificateID6>,<clientPrivateKeyID6>, <psk6>,* *<pskIdentity6>, <storageId6>,<resume6>, <lifetime6>* OK
AT+SQNSPCFG=?	+SQNSPCFG: (1-6),(0-4),(list of supported cipher suites),(0x00-0xFF),(1-19),(1-19),(1-19),,,(0,1), (0,1),(0-UINT_MAX) OK

Note: <S3> and <S4> represent the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 and Response Formatting Character: ATS4.

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2.1.5.2 Description

This command sets the security profile parameters required to configure subsequent SSL/TLS connections.

A security profile is identified by a unique ID `<spId>`. Up to 6 security profiles can be configured. Each security profile contains the following SSL/TLS connections properties:

1. SSL/TLS protocol `<version>` to use:
   — TLS v1.0
   — TLS v1.1
   — TLS v1.2
   — TLS v1.3

2. List of cipher suites (`<cipherSpecs>`) to be used for SSL/TLS connection security settings negotiation.
   Caution: If the remote server supports none of the cipher suites configured in the `<cipherSpecs>` list, the handshake fails.
   Note: For security reasons, it is recommended to keep the list as short as possible and include only the strongest suites.

3. Server certificate validation level `<certValidLevel>`:
   — No certificate validation
   — Certificate validation done against a specific or a list of imported trusted root certificates and against validity period.
   — Server URL verified against a certificate common name field.

4. Certificate to be used for server authentication (stored using `AT+SQNSNVW="certificate"` command): `<caCertificateID> (num):` The trusted Certificate Authority certificate

5. Certificate to be used for client authentication (stored using `AT+SQNSNVW="certificate"` command): `<clientCertificateID> (num):` The client certificate

6. Private key to be used for client authentication (stored using `AT+SQNSNVW="privatekey"` command): `<clientPrivateKeyID> (num):` The client private key (password protected keys are not supported)

7. Pre-shared key `<psk>` used for connection (when a `TLS_PSK_*` cipher suite is used). Pre-shared key identity `<pskIdentity>` used for connection (when a `TLS_PSK_*` cipher suite is used).

8. `<storageId>` used to identify whether the private key is stored in NVM or HCE (Hardware Crypto Engine).

9. `<resume>`: When session resumption is enabled (this is disabled by default for backward compatibility), the module attempts to resume the previous security session if possible. If the option is disabled, the module starts a new security session at each data connection establishment.

10. `<lifetime>`: The security profile user has the capability to configure a maximum `<lifetime>`. The TLS client enforces a TLS session restart after `<lifetime>` even if the TLS server allows a longer session lifetime.

To reset all the parameters of the `<spId>` security profile, use `AT+SQNSPCFG=<spId>,255`.

When passed only a security profile ID (`AT+SQNSPCFG=<spId>`), the command outputs the requested security profile.

To display all configuration profiles, use the exec command (`AT+SQNSPCFG`).

Examples:
```
+SQNSPCFG:1,0,"0x2f;0x3C;0x35;0x3D",0,,,,"","",0
+SQNSPCFG:1,3,"0x3D",3,1,2,3,"","",1
```

The exhaustive list of supported cipher suites can be extracted from the test form (3rd parameter).

2.1.5.3 Defined Values

spld

Integer in range [1-6]. Security Profile identifier.

version

Integer in range [0-3] or 255:SSL/TLS version.

Table 8. version

Value	Description
0	TLS 1.0
1	TLS 1.1
2	(default): TLS 1.2
3	TLS 1.3
255	Special code to reset the profile

cipherSpecs

String. The list of the available cipher suites, coded as 16-bit hexadecimal "0x" prefixed IANA numbers, semicolon delimited. An empty string means any of the supported suites.

Cipher suites are identified by their IANA (Internet Assigned Numbers Authority) TLS Cipher Suite Registry number.

The factory default value is an empty string, any of the supported cipher can be used.

Ciphering is implemented using the WolfSSL library. The following ciphering suites are currently supported, but additional suites are added with each new release. Always use `AT+SQNSPCFG?` to get the actual list of cipher suites supported by the module:

- 0x1301: TLS_AES_128_GCM_SHA256
- 0x1302: TLS_AES_256_GCM_SHA384
- 0x1303: TLS_CHACHA20_POLY1305_SHA256
- 0x1304: TLS_AES_128_CCM_SHA256
- 0x1305: TLS_AES_128_CCM_8_SHA256
- 0x000A: SSL_RSA_WITH_3DES_EDE_CBC_SHA
- 0x002F: TLS_RSA_WITH_AES_128_CBC_SHA
- 0x0035: TLS_RSA_WITH_AES_256_CBC_SHA
- 0x0033: TLS_DHE_RSA_WITH_AES_128_CBC_SHA
- 0x0039: TLS_DHE_RSA_WITH_AES_256_CBC_SHA
- 0x00AB: TLS_DHE_PSK_WITH_AES_256_GCM_SHA384
- 0x00AA: TLS_DHE_PSK_WITH_AES_128_GCM_SHA256
- 0x00A9: TLS_PSK_WITH_AES_256_GCM_SHA384
- 0x00A8: TLS_PSK_WITH_AES_128_GCM_SHA256
- 0x00B3: TLS_DHE_PSK_WITH_AES_256_CBC_SHA384
- 0x00B2: TLS_DHE_PSK_WITH_AES_128_CBC_SHA256
- 0x00AF: TLS_PSK_WITH_AES_256_CBC_SHA384

- 0x00AE: TLS_PSK_WITH_AES_128_CBC_SHA256

- 0x008C: TLS_PSK_WITH_AES_128_CBC_SHA

- 0x008D: TLS_PSK_WITH_AES_256_CBC_SHA

- 0xC0A6: TLS_DHE_PSK_WITH_AES_128_CCM

- 0xC0A7: TLS_DHE_PSK_WITH_AES_256_CCM

- 0xC0A4: TLS_PSK_WITH_AES_128_CCM

- 0xC0A5: TLS_PSK_WITH_AES_256_CCM

- 0xC0A8: TLS_PSK_WITH_AES_128_CCM_8

- 0xC0A9: TLS_PSK_WITH_AES_256_CCM_8

- 0xC0A0: TLS_RSA_WITH_AES_128_CCM_8

- 0xC0A1: TLS_RSA_WITH_AES_256_CCM_8

- 0xC0AC: TLS_ECDHE_ECDSA_WITH_AES_128_CCM

- 0xC0AE: TLS_ECDHE_ECDSA_WITH_AES_128_CCM_8

- 0xC0AF: TLS_ECDHE_ECDSA_WITH_AES_256_CCM_8

- 0xC013: TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA

- 0xC014: TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA

- 0xC009: TLS_ECDHE_ECDSA_WITH_AES_128_CBC_SHA

- 0xC00A: TLS_ECDHE_ECDSA_WITH_AES_256_CBC_SHA

- 0xC012: TLS_ECDHE_RSA_WITH_3DES_EDE_CBC_SHA

- 0xC008: TLS_ECDHE_ECDSA_WITH_3DES_EDE_CBC_SHA

- 0x003C: TLS_RSA_WITH_AES_128_CBC_SHA256

- 0x003D: TLS_RSA_WITH_AES_256_CBC_SHA256

- 0x0067: TLS_DHE_RSA_WITH_AES_128_CBC_SHA256

- 0x006B: TLS_DHE_RSA_WITH_AES_256_CBC_SHA256

- 0x009C: TLS_RSA_WITH_AES_128_GCM_SHA256

- 0x009D: TLS_RSA_WITH_AES_256_GCM_SHA384

- 0x009E: TLS_DHE_RSA_WITH_AES_128_GCM_SHA256

- 0x009F: TLS_DHE_RSA_WITH_AES_256_GCM_SHA384

- 0xC02F: TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256

- 0xC030: TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384

- 0xC02B: TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256

- 0xC02C: TLS_ECDHE_ECDSA_WITH_AES_256_GCM_SHA384

- 0xC027: TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA256

- 0xC023: TLS_ECDHE_ECDSA_WITH_AES_128_CBC_SHA256

- 0xC028: TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA384

- 0xC024: TLS_ECDHE_ECDSA_WITH_AES_256_CBC_SHA384

- 0xCCA8: TLS_ECDHE_RSA_WITH_CHACHA20_POLY1305_SHA256

- 0xCCA9: TLS_ECDHE_ECDSA_WITH_CHACHA20_POLY1305_SHA256

- 0xCCAA: TLS_DHE_RSA_WITH_CHACHA20_POLY1305_SHA256

- 0xCC13: TLS_ECDHE_RSA_WITH_CHACHA20_OLD_POLY1305_SHA256

- 0xCC14: TLS_ECDHE_ECDSA_WITH_CHACHA20_OLD_POLY1305_SHA256

- 0xCC15: TLS_DHE_RSA_WITH_CHACHA20_OLD_POLY1305_SHA256

- 0xC037: TLS_ECDHE_PSK_WITH_AES_128_CBC_SHA256

- 0xCCAB: TLS_PSK_WITH_CHACHA20_POLY1305_SHA256

- 0xCCAC: TLS_ECDHE_PSK_WITH_CHACHA20_POLY1305_SHA256

- 0xCCAD: TLS_DHE_PSK_WITH_CHACHA20_POLY1305_SHA256

- 0x0016: TLS_DHE_RSA_WITH_3DES_EDE_CBC_SHA

Example: <cipherSpecs>="0x8C;0x8D;0xAE;0xAF"

Warning: If the remote server does not support one of the cipher suites configured in the `<cipherSpecs>` list, the handshake fails.

certValidLevel

Server certificate validation 8-bit field, integer in range [0x00-0xFF].

Configuration bits:

- All 0 (default): certificate not validated

- Bit 0 set to 1: certificate validation done against a specific or a list of imported trusted root certificates and against validity period

- Bit 1: unused

- Bit 2 set to 1: server URL verified against certificate common name field (on top of bit 0)

- Bit 3-7 are reserved for future use

As an example: to activate certification verification including validity period check, `<certValidLevel>`=0x01

caCertificateID

Trusted Certificate Authority certificate ID, integer in range [0-19].

Exact CA certificate to use to validate server certificate ID. The CA certificate should be imported with `AT+SQNSNVW="certificate"` command. When parameter is not provided (default), no certificate is referenced.

clientCertificateID

Client certificate ID, integer in range [0-19].

The client certificate is used to authenticate the client in the case where mutual authentication is requested. The client certificate should be imported with `AT+SQNSNVW="certificate"` command. When parameter is not provided (default), no certificate is referenced.

clientPrivateKeyID

Client private key ID, integer in range [0-19].

The client private key is used to authenticate the client in the case where mutual authentication is requested. The client private key should be imported with the `AT+SQNSNVW="certificate"` command. When the parameter is not provided (default), no key is referenced.

Note: Password protected keys are not supported.

psk

String. Pre-shared key used for connection (when a `TLS_PSK_*` cipher suite is used). The value must be specified as a string of hexadecimal numbers (for example, "734c61425224655f…")

The factory default value is an empty string, meaning no pre-shared key defined.

pskIdentity

String. Optional. Pre-shared key identity used for connection (when a `TLS_PSK_*` cipher suite is used). The factory default value is an empty string, meaning empty key identity defined.

storageId

Integer: 0, 1 or 2. Private key storage id used to identify whether key stored on NVM or HCE.

Table 9.   storageId

Value	Description
0	(default): Embedded non-volatile memory (see `AT+SQNSNVW`)
1	Hosted Crypto Engine (host MCU acting as storage proxy)]
2	For future use

resume

Integer: 0 or 1. Session resumption feature enable.

Table 10. resume

Value	Description
0	Session resumption feature disabled (default)
1	Session resumption feature enabled

lifetime

Integer. Maximum TLS client session duration in seconds.

Table 11. lifetime

Value	Description
0	No limit. The server can set its own expiration value, advertised in the session ticket lifetime expiration mechanism
>0	Maximum duration of a given TLS session. This parameter takes precedence over the server own value

2.1.5.4   SSL/TLS Security Introduction

This section is a brief introduction to SSL/TLS.

Transport Layer Security (TLS) and its predecessor, Secure Sockets Layer (SSL), both frequently referred to as SSL, are cryptographic protocols that provide communications security ove a computer network. Several versions of the protocols are currently widely used:

- TLS Protocol Version 1.0: RFC 2246 - https://www.ietf.org/rfc/rfc2246.txt
- TLS Protocol Version 1.1: RFC 4346 - https://www.ietf.org/rfc/rfc4346.txt TLS Protocol Version 1.2: RFC 5246 - https://www.ietf.org/rfc/rfc5246.txt
- TLS Protocol Version 1.3: IETF draft #21 - https://tools.ietf.org/html/draft-ietf-tls- tls13-21

The Transport Layer Security protocol provides privacy and data integrity between two communication entities. When secured by TLS, connections between a client and a server have one or more of the following properties:

- The connection is private (or secure) because symmetric cryptography is used to encrypt the data transmitted. The keys for symmetric encryption are regenerated at each connection and are based on a shared secret negotiated at the start of the session (TLS handshake protocol). The server and client negotiate which encryption algorithm and cryptographic keys to use before the first byte of data is transmitted. The negotiation of a shared secret is both secure (the negotiated secret is unavailable to eavesdroppers and cannot be obtained, even by an attacker in the middle of the connection) and reliable (no attacker can modify the payloads during the negotiation without being detected).
- The identity of the communicating parties can be authenticated using public-key cryptography. This authentication is optional, but generally required and should be mutual (both device and server are authenticated).
- The connection ensures integrity because each message transmitted includes a message integrity check using a hash code to prevent loss or alteration of the data during transmission.

TLS supports many different methods for exchanging keys, encrypting data, and authenticating message integrity. The set of algorithms used to negotiate the security settings of an SSL/TLS connection is known as a cipher suite. Cipher suites are identified by their IANA (Internet Assigned Numbers Authority) TLS Cipher Suite Registry number (https://www.iana.org/assignments/tls-parameters/tls-parameters.xhtml#tls-parameters-4), and include:

- A key exchange algorithm used for authentication during the handshake: RSA, PSK, RSA_PSK...
- The encryption algorithm used to encrypt the message: AES_128_CBC, AES_256_CBC...
- The hash function ensuring data integrity (HMAC: Hash Message Authentication Code): SHA, SHA256, SHA384...

Digital certificates can also be used to provide:

- Server authentication: the server certificate is checked against a specific trusted certificate or a trusted certificates list
- Client authentication: use of the client certificate and the corresponding private key

The security details used in the active connection are negotiated at connection establishment based on the security capabilities of the communicating entities. The client security profile must be carefully adjusted to meet the security level requested by the user application.

Note: Security best practices require to configure mutual authentication TLS connections, even though this results in an increased overhead and power consumption.

In order to configure every parameter of the SSL/TLS security protocol, several AT commands must be used:

- `AT+SQNSNVR` and `AT+SQNSNVW`: Read/write X.509 certificates and private keys from/ to the non-volatile (NV) memory. Up to 20 certificates/keys can be stored.
- `AT+SQNSPCFG:` SSL/TLS connection security profile configuration. Up to 6 security profiles can be configured.

Any secure connection must refer to a security profile ID to exploit the corresponding SSL/TLS configuration:

- `AT+SQNSSCFG`: Secure socket configuration
- `AT+SQNMQTT`: MQTT protocol over TLS
- `AT+SQNHTTPCFG`: HTTP protocol over TLS
- `AT+SQNSUPGRADE`
- `AT+SQNCOAPCREATE`
- `AT+SQNFGET`

2.2   Data Transfer Commands

2.2.1   File Download: AT+SQNFGET

2.2.1.1   Syntax

Command	Possible Response(s)
AT+SQNFGET=<remote_url>,[<sync>],[<local_filename>]	`+CME ERROR:<err>`

AT+SQNFGET?	`+SQNFGET: "started"`
	
	`+SQNFGET: "downloading"`
	
	`+SQNFGET: "downloaded"`
	
	`+SQNFGET: "error"`
	
	`+SQNFGET: "complete"`
	`+SQNFGET: "not running"`
	
	`OK`

AT+SQNFGET=?	`+SQNFGET:<remote_url>,[<sync>],[<local_filename>]`
	
	`OK`

2.2.1.2   Description

This command initiates TFTP/FTP/HTTP connection in order to download a specified file.

The Read command returns the current state of connection.

The Test command returns string, which defines command syntax.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

Caution: The module enforces no limit on the size of the filename that is being downloaded. If the file is too large, it will overwrite other files on the filesystem and cause the module to crash. Lost information might prevent reboot of the module, even after `AT+SQNFACTORYRESET` is attempted. Therefore, THIS COMMAND IS FOR DEBUG PURPOSES ONLY.

2.2.1.3   Defined Values

remote_url

   String type. URL of the remote file to download using TFTP/FTP/HTTP.

sync

   Integer in range 0-1. Download handling type.

Table 12. sync

Value	Description
0	Asynchronous: starts the download and returns immediately, reports download progress and result via +SQNFGETREPORT URC. Command response indicates whether the download has been started successfully.
1	Synchronous. Return after the download has finished. Default value.

local_filename

   String. Filename to store the file to. If `<local_filename>` is specified, the command saves the file as `<local_filename>` on the device's file system. If `<local_filename>` parameter is not specified, `AT+SQNFGET` switches AT channel to data mode and outputs downloaded binary octet stream to the host. In this scenario, host is responsible for error handling.

Warning: This string MUST NOT be more than 64 bytes long, lest a fatal corruption of the file system occurs, which leads to an unrecoverable crash.

Note:

- If `<local_filename>` is not specified and `<sync>` is 0, then the received data is accumulated in the internal buffers, which could be read using `AT+SQNFGETDATA` command.

- If `<local_filename>` is not specified and `<sync>` is 0, every answer from the server triggers a `+SQNFGETRING` URC is shown.

2.2.1.4 Download Status URC: +SQNFGETREPORT

A URC used to notify the host on current status of asynchronous mode.

Command	Possible Response(s)
	`+SQNFGETREPORT :<status>`

The possible values of `<status>` are as follows:

status
   String. File download status

Table 13. status

Value	Description
"started"	Request sent to server
"downloading"	Server started the transfer
"downloaded"	Download completed successfully
"complete"	Download completed and read from a buffer (or saved to a file)
"error"	An error occurred during the download process

2.2.1.5 Download Size URC: +SQNFGETRING

A URC is used to notify the host about size of the requested URI in asynchronous mode.

Command	Possible Response(s)
	`+SQNFGETRING :<size>`

The possible values of <size> are as follows:

size
   Integer. Size, in bytes, communicated by server the after the prior `AT+SQNFGET` request.

2.2.1.6 Example

```
AT+SQNFGET
+CME ERROR: Incorrect parameters AT+SQNFGET=?
+SQNFGET=<remote_url>[,[(0-1)][,<local_filename>]]

OK
AT+SQNFGET="http://www.example.com/index.html"
<!doctype html>
<html>
<head>
    <title>Example Domain</title>
```

RENESAS

```
[... output omitted partly ...]
</head>
<body>
<div>
    <h1>Example Domain</h1>
    <p>This domain is established to be used for illustrative examples in
documents. You may use this domain in examples without prior coordination or
asking for permission.</p>
    <p><a href="http://www.iana.org/domains/example">More
information...</a></p>
</div>
</body>
</html>

OK
AT+SQNFGET="tftp://example.com/index.html",1,"index.html"
OK
AT+SQNFGET="ftp://example.com/index.html",0,"index.html"

OK

+SQNFGETREPORT: "started"

+SQNFGETREPORT: "downloading"

+SQNFGETREPORT: "complete"

AT+SQNFGET?
+SQNFGET: "complete"
OK
```

2.2.2 Read Asynchronously Received data: AT+SQNFGETDATA

2.2.2.1 Syntax

Command	Possible Response(s)
AT+SQNFGETDATA=<max_bytes>	`+CME ERROR:`<err>
AT+SQNFGETDATA=?	`+SQNFGETDATA:`[<max_bytes>] `OK`

2.2.2.2 Description

This command dumps the internal buffer where the file received after an `AT+SQNFGET` command in asynchronous mode with no `<local_filename>` specified, has been stored. See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

2.2.2.3 Defined Values

max_bytes
> Integer in range 0 to 64-1500. Number of bytes to read at a time. The actual number of bytes transmitted may be less than asked for if EOF is reached.

Table 14. max_bytes

Value	Description
0	Read all the buffer. Default value.
64-1500	Read the specified quantity of bytes.

2.2.2.4 Example

```
AT+SQNFGET="tftp://example.com/index.html",0

OK
+SQNFGETREPORT: "started"
AT+SQNFGETDATA=64
+CME ERROR: Operation temporary not allowed
+SQNFGETRING: 120

+SQNFGETREPORT: "downloading"
AT+SQNFGETDATA=64
[... output omitted ...]
OK
AT+SQNFGETDATA=129
[... output omitted ...]
OK
AT+SQNFGETDATA=1501
+CME ERROR: Incorrect parameters
AT+SQNFGETDATA
[... output omitted ...]

OK

+SQNFGETREPORT: "complete" AT+SQNFGETDATA?
+CME ERROR: operation not supported AT+SQNFGETDATA=?
+SQNFGETDATA:[(0,64-1500)]

OK
```

2.2.3 File Upload: AT+SQNFPUT

2.2.3.1 Syntax

Command	Possible Response(s)
AT+SQNFPUT=<prof_id>,<command>, <resource>,<filename>[,<post_param>[, <extra_header_line>][,[<disconnect>] [,<max_to_sec>]]]]	OK ERROR +CME ERROR:**<err>**
AT+SQNFPUT=?	+SQNFPUT:(0-2),(0-1),(1000),(256) [,[(1000)][,[(1500)][,[(0-1)][, (0-65535)]]]] OK

2.2.3.2 Description

This command performs a HTTP POST or PUT request and attempts to send the contents of the file <filename> located in the module file system to the server.

Secure HTTP connections using a private key stored in a Hosted Cryptographic Engine (see AT+SQNSPCFG and HCE storage mode) require an asynchronous HTTP connection creation with AT+SQNHTTPCONNECT before calling this command. If the connection is not already opened, ERROR is returned.

The command automatically opens unsecured connections, or connections secured without HCE usage, then proceeds with the HTTP data session.

The command returns OK. The +SQNHTTPRING:<prof_id>,<http_status_code>,<content_type>,<data_size> URC (when supported) is emitted when the HTTP response code, content type and size are available. See HTTP Response URC: +SQNHTTPRING for details.

The test command returns the range of supported values/lengths for all the parameters.

When an answer from the remote HTTP server is received, the `+SQNHTTPRING` URC is emitted. If the `<disconnect>` parameter is set, the data session is automatically released on completion.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for `<err>` values.

2.2.3.3 Defined Values

prof_id
Integer in range [0-2]. HTTP configuration profile identifier.

command
Integer in range [0-1]. HTTP request type.

Table 15. command

Value	Description
0	Post
1	Put

resource
String. URI to send the data to. Maximum 1000 bytes.

Filename
String. Name of the file to send. Maximum 256 bytes.

post_param
String. HTTP Content-Type identifier of request. Used only for POST requests, optionally followed by colon character (:) and a string `<extension>` that extends the identifier with sub-types. Other content-free strings corresponding to other content type and possible sub-types.

Table 16. post_param

Value	Description
0	application/x-www-form-urlencoded
1	text/plain
2	application/octet-stream
3	multipart/form-data
4	application/json

Notes: For example, if `<post_param>` is set to "1:charset=us-ascii", then the request will contain "Content-type: text/plain; charset=us-ascii" header line.

extra_header_line
String (max length 1500 characters). Optional HTTP header line.

max_to_sec
Integer: 1..65535. Maximum data transfer time-out in seconds. This is the maximum time in seconds allowed for the HTTP(S) connection establishment/completion (if needed) and the data transfer. This time-out prevents the host MCU from hanging indefinitely due to a slow network or a cellular connection dropped during operation. This timer shall be set according to the expected network performance to avoid aborting normal operations. The time-out value must be greater than the connection time-out value configured in HTTP configuration profile (see HTTP Configure: AT+SQNHTTPCFG `<cnx_to_sec>` parameter), otherwise the command returns a configuration `ERROR`. If not provided, the time-out value defined in the HTTP configuration profile (see HTTP Configure: AT+SQNHTTPCFG `<max_to_sec>` parameter) is applied.

disconnect

Integer: 0 or 1. Automatic connection/disconnection.

Table 17. disconnect

Value	Description
0	The connection remains open after completion.
1 (default)	The connection is closed after the HTTP transaction completes.

2.2.4   Receive Data in Command Mode: AT+SQNSRECV
2.2.4.1   Syntax

Command	Possible Response(s)

AT+SQNSRECV=<connId>, <maxByte>	`+SQNSSRECV:`<connId>,<maxByte>[,<IPaddr>,<rPort>]<S3><S4> <data>
	 `OK`
	
	 `ERROR`
	 `+CME ERROR:`<err>

AT+SQNSRECV=?	`+SQNSRECV:(1-6), (1-1500)`
	
	 `OK`

Note: <S3> and <S4> represent the value of the command line termination character and the response
formatting character, respectively. See Command Line Termination Character: ATS3 and Response
Formatting Character: ATS4

2.2.4.2   Description

This command dumps the data received on a connected socket while the module is in 'command mode'. The
module is notified of these data by a `SQNSRING` URC, whose presentation format depends on the last
`AT+SQNSCFGEXT` setting.

Notes:

1. Attempting `AT+SQNSRECV` when no data is buffered raises an error.
2. `<IPaddr>` and `<rPort>` are showed only if `<acceptAnyRemote>`=2.

2.2.4.3   Defined Values

connId

Integer in range [1-6]. Socket connection identifier.

cid

Integer in range [1-1500]. Maximum number of bytes to read.

2.2.4.4   Example

```
AT+SQNSRECV=?
+SQNSRECV: (1-6),(1-1500)
OK
AT+SQNSRECV=1,5
+SQNSRECV:1,5
hello+OK
```

2.2.5 Send Data in Command Mode: AT+SQNSSEND
2.2.5.1 Syntax

Command	Possible Response(s)

AT+SQNSSEND=<connId>[,<IPaddr>,<rPort>,<RAI>]	Intermediate result code:
	`OK`
	`ERROR`
	`NO CARRIER`
	`+CME ERROR:`<err>

AT+SQNSSEND=?	`+SQNSSEND:(1-6),[<IPaddr>,(0-65535),(0-2)]` `OK`

2.2.5.2 Description

This command sends data through a connected socket when the module is in command mode. The device responds to the command with the prompt '>' (<greater than> <space>) and waits for the data to be sent.

`Ctrl-Z` char (0x1A in hexadecimal) validates the data. An `ESC` char (0x1B in hexadecimal) cancels the operation.

If the data is successfully sent, then the response is `OK`. If the transmission fails, an error code is reported.

Notes: 1. The maximum number of bytes to send is 1500.
2. It is possible to use `AT+SQNSSEND` only if the connection was opened using `AT+SQNSD`.
3. The `BS` character (0x08) erases the previous byte. The `BS` character itself is never sent.
4. If <IPaddr> and <rPort> parameters are not passed, their values are inferred from `AT+SQNSD` command.

2.2.5.3 Defined Values

connId
Integer in range [1-6]. Socket connection identifier.

IPaddr
String. Address of the remote host. It can be any valid IP address or any host name. If <IPaddr> parameter is not passed, its value is inferred from the `AT+SQNSD` command.

Note: This parameter is present only if <acceptAnyRemote> =2.
rPort
Integer in range [0-65535]. Remote host port to connect to. If <rPort> parameter is not passed, its value is inferred from the `AT+SQNSD` command.

Note: This parameter is present only if <acceptAnyRemote> = 2.
RAI
Note: This parameter applies only for NB-IoT applications.
Integer in range [0-2]. RAI field (Release Assistance Information). The UE uses RAI to notify the MME that no further data transmissions are expected (RAI=1), or that only a single downlink data transmission is expected (RAI=2)

Table 18. RAI

Value	Description
0	No information
1	No further uplink or downlink data transmissions are expected
2	Only a single downlink data transmission is expected

2.2.5.4 Example

```
AT+SQNSSEND=?
+SQNSSEND:(1-6),[<IPaddr>,(0-65535),(0-2)]
OK
AT+SQNSSEND=1
>hello
OK
```

2.2.6 Extended Send Data In Command Mode: AT+SQNSSENDEXT

2.2.6.1 Syntax

Command	Possible Response(s)

AT+SQNSSENDEXT=<connId>,<bytesToSend>[,<RAI>]	Intermediate result code:
	
	`>`
	
	`OK`
	
	`ERROR`
	
	`NO CARRIER`
	`+CME ERROR:`<err>

AT+SQNSSENDEXT=?	`+SQNSSENDEXT: (1-6), (1-1500)[, (0-2)]`
	
	`OK`

2.2.6.2 Description

This command allows to send binary data through a connected socket, while the module is in command mode.

The device responds to the command with the prompt '>' (<greater_than> sign and <space> character) and waits for the data to send.

When `<bytestosend>` bytes have been sent, then the operation is automatically completed.

If data is successfully sent by the modem, then the response is `OK`. If data transmission fails, an error code is reported. The response is sent regardless of the processing at network/eNB level.

Notes: 1. Input data format is raw binary by default. It is configurable using `AT+SQNSCFGEXT` command to change it to hexadecimal bytes (for example, "AEB764008B…").
      2. The maximum number of bytes to send is 1500.
      3. It is possible to use `AT+SQNSSENDEXT` only if the connection was opened using `AT+SQNSD`.
      4. All special characters, for example `BS,` are sent as regular data.

2.2.6.3 Defined Values

connId
     Integer in range [1-6]. Socket connection identifier.

bytesToSend
     Integer in range [1-1500]. Number of bytes to send.

RAI

Note: This parameter applies only for NB-IoT applications.

Integer in range [0-2]. RAI field (Release Assistance Information). The UE uses RAI to notify the MME that no further data transmissions are expected (RAI=1), or that only a single downlink data transmission is expected (RAI=2)

Table 19. RAI

Value	Description
0	No information
1	No further uplink or downlink data transmissions are expected
2	Only a single downlink data transmission is expected

2.2.6.4 Example

```
AT+SQNSSENDEXT=1,11
>hello again
```

2.3 HTTP Related Commands

2.3.1 Secure Socket Configuration: AT+SQNSSCFG

2.3.1.1 Syntax

Command	Possible Response(s)
AT+SQNSSCFG=<connId>,<enable>,<spId>	+SQNSSCFG:<connId>,<enable>,<spId> +CME ERROR:<err> OK
AT+SQNSSCFG?	+SQNSSCFG:1,<enable1>,<spId1><S3><S4> ... +SQNSSCFG:6<enable6>,<spId6> OK
AT+SQNSSCFG=?	+SQNSSCFG:(1-6),(0-1),(1-6) OK

Note: <S3> and <S4> represent the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 and Response Formatting Character: ATS4.

2.3.1.2 Description

This command enables or disables SSL/TLS over a TCP or UDP socket.

The configuration of the SSL/TLS properties is provided with an SSL/TLS profile set using AT+SQNSPCFG.

The <spId> parameter is listed in the information text response to the read command only if the SSL/TLS is enabled on the specified socket.

Notes:
1. SSL/TLS configuration is available for both TCP and UDP sockets.
2. SSL/TLS is not supported on sockets configured in listen mode (AT+SQNSL command).
3. Enabling/disabling or modifying the security profile must be performed when the socket is not active (socket dial with AT+SQNSD command). Any attempt to change the security configuration on an active socket fails.

4. After security activation, any attempt to create a socket in listen mode (`AT+SQNSL`, `AT+SQNSLUDP`) will fail.

2.3.1.3 Defined Values

spId

> Integer in range [1-6]. Security profile identifier. See `AT+SQNSPCFG` for security profile details.

connId

> Integer in range [1-6]. Socket connection identifier.

enable

> Integer in range [0-1]. Security enable status.

Table 20. state

Value	Description
0	No security (default value).
1	Activate SSL/TLS on the socket.

2.3.1.4 Example

- Write configuration:
```
AT+SQNSSCFG=1,1,1
OK
```

- Read configurations:
```
AT+SQNSSCFG
+SQNSSCFG: 1,1,1
+SQNSSCFG: 2,0,1
+SQNSSCFG: 3,0,1
+SQNSSCFG: 4,0,1
+SQNSSCFG: 5,0,1
+SQNSSCFG: 6,0,1
OK
```

- Test command:
```
AT+SQNSSCFG=?
Possible response(s):
+SQNSSCFG:(1-6),(0-1),(1-6)
OK
```

2.3.2 HTTP Configure: AT+SQNHTTPCFG

2.3.2.1 Syntax

Command	Possible Response(s)
AT+SQNHTTPCFG=*<prof_id>* *[,<server_address>* *[,<server_port>* *[,<auth_type>[,<username>* *[,<password>[,<ssl_enabled>* *[,<max_to_sec>[,<cid>* *[,<spId>,[<cnx_to_sec>]]]]]]]]]*	`+CME ERROR:`*<err>* `OK`

AT+SQNHTTPCFG?	`+SQNHTTPCFG:`
	
	<prof_id1>,<server_address1>,<server_port1>,<auth_type1>,<username1>,
	<password1>,<ssl_enabled1>,<max_to_sec1>,<cid1>,<spId1>,<cnx_to_sec1>
	
	...
	
	`+SQNHTTPCFG:`
	
	<prof_idN>,<server_addressN>,<server_portN>,<auth_typeN>,<usernameN>,<passwordN>,<ssl_enabledN>,<max_to_secN>,<cidN>,<spIdN>,<cnx_to_secN>
	
	`OK`

AT+SQNHTTPCFG=?	`+SQNHTTPCFG:` (0-2)[,(1500)[,[(0-65535),[(0-1),[(100),[(100),[(0-1),[(0-65535),[(1-8),[(1-6),(1-120)]]]]]]]]]] `OK`

2.3.2.2 Description

This command sets the parameters needed to establish the HTTP connection. The configuration is persistent (survives device reboots and whatever modem power states) and changes are applied at the next HTTP session (`AT+SQNHTTPSND`, `AT+SQNHTTPQRY`).

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

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

The test command returns the range of supported values/lengths for all the parameters.

Note: The special form of the Set command, `+SQNHTTPCFG=<prof_id>`, causes the values for profile number <prof_id> to reset to default values.

Parameters of `+SQNHTTPCFG` are automatically saved to NVM. They survive reboots.

2.3.2.3 Defined Values

prof_id

Integer in range [0-2]. HTTP configuration profile identifier.

server_address

String (max: 1500 bytes). IP address of the HTTP server.

This parameter can be either:

- Any valid IP address in the format: "`xxx.xxx.xxx.xxx`"

- Any valid host name. Default "".

server_port

Integer in range [0-65535]. Remote TCP port number to connect to.

Default values are `80` for the first, second and third profiles.

auth_type

Integer in range [0-1]. HTTP authentication type.

Table 21. auth_type

Value	Description
0	(Default) No authentication
1	Basic authentication

username

String. Authentication user name for HTTP. Empty by default.

password

String. Authentication password for HTTP. Empty by default.

ssl_enabled

Integer in range [0-1]. SSL encryption status.

Table 22. ssl_enabled

Value	Description
0	(Default) SSL encryption disabled
1	SSL encryption is enabled

max_to_sec

Integer: 0..65535. Maximum data transfer time-out in seconds. This is the maximum time in seconds allowed for the HTTP(S) connection establishment/completion (if needed) and the data transfer. This time-out prevents the host MCU from hanging indefinitely due to a slow network or a cellular connection dropped during operation. This timer shall be set according to the expected network performance to avoid aborting normal operations. The special value 0 disables the time-out.

This time-out starts with the AT command call and stops when the operation requested by the AT command has completed. This includes waiting for LTE connectivity, DNS lookup and TCP+(TLS)+HTTP session establishment (`AT+SQNHTTPCONNECT`). In the case of `AT+SQNHTTPSND/QRY`, the HTTP connection (if needed) and the data transfer. This time-out value must be greater than <cnx_to_sec> value, or the AT command reports a configuration `ERROR`. Default time-out is 0 (no time-out).

cnx_to_sec

Integer: 1..120. Maximum time in seconds to wait for the HTTP server response. The time-out starts with the execution of the AT command (`AT+SQNHTTPCONNECT/SND/QRY`)and stops when the response is received, taking into account any LTE latencies and DNS query overhead. If the connection has not been made when the time-out expires, the command returns `ERROR`. This time-out value must be less than <max_to_sec> or the command reports a configuration error. The default value is 60.

cid

Integer in range [1-8]. PDN Context Identifier. Default value is the PDN of the current operator.

spld

Integer in range [1-6]. Security Profile identifier to be used for HTTPS request if `<ssl_enabled>`>=1. Default: 1.

s_length

Integer. Maximum length of parameter `<server_address>` parameter.

RENESAS

2.3.3 HTTP Query: AT+SQNHTTPQRY

2.3.3.1 Syntax

Command	Possible Response(s)
AT+SQNHTTPQRY=<prof_id>,<command>,<resource> [,[<extra_header_line>][,[<disconnect>] [,<max_to_sec>]]]	`+CME ERROR:<err>`
AT+SQNHTTPQRY=?	`+SQNHTTPQRY:(0-2),(0-2),1000[,[1500][,` `[(0-1)][,(0-65535)]]]` `OK`

2.3.3.2 Description

This command performs HTTP GET, HEAD or DELETE request to server.

Notes:

- Secure HTTP connections using a private key stored in a Hosted Cryptographic Engine (see `AT+SQNSPCFG` and HCE storage mode) require an asynchronous HTTP connection creation with `AT+SQNHTTPCONNECT` before calling this command. If the connection is not already opened, ERROR is returned.

- The command automatically opens unsecured connections, or connections secured without HCE usage, then proceeds with the HTTP data session.

- OK is returned immediately if radio network connectivity is up, else `ERROR`. Then the `+SQNHTTPRING` URC is emitted asynchronously with the HTTP response code, content type and size (+SQNHTTPRING URC description for details) as soon as the HTTP response header is received.

- After the HTTP data session is complete, the modem drops the HTTP connection automatically if the <disconnect> parameter is set.

- Requesting a new HTTP data session while another HTTP connection is already active or in progress returns `ERROR`.

- The HTTP request header contains the 'Connection: close' line if the `<disconnect>` flag is set.

- If the HTTP connection fails before the reception of the HTTP response, (HTTP request transmission error, HTTP time-out, etc.), the command returns `ERROR`. In such a case, the `+SQNHTTPRING` URC is also issued with a <http_status_code> value of 0 (special return code). Additionally, the `+SQNHTTPSH` URC is sent to notify of an unexpected HTTP connection failure.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

Test command returns the range of supported values/lengths for all the parameters.

2.3.3.3 Defined Values

prof_id
Integer in range [0-2]. HTTP profile configuration identifier.

command
Integer in range [0-2]. Command requested to HTTP server.

Table 23. command

Value	Description
0	GET
1	HEAD
2	DELETE

resource

String. HTTP resource (URI), object of the request. Maximum 1000 bytes.

extra_header_line

String. Optional HTTP header line. Maximum 1500 bytes.

max_to_sec

Integer: 1..65535. Maximum data transfer time-out in seconds. This is the maximum time in seconds allowed for the HTTP(S) connection establishment/completion (if needed) and the data transfer. This time-out prevents the host MCU from hanging indefinitely due to a slow network or a cellular connection dropped during operation. This timer shall be set according to the expected network performance to avoid aborting normal operations. The time-out value must be greater than the connection time-out value configured in HTTP configuration profile (see HTTP Configure: AT+SQNHTTPCFG `<cnx_to_sec>` parameter), otherwise the command returns a configuration ERROR. If not provided, the time-out value defined in the HTTP configuration profile (see HTTP Configure: AT+SQNHTTPCFG `<max_to_sec>` parameter) is applied.

disconnect

Integer: 0 or 1. Automatic connection/ disconnection.

Table 24. disconnect

Value	Description
0	Connection remains open after the HTTP request completion
1 (default)	Connection is closed at the end of the HTTP request

2.3.4   HTTP Receive: AT+SQNHTTPRCV
2.3.4.1   Syntax

Command	Possible Response(s)

AT+SQNHTTPRCV=`<prof_id>`[,`<maxbytes>`]	`OK`
	
	`ERROR`
	
	`+CME ERROR:`**`<err>`**

AT+SQNHTTPRCV=?	`+SQNHTTPRCV:(0-2)[,(0,64-1500)]`
	
	`OK`

2.3.4.2   Description

This command reads the HTTP response content data received with the last HTTP response (the HTTP response reception advertised by the `+SQNHTTPRING` notification, see HTTP Response URC: +SQNHTTPRING).

Important: This command is synchronous. `AT+SQNHTTPDISCONNECT` cannot be used to abort it.

After the command is sent to the modem, the host receives a three character sequence `<<<` (`<less_than><less_than><less_than>` (IRA 60, 60, 60)) followed by the data. If reading ends successfully, the response is OK; otherwise an error code is reported.

If no data are pending for the specified HTTP connection (because the HTTP transaction is complete and all received bytes have already been read, or the HTTP response has not yet arrived), the command returns `ERROR`.

Because the HTTP response may not have been entirely received when the `+SQNHTTPRING` URC is emitted, the command grabs the AT interface until the requested number of bytes to read (`<max_bytes>`) is received, the HTTP response message reception is complete or a HTTP error (time-out, connection

unexpected dropped, and so forth) happens. In this case of a HTTP transaction error, the command returns `ERROR`.

If the application's reception buffer is small, it is possible to chain several calls to `AT+SQNHTTPRCV` with an acceptable `<max_bytes>` value until the entire HTTP response body is transferred (total received bytes equal to the `+SQNHTTPRING <data_size>` parameter) or `ERROR` is received.

Notes:

- The response is buffered in the modem volatile memory until it is read. Buffer size is 2524 bytes.

- Buffered data are lost if the modem enters Deep Sleep.

- Buffered data are flushed when a new HTTP transaction begins.

If a large HTTP response is expected and the MCU is unable to read the already received bytes fast enough, the HTTP client suspends the HTTP response reception, and resumes it after the buffer has been read. To avoid unexpected HTTP session termination during the on-hold period, the maximum data transfer time-out must be set to a value that takes into account the estimated network speed, the expected HTTP message sizes and the MCU processing capability (see `AT+SQNHTTPCFG/SND/QRY <max_to_sec>` parameter).

Note: When reading large packets, hardware flow control should be used to minimize the risk of data loss. See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

Test command returns values supported as a compound value.

2.3.4.3 Defined Values

prof_id
> Integer in range [0-2]. Numeric parameter indicating the profile identifier.

max_bytes
> Integer. Max number of bytes to read at a time, range is [0, 64-1500]. Default: 0, which means no limit.

> **Note:** If `<max_byte>` is unspecified, server data will be transferred all at once. If the data are not present or if the `+SQNHTTPRING <http_status_code>` parameter has value 0, then an error code is reported.

> **Note:** If the specified `<max_byte>` value is less than the `<data_size>` parameter provided in the HTTP response URC `+SQNHTTPRING`, then the host application has to use the `+SQNHTTPRCV` command multiple times to read all the data.

> **Note:** To ensure optimal system performance, the `AT+SQNHTTPRCV` command must be sent soon after the `AT+SQNHTTPRING` URC is received.

http_status_code
> Integer. Status code, as received from the server (see RFC 2616).

2.3.4.4 Examples

- Setting www.w3.org as remote server.
  ```
  AT+SQNHTTPCFG=1,"www.w3.org"
  OK
  ```
- Perform HTTP GET request to "/Summary.html" page.
  ```
  AT+SQNHTTPQRY=1,0,"/Summary.html"
  OK
  ```
- The `+SQNHTTPRING` URC is received. Status code is 200 (OK), content type has an extension and content-length is 5223 bytes.
  ```
  +SQNHTTPRING: 1,200,"text/html; charset=iso-8859-1",5223
  ```
- Perform size-unlimited reading of the server's response.
  ```
  AT+SQNHTTPRCV=1
  <<<<HTML>
  <HEAD>
  ... output omitted ...
  </ADDRESS></BODY>
  </HTML>
  ```

`OK`

2.3.5 HTTP Response URC: +SQNHTTPRING

2.3.5.1 Syntax

Command	Possible Response(s)
	`+SQNHTTPRING:`<prof_id>,<http_status_code>,<content_type>,<data_size>

2.3.5.2 Description

This URC is emitted when:

— an answer from HTTP server is received.
— A HTTP response has timed out (see `AT+SQNHTTPCFG <max_to_sec>` timeout parameter).

In the former case, the URC contains the HTTP response code, the content type and size.

`AT+SQNHTTPRCV` retrieves the HTTP response data. Buffer size is 2524 bytes.

In the latter case, the <http_status_code> value is set to 0 (special return code).

Note: The HTTP response may not have been completely received when the `+SQNHTTPRING` URC presentation time. Consequently, `AT+SQNHTTPRCV` command will block AT interface until requested number of bytes to read reception, HTTP response message reception complete or HTTP error (timeout, connection unexpected closure, and so forth) is reported.

2.3.5.3 Defined Values

prof_id
   HTTP profile identifier, integer [0-2].

http_status_code
   HTTP request timed out, 0

   HTTP status code, as received from the server, 3-digit integer.

content_type
   String. `"Content-Type"` header line, as received from the server.

data_size
   String. `"Content-Length:"` header line, as received from the server.

2.3.6 HTTP Send: AT+SQNHTTPSND

2.3.6.1 Syntax

Command	Possible Response(s)
AT+SQNHTTPSND=<prof_id>,<command>,<resource>,<data_len> [,[<post_param>][,[<extra_header_line>][,[<disconnect] [,<max_to_sec]]]]	`+CME ERROR:`<err>
AT+SQNHTTPSND=?	`+SQNHTTPSND:` (0-2),(0-1),(1000), (0-16777215)[,[(1000)][,[(1500)] [,[(0-1)][,(0-65535)]]]] `OK`

2.3.6.2 Description

This command performs a POST or PUT request to a HTTP server and starts sending data to the server. The device must wait for the three character sequence `>>>`

(`<greater_than><greater_than><greater_than>` (IRA 62, 62, 62)) before `<data_len>` bytes of data can be entered.

Secure HTTP connections using a private key stored in a hosted cryptographic engine (see `AT+SQNSPCFG` and HCE storage mode) require an asynchronous HTTP connection creation with `AT+SQNHTTPCONNECT` before calling this command. If the connection is not already opened, `ERROR` is returned.

The command automatically opens unsecured connections, or connections secured without HCE usage, the proceeds with the HTTP data session.

When the HTTP response header is received, the `+SQNHTTPRING` URC (when supported) is put on the serial port:

See +SQNHTTPRING for details. The test command returns the values supported as a compound value.

2.3.6.3　Defined Values

prof_id

　　Integer in range [0-2]. HTTP configuration profile identifier.

Command

　　Integer in range [0-1]. Command sent to the HTTP server.

Table 25. command

Value	Description
0	POST
1	PUT

resource

　　String. HTTP resource (URI), object of the request. Maximum size is 1000 bytes.

Data_len

　　24-bit integer (0-16777215). Length of input data in bytes.

Important:　Reliable data input is possible only when hardware flow control is enabled. If not, some data are likely to be dropped, leading to a corrupted input. As a result, the AT command may hang waiting for additional data while the application has finished sending them.

Post_param

　　String. HTTP Content-Type identifier. Maximum 1000 bytes.

　　Used only for POST command, optionally followed by colon character (:) and a string `<extension>` that extends the identifier with sub-types. Other content–free string corresponding to other content type and possible sub-types.

Table 26. post_param

Value	Description
0[:extension]	"application/x-www-form-urlencoded" with optional extension
1[:extension]	"text/plain" with optional extension
2[:extension]	"application/octet-stream" with optional extension
3[:extension]	"multipart/form-data" with optional extension
4	"application/json"

extra_header_line

　　String. Optional HTTP header line. Maximum 1500 bytes.

2.4 MQTT Related Commands

2.4.1 Initiate a Client Configuration: AT+SQNSMQTTCFG

2.4.1.1 Syntax

Command	Possible Response(s)
AT+SQNSMQTTCFG=<id>,<client_id>[,username][,pass word][,sp_id]	OK ERROR
AT+SQNSMQTTCFG=?	+SQNSMQTTCFG:<id>,<client_id>[,username][,password][,sp_id]

2.4.1.2 Description

This command configures the MQTT stack with client id, user name and password (if required) by remote broker and CA cert name to use for server authorization.

Note: This command should be executed before any other +SQNSMQTT command.

2.4.1.3 Defined Values

id
> Integer type; 0

Note: The only supported value is 0 (only one client is supported).

client_id
> String type; the unique client id string used when connecting to the broker.

Caution: String must not be empty.

username
> String type; user name for broker authentication.

password
> String type; password for broker authentication.

sp_id
> Integer type; the index of the secure profile previously set with AT+SQNSPCFG command.

Important: If not specified, the modem does not establish a secure connection.

2.4.2 Initiate MQTT Connection to a Broker: AT+SQNSMQTTCONNECT

2.4.2.1 Syntax

Command	Possible Response(s)
AT+SQNSMQTTCONNECT=<id>,<host>[,port][,keepalive]	OK ERROR
AT+SQNSMQTTCONNECT=?	+SQNSMQTTCONNECT:<id>,<host>[,port][,keepalive]
URC	+SQNSMQTTONCONNECT:<id>,<rc>

2.4.2.2 Description

This command is used to create new client connection to an external bridge or a broker.

Note: This command only initiates new connection to the MQTT broker.
URC +SQNSMQTTONCONNECT <id>,<rc> notifies that the connection operation was finished for client with <id>.

`<rc>` provides connection result code `0` if connection was established, or an error occurred and connection was not established. See more values detailed below.

Note: As DNS queries can take up to 120 seconds, and some might already be pending, it can take up to several DNS max resolve time for URC to be sent.

Note: If the MQTT connection was dropped by the server and automatically resumed by the modem, the latter sends a `+SQNSMQTTONCONNECT:0,0` URC to the host CPU.

2.4.2.3 Defined Values

id

Integer type; 0

Note: The only supported value is 0 (only one client is supported).

host

String type; bridge or broker host name or IP address.

port

Integer type; port for TLS connection. Port 8883 is used by default if any TLS certificate was provided, otherwise port 1883 for non-TLS connection.

keepalive

Integer type; maximum period in seconds allowed between communications with the broker.

If no other messages are being exchanged, this controls the rate at which the client sends ping messages to the broker. Default value is 60 seconds.

rc

Integer type; return code for the URC `+SQNSMQTTONCONNECT`.

Table 27. rc

Value	Description
0	SQNSMQTT_ERR_SUCCESS
-1	SQNSMQTT_ERR_NOMEM
-2	SQNSMQTT_ERR_PROTOCOL
-3	SQNSMQTT_ERR_INVAL
-4	SQNSMQTT_ERR_NO_CONN
-5	SQNSMQTT_ERR_CONN_REFUSED
-6	SQNSMQTT_ERR_NOT_FOUND
-7	SQNSMQTT_ERR_CONN_LOST
-8	SQNSMQTT_ERR_TLS
-9	SQNSMQTT_ERR_PAYLOAD_SIZE
-10	SQNSMQTT_ERR_NOT_SUPPORTED
-11	SQNSMQTT_ERR_AUTH
-12	SQNSMQTT_ERR_ACL_DENIED
-13	SQNSMQTT_ERR_UNKNOWN
-14	SQNSMQTT_ERR_ERRNO

Value	Description
-15	SQNSMQTT_ERR_EAI
-16	SQNSMQTT_ERR_PROXY
-17	SQNSMQTT_ERR_UNAVAILABLE

2.4.3   Client Disconnect: AT+SQNSMQTTDISCONNECT
2.4.3.1   Syntax

Command	Possible Response(s)
AT+SQNSMQTTDISCON NECT=`<id>`	`OK` `ERROR`
AT+SQNSMQTTDISCON NECT=?	`+SQNSMQTTDISCONNECT:`**<id>**
URC	`+SQNSMQTTDISCONNECT:`**<id>,<rc>**

2.4.3.2   Description

This command used to disconnect from a broker. Connection must be previously initiated with `+SQNSMQTTCONNECT` command.

Note: This command initiates disconnection.
The URC `+SQNSMQTTONDISCONNECT:<id>,<rc>` notifies about drop of MQTT connection for client with `<id>`.

`<rc>` provides disconnection reason: `0` if disconnection was initiated by user, otherwise an error occurred during connection.

2.4.3.3   Defined Values

id
    Integer type; 0. The id of MQTT client.

Note: The only supported value is 0 (only one client is supported).
rc
    Integer type; subscription return code.

Table 28. rc

Value	Description
-1	PENDING
0	SUCCESS
1	NOMEM
2	PROTOCOL
3	INVALID
4	NO_CONNECTION
5	CONNCTION_REFUSED

Value	Description
6	NOT_FOUND
7	CONNECTION_LOST
8	TLS ERROR
9	PAYLOAD_SIZE_INVALID
10	NOT_SUPPORTED
11	AUTHENTICATION_ERROR
12	ACL_DENIED
13	UNKNOWN
14	ERRNO
15	EAI
16	PROXY ERROR

2.4.4   Publish to a Topic: AT+SQNSMQTTPUBLISH
2.4.4.1   Syntax

Command	Possible Response(s)

AT+SQNSMQTTPUBLISH=<id>, <topic>[,qos],<length> <S3><payload>	(prompt to payload)
	`+SQNSMQTTPUBLISH:`<pmid>
	`OK`
	`ERROR`

AT+SQNSMQTTPUBLISH =?	`+SQNSMQTTPUBLISH:`<id>,<topic>[,qos],<length><S3><S4><payload>
URC	`+SQNSMQTTONPUBLISH:`<id>,<pmid>,<rc>

Note: <S3> and <S4> represent the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 and Response Formatting Character: ATS4.

2.4.4.2   Description

This command is used to publish a payload into a topic on a broker host. It starts the publishing operation.

The <payload> is provided as binary data with <length> bytes. The behavior is similar to `AT+SQNSNVW` command.

Important: The connection must have been established with the `+SQNSMQTTCONNECT` command. The command must be used after reception of the URC `+SQNSMQTTONCONNECT` with <rc>=0.

The URC `+SQNSMQTTONPUBLISH:`<id>,<pmid>,<rc> notifies that publishing operation was finished for client with <id>.

<pmid> provides publishing message id <rc> provides publishing result code: 0 if success, otherwise an error occurred and the message was not published.

2.4.4.3   Defined Values

id

    Integer type; the id of MQTT client.

  Note: The only supported value is 0 (only one client is supported).

topic

    String type; the topic that the client should subscribe to.

qos

    Integer type; the quality of service level to request for the subscription.

Table 29. qos

Value	Description
0	At most once (default value)
1	At least once
2	Exactly once

length

    Integer type; indicates the amount of published bytes with the following range [1-65535].

payload

    String type; the actual multi-line message to send.

pmid

    Integer: Range [0-65535]. Publishing message ID. The message ID after 65535 winds back to 0. This ID is local to the modem.

rc

    Integer: Publishing return code.

Table 30. rc

Value	Description
0	SQNSMQTT_ERR_SUCCESS
-1	SQNSMQTT_ERR_NOMEM
-2	SQNSMQTT_ERR_PROTOCOL
-3	SQNSMQTT_ERR_INVAL
-4	SQNSMQTT_ERR_NO_CONN
-5	SQNSMQTT_ERR_CONN_REFUSED
-6	SQNSMQTT_ERR_NOT_FOUND
-7	SQNSMQTT_ERR_CONN_LOST
-8	SQNSMQTT_ERR_TLS
-9	SQNSMQTT_ERR_PAYLOAD_SIZE
-10	SQNSMQTT_ERR_NOT_SUPPORTED
-11	SQNSMQTT_ERR_AUTH
-12	SQNSMQTT_ERR_ACL_DENIED

Value	Description
-13	SQNSMQTT_ERR_UNKNOWN
-14	SQNSMQTT_ERR_ERRNO
-15	SQNSMQTT_ERR_EAI
-16	SQNSMQTT_ERR_PROXY
-17	SQNSMQTT_ERR_UNAVAILABLE

2.4.4.4 Example

```
AT+SQNSMQTTPUBLISH=?
+SQNSMQTTPUBLISH:(0),<topic>[,(0-2)],(1-65535)<S3><S4><payload>

OK

AT+SQNSMQTTPUBLISH=0,"sqn/test",,5
> Test message 1
+SQNSMQTTPUBLISH:2
OK
+SQNSMQTTONPUBLISH:0,2,0
```

2.4.5 Receive a Message: AT+SQNSMQTTRCVMESSAGE

2.4.5.1 Syntax

Command	Possible Response(s)
AT+SQNSMQTTRCVMESSAGE=id, topic[,mid][,max_length]	OK ERROR
AT+SQNSMQTTRCVMES SAGE=?	+SQNSMQTTRCVMESSAGE:id,topic[,mid][,max_length]
URC	+SQNSMQTTONMESSAGE:\<id\>,\<topic\>,\<msg_length\>,\<qos\>[,\<mid\>]

2.4.5.2 Description

This command delivers a message selected by its id or the last received message in case of `<qos>=0`. The device must be previously connected with `AT+SQNSMQTTCONNECT` command.

Note: This command should be used after reception of the URC
`+SQNSMQTTONMESSAGE:<id>,<topic>,<msg_length>,<qos>,<mid>`
The `+SQNSMQTTONMESSAGE:<id>,<topic>,<msg_length>,<qos>,<mid>` URC notifies about a newly received message which was stored to the internal message cache for client `<id>`.

2.4.5.3 Defined Values

id
    Integer type; Id of MQTT client.

Note: The only supported value is 0 (only one client is supported).

topic
    String type; topic name from `+SQNSMQTTONMESSAGE` URC (name of subscribed topic where message was published).

mid
    Integer type; the id of the message to read. `<mid>` is generated by a broker.

A maximum 100 messages are saved in FIFO before `+SQNSMQTTRCVMESSAGE` is emitted. In the queue overflows, the oldest message is lost.

A message with `<qos>=0` does not have `<mid>`, as this type of message is overwritten every time a new message arrives. No `<mid>` value is to be given to read a message with `<qos>=0`.

max_length
Integer type [1-1024]; the maximum length to read from the message. Default is 1024. Currently only messages with payloads up to 1024 characters are supported.

qos
Integer type [0-2]; the quality of service level to request for the subscription.

Table 31. qos

Value	Description
0	At most once
1	At least once
2	Exactly once

msg_length
Integer type; provides size of message payload.

2.4.6　Subscribe to a Topic: AT+SQNSMQTTSUBSCRIBE
2.4.6.1　Syntax

Command	Possible Response(s)
AT+SQNSMQTTSUBSCRIBE=<id>,<topic>[,qos]	OK ERROR
AT+SQNSMQTTSUBSCRIBE=?	+SQNSMQTTSUBSCRIBE:<id>,<topic>[,qos]
URC	+SQNSMQTTONSUBSCRIBE:<id>,<topic>,<rc>

2.4.6.2　Description

This command used to subscribe to a topic on a broker host previously connected with `AT+SQNSMQTTCONNECT` command. This command initiates subscribing operation.

URC `+SQNSMQTTONSUBSCRIBE:<id>,<topic>,<rc>` notifies that subscribing operation was finished for client with `<id>`.

`<topic>` provides topic name. `<rc>` provides the subscription result code: 0 if success, otherwise an error occurred and the client's request has been rejected.

Note: This command must be used after the reception of the `+SQNSMQTTONCONNECT` URC with `<rc>=0`,confirming that the connection is established.

2.4.6.3　Defined Values

id
Integer type;

Note: The only supported value is 0 (only one client is supported).
topic
String type; the topic that the client should subscribe to.

qos
Integer type with range [0-2]; the quality of service level to request for the subscription.

Table 32. qos

Value	Description
0	At most once
1	At least once
2	Exactly once

rc

　　Integer: subscription return code.

Table 33. rc

Value	Description
0	SQNSMQTT_ERR_SUCCESS
-1	SQNSMQTT_ERR_NOMEM
-2	SQNSMQTT_ERR_PROTOCOL
-3	SQNSMQTT_ERR_INVAL
-4	SQNSMQTT_ERR_NO_CONN
-5	SQNSMQTT_ERR_CONN_REFUSED
-6	SQNSMQTT_ERR_NOT_FOUND
-7	SQNSMQTT_ERR_CONN_LOST
-8	SQNSMQTT_ERR_TLS
-9	SQNSMQTT_ERR_PAYLOAD_SIZE
-10	SQNSMQTT_ERR_NOT_SUPPORTED
-11	SQNSMQTT_ERR_AUTH
-12	SQNSMQTT_ERR_ACL_DENIED
-13	SQNSMQTT_ERR_UNKNOWN
-14	SQNSMQTT_ERR_ERRNO
-15	SQNSMQTT_ERR_EAI
-16	SQNSMQTT_ERR_PROXY
-17	SQNSMQTT_ERR_UNAVAILABLE

2.5　Socket Related Commands

2.5.1　Socket Accept: AT+SQNSA

2.5.1.1　Syntax

Command	Possible Response(s)

AT+SQNSA=`<connId>[,<connMode>]`	Possible intermediate response:
	
	`CONNECT`
	
	`OK`
	
	`ERROR`
	
	`NO CARRIER`
	`+CME ERROR:`**\<err>**

AT+SQNSA=?	`+SQNSA: (1-6)[,(0-1)]`

2.5.1.2 Description

This command accepts an incoming socket connection after an unsolicited result code `+SQNSRING:`
`<connId>`. Note that this `+SQNSRING` URC is the consequence of the creation of a socket listen
(`AT+SQNSL`).

Trying to execute this command before receiving a `+SQNSRING` URC results in an `ERROR` indication, with
information that a connection request has not yet been received.

Use `AT+SQNSH` command to reject the connection.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for `<err>` values.

Test command returns the range of supported values for all the parameters.

2.5.1.3 Defined Values

connId

Socket connection identifier, integer [1-6].

connMode

Connection mode, optional, integer [0-1]. Default is 0.

Table 34. connMode

Value	Description
0	Default. Online data mode.
1	Command mode.

2.5.1.4 Example

- General syntax:

```
AT+SQNSA=?
+SQNSA: (1-6)[,(0-1)]
OK
AT+SQNSA=1
CONNECT
AT+SQNSA=2,1
OK
```

- Begin listening on a TCP socket on port 1234.

```
AT+SQNSL=1,1,1234
OK
+SQNSRING URC indicates here that there is incoming connection on socket #1.
+SQNSRING: 1
```

- Accept connection in command mode.

```
AT+SQNSA=1,1
OK
```

- Check socket status while connected to a remote host on 192.168.15.135:41829.

```
AT+SQNSS
+SQNSS: 1,2,192.168.15.1,1234,192.168.15.135,41829,0
+SQNSS: 2,0
+SQNSS: 3,0
+SQNSS: 4,0
+SQNSS: 5,0
+SQNSS: 6,0
OK
```

- +SQNSRING URC indicates that some data is received on socket #1.

```
+SQNSRING: 1
```

- Receive up to 10 bytes from the 1st socket. 6 bytes are actually received.

```
AT+SQNSRECV=1,10
+SQNSRECV: 1,6 Test!
OK
```

- Send some text to socket. Note the final `<Ctrl+Z>` before `<S3>`(see Command Line Termination Character: ATS3).

```
AT+SQNSSEND=1
> Some text <Ctrl+Z>
OK
```

- Shutdown connection.

```
AT+SQNSH=1
OK
```

2.5.2 Socket Configuration Extended: AT+SQNSCFG
2.5.2.1 Syntax

Command	Possible Response(s)
AT+SQNSCFG=<*connId*>,<*cid*>,<*pktSz*>,<*maxTo*>, <*connTo*>,<*txTo*>	OK ERROR +CME ERROR:<err>
AT+SQNSCFG?	+SQNSCFG:<*connId1*>, <*cid1*>, <*pktSz1*>, <*maxTo1*>, <*connTo1*>, <*txTo1*><S3><S4> ... +SQNSCFG:<*connId6*>, <*cid6*>, <*pktSz6*>, <*maxTo6*>, <*connTo1*>, <*txTo6*> OK
AT+SQNSCFG=?	+SQNSCFG:(1-6),(0-6),(0-1500),(0-65535), (0, 10-1200), (0-255) OK

Note: <S3> and <S4> represent the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 and Response Formatting Character: ATS4.

2.5.2.2 Description

This command sets the socket configuration parameters.

Note: These values are automatically saved in the device's NVRAM.

2.5.2.3 Defined Values

connId
   Integer in range [1-6]. Socket connection identifier.

cid

 Integer in range [0-6]. PDP context identifier.

pktSz

 Integer in range [0-1500]. Packet size to be used by the TCP/UDP/IP stack for data sending. Used for online data mode only.

Caution: UDP packets can be up to 65, 535 byte long, but the current implementation truncates UDP packets to 1500 bytes. All additional data are lost.

Table 35. pktSz

Value	Description
0	Automatically chosen by the device (default: 300)
1..1500	Packet size in bytes

maxTo

 Integer in range [0-65535]. Exchange timeout. If there is no data exchange within this timeout period, then the connection is closed. `<maxTo>` is started after the socket connection establishment. This time is restarted after any traffic (Tx or Rx) on the socket.

Note: These value is ignored if the socket is in the listening state.

Table 36. maxTo

Value	Description
0	No timeout.
1..65535	Timeout value in seconds (default: 90s)

connTo

 Integer 0 or in range [10-1200]. Connection timeout. If a connection to the remote host cannot be established within this period, then an error is generated. `<connTo>` starts with `AT+SQNSD` execution and stops once the connection is established (thereby excluding any TLS overhead).

 After the connection is established, `<connTo>` is restarted and serves as timeout for establishing the TLS layer.

Table 37. connTo

Value	Description
0	No timeout.
10..1200	Timeout value in tenths of second (default: 600)

txTo

 Integer in range [0-255]. Data sending timeout. The data are sent after this delay, regardless of the size. Used for online data mode only.

Table 38. txTo

Value	Description
0	No timeout.
1..255	Timeout value in tenths of second (default: 50)

2.5.2.4 Example

```
AT+SQNSCFG=?
+SQNSCFG: (1-6),(0-5),(0-1500),(0-65535),(0,10-1200),(0-255)
OK
 AT+SQNSCFG?
+SQNSCFG: 1,1,300,90,600,50
+SQNSCFG: 2,1,300,90,600,50
+SQNSCFG: 3,1,300,90,600,50
+SQNSCFG: 4,1,300,90,600,50
+SQNSCFG: 5,1,300,90,600,50
+SQNSCFG: 6,1,300,90,600,50
OK

AT+SQNSCFG=1,3,0,90,600,50
OK
```

2.5.3   Socket Configuration Extended: AT+SQNSCFGEXT
2.5.3.1   Syntax

Command	Possible Response(s)

AT+SQNSCFGEXT=<connId>,<srMode>, <recvDataMode>, <keepalive>, [<listenAutoRsp>], [<sendDataMode>[,<unused_A> [,<unused_B>]]]]	`OK`
	 `ERROR`
	 `+CME ERROR:<err>`

AT+SQNSCFGEXT?	`+SQNSCFGEXT:<connId1>, <srMode1>, <recvDataMode1>, <keepalive1>, <listenAutoRsp1>, <sendDataMode1>, <unused_A1>, <unused_B1><S3><S4>`
	
	 `...`
	
	 `+SQNSCFGEXT: <connId6>, <srMode6>, <recvDataMode6>, <keepalive6>, <listenAutoRsp6>, <sendDataMode6>, <unused_A6>, <unused_B6>`
	 `OK`

AT+SQNSCFGEXT=?	`+SQNSCFGEXT:(1-6),(0-2),(0-1),(0-240)[,(0-1)[,(0-1)[,(0)[,(0)]]]]` `OK`

Note: <S3> and <S4> represent the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 and Response Formatting Character: ATS4.

2.5.3.2   Description

This command sets the socket configuration extended parameters.

Note: These values are automatically saved in the device's NVRAM.

2.5.3.3   Defined Values

connId
   Integer in range [1-6]. Socket connection identifier.

srMode
   Integer in range [0-2]. +SQNSRING URC mode.

Table 39. srMode

Value	Description
0	Normal mode (default), SQNSRING : <connId>
1	Data amount mode, SQNSRING : <connId>,<recData>
2	Data view mode, SQNSRING: <connId>,<recData>,<data>

recvDataMode

Integer in range [0-1]. "Received data view mode" presentation format.

Table 40. recvDataMode

Value	Description
0	Data represented as text or raw binary (default)
1	Data represented as sequence of hexadecimal numbers (from 00 to FF). Note that this parameter changes the presentation of SQNSRING URC but not SQNSSEND. No conversion is done on the data before sending on the network.

keepalive

Integer type [0-240]. Currently unused.

listenAutoRsp

Integer in range [0-1]. "Listen auto-response mode", that affects AT+SQNSL command.

Table 41. listenAutoRsp

Value	Description
0	Disabled (default). Use AT+SQNSA to accept incoming TCP connections.
1	Activated. Incoming TCP connections are automatically accepted. Modem remains in command mode.

sendDataMode

Integer in range [0-1]. "Sent data view mode" presentation format.

Table 42. sendDataMode

Value	Description
0	Data represented as text (default) when using AT+ SQNSSEND, or as a raw binary flow when using AT+SQNSSENDEXT.
1	Data represented as sequence of hexadecimal numbers (from 00 to FF).

2.5.3.4 Example

```
AT+SQNSCFGEXT=?
+SQNSCFGEXT: (1-6),(0-2),(0-1),(0-240),(0-1),(0-1),(0),(0)
OK   AT+SQNSCFGEXT?
+SQNSCFGEXT: 1,0,0,0,0,0,0,0
+SQNSCFGEXT: 2,0,0,0,0,0,0,0
+SQNSCFGEXT: 3,0,0,0,0,0,0,0
+SQNSCFGEXT: 4,0,0,0,0,0,0,0
+SQNSCFGEXT: 5,0,0,0,0,0,0,0
+SQNSCFGEXT: 6,0,0,0,0,0,0,0
OK
AT+SQNSCFGEXT=1,0,0,0
```

OK

2.5.4   Socket Dial: AT+SQNSD
2.5.4.1   Syntax

Command	Possible Response(s)

AT+SQNSD=<connId>,<txProt>,<rPort>,<IPaddr>[,<closureType>[,<lPort>[,<connMode>[,acceptAnyRemote]]]]	Possible intermediate response:
	 `CONNECT`
	 `OK`
	 `ERROR`
	 `NO CARRIER`
	 `+CME ERROR:`**<err>**

AT+SQNSD=?	`+SQNSD:`
	 `(1-6),(0-1),(0-`
	 `65535),<IPaddr>[,(0,2`
	 `55)[,(0-65535)[,(0-`
	 `1)[,`
	 `(0-2)]]]]`
	 `OK`

2.5.4.2   Description

This command opens a remote connection using a socket.

2.5.4.3   Defined Values

connId
>   Integer in range [1-6]. Socket connection identifier.

txProt
>   Integer type [0-1]. Transmission protocol

Table 43. txProt

Value	Description
0	TCP
1	UDP

rPort
>   Integer type [0-65535]. Remote host port to contact.

IPaddr
>   String type. Address of the remote host.
>
>   Any valid IPv4/v6 address or host name.

closureType

 Integer type [0-255]. Socket closure behavior for TCP, has no effect for UDP connections.

Important: The `+++` string will be processed as escape sequence if it is issued at least one second after the last data exchange ended.

Table 44. closureType

Value	Description
0	Local host hangs up immediately after remote host has closed (default)
255	Local host closes after an escape sequence (+++)

lPort

 Integer type in range [0-65535]. UDP connection local port, ignored for TCP connections.

connMode

 Integer type [0-1]. Connection mode.

Table 45. connMode

Value	Description
0	Online mode connection (default)
1	Command mode connection

acceptAnyRemote

 Integer type [0-2]. Determines whether receive/send datagrams from/to any another remote than `<IPaddr>:<rPort>` or not.

Note: This parameter is applicable to UDP connection only.

Table 46. acceptAnyRemote

Value	Description
0	Disabled (default)
1	The modem accepts data from any host other than `<IPaddr>:<rPort>`
2	The modem receives data from any host other than `<IPaddr>:<rPort>` and can send data to any address other than `<IPaddr>:<rPort>` within the same socket family using `AT+SQNSSEND` command.

2.5.4.4 Example

```
AT+SQNSD=?
+SQNSD:
(1-6),(0-1),(0-65535),<IPaddr>[,(0,255)[,(0-65535)[,(0-1)[,(0-2)]]]]
OK
AT+SQNSD=1,0,7,"10.10.10.4",0,0,0
CONNECT
AT+SQNSD=1,0,80,"www.example.com",0,0,1
OK
```

2.5.5   Socket Shutdown: AT+SQNSH
2.5.5.1   Syntax

Command	Possible Response(s)
AT+SQNSH=<connId>	OK ERROR +CME ERROR:**<err>**
AT+SQNSH=?	+SQNSH: (1-6) OK
(URC)	+SQNSH:**<connId>**

2.5.5.2   Description

This command closes a socket connection.

Note: A socket connection can be closed only when it is in suspended mode (even if data is pending). Trying to close an active socket connections fails with an error.

2.5.5.3   Defined Values

connId
>   Integer in range [1-6]. Socket connection identifier.

2.5.5.4   Example

```
AT+SQNSH=?
+SQNSH: (1-6)
OK

AT+SQNSH=1
OK
```

2.5.6   Socket Information: AT+SQNSI
2.5.6.1   Syntax

Command	Possible Response(s)
AT+SQNSI=<connId>	+SQNSI:<connId>,<sent>,<received>,<buff_in>,<ack_waiting> OK ERROR NO CARRIER +CME ERROR<err>
AT+SQNSI	+SQNSI:<connId1>,<sent1>,<received1>,<buff_in1>,<ack_waiting1><S3><S4> ... +SQNSI:<connId6>,<sent6>,<received6>,<buff_in6>,<ack_waiting6> OK
AT+SQNSI=?	+SQNSI:(1-6)

Note: <S3> and <S4> represent the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 and Response Formatting Character: ATS4.

2.5.6.2 Description

This command reports information about the socket data traffic.

Test command reports the possible range for the parameter `<connId>`.

Important: On an encrypted connection, the returned data traffic information includes the encryption overhead (information is taken at IP layer).

Note: A bare `AT+SQNSI<CR>` causes getting information about data traffic of all the sockets, the response format is:`+SQNSI: <connId1>, <sent1>, <received1>, <buff_in1>,<ack_waiting1><S3><S4>`
…
`+SQNSI: <connId6>, <sent6>, <received6>, <buff_in6>,<ack_waiting6><S3><S4>`

2.5.6.3 Defined Values

connId

Integer in range [1-6]. Socket connection identifier.

sent

Integer. Total amount (in bytes) of sent data since the last time the socket connection identified by `<connId>` has been opened.

received

Integer. Total amount (in bytes) of received data since the last time the socket connection identified by `<connId>` has been opened.

buff_in

Integer. Total amount (in bytes) of data just arrived through the socket connection identified by `<connId>` and currently waiting to be read.

ack_waiting

Integer. Total amount (in bytes) of sent and not yet acknowledged data since the last time the socket connection identified by `<connId>` has been opened.

Note: Data not yet acknowledged is available only for TCP connections. The value `<ack_waiting>` is always 0 for UDP connections.

2.5.6.4 Examples

- Test Command
```
AT+SQNSI=?
+SQNSI: (1-6) OK
```
- Read Command
```
AT+SQNSI
+SQNSI: 1,32,75,8,0
+SQNSI: 2,0,0,0,0
+SQNSI: 3,0,0,0,0
+SQNSI: 4,0,0,0,0
+SQNSI: 5,0,0,0,0
+SQNSI: 6,0,0,0,0 OK
```
- Set connection 1
```
AT+SQNSI=1
+SQNSI: 1,0,0,0,0
OK
```

2.5.7 Socket Listen : AT+SQNSL
2.5.7.1 Syntax

Command	Possible Response(s)
AT+SQNSL=<connId>,<listenState>,<listenPort>[,<closureType>]	OK ERROR +CME ERROR:**<err>**
AT+SQNSL?	+SQNSL:<connId1><S3><S4> ... [+SQNSL:<connIdN>]
AT+SQNSL=?	+SQNSL: (1-6),(0-2),(0-65535),(0,255)

Note: <S3> and <S4> represent the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 and Response Formatting Character: ATS4.

2.5.7.2 Description

This command opens/closes a socket listening for an incoming TCP connection on a specified port.

If successful, commands returns OK. When there is an incoming connection on the local port, the +SQNSRING: <connId> URC is sent.

The user can use Socket Accept: AT+SQNSA to accept the connection or Socket Shutdown: AT+SQNSH to reject it. <listenPort> is optional when closing the socket.

If the ListenAutoRsp flag from AT+SQNSCFGEXT command has been set, incoming TCP connections request on the port, are automatically accepted: the CONNECT URC is sent and the modem enters 'online data mode'.

If the socket is closed by the remote host, the modem sends the +SQNSH: <connId> URC.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

The read command returns a list of listening TCP sockets.

The test command returns the range of supported values for all the parameters.

2.5.7.3 Defined Values

connId
> Socket connection identifier, integer [1-6].

listenstate
> Open or close the listening socket, integer [0-2].

Table 47. listenState

Value	Description
0	Close listening socket
1	Open listening ipv4 socket. (If PDN does not have IPv4 address then IPv6 is used)
2	Open listening ipv6 socket. (If PDN does not have IPv6 address then IPv4 is used)

listenPort
> Local listening TCP port, integer [0-65535].

closureType

Termination cause, optional, integer [0-255].

Important: The `+++` string is interpreted as an escape sequence if it sent at least one second after the last data exchange ended.

Table 48. closureType

Value	Description
0	Default value. Hang up after remote disconnection.
255	Socket is closed after an escape sequence (`+++`) or after remote host disconnection.

2.5.7.4 Example

```
AT+SQNSL=?
+SQNSL: (1-6),(0-2),(0-65535)[,(0,255)]
OK
AT+SQNSL?
OK
AT+SQNSL=1,1,99
OK
AT+SQNSL=2,1,555
OK
AT+SQNSL?
+SQNSL: 1
+SQNSL: 2
OK
```

2.5.8 Socket Listen UDP: AT+SQNSLUDP

2.5.8.1 Syntax

Command	Possible Response(s)

AT+SQNSLUDP=<connId>,<listenState>[,<listenPort>]	`OK`
	
	`ERROR`
	`+CME ERROR:`<err>

AT+SQNSLUDP?	`+SQNSLUDP:`<connId1> ... `+SQNSLUDP:`<connIdN> `OK`
AT+SQNSLUDP=?	`+SQNSLUDP: (1-6),(0-2),(0-65535)`

2.5.8.2 Description

This command opens/closes a socket listening for an incoming UDP connection on a specified port.

If successful, command returns `OK`. When the connection is established, the unsolicited result code `+SQNSRING: <connId>` is received.

Since UDP is a connection-less protocol, there is no need to accept incoming connection with an `AT+SQNA` command. To prevent datagrams from different sources from mixing on the same socket, the address and port of the first incoming datagram is stored. Subsequent datagrams received from other sources are discarded.

Note: The remote server must never change the port used to send its datagrams, or they will be lost.

If the socket is closed by the network, the modem sends the `+SQNSLUDP: ABORTED` URC.

The read command returns all the currently listening sockets.

The test command returns values supported as a compound value.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for `<err>` values.

Caution: UDP packets can be up to 65,535 byte long, but the current implementation truncates packets to 1500 bytes. All additional data are lost.

2.5.8.3 Defined Values

connId
Socket connection identifier, integer [1-6].

listenState
Open or close the listening socket, integer [0-2].

Table 49. listenState

Value	Description
0	Close listening socket
1	Open listening IPv4 socket. (If PDN does not have IPv4 address then IPv6 is used)
2	Open listening IPv6 socket. (If PDN does not have IPv6 address then IPv4 is used)

listenPort
Listening UDP port, Integer [0-65535].

2.5.8.4 Example

```
AT+SQNSLUDP=?
+SQNSLUDP: (1-6),(0-2),(0-65535)
OK

AT+SQNSLUDP?
OK

AT+SQNSLUDP=1,1,456
OK

AT+SQNSLUDP?
+SQNSLUDP: 1
OK
```

2.5.8.5 Use of listening and dial socket

If a listening socket is used simultaneously with another dial socket, ensure that the option `<acceptAnyRemote>` is set to 0 on the dial socket, so that the incoming datagrams for the listening socket arrive on the correct socket.

2.5.9   Socket Restore: AT+SQNSO

2.5.9.1   Syntax

Command	Possible Response(s)

AT+SQNSO=<connId>	Possible intermediate response:
	`CONNECT`
	`OK`
	`ERROR`
	`NO CARRIER`
	`+CME ERROR:`**<err>**

AT+SQNSO=?	`+SQNSO: (1-6)` `OK`

2.5.9.2   Description

This command resumes the socket connection which has been suspended by the escape sequence. A `CONNECT` URC is sent as an acknowledgement.

Important: The +++ string is interpreted as an escape sequence if it is emitted at least 1 second after the last data exchange ended.

Note: After a `CONNECT` URC, the MCU can suspend the socket connection (the socket remains open) using the escape sequence (+++). The device re-enters 'command mode' and a final result code `OK` is sent after the suspension.

2.5.9.3   Defined Values

connId

Integer in range [1-6]. Socket connection identifier.

2.5.9.4   Example

```
AT+SQNSO=?
+SQNSO: (1-6)
OK

AT+SQNSO=1
CONNECT
```

2.5.10   Socket Activity Notification: +SQNSRING

2.5.10.1 Syntax

	Unsollicited Response(s)
	• When `AT+SQNSCFGEXT` parameter `<srMode>` is set to 0 (default), or for an incoming TCP connection: `+SQNSRING:`**<connId>** • When `AT+SQNSCFGEXT` parameter `<srMode>` is set to 1: `+SQNSRING:`**<connId>,<recData>** • When `AT+SQNSCFGEXT` parameter `<srMode>` is set to 2: `+SQNSRING:`**<connId>,<recData>,<data>**

RENESAS

2.5.10.2 Description

Unsolicited response that can be received while being in 'command mode' only. It can notify of data arrival, or of an incoming TCP connection if a listening socket has been created with `AT+SQNSL` command.

Note:

- After a data arrival notification, the received bytes must be read using the `AT+SQNSRECV` command.
- The internal buffering is limited and the `+SQNSRING` notification will stop until host starts reading the data with the `AT+SQNSRECV` command. The URC will be sent again if enough data has been read and if new data keeps coming.

2.5.10.3 Defined Values

connId

    Integer in range [1-6]. Socket connection identifier.

recData

    Integer in range [1-1500]. Maximum number of bytes to read.

data

    Data to read.

2.5.10.4 Example

```
AT+SQNSCFGEXT=1,0, 0,0,0,0,0,0
OK
(...)
+SQNSRING: 1
+SQNSRING : 1
+SQNSRING: 1
+SQNSRING: 1
+SQNSRING: 1

AT+SQNSCFGEXT=2,1,0,0,0,0,0,0
 OK
(...)
+SQNSR I NG: 2,1500

AT+SQNSCFGEXT=3,2,0,0,0,0,0,0
OK(...)
+SQNSRING: 3,264,fdkkkkkkkkkkkkkkkmoSDQFfdd...
+SQNSRING: 3,264,fgiojnerogijoijopfdsqpioiop...
+SQNSRING: 3,168,gGgGgGgGgGgGgGgGgGgGgGgGgGgU...

AT+SQNSL?
+SQNSL: 4
OK
+SQNSRING: 4
```

2.5.11 Socket Status : AT+SQNSS
2.5.11.1 Syntax

Command	Possible Response(s)

AT+SQNSS	`+SQNSS:<connId1>,<state1>,<locIP1>,<locPort1>,<remIP1>,<remPort1>,<txProt1><S3><S4>`
	
	...
	
	`+SQNSS:<connId6>,<state6>,<locIP6>,<locPort6>,<remIP6>,<remPort6>,<txProt6><S3><S4> OK`

Command	Possible Response(s)

AT+SQNSS ?	`+SQNSS:<connId1>,<state1>,<locIP1>,<locPort1>,<remIP1>,<remPort1>,<txProt1><S3><S4>`
	
	`...`
	
	`+SQNSS:<connId6>,<state6>,<locIP6>,<locPort6>,<remIP6>,<remPort6>,<txProt6><S3><S4> OK`

AT+SQNSS =?	`OK`

Note: If a channel is closed (`<state>` value 0), then `<locIP>`, `<locPort>`, `<remIP>`, `<remPort>` and `<txProt>` parameters are omitted.

Note: <S3> and <S4> represent the value of the command line termination character and the response formatting character respectively. See Command Line Termination Character: ATS3 and Response Formatting Character: ATS4.

2.5.11.2 Description

This command reports the current status of the sockets.

Note: If the corresponding socket is closed (`<state>` has value 0), then the `<locIP>,<locPort>,<remIP>,<remPort>` parameters are omitted.

2.5.11.3 Defined Values

connId
Integer in range [1-6]. Socket connection identifier.

state
Integer in range [0-6]. Current state of the socket.

Table 50. state

Value	Description
0	Socket Closed.
1	Socket with an active data transfer connection.
2	Socket suspended, no pending data.
3	Socket suspended with pending data.
4	Socket listening.
5	Socket with an incoming connection. Waiting for user acceptance or shutdown command.
6	Socket in opening process. The socket is not in Closed state but still not in Active or Suspended or Suspended with pending data state.

locIP
IP address the socket can be reached at.

locPort
One of the following:

- The listening port if the socket is in listen mode.
- The local port for the connection if the socket is connected.

remIP
Remote IP address when the device is connected.

remPort
    Port that the socket is connected to.

txProt
    Integer in range [0-1]. Transmission protocol.

Table 51. state

Value	Description
0	TCP
1	UDP

2.5.11.4 Example

```
AT+SQNSS
+SQNSS: 1,2,192.168.6.8,36419,65.52.116.180,80,0
+SQNSS: 2,4,0.0.0.0,888,,0,0
+SQNSS: 3,0
+SQNSS: 4,5,192.168.9.2,999,10.10.10.6,45133,0
+SQNSS: 5,3,192.168.6.2,57037,10.10.10.4,7,1
+SQNSS: 6,0

AT+SQNSS?
+SQNSS: 1,0
+SQNSS: 2,0
+SQNSS: 3,0
+SQNSS: 4,0
+SQNSS: 5,0
+SQNSS: 6,0
OK

AT+SQNSS=?
OK
```

3. Device Configuration Commands

3.1 Received Line Signal Detector Behavior: AT&C

Note: This command is described in ITU-T V.250. See Section References.

3.1.1 Syntax

Command	Possible Response(s)
AT&C[<value>]	

3.1.2 Description

This command defines the Circuit 109 (Received line signal detector) behavior.

Important: Changing the `<value>` parameter is not supported.

In `AT&C1` mode of operation, circuit 109 is not turned off until all data previously received from the remote DCE is delivered to the local DTE. However, such buffered data shall be discarded and circuit 109 turned off if the DTE turns off circuit 108 (if `AT&D1` or `AT&D2` is set).

3.1.3 Defined Values

value

    Integer: 0 or 1.

Note: Only value is 1 is supported.

Table 52. value

Value	Description
0 (not supported)	The DCE always presents the ON condition on circuit 109.
1	Circuit 109 changes in accordance with the underlying DCE, which may include functions other than the physical layer functions (for example, ITU-T Recs V.42, V.110, V.120 and V.13).

3.2 Data Terminal Ready Behavior: AT&D

Note: This command is described in ITU-T V.250. See section References.

3.2.1 Syntax

Command	Possible Response(s)
AT&D[<value>]	OK

3.2.2 Description

This command defines the Circuit 108 (data terminal ready, DTR) behavior.

This parameter determines how the DCE responds when circuit 108/2 is changed from the ON to the OFF condition during online data state.

If the value specified is not recognized, an `ERROR` result code is issued.

3.2.3 Defined Values

value

    Integer: 0, 1 or 2.

Note: The recommended default value is 1.

Table 53. value

Value	Description
0	DCE ignores circuit 108/2.
1 (default)	Upon an on-to-off transition of circuit 108/2, the DCE enters online command state and issues an OK result code; the call remains connected.
2	Upon an on-to-off transition of circuit 108/2, the DCE instructs the underlying DCE to perform an orderly cleardown of the call. The disposition of any data in the DCE pending transmission to the remote DCE is controlled by the `+ETBM` parameter (see Error control commands) if implemented; otherwise, this data is sent before the call is cleared, unless the remote DCE clears the call first (in which case pending data is discarded). The DCE disconnects from the line. Automatic answer is disabled while circuit 108/2 remains off.

3.3   Set to Factory-Defined Configuration: AT&F

Note: This command is described in ITU-T V.250. See section References.

3.3.1   Syntax

Command	Possible Response(s)
AT&F[<value]	OK if value is valid.
	ERROR if value is not recognized or supported.

3.3.2   Description

This command instructs the DCE to set all parameters to default values specified by the manufacturer, which may take into consideration hardware configuration switches and other manufacturer-defined hardware/software switches/variables.

An OK result code for this command is issued using the same rate, parity, and word format as the DTE command line containing the command, but using the factory-defined values for other parameters that affect the format of result codes (for example, ATQ, V, ATS3, ATS4) and dependent upon other commands that may follow on the same command line.

The execution time for this action varies widely depending on manufacturer implementation. The DTE should not assume the amount of time required to execute this command, but await a result code or other positive indication from the DCE that it is ready to accept a command.

3.3.3   Defined Values

value

Integer: 0

Table 54. value

Value	Description
0	Set parameters to factory defaults.
Other	Reserved for manufacturer proprietary use.

3.4   Data Set Ready (DSR) Control: AT&S

3.4.1   Syntax

Command	Possible Response(s)
AT&S[<value]	OK
	ERROR

3.4.2   Description

Set command controls the RS232 DSR pin behavior.

If value 1 is set then the DSR signal is pulled High when the device receives data from the network.

In power saving mode the DSR pin is always tied Low.

If parameter is omitted, the command has the same behavior as AT&S0.

3.4.3 Defined Values

value

Integer: 0, 1, 2, or 3

Table 55. value

Value	Description
0	Always High
1	Follow the GSM traffic indication
2	High when connected
3	High when device is ready to receive commands

3.5 View Configuration Profiles: AT&V

3.5.1 Syntax

Command	Possible Response(s)
AT&V	`<CR><LF>(list of stored setting)<CR><LF><CR><LF>OK<CR><LF>`

3.5.2 Description

This command reads the current settings of the system for various parameters set by AT commands and stored by Write Active Profile in Memory: AT&W.

3.5.3 Example

```
AT&V
E: 0; V: 1; Q: 0; &C: 1; &D: 2; &S: 0;
S3 : 013; S4 : 010; +IFC : 2,2; +ICF: 3; +IPR : 921600;
OK

AT+CFUN?
+CFUN: 0
OK
```

3.6 Write Active Profile in Memory: AT&W

3.6.1 Syntax

Command	Possible Response(s)
AT&W<profile>	`OK`

3.6.2 Description

AT&W stores the current AT command settings to a user defined profile in non-volatile memory. The settings corresponding to the following commands are stored:

- ATE
- ATV
- ATQ
- AT&C
- AT&D
- AT&S
- ATS3
- ATS4
- AT+IFC
- AT+ICF
- AT+IPR

See also command View Configuration Profiles: AT&V.

3.7 Hard Reset: AT^RESET

3.7.1 Syntax

Command	Possible Response(s)
AT^RESET	Device is reset

	`+SHUTDOWN ...`
	
	`+SYSSTART`

3.7.2 Description

This command performs a hardware reset.

In order to optimize power consumption, the behavior of this command differs slightly from a power-down/power-up cycle or a `RESETN` signal activation. In particular, it does not invalidate the DNS cache, nor does it close an active TLS session. DNS cache entries, as well as active TLS sessions, remain valid after the module has rebooted.

3.8 Alarm: AT+CALA

Note: This command is described in 3GPP TS 27.007. See Section References.

3.8.1 Syntax

Command	Possible Response(s)
AT+CALA=<time>[,<n>[,<type>[,<text>[,<recurr>[,<silent>]]]]]	`+CME ERROR:` <err>
AT+CALA?	`[+CALA:` <time>,<n1>,<type>,[<text>],[<recurr>],<silent>]`[<S3><S4>+CALA:`<time>,<n2>,<type>,[<text>],[<recurr>],<silent> [...]] `+CME ERROR:` <err>
AT+CALA=?	`+CALA:`(list of supported <n>s),(list of supported <type>s),<tlength>,<rlength>,(list of supported <silent>s) `+CME ERROR:` <err>

Note: <S3> and <S4> represent the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 and Response Formatting Character: ATS4.

3.8.2 Description

The set command sets an alarm time in the MT. There can be an array of different types of alarms, and each alarm may cause different text to be displayed in the MT display. If setting fails in an MT error, `+CME ERROR: <err>` is returned.

To set up a recurrent alarm for one or more days in the week, the <recurr>-parameter may be used.

When an alarm is timed out and executed, the unsolicited result code `+CALV: <n>` is emitted, even if the alarm is set up to be silent.

The read command returns the list of currently active MT alarms.

The test command returns supported array index values, alarm types, and maximum length of the text to be displayed as compound values.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

3.8.3 Defined Values

time

> See parameter description in Clock: AT+CCLK.

> If the `<recurr>` parameter is used, then the <time> parameter must not contain a date.

n, n1, n2

> Integer type. Index of the alarm; default is manufacturer specific.

Type

> Integer type. Type of the alarm (for example, sound, volume, LED); values and default are manufacturer specific.

text

> String type value indicating the text to be displayed when alarm time is reached; maximum length <tlength>; values and default are manufacturer specific.

tlength

> Integer type. Maximum length of <text>.

recurr

> String type. Days of week for the alarm in one of the following formats (values and default are manufacturer specific).

Table 56. recurr

Value	Description
0	Sets a recurrent alarm for all days in the week.
1..7	Sets a recurrent alarm for one or more days in the week. The digits 1 to 7 corresponds to the days in the week, Monday (1), …, Sunday (7). The string "1,2,3,4,5" is used to set an alarm for every weekday.

rlength

> Integer type value indicating the maximum length of <recurr>

silent

> Integer: 0 or 1. Specify whether the alarm is silent or not.

Table 57. silent

Value	Description
0	The alarm is not silent
1	The alarm is silent and its only effect is to send a `+CALV` URC

RENESAS

3.9 Delete Alarm: AT+CALD

Note: This command is described in 3GPP TS 27.007. See section References.

3.9.1 Syntax

Command	Possible Response(s)
AT+CALD=\<n>	+CME ERROR: **\<err>**
AT+CALD=?	+CALD: (list of supported \<n>s) +CME ERROR: **\<err>**

3.9.2 Description

The set command deletes an alarm in the MT. If the command fails, +CME ERROR: \<err> is returned.

Test command returns the supported array index values as a compound value.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for \<err> values.

3.9.3 Defined Values

n

    Integer type. Index of the alarm to reset. Default is manufacturer specific

3.10 Clock: AT+CCLK

Note: This command is described in 3GPP TS 27.007. See section References.

3.10.1 Syntax

Command	Possible Response(s)
AT+CCLK= \<time>	+CME ERROR: **\<err>**
AT+CCLK=?	+CCLK: **\<time>** +CME ERROR: **\<err>**
AT+CCLK=?	

3.10.2 Description

The set command sets the real time clock of the MT. If setting fails in an MT error, +CME ERROR: \<err> is returned. See Section 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121.
Read command returns the current setting of the clock.

3.10.3 Defined Values

time

    String. Format is "yy/MM/dd,hh:mm:ss zz", where characters indicate year (two last digits), month, day, hour, minutes, seconds and the CC, computed as the differences in quarters of an hour, between the local legal time and GMT; range -96...+96. For example, 6th of May 1994, 10:10:00 PM GMT+2 hours equals to "94/05/06,22:10:00+08"

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

3.11 Set Phone Functionality: AT+CFUN

Note: This command is described in 3GPP TS 27.007. See section References.
See the current implementation limitation in `fun` parameter description.

3.11.1 Syntax

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

3.11.2 Description

This command selects the level of functionality <fun> in the MT. The level "full functionality" corresponding to the highest power consumption. Conversely, 'minimum functionality' corresponds to the lowest power consumption. The level of functionality between these can also be specified by manufacturers. When supported by manufacturers, MT resetting with <rst> parameter may be utilized.

Note: It is manufacturer specific if this command affects network registration. Command Operator Selection +COPS is used to force registration/deregistration.
The test command returns values supported by the MT as a compound value.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

3.11.3 Defined Values

Caution: Restriction: only functionality levels 0, 1, 4 and 5 can be set:

- **AT+CFUN=0** is used to configure the minimum functionality level
- **AT+CFUN=1** is used to configure the full functionality level
- **AT+CFUN=4** is used to disable the RF circuits. In this mode, access to the SIM card is still possible
- **AT+CFUN=5** is used to enable the Manufacturing mode.

fun
Integer. 0, 1, 4, or 5. Functionality code.

Table 58. fun

Value	Description
0	Minimum functionality
1	Full functionality
2, 3	Reserved
4	Disable RF
5	Disable RF and enable manufacturing mode. Mandatory to use manufacturing AT commands (see section Manufacturing Commands)
6...12	Reserved

Important: Since AT+CFUN=1 is asynchronous, the OK response does not mean that the UE is attached to the network. The successful attachment is signaled with the subsequent CEREG URC.

Important: Since `AT+CFUN=0` is synchronous, the OK response is sent once the modem has successfully detached from the network. The `CEREG:0` URC (if enabled) follows immediately after the OK response.

rst
   Integer: 0 or 1. Reset required indication.

Table 59. rst

Value	Description
0	Do not reset the MT before setting it to <fun> functional level. **Note**: This shall be always default when `<rst>` is not given.
1	Reset the MT before setting it to `<fun>` functional level.

3.12 List All Available AT Commands: AT+CLAC

Note: This command is described in 3GPP TS 27.007. See Section References.

3.12.1 Syntax

Command	Possible Response(s)
AT+CLAC	`<AT Command1>[<S3><S4><AT Command2>[...]]`
AT+CLAC=?	`+CME ERROR:` <err>

Note: <S3> and <S4> represent the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 and Response Formatting Character: ATS4.

3.12.2 Description

Execution command causes the modem to return one or more lines of AT Commands.

Note: This command only returns the AT commands that are available for the user in the current mode. See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

3.12.3 Defined Values

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

3.13 DTE-DCE Character Framing: AT+ICF

Note: This command is described in ITU-T V.250. See section References.

3.13.1 Syntax

Command	Possible Response(s)
AT+ICF=[<format[,<parity>]]	
AT+ICF?	`+ICF:`<format>,<parity>
AT+ICF=?	`+ICF:`(list of supported <format> values),(list of supported <parity> values)

3.13.2 Description

This extended-format compound parameter is used to determine the local serial port start-stop (asynchronous) character framing that the DCE shall use while accepting DTE commands and while transmitting information text and result code, if this is not automatically determined; `AT+IPR=0` forces `AT+ICF=0`. Note that the definition of fixed character format for online data state is for further study.

3.13.3 Defined Values

format

> Integer with the range [0-6]. Number of bits in the data bits, the presence of a parity bit, and the number of stop bits in the start-stop frame. Default value is 3.

Note: The semantics of this command are derived from ITU-T Rec. V.58.

Table 60. format

Value	Description
0	autodetect
1	8 Data ; 2 Stop
2	8 Data ; 1 Parity ; 1 Stop
3 (default)	8 Data ; 1 Stop
4	7 Data ; 2 Stop
5	7 Data ; 1 Parity ; 1 Stop
6	7 Data ; 1 Stop

parity

> Integer with the range [0-3]. Determines how the parity bit is generated and checked if present. Default value is 3.

Table 61. parity

Value	Description
0	Odd
1	Even
2	Mark
3 (default)	Space

3.13.4 Examples

- Read syntax

  `+ICF?`

  > `+ICF:3,3` for the recommended defaults.

- Test syntax

  `+ICF=?`

  > `+ICF:(0-6),(0-3)` for all defined values.

3.14   DTE-DCE Local Flow Control: AT+IFC

Note: This command is described in ITU-T V.250. See Section References.

3.14.1 Syntax

Command	Possible Response(s)
AT+IFC=[<DCE_by_DTE[,<DTE_by_DCE>]]	
AT+IFC?	`+IFC:`<DCE_by_DTE>,<DTE_by_DCE>
AT+IFC=?	`+IFC:`(list of supported <DCE_by_DTE> values),(list of supported <DTE_by_DCE> values)

3.14.2 Description

This extended-format compound parameter is used to control the operation of local flow control between the DTE and DCE during the data state when V.42 error control is being used, or when fallback to non-error control mode is specified to include buffering and flow control. It accepts two numeric parameters:

- `<DCE_by_DTE>`, which specifies the method to be used by the DTE to control the flow of received data from the DCE;
- `<DTE_by_DCE>`, which specifies the method to be used by the DCE to control the flow of transmitted data from the DTE.

3.14.3 Defined Values

DCE_by_DTE

   Integer with range [0-3]. Method to be used by the DTE to control the flow of received data from the DCE. Recommended default value is 2.

Note: The semantics of this command are derived from ITU-T Rec. V.58.

Table 62. DCE_by_DTE

Value	Description
0	None
1	DC1/DC3 on circuit 103; do not pass DC1/DC3 characters to the remote DCE
2	Circuit 133 (Ready for Receiving)
3	DC1/DC3 on circuit 103 with DC1/DC3 characters being passed through to the remote DCE in addition to being acted upon for local flow control
4 to 12	Reserved for future standardization
Other	Reserved for manufacturer-specific use

DTE_by_DCE

Integer with range [0-2]. Specifies the method to be used by the DCE to control the flow of transmitted data from the DTE. Recommended default value is 2.

Table 63. DTE_by_DCE

Value	Description
0	None
1	DC1/DC3 on circuit 104

Value	Description
2	Circuit 106 (Clear to Send/Ready for Sending)
3 to 12	Reserved for future standardization
Other	Reserved for manufacturer-specific use

3.14.4 Examples

- Read syntax

  `+IFC?`
  `+IFC:2,2` for the recommended defaults.

- Test syntax

  `+IFC=?`
  `+IFC:(0-3),(0-2)` for all defined values.

3.15 Fixed DTE Rate: AT+IPR

Note: This command is described in ITU-T V.250. See section References.

3.15.1 Syntax

Command	Possible Response(s)
AT+IPR=<rate>	`OK`
AT+IPR?	`+IPR:`<rate>
AT+IPR=?	`+IPR:`(list of supported auto detectable <rate> values)[,(list of fixed-only <rate> values)]

3.15.2 Description

This numeric extended-format parameter specifies the data rate at which the DCE will accept commands, in addition to 1200 bit/s or 9600 bit/s (as required in 4.3). It may be used to select operation at rates at which the DCE is not capable of automatically detecting the data rate being used by the DTE. Specifying a value of 0 disables the function and allows operation only at rates automatically detectable by the DCE. The specified rate takes effect following the issuance of any result code(s) associated with the current command line.

The `<rate>` specified does not apply in online data state if Direct mode of operation is selected.

3.15.3 Defined Values

rate

The value specified shall be the rate in bits per second at which the DTE-DCE interface should operate, for example, "19200" or "115200". The rates supported by a particular DCE are manufacturer-specific; however, the AT+IPR parameter should permit the setting of any rate supported by the DCE during online operation. Rates which include a non-integral number of bits per second should be truncated to the next lower integer (for example, 134.5 bit/s should be specified as 134; 45.45 bit/s should be specified as 45).

Note: Value unspecified or set to 0 (automatic detection) is not currently supported.

3.15.4 Examples

- Read syntax

  `AT+IPR?`
  The DCE shall transmit a string of information text to the DTE, consisting of `+IPR:<rate>`.

  — `+IPR:0` if set for automatic rate detection.

  — `+IPR:9600` if set to 9600 bit/s.

- Test syntax

`AT+IPR=?`

> The DCE transmits one or two strings of information text to the DTE, consisting of `+IPR:(list of supported auto detectable <rate> values)[,(list of fixed-only <rate> values)]`

> `+IPR:(0,300,1200,2400,4800,9600),(19200,38400,57600)` if the DCE can auto detect up to 9600 bit/s and can support three additional higher fixed rates.

3.16 Shutdown/Start-up URC: +SHUTDOWN, +SYSSTART

3.16.1 Syntax

Command	Possible Response(s)
	`+SYSSTART`
	`+SHUTDOWN`

3.16.2 Description

The `+SYSSTART` URC indicates that the ME has started (or restarted after a `^RESET`) and is ready to operate.

The `+SHUTDOWN` URC indicates that the ME has completed the reset procedure and will restart.

3.17 Enable Smart Terminal AT+SMART

3.17.1 Syntax

Command	Possible response(s)
AT+SMART[=enable]	
AT+SMART=?	

3.17.2 Description

This command switches the AT command interface between the default 'dumb' text-based terminal mode and a human-friendly smart terminal mode (with, for example, up and down arrow search in command history and in-line command editing).

3.17.3 Defined Values

The following values are defined:

enable

> Whether to enable or disable the smart terminal:

> - 0: Disable smart terminal.
> - 1: Enable smart terminal.

> The default value is 1.

3.18 Auto-Connect: AT+SQNAUTOCONNECT

3.18.1 Syntax

Command	Possible Response(s)
AT+SQNAUTOCONNECT=<autoconnect>[,forceautoconnect]	OK
AT+SQNAUTOCONNECT?	+SQNAUTOCONNECT:<autoconnect> OK
AT+SQNAUTOCONNECT=?	+SQNAUTOCONNECT: (0,1),(0,1) OK

3.18.2 Description

The command changes the autoconnect mode of the device. When enabled, the device will automatically set the UE to its maximal functionality (equivalent to `AT+CFUN=1`) after each reboot. This setting is persistent across reboot.

The read command returns the current autoconnect mode.

The test command returns the possible autoconnect values.

3.18.3 Defined Values

autoconnect
> Integer: 0 or 1. Autoconnect Mode.

Table 64. autoconnect

Value	Description
0	Autoconnect is disabled.
1	Autoconnect is enabled.

forceautoconnect
> Integer: 0 or 1. Force autoconnect Mode.

Table 65. forceautoconnect

Value	Description
0	`ForceAutoconnect` if disabled, the Autoconnect is overriden to 0 in case of `"3gpp-conformance"`, `"verizon-conformance"`
1	`ForceAutoconnect` is enabled.

3.18.4 Example

- Enable autoconnect:
  ```
  AT+SQNAUTOCONNECT=1
  OK
  ```
- Read the current autoconnect setting:
  ```
  AT+SQNAUTOCONNECT?
  +SQNAUTOCONNECT: 1 OK
  ```

3.19 Internet Auto-Connect: AT+SQNAUTOINTERNET

3.19.1 Syntax

Command	Possible Response(s)
AT+SQNAUTOINTERNET=<autointer net>	`+CME ERROR:<err>`

AT+SQNAUTOINTERNET?	`+SQNAUTOINTERNET: <autointernet>`
	
	`OK`

AT+SQNAUTOINTERNET=?	`+SQNAUTOINTERNET:(0,1)`
	
	`OK`

3.19.2 Description

The set command changes the `autointernet` mode of the device. When enabled, the device automatically tries to connect to the internet PDN provisioned into `/etc/config/sqnmm` after each attach to the network.

This setting is persistent across reboots.

The read command returns the current `autointernet` mode.

The test command returns the possible `autointernet` values.

3.19.3 Defined Values

autointernet

Auto connect to Internet, integer [0-1]. Status of the autointernet feature.

Table 66. autointernet

Value	Description
0	Autointernet is disabled
1	Autointernet is enabled

3.20 4G LTE Band Selection: AT+SQNBANDSEL

3.20.1 Syntax

Command	Possible Response(s)
AT+SQNBANDSEL=<rat>,<operator>,<bandList>	`OK`

AT+SQNBANDSEL?	`+SQNBANDSEL:<rat1>,<operator1>,<bandList>`
	
	`+SQNBANDSEL:<rat1>,<operator2>,<bandList>`
	
	`...`
	
	`+SQNBANDSEL:<rat27>,<operator1>,<bandList>`
	
	`+SQNBANDSEL:<rat27>,<operator2>,<bandList>`
	
	`...`

Command	Possible Response(s)
	`OK`
AT+SQNBANDSEL=?	`+SQNBANDSEL:`(list of supported <rat>s),(list of supported <operator>s),(list of hardware supported bands) `OK`

3.20.2 Description

This command enables the user to specify a list of 4G LTE bands the modem is allowed to use for different Radio Access Technologies (RATs) during all cell search operations (initial scanning, cell drop scanning, cell reselection, handover, and so forth) for identified `<rat>` and `<operator>`. New configuration is saved in the non-volatile memory and applied at the next device registration to network.

For a given pair of `<rat>` and `<operator>`, the list of enabled bands is given by the `<bandList>` parameter containing comma-separated list of LTE band numbers as defined by 3GPP standard TS 36.101 (4G). Any LTE band not part of `<bandList>` is considered as deactivated.

Default authorized band per `<rat>` and `<operator>` mode is defined as is:

- `standard`: equal to device's supported bands as declared in the device's boot rom
- `MNO/MVNO`: list of bands enabled by carrier

Trying to configure a `<bandList>` containing band(s) not supported in the regarded product variant, the AT command rejects the configuration request and responds with an `ERROR` message.

Test command reports the list of supported `<rat>` and `<operator>` as well as list of 4G LTE bands supported by the device (Hardware capabilities).

The read command reports the list of authorized band configuration per `<rat>` and `<operator>`.

Important notes - current limitations to this command are as follows:

- This AT command should be used only to LIMIT the bands to be scanned compared to default configuration.
- The number of bands that can enabled is limited to the maximum number of bands that can be read by `AT+SQNBANDSEL=?`. Additional bands above this number will be ignored.

3.20.3 Defined Values

rat

  Integer in range [0-1]. Radio Access Technology

Table 67. rat

Value	Description
0	LTE Category M1
1	LTE Category NB1

operator

  String. operator mode.

Table 68. operator

Value	Description
"3GPP"	Default mode if the operator is unknown (no SIM card, and so forth)
"operator name"	"Operator name" mode

bandlist

> String. List of authorized LTE bands, comma separated.
>
> Example syntax is `"5,3,8"`.

3.21 Conformance Test Mode: AT+SQNCTM

3.21.1 Syntax

Command	Possible Response(s)
AT+SQNCTM=<ctm>	`OK`
AT+SQNCTM?	`+SQNCTM:`<ctm>,<automatic> `OK`

AT+SQNCTM=?	`+SQNCTM:("standard", "3gpp-conformance", list of supported`
	`operators)`
	`OK`

3.21.2 Description

This command changes the conformance test mode of the device. The `<ctm>` mode acting as a configuration command to enable automatic selection mode:

- If `AT+SQNCTM="automatic"`, then automatic selection mode is enabled and operator check is immediately launched if a SIM card is present.
- If `AT+SQNCTM=<ctm>` with `<ctm>` other than `"automatic"`, then the automatic selection mode is disabled and the new `<ctm>` mode is enforced if `<ctm>` is different from the active one.

Caution: For the change to be effective, a reboot of the device is required. Reboot is automatic except for `3gpp-conformance` mode.

The read command returns which operator mode is active, and if automatic selection mode is enabled or not.

The test command returns the supported conformance test modes.

Note: The values not listed in Table 69 are reserved for internal use and should not be used.

3.21.3 Defined Values

ctm

> String. Conformance Test Mode.

Table 69. ctm

Value	Description
"automatic"	Automatic operator selection mode activation (mode selected based on SIM profile).
"standard"	Standard 3GPP mode
"3gpp-conformance"	Standard 3GPP mode to pass GCF tests
"operator_name"	Test mode related to a specific supported operator. **Note:** Please use `AT+SQNCTM=?` to confirm the list of the operators supported in the current software release.
Other values	Reserved

automatic

Integer. Automatic detection mode status.

Table 70. automatic

Value	Description
0	Automatic operator selection mode is disabled.
1	Automatic operator selection mode is enabled.

3.21.4 Example

- Change the conformance test mode to "`3gpp-conformance`" to run PS tests:

```
AT+SQNCTM="3gpp-conformance"
OK
AT^RESET
```

- Read the current conformance test mode:

```
AT+SQNCTM?
+SQNCTM: "3gpp-conformance"
OK
```

- Automatic mode example (switch from AT&T mode to Verizon Wireless mode):

```
AT+SQNCTM?
+SQNCTM: att,0

OK
AT+SQNCTM="automatic"
OK
AT+SQNCTM?
+SQNCTM: att,1
AT+CFUN=1
OK
  ====> SIM profile is for VzW, conformance test mode is switched to VzW and
reset automatically AT+SQNCTM?
+SQNCTM: verizon,1

OK
```

3.22 Dynamic Power Reduction Mode Configuration: AT+SQNDPR

3.22.1 Syntax

Command	Possible Response(s)
AT+SQNDPR=<mode>[, <state>]	OK
AT+SQNDPR?	+SQNDPR=<mode>, <state> OK
AT+SQNDPR =?	+SQNDPR=(0-1), (0-1) OK

3.22.2 Description

The command configures the dynamic power reduction (DPR) feature. Dynamic power reduction values are specified using the `AT+SQNTXPWR` command.

Two <mode>s are available: 'manual' and 'automatic'.

- In manual mode, the MCU dynamically enables/disables power reduction using the `AT+SQNDPR` command (with the `<state>` parameter);

- Automatic mode is currently not supported.

The read form returns the DPR application `<mode>` as well as the instant back-off application `<state>`.

The DPR `<mode>` selected is stored in non-volatile memory and persist through device reboots and software upgrades. In manual mode, the instant DPR `<state>` is volatile but kept through modem low power states. DPR `<mode>` and `<state>` configuration changes are applied on the fly (no need to reboot).

3.22.3　Defined Values

mode

　　Integer: 0 or 1. Dynamic power reduction mode.

Table 71. mode

Value	Description
0	(default): Manual
1	Automatic (not yet supported)

state

　　Integer: 0 or 1. Dynamic power reduction state.

Table 72. state

Value	Description
0	(default): DPR disabled
1	DPR enabled

3.23　UART0 Break Line Setting: AT+SQNIBRCFG

3.23.1　Syntax

Command	Possible Response(s)

AT+SQNIBRCFG=<moBreakMode>[,<moBreakDuration>]	`+SQNIBRCFG:`
	`+CME ERROR:`**<err>**
	
	`OK`

AT+SQNIBRCFG?	`+SQNIBRCFG:`**<moBreakMode>,<moBreakDuration>**
AT+SQNIBRCFG=?	`+SQNIBRCFG:(0-1)[,(100-5000)]OK`

3.23.2　Description

Break signal may be generated whenever an URC cannot be delivered to MCU and UART is configured in AT channel/data mode (PPP, Data over AT in online mode).

The `AT+SQNIBRCFG` command purpose is configuration of break signal behavior.

Important: Break signal is only available on UART0.

3.23.3 Defined Values
moBreakMode
> Integer :0 or 1. Host handshake mode.

Table 73. moBreakMode

Value	Description
0	(default) Events are not indicated by a BREAK line.
1	The break signal is generated whenever an URC cannot be presented to MCU and UART is in data mode (PPP, data over AT in transparent mode).

moBreakDuration
> Integer in range [100-5000]. MO break signal duration in milliseconds. Default: 100 ms

3.23.4 Example
```
+SQNIBRCFG=?
+SQNIBRCFG: (0-1)[,(100-5000)]

OK
AT+SQNIBRCFG?
+SQNIBRCFG: 0,100

OK
AT+SQNIBRCFG
OK
AT+SQNIBRCFG=1,100
OK
AT+SQNIBRCFG?
+SQNIBRCFG: 1,100

OK
```

3.24 UART Interface Power Saving Configuration: AT+SQNIPSCFG

3.24.1 Syntax

Command	Possible Response(s)
AT+SQNIPSCFG=<mode>[,<timeout>]	`+CME ERROR: <err>` `OK`
AT+SQNIPSCFG?	`+SQNIPSCFG:(0-2),(100-10000)`
AT+SQNIPSCFG=?	`+SQNIPSCFG: <mode>[,<timeout>]`

3.24.2 Description
This command sets the UARTs power saving configuration, with global effect on the module power saving behavior.

Important: This command does not immediately apply mode transitions. A reset is required to apply a mode change.

The read command displays power saving mode and timeout.

Available power modes:

- In <mode>=0, power saving is disabled. UART0, UART1, UART2 interfaces are permanently activated and module never enters Sleep mode.
- In <mode>=1, power saving is activated. UART0 interface is activated with Sleep mode support (RTS0 line). UART1 and UART2 interfaces do not interfere on module power saving behavior. The module does not enter Sleep mode as long as the RTS0 line state is low.

  Note: In <mode>=1, in order to ignore RTS1 line, it is also necessary to disable the `wakeRTS1` signal with these commands.

  ```
  AT+CFUN=5

  AT+SQNHWCFG="wakeRTS1","disable"

  AT^RESET
  ```

- In <mode>=2, power saving is activated. UART0/UART1/UART2 interfaces are activated with Sleep mode support (RTS0/1/2 lines) whenever applicable (hardware flow control supported and activated on UART interface). The module does not enter Sleep mode as long as one of RTS line state is low.

When power saving is enabled, module power state is controlled by RTS line:

- If the RTS line state is set to OFF, the power saving mode is allowed
- If the RTS line state is set to ON, the module shall exit from power saving mode

More precisely when power saving is enabled:

- When no activity is detected on the UART, the CTS line will be set to OFF state (driven high level), <timeout> milliseconds (100 ms to 10 s, default 5 s) after the last sent character, then module will go to Sleep mode as soon as DTE set the RTS line to OFF state (driver high level).
- When module is in Sleep mode, it can be waken-up by driving the RTS0 line (<mode>=1 or 2) or one of the RTS1/2 lines (<mode>=2) to ON state (low level). After RTS0/1/2 assertion (RTS line set ON state, for example, pin set to low level), and module is woken-up, CTS line signals will change to ON state (low level), stating UART interfaces are ready to operate.

Notes:
- UART Sleep mode support requires that CTS/RTS flow control be configured both on the UE side and the DTE side.
- In <mode>=1 or 2, the DTE can start sending data to the module without risk of data loss after having asserted the UART RTS line.
- Factory default is <mode>=2, <timeout>=5000 msec

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for `<err>` values.

3.24.3 Defined Values
mode
  Integer type: 0, 1, or 2. UART power saving mode.

Table 74. mode

Value	Description
0	Power saving is disabled. UART0, UART1, UART2 interfaces are permanently activated and the module never enters Sleep mode.
1	Default value. Power saving is activated. UART0 interface is activated with Sleep mode support. The module's power state is controlled by the RTS0 line.
2	Power saving is activated. UART0/UART1/UART2 interfaces are activated with Sleep mode support whenever applicable (HW flow control activated). The module power state is controlled by the RTS0, RST1, and RTS2 lines.

timeout

Integer type in range (100 .. 10000). Inactivity timeout in milliseconds.
Default configuration is 5000 msec.

In Sleep modes (<mode>=1 or 2), the guard time period during which no character should be received on UART before module entering in Sleep mode.

This parameter is ignored if the power saving mode is disabled (<mode>=0).

3.25 Set LED Blink Mode: AT+SQNLED

3.25.1 Syntax

Command	Possible Response(s)

AT+SQNLED=<mode>	`OK`
	
	`ERROR`
	`+CME ERROR:`<err>

AT+SQNLED?	`+SQNLED:`<mode > `OK`
AT+SQNLED=?	`+SQNLED:(list of possible <modes>)` `OK`

3.25.2 Description

This command turns the LTE LED on or off. The LTE LED blinks when traffic is exchanged over the air.

The read form returns the current LED state.

The test form returns the list of possible modes.

3.25.3 Defined Values

mode

Integer: 0 or 1. Configures the LTE LED mode. This setting persists at reboot.

Table 75. mode

Value	Description
0 (default)	Blink mode Off. The LED is switched off.
1	Blink mode On. The LED will blink according to the system state.

3.26 Power Saving Configuration (Host Latency): AT+SQNPSCFG

3.26.1 Syntax

Command	Possible Response(s)
AT+SQNPSCFG=<latency>	`OK`
AT+SQNPSCFG?	`+SQNPSCFG:(0-10000)`
AT+SQNPSCFG=?	`+SQNPSCFG:` <latency>

3.26.2 Description

This command sets the power saving configuration, with direct effect on the module power saving behavior.

The read command displays the active power saving configuration.

The configuration is non-volatile.

This command configures the maximum `<latency>` the module can take to exit Sleep mode after the host wakes it.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for `<err>` values.

3.26.3 Defined Values

latency

　　Integer type in range [0-10000]. Default configuration is 5000 msec. Maximum authorized wake-up latency in milliseconds. The module enters the deepest power saving mode compatible with the required wake-up time.

　　Configuring a maximum latency below the suspend wake-up time (~4 seconds) typically prevents the module from sleeping.

3.27 RING Line Behavior Configuration: AT+SQNRICFG

3.27.1 Syntax

Command	Possible Response(s)
AT+SQNRICFG=[<mode>][,<events>][,<timeout>]	+SQNRICFG:<mode>,<events>,<timeout>
AT+SQNRICFG?	+SQNRICFG:<mode>,<events>,<timeout>
AT+SQNRICFG=?	+SQNRICFG: [(0-2)][,(0-3)][,(1000-5000)]

3.27.2 Description

This command sets the RING line behavior according to the channel (defined by `<mode>` parameter), the `<events>` selected and a `<timeout>`.

3.27.3 Defined Values

mode

　　Integer [0-2]. RING line behavior for signaling URCs both for idle interface and while interface is reserved, that is, while busy on AT command execution or data transmission. This functionality serves to fine-tune the conditions under which the ME signals service request to the TE.

Table 76. mode

Value	Description
0	URCs are not indicated by a ring line.
1	(default): URCs are indicated by an activated `RING` line on the same interface where the URC appears. If URC is presented on AT channel mapped to UART0, then `RING` line will be activated. If URC happens on an AT channel not mapped to UART0, then `RING` line is unaffected.
2	All URCs are indicated by the `RING` line of the UART0 interface, irrespective of their origin

events

Integer in range [0-3]. Event.

Table 77. events

Value	Description
0	No `RING` activation
1	`RING` activation triggered by general URC events
2	`RING` activation triggered by data events
3	(default): `RING` activation triggered by general URC events and data.

timout

Integer in range [100-5000] (default:1000). `RING` line active duration in milliseconds.

This parameter determines how long the `RING` line is activated to indicate a URC or pending data. No value means leave previous timeout with no change.

3.27.4 Examples

- Read configuration:

```
AT+SQNRICFG?
+SQNRICFG: 1,3,1000
OK
```

- Write default configuration and read again:

```
AT+SQNRICFG
OK
AT+SQNRICFG?
+SQNRICFG: 2,3,1000
OK
```

- Write other configuration and read again:

```
AT+SQNRICFG=0,0
OK
AT+SQNRICFG?
+SQNRICFG: 0,0,1000
OK
```

3.28 Data Encrypt/Decrypt: AT+SQNSDECRYPT

3.28.1 Syntax

Command	Possible Response(s)
AT+SQNSDECRYPT=<algoType>,<spId>,<dataLen>,<isBase64In>,<isBase64Out>,<isBase64IV>,<initVector>	Intermediate response: > +SQNSDECRYPT:**<size>** <<<**<data>** OK ERROR +CME ERROR:**<err>**
AT+SQNSDECRYPT?	OK
AT+SQNSDECRYPT=?	SQNSDECRYPT:(0..6),(0..1),(**<size>**),(0..1),(0..1),(0..1),**""** OK

3.28.2 Description

This command allows to encrypt/decrypt data using AES cyphering.

Data is prefixed with "<<<" delimiter.

3.28.3 Defined Values

algoType
> Integer or string. Type of encryption algorithm. "AES" or 0.

spId
> Integer [0-6]. Security Profile identifier. See `AT+SQNSPCFG`.

dataLen
> Integer. Length of encrypted/decrypted data.

isBase64In
> Integer 0 (default) or 1. Whether input data is Base64 encoded.

isBase64Out
> Integer 0 (default) or 1. Whether output data must be Base64 encoded (1) or not (0).

isBase64IV
> Integer 0 (default) or 1. Whether the initialization base is Base64 encoded (1) or not (0).

initVector
> String. Initialization vector. See previous parameter.

size
> Integer. Size of decrypted data.

3.28.4 Example

- Decrypt AES-encrypted "Hi there!" string:

```
AT+SQNSPCFG=1,2,"0x8C;0x8D;0xAE;0xAF",,,,,"CC362389DB79D7788C3FA97572C
8AD0851F2EB73E8DCC49391557ABB18C070D0"
OK
AT+SQNSDECRYPT=0,1,24,1,1,0,"hellohellohelloh"

> l/yMF1yNirYXRE+el+ybgA==
+SQNSDECRYPT: 24
<<<SGkgdGhlcmUhCgYGBgYGBg== OK
```

3.29 Device Reset to Factory State: AT+SQNSFACTORYRESET

3.29.1 Syntax

Command	Possible Response(s)
AT+SQNSFACTORYRESET	`+CME ERROR:<err>`
AT+SQNSFACTORYRESET=?	`OK`

3.29.2 Description

This command causes the device to reset to factory state. A device reboot is necessary to complete the operation.

This command performs a factory reset. This factory reset rewinds all non-volatile parameters of the module back to the last restoration point. This includes any configuration change done with `AT+SQNHWCFG`, or any other AT command. If no restoration point has been created, the parameters are overwritten with their factory defaults. This AT command also flushes any data cached by the LTE modem, such as last used cell.

A reboot is needed to finalize the command.

Note: The manufacturing command `AT+SQNHWCFGSAVE="OEM"` must be used during the manufacturing process to define a restoration point for the `AT+SQNSFACTORYRESET`. Please refer to mTools Reference Manual for more details.

Note: To create a restoration point, see Save Module Configuration: `AT+SQNFACTORYSAVE`.

3.30 Read Data in NVM: AT+SQNSNVR

3.30.1 Syntax

Command	Possible Response(s)

AT+SQNSNVR="privatekey"[,<index>]	`+SQNSNVR:`<index>,
	
	`"-----BEGIN RSA PRIVATE KEY-----`<S3><S4>
	
	`"`<8 first bytes> [...] <8 last bytes>"
	
	`"-----END RSA PRIVATE KEY-----`
	
	[<S3><S4>
	
	`+SQNSNVR:`<index>,
	
	`"-----BEGIN RSA PRIVATE KEY-----`<S3><S4>"<8 first bytes>
	
	[...] <8 last bytes>"
	
	`"-----END RSA PRIVATE KEY-----`[...]]
	
	`OK`

AT+SQNSNVR="certificate",<index>,<size><S3><S4><data>	`+SQNSNVR:`<type>...<type>…
	[...]][<S3><S4>+SQNSNVR: <type>...[...]]
	
	`OK`
	
	`ERROR`
	
	`+CME ERROR:`<err>

AT+SQNSNVR="json"[,<index>]	
AT+SQNSNVR="strid"[,<index>]	
AT+SQNSNVR?	`OK`
AT+SQNSNVR=?	`+SQNSNVR: "certificate",`(list of supported <index>) `+SQNSNVR: "privatekey",`(list of supported <index>),(list of supported <mode> `+SQNSNVR: "json",`(list of supported <index>) `+SQNSNVR: "strid",`(list of supported <index>) `OK`

Note: <S3> and <S4> represent the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 and Response Formatting Character: ATS4.

3.30.2 Description

This command allows to read data (certificate, private key) stored in the non-volatile (NV) memory or the Flash File System.

Read command usage and syntax vary depending on the type of stored data.

- `AT+SQNSNVR="certificate"[,<index>]`

  This command dumps all certificate stored in the system.

  If `<index>` is provided, only certificate with given `<index>` is displayed. An `ERROR` is reported in case this entry is empty.

  If `<index>` is not provided, then all available certificates are displayed, one per line.

- `AT+SQNSNVR="privatekey"`

  This command dumps all the private keys stored in the system. Only the first 8 bytes and the last 8 bytes of the private key are displayed, separated by `[...]` characters.

- `AT+SQNSNVR="json"[,<index>]`

  This command dumps all JSON files stored in the system.

3.30.3 Defined Values

type

Type of data, string.

`"certificate"`: Certificate data.

`"privatekey"`: Private key data.

`"json"`: JSON data.

index

Integer [0-19]. Certificate index.

issuer

String. Certificate issuer (Entity that verified the information and issued the certificate).

serial-number

String. Certificate serial number (used to uniquely identify the certificate).

subject

String. Certificate subject (person or entity identified).

valid-from

String. Certificate inception date.

valid-to

String. Certificate expiration date.

signature-algorithm

String. Certificate signature algorithm.

signature

String. Certificate signature.

thumbprint-algorithm

String. Certificate thumbprint algorithm (hash algorithm).

thumbprint

String. Certificate thumbprint (the hash value).

3.30.4 Example

- Read certificate at index 5

```
AT+SQNSNVR="certificate",5
+SQNSNVR:
"certificate",5,<issuer>,<serial-number>,<subject>,<valid-from>,< valid-
to>,<signature-algorithm>,<signature>,<thumbprint-algorithm>,<thumbprint>
OK
```

- Read all certificates:

Note: All certificate data is not displayed in the example below.
Shortened sections are identified by "(...)".

```
AT+SQNSNVR="certificate"
+SQNSNVR: "certificate",0,"/C=US/O=VeriSign, Inc./OU=VeriSign Trust
Network/OU=(c) 2006 VeriSign, Inc. - For authorized use only/CN=VeriSign Class
3 Public Primary Certification Authority -
G5","0000(...)00000","/C=US/O=VeriSign, Inc./OU=VeriSign Trust Network/OU=(c)
2006 VeriSign, Inc. - For authorized use only/CN=VeriSign Class 3 Public
Primary Certification Authority -
G5","06/11/08 00:00:00","36/07/16
23:59:59","sha1RSA","0000(...)0000","sha1","b054ec81256dc47f1f036
0e38fe30d6ccba35424"
+SQNSNVR: "certificate",1,"/OU=Amazon Web Services O=Amazon.com
Inc. L=Seattle ST=Washington
C=US","0000000(...)0000000000","/CN=AWS IoT
Certificate","18/01/03 07:06:00","49/12/31
23:59:59","sha256RSA","000000(...)0000","sha1","f6bb69bdc40afedb8
40e6854749db37c74501e6b"
OK
```

- Read a single private key:

```
AT+SQNSNVR="privatekey",2
+SQNSNVR: 1,"-----BEGIN RSA PRIVATE KEY-----
MIIFQTCC [...] 4PsJYGw=
-----END RSA PRIVATE KEY-----
```

3.31 Write Data in NVM: AT+SQNSNVW

3.31.1 Syntax

Command	Possible Response(s)
AT+SQNSNVW=\<type>,...	OK
AT+SQNSNVW="certificate",\<index>,\<size>\<S3>\<S4>\<data>	OK
AT+SQNSNVW="privatekey",\<index>,\<size>\<S3>\<S4>\<data>	OK
AT+SQNSNVW="strid",\<index>,\<size>\< S3>\<S4>\<data>	OK
AT+SQNSNVW?	OK
AT+SQNSNVW=?	+SQNSNVW: "certificate",(list of supported \<index>),(list of supported \<size>) +SQNSNVW: "privatekey",(list of supported \<index>),(list of supported \<size>) +SQNSNVW: "strid",(list of supported \<index>),(list of supported \<size>) OK

Note: <S3> and <S4> represent the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 and Response Formatting Character: ATS4.

3.31.2 Description

Note: This command writes or deletes data (certificates, and so forth) to or from the non-volatile (NV) memory. Data stored in Non-Volatile Memory is not affected by device reboots and software upgrades.

Attention: A factory reset (see Device Reset to Factory State: `AT+SQNSFACTORYRESET`) deletes all data written in the Non-volatile memory.

The command usage and syntax may change depending on the type of data to store.

```
AT+SQNSNVW="certificate",<index>,<size>
```

This write command with `"certificate"` writes a single certificate, or several concatenated certificates, in the non-volatile memory . Once the operation is complete, public certificates are immediately available for all client secured IP connection (`AT+SQNSUPGRADE`, Secured socket). For secured socket in server mode, certificate `<index>` should be used to assign private certificate to secure server.

An `<index>` should be provided and will be used by the system to identify in a unique way the certificate for future operations (delete, and so forth).

The `<size>` parameter gives the size in bytes of the certificate to upload: after `AT+SQNSNVW` write command issued, user should send certificate bytes in PEM (Privacy-enhanced Electronic Mail) format. Once `<size>` bytes have been received, the operation is automatically completed. If the certificate is successfully uploaded and verified, the response is `OK`. If the upload fails for some reason, then an error code is reported. Maximum <size> for certificates is 8 kB.

To delete a certificate, one should simply write a 0 byte certificate using certification ID as `<index>`.

```
  AT+SQNSNVW="privatekey",<index>,<size>
```
This write command writes a private key in PEM format to the non-volatile memory. Private keys are used by `AT+SQNSJWTENCODE` command. Maximum <size> for private keys is 2 kB.

```
AT+SQNSNVW="strid",<index>,<size>
```

Write a string value to the non-volatile memory. Maximum <size> for strings is 1 kB.

Note: Password encrypted private RSA keys are not supported.

Note: The MQTT broker may provide certificates and private keys files with <CR><LF> (carriage return and line feed) endings. The parameter <size>, however, must not take the <CR> characters into account. To remove the <CR>s (carriage return) use the following command on UNIX:
```
cat file_with_cr | tr -d \015 > no_cr_file
```

3.31.3 Defined Values

type

String. Type of data.

"certificate": Certificate data.

"privatekey": Private key.

"strid": Generic string.

index

Integer [0-19]. Certificate or private key or string index.

Caution: Indexes 0 to 4 and 7 to 10 are reserved for internal use. Do not change their contents.

size

Integer. Size in bytes of certificate or private key or string to upload. A `0` value removes the corresponding entry. See above for individual limits.

Important: The NVRAM has a maximum user capacity of 200 kB. Any attempt to store new data beyond that limit fails with `ERROR`.

3.31.4 Example

- Certificate upload at index 5:

```
AT+SQNSNVW="certificate",5,1346
-----BEGIN CERTIFICATE-----
MIIDXTCCAkWgAwIBAgIJAJC1[…]j3tCx2IUXVqRs5mlSbvA==
-----END CERTIFICATE-----
OK
```

- Remove certificate at index 5:

```
AT+SQNSNVW="certificate",5,0
OK
```

- Upload client private key with keyid 6:

```
$ AT+SQNSNVW="privatekey",2,1675
> -----BEGIN RSA PRIVATE KEY-----
...
-----END RSA PRIVATE KEY-----
OK
```

3.32 Device Shutdown: AT+SQNSSHDN

3.32.1 Syntax

Command	Possible Response(s)
AT+SQNSSHDN	`+CME ERROR:<err>`
AT+SQNSSHDN=?	`OK`

3.32.2 Description

This command causes device to detach from the network and shutdown. Before turning off, an `OK` response is returned. This command proceeds despite any active or pending activity. The device does not respond to any further command.

Attention: Once this command is acknowledged, the module must be reset using the RESET line. Toggling the power does not reboot the module.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

3.32.3 URC +SQNSSHDN

The `+SQNSSHDN` URC is issued on the AT port when the power down process has completed. However, the power must not be turned off immediately after reception of this URC. The minimum time to wait is specified in the module's Manufacturing Guidelines.

3.33 Temperature Monitoring: AT+SQNTMON

3.33.1 Syntax

Command	Possible Response(s)

AT+SQNTMON=[<mode>,<extremeLow>, <warningLow>, <warningHigh>,<extremeHigh>]	`+SQNTMON: <mode>,<status>,<temperature>`
	
	`OK`
	
	`ERROR`
	`+CME ERROR:<err>`

AT+SQNTMON?	`+SQNTMON:<mode>,<extremeLow>,<warningLow>,<warningHigh>,` <extremeHigh>, <temperature> `OK`
AT+SQNTMON=?	`+SQNTMON: (0-2),(-100-100),(-100-100),(-100-100),(-100-100)`
URC	`+SQNTMONS:<mode>,<status>,<temperature>`

3.33.2　Description

This command activates/deactivates and configures the temperature monitoring function.

The temperature range is split into 5 operation zones:

- 0: Extreme low temperature range: below `<extremeLow>`
- 1: Low temperature range: from `<extremeLow>` to `<warningLow>`
- 2: Operational range: from `<warningLow>` to `<warningHigh>`
- 3: High temperature range: from `<warningHigh>` to `<extremeHigh>`
- 4: High extreme temperature range: above `<extremeHigh>`

Temperature thresholds configuration is optional, default values are `<extremeLow>`=-40°C, `<warningLow>`=-30°C, `<warningHigh>`=+80°C, `<extremeHigh>`=+90°C.

When the feature is enabled, the module temperature is measured via the internal temperature sensor according to the following rules:

- When the modules enter a new thermal operation zone, then `+SQNTMONS` notification is issued
- To avoid fluctuations, a non-configurable hysteresis of +/-2°C is applied to raw temperature
- Operation in low or high temperature range is still safe.
- Operating in low or high temperature ranges is still safe.

If the module remains in low or high extreme zone for more than three seconds and `<mode>` set to 2, the device sends a final URC (`+SQNTMONS:2,10,<temperature>`), then triggers an emergency shutdown procedure to prevent damage.

The `+SQNTMONS` URC is also sent after enabling the feature indication (by means of `<mode>` set to value 1 or 2).

The read command allows reading the configured parameters as well as the current <temperature>.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for `<err>` values.

3.33.3　Defined Values

mode
Integer [0-2]. Temperature monitoring mode.

Table 78. mode

Value	Description
0	Default value. temperature monitoring disabled
1	temperature monitoring activated with `+SQNTMONS` URC activated
2	temperature monitoring activated with `+SQNTMONS` URC activated and automatic emergency shutdown enabled

extremeLow
　Integer in range [-100;100]. Extreme low temperature threshold in °C. Default value is -40°C.

warningLow
　Integer in range [-100;100]. Warning low temperature threshold in °C. Default value is -30°C.

warningHigh
　Integer in range [-100;100]. Warning high temperature threshold in °C. Default value is 80°C.

extremeHigh
　Integer in range [-100;100]. Extreme high temperature threshold in °C. Default value is 90°C.

status

Integer. Temperature monitoring status

Table 79. status

Value	Description
-2	Below extreme low temperature limit
-1	Below low temperature limit
0	Normal operating temperature
1	Above high temperature alert limit
2	Above extreme high temperature limit
10	Extreme temperature timer expired; shutdown procedure started

temperature

Integer. Current board temperature in °C.

3.33.4 Example

```
AT+SQNTMON=?
+SQNTMON: (0-2),(-100-100),(-100-100),(-100-100),(-100-100) OK
```

3.34 Maximum Transmission Power Configuration: AT+SQNTXPWR

3.34.1 Syntax

Command	Possible Response(s)
AT+SQNTXPWR=<rat>, **<band> [,[<maxTxPwr>] [,<dprBackoff>]]**	+SQNTXPWR:<rat>, <band>, <maxTxPwr>, <dprBackoff> OK ERROR
AT+SQNTXPWR=?	+SQNTXPWR:(list of supported <rat>s), (list of supported <band>s), (range of <maxTxPwr>), (range of <drpBackoff>) OK
AT+SQNTXPWR?	+SQNTXPWR:<rat_1>,<band_1>,<maxTxPwr_1>,<dprBackoff_1> … +SQNTXPWR:<rat_n>,<band_n>,<maxTxPwr_n>,<dprBackoff_n> OK

3.34.2 Description

By default, the maximum transmission power is set depending on 3GPP device power class definition (23 dBm for power class 3) and dynamic power reduction is set to 0 dB.

With this command, the device manufacturer can customize the maximum transmission power per 4G LTE <band> for a given radio access technology (<rat>). The dynamic power reduction backoff can also be configured and used for various purposes such as regulatory FCC SAR rule implementation (proximity protection), power consumption reduction or thermal mitigation.

The dynamic power reduction application mode is configured using the AT+SQNDPR command.

Trying to configure a <rat> or a <band> not supported by a product variant results in the AT command rejecting the configuration request and responding with an ERROR message.

The test command reports the list of supported <rat>s and <band>s (hardware capabilities).

The read command reports the list of custom transmission power configuration per `<rat>` and `<band>`, one `{<rat>; <band>}` per line.

The custom transmission power configuration is stored in non-volatile memory and persists through device reboots and software upgrades. Update are applied when the device registers itself to the network (`CFUN`=1).

Important: Warning: Any change to the transmission power configuration should be carefully evaluated as it may impact regulatory certification. Any configuration change is the device owner's responsibility.

Note: The FCC requires cell phone manufacturers to ensure that their phones comply with its objective limits for safe exposure. Any cell phone at or below the SAR levels (that is, any phone legally sold in the U.S.) is a 'safe' phone, according to the standard. The FCC SAR limit for public exposure to cellular telephones is 1.6 watts per kilogram (1.6 W/kg). See https://www.fcc.gov/general/specific-absorption-rate-sar-cellular-telephones for more information.

3.34.3　Defined Values

rat

Integer [0-1]. Radio Access Technology.

Value	Description
0	LTE CAT M1
1	LTE CAT NB1

band

Integer. Band number as defined by 3GPP standard TS 36.101.

maxTxPwr

Integer in [0-2400]: Maximum transmission power. Power unit is in hundredths of dBm. Default: the maximum transmission power as defined by the device power class (2300 for class 3 devices)

dprBackoff

Integer type in [0-2000]: Dynamic power reduction. Back-off unit is in hundredths of dB. Default value is 0.

3.34.4　Example

To customize band 2 with 8 dB backoff on a class 3 category M1 device:

```
AT+SQNTXPWR=0,2,,800

+SQNTXPWR: 0,2,23000,800

OK
```

To customize band 4 maximum transmission power to 20.5 dBm on category M1 device:

```
AT+SQNTXPWR=0,4,2050

+SQNTXPWR: 0,4,2050,0

OK
```

To dump custom transmission power configuration:

```
AT+SQNTXPWR?

+SQNTXPWR: 0,2,23000,800

+SQNTXPWR: 0,4,2050,0
```

3.35 Wake Lock Management: AT+SQNWL

3.35.1 Syntax

Command	Possible Response(s)
AT+SQNWL=<app>[,<wl_mask>]	`+CME ERROR:`<err> `+SQNWL:`<app>,<wl_mask> `OK`
AT+SQNWL?	`+SQNWL:`<app1>,<mask1> [<S3><S4>...<S3><S4>`+SQNWL:` <appN>,<maskN>[...]] `OK`
AT+SQNWL=?	`+SQNWL:""`,(0-3) `OK`

Note: <S3> and <S4> represent the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 and Response Formatting Character: ATS4.

3.35.2 Description

This command manages resources wake locks to indicate that a client application running on the Host CPU needs to secure full and immediate availability of some device resources, which implies to prevent the considered resources to enter Sleep mode.

Currently, the wake-lockable system resources are:

- The CPU and external interfaces (UART, GPIO)
- Device memory (RAM)

The command sets and releases the wake locks based on the resource identified by the bitmask `<wl_mask>`. To set the wake locks and prevent the Sleep mode for the specified resource(s), `<wl_mask>` bit(s) should be set to 1. To release the wake locks and allow sleep mode for the specified resource(s), `<wl_mask>` bit(s) should be set to 0.

Note: The wake locks configuration is volatile. It is lost at reboot.

The command without a bitmask returns the wake lock defined by the `<app>` client application.
The read command returns the list of client applications using wake locks and lock status.

Caution: It is very important to release the wake locks as soon as possible to avoid draining the device's battery excessively. Each application much clear its wake locks when it does not need the resource anymore.

3.35.3 Defined Values

app
    String. Client application name.

wl_mask

Bitmask as integer in range [0-3] identifying the resource to keep available. Bit is set to 1 to keep the resource available and prevent Sleep mode.

Table 80. wl_mask

Value	Description
0	Default value. No system resource locked
Bit 0 (0x01)	Keep CPU and external interfaces (UART, GPIO) active. Prevents the CPU and external interfaces to enter Sleep mode.
Bit 1 (0x02)	Keep device's RAM memory active. Prevents the device's RAM memory to enter Sleep mode.
Bits 0 and 1 (0x03)	Keep CPU, external interfaces (UART, GPIO) and device's RAM memory active. Prevents the CPU, external interfaces and device's RAM memory to enter Sleep mode.

3.36 Echo: ATE

Note: This command is described in ITU-T V.250. See Section References.

3.36.1 Syntax

Command	Possible Response(s)
ATE<value>	

3.36.2 Description

The setting of this parameter determines whether or not the DCE echoes characters received from the DTE during command state and online command state.

3.36.3 Defined Values

value

Integer 0 or 1.

Note: The default value is 0, that is, DCE does not echo characters.

Table 81. value

Value	Description
0	DCE does not echo characters during command state and online command state.
1	DCE echoes characters during command state and online command state.

3.37 Result Code Suppression: ATQ

Note: This command is described in ITU-T V.250. See Section References.

3.37.1 Syntax

Command	Possible Response(s)
ATQ[<value>]	OK if value is 0.
	No response if value is 1 (because result codes are suppressed).
	ERROR for unsupported values (if previous value was Q0).
	No response for unsupported values (if previous value was Q1).

RENESAS

3.37.2 Description

The setting of this parameter determines whether or not the DCE transmits result codes to the DTE. When result codes are being suppressed, no portion of any intermediate, final, or unsolicited result code – header, result text, line terminator, or trailer – is transmitted. Information text transmitted in response to commands is not affected by the setting of this parameter.

3.37.3 Defined Values

value

　　Integer 0 or 1.

Note: The recommended default value.

Table 82. value

Value	Description
0	DCE transmits result codes.
1	Result codes are not transmitted.

3.38 Command Line Termination Character: ATS3

Note: This command is described in ITU-T V.250. See Section References.

3.38.1 Syntax

Command	Possible Response(s)
ATS3=[<value>]	

3.38.2 Description

This S-parameter represents the decimal IA5 value of the character recognized by the DCE from the DTE to terminate an incoming command line. It is also generated by the DCE as part of the header, trailer, and terminator for result codes and information text, along with the `S4` parameter (see the description of the V parameter for usage).

The previous value of `S3` is used as the command line termination character of a new `ATS3` setting command. However, the result code issued uses the value of `S3`. For example, if `S3` was previously set to 13 and the command line "`ATS3=30`" is issued, the command line shall be terminated with a CR character (IA5 0/13), but the result code issued will use the character with the ordinal value 30 (IA5 2/14) in place of the CR.

3.38.3 Defined Values

value

　　Integer in range 0..127. Set command line termination character to this value. The mandatory default value is 13 carriage return character (CR, IA5 0/13).

3.39 Response Formatting Character: ATS4

Note: This command is described in ITU-T V.250. See Section References.

3.39.1 Syntax

Command	Possible Response(s)
ATS4=[<value>]	

3.39.2 Description

This S-parameter represents the decimal IA5 value of the character generated by the DCE as part of the header, trailer, and terminator for result codes and information text, along with the `S3` parameter (see the description of the V parameter for usage).

If the value of `S4 is` changed in a command line, the result code issued in response to that command line will use the new value of `S4`.

3.39.3 Defined Values

value

Integer in range 0..127. Set response formatting character to this value.

The recommended default value is 10, that is the line feed character (LF, IA5 0/10).

3.40 Command Line Editing Character: ATS5

Note: This command is described in ITU-T V.250. See Section References.

3.40.1 Syntax

Command	Possible Response(s)
ATS5=[<value>]	

3.40.2 Description

This S-parameter represents the decimal IA5 value of the character interpreted by the DCE as a request to delete from the command line the immediately preceding character.

3.40.3 Defined Values

value

Integer in range 0..127. Set the command line editing character to this value.

Recommended default value is 8 backspace character (BS, IA5 0/8).

3.41 DCE Response Format: ATV

Note: This command is described in ITU-T V.250. See Section References.

3.41.1 Syntax

Command	Possible Response(s)
ATV[<value>]	0 if value is 0 (because numeric response text is being used). OK if value is 1. 4 for unsupported values (if previous value was V0). ERROR for unsupported values (if previous value was V1).

3.41.2 Description

The setting of this parameter determines the contents of the header and trailer transmitted with result codes and information responses. It also determines whether result codes are transmitted in a numeric form or an alphabetic (or "verbose") form. The text portion of information responses is not affected by this setting.

Table 75 shows the effect of the setting of this parameter on the format of information text and result codes. All references to <S3> mean "the character with the ordinal value specified in parameter S3"; all references to <S4> likewise mean "the character with the ordinal value specified in parameter S4". See Table 83.

Table 83. Effect of V Parameter on Response Formats

	V0	V1
Information Response	<text><S3><S4>	<S3><S4><text><S3><S4>
result Codes	<numeric code><S3>	<S3><S4><verbose code><S3><S4>

3.41.3 Defined Values

value

Integer 0 or 1.

Note: The recommended default value is 1.

Table 84. value

Value	Description
0	DCE transmits limited headers and trailers and numeric text.
1	DCE transmits full headers and trailers and verbose response text.

3.42 Reset to Default Configuration: ATZ

Note: This command is described in ITU-T V.250. See Section References.

3.42.1 Syntax

Command	Possible Response(s)
ATZ[<value]	OK if <value> is recognized.
	ERROR if <value> is not recognized or supported.

3.42.2 Description

This command instructs the DCE to set all parameters to their factory defaults as specified by the manufacturer. This may include the settings of hardware configuration switches or reset persistent parameters (if implemented). If the DCE is connected to the network, it is disconnected terminating any call in progress.

All the internal operations triggered by the command are completed before the DCE issues the result code. The DTE should not include additional commands on the same command line after the ATZ command because such commands may be ignored.

Note: Because this command may restore the settings of switches and parameters, it does not necessarily return the DCE to a "known state". In particular, the DCE may, as a result of execution of this command, be placed in a state in which it appears to not respond to DTE commands, or respond in a completely different format than was being used prior to execution of the command.

Caution: The use of this command is strongly discouraged. Please use Device Reset to Factory State: AT+SQNSFACTORYRESET instead.

4. Device Identification Commands

4.1 Request Manufacturer Identification: AT+CGMI

Note: This command is described in 3GPP TS 27.007. See Section References.

4.1.1 Syntax

Command	Possible Response(s)
AT+CGMI	<manufacturer> +CME ERROR: <err>
AT+CGMI=?	

4.1.2 Description

The execution of this command causes the TA to return one or more lines of information text <manufacturer>, determined by the MT manufacturer, which is intended to permit the user of the TA to identify the manufacturer of the MT to which it is connected to. Typically, the text will consist of a single line containing the name of the manufacturer, but manufacturers may choose to provide more information if desired.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

4.1.3 Defined Values
manufacturer
> String. The total number of characters, including line terminators, in the information text shall not exceed 2048 characters. Text must not contain the sequence 0<S3> or OK<S3>. Here <S3> represents the value of the command line termination character. See Command Line Termination Character: ATS3.

4.2 Request Model Identification: AT+CGMM

Note: This command is described in 3GPP TS 27.007. See Section References.

4.2.1 Syntax

Command	Possible Response(s)
AT+CGMM	<model> `+CME ERROR:` <err>
AT+CGMM=?	

4.2.2 Description

This command causes the TA to return one or more lines of information text `<model>`, determined by the MT manufacturer, which is intended to permit the user of the TA to identify the specific model of the MT to which it is connected to. Typically, the text will consist of a single line containing the name of the product, but manufacturers may choose to provide more information if desired.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

4.2.3 Defined Values
model
> String. The total number of characters, including line terminators, in the information text shall not exceed 2048 characters. Text shall not contain the sequence 0<S3> or OK<S3>. Here <S3> represents the value of the command line termination character. See Command Line Termination Character: ATS3.

4.3 Request Revision Identification: AT+CGMR

Note: This command is described in 3GPP TS 27.007. See Section References.

4.3.1 Syntax

Command	Possible Response(s)
AT+CGMR	<revision> `+CME ERROR:` <err>
AT+CGMR=?	

4.3.2 Description

Execution command causes the TA to return one or more lines of information text `<revision>`, determined by the MT manufacturer, which is intended to permit the user of the TA to identify the version, revision level or date, or other pertinent information of the MT to which it is connected to. Typically, the text will consist of a single line containing the version of the product, but manufacturers may choose to provide more information if desired.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

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

4.4 Request Product Serial Number Identification: AT+CGSN

Note: This command is described in 3GPP TS 27.007. See Section References.

4.4.1 Syntax

Command	Possible Response(s)
AT+CGSN[=<snt>]	when <snt>=0 (or omitted) and the command succeeds:<sn> when<snt>=1 and the command succeeds: +CGSN:<imei> when <snt>=2 and the command succeeds: +CGSN:<imeisv> when <snt>=3 and the command succeeds: +CGSN:<svn> If the command fails: +CME ERROR: <err>
AT+CGSN=?	When TE supports <snt> and command successful: +CGSN: OK

4.4.2 Description

Execution command causes the TA to return IMEI (International Mobile station Equipment Identity number) and the related information to identify the MT that the TE is connected to.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

Test command returns values supported as a compound value. For a TA which does not support <snt>, only OK is returned.

4.4.3 Defined Values

snt
> Integer [0-3]. Indicating the serial number type that has been requested.

Table 85. snt

Value	Description
0	returns <sn>
1	returns the IMEI (International Mobile station Equipment Identity)
2	returns the IMEISV (International Mobile station Equipment Identity and Software Version number)
3	returns the SVN (Software Version Number)

sn
> String. one or more lines of information text determined by the MT manufacturer. Typically, the text will consist of a single line containing the IMEI number of the MT, but manufacturers may choose to provide more information if desired. The total number of characters, including line terminators, in the information text shall not exceed 2048 characters. Text shall not contain the sequence 0<CR> or OK<CR>

imei
> String type in decimal format indicating the IMEI; refer 3GPP TS 23.003 [7], subclause 6.2.1. 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: AT+CSCS.

imeisv
> String type in decimal format indicating the IMEISV; refer 3GPP TS 23.003 [7], subclause 6.2.2. The 16 digits of IMEISV are composed of Type Allocation Code (TAC) (8 digits), Serial Number (SNR) (6 digits) ETSI 3GPP TS 27.007 version 12.10.0 Release 12 23 ETSI TS 127 007 V12.10.0 (2015-10) and the

software version (SVN) (2 digits). Character set used in `<imeisv>` is as specified by command Select TE Character Set: AT+CSCS.

svn

String type in decimal format indicating the current SVN which is a part of IMEISV; refer 3GPP TS 23.003 [7], subclause 6.2.2. This allows identifying different software versions of a given mobile. Character set used in `<svn>` is as specified by command Select TE Character Set: AT+CSCS.

Note: The default value `<snt>`=0 returns the information text `<sn>` with no command name prefixed. This has been done to retain backward compatibility. All other values of `<snt>` return the information text including command name prefix.

4.4.4   Informative examples

- To get `<sn>` which returns IMEI of the MT

```
AT+CGSN
490154203237518
OK
```

- To get `<imei>` which returns IMEI of the MT

```
AT+CGSN=1
+CGSN: "490154203237518"
OK
```

4.5   Request International Mobile Subscriber Identity: AT+CIMI

Note: This command is described in 3GPP TS 27.007. See Section References.

4.5.1   Syntax

Command	Possible Response(s)
AT+CIMI	<IMSI> +CME ERROR: **<err>**
AT+CIMI=?	

4.5.2   Description

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

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for `<err>` values.

4.5.3   Defined Values

IMSI

String (without double quotes). International Mobile Subscriber Identity.

4.6   Request Product Serial Number Identification: AT+GSN

Note: This command is described in ITU-T V.250. See Section References. See also 4.4 Request Product Serial Number Identification: AT+CGSN command.

4.6.1   Syntax

Command	Possible Response(s)
AT+GSN	OK

4.6.2   Description

This command causes the DCE to transmit one or more lines of information text, determined by the manufacturer, which is intended to permit the user of the DCE to identify the individual device. Typically, the text will consist of a single line containing a manufacturer determined alpha-numeric string, but manufacturers may choose to provide any information desired.

The total number of characters, including line terminators, in the information text returned in response to this command shall not exceed 2048 characters. Note that the information text shall not contain the sequence `"0 <CR>"` `(3/0, 0/13)` or `"OK<CR>"` `(4/15, 4/11, 0/13)`, to avoid premature end detection.

4.7   Request Identification Information: ATI

Note: This command is described in ITU-T V.250. See Section References.

4.7.1   Syntax

Command	Possible Response(s)
ATI[<value>]	
ATI or **ATI0**	<manufacturer><S3><S4><model><S3><S4><ue_version>
ATI1	<ue_version><S3><S4><lr_version>
ATI2	serial: <serial> imeisv:<imeisv> OK

Note: <S3> and <S4> represent the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 and Response Formatting Character: ATS4.

4.7.2   Description

This command causes the DCE to transmit one or more lines of information text, determined by the manufacturer, followed by a final result code. <value> may optionally be used to select from among multiple types of identifying information, specified by the manufacturer.

Note: The responses to this command may not be reliably used to determine the DCE manufacturer, revision level, feature set, or other information, and should not be relied upon for software operation. In particular, expecting a specific numeric response to an `ATI0` command to indicate which other features and commands are implemented in a DCE dooms software to certain failure, since there are widespread differences in manufacturer implementation among devices that may, coincidentally, respond with identical values to this command. Software developers should use `ATI` commands with extreme caution. The amount of data returned by a specific implementations may vary widely from a few bytes to several thousand bytes or more. Software must prepare to receive `ERROR` responses if the value passed is not recognized.

ATI or ATI0 write commands reports device MT manufacturer, MT model and the UE software version.

ATI1 write commands reports the UE and LR software versions.

AT2 reports the device serial number and IMEISV.

4.7.3   Defined Values

serial
    String (max. 64 characters): device serial number

Imeisv
    String: IMEISV (International Mobile station Equipment Identity and Software Version number). Refer to 3GPP TS 23.003 [7], subclause 6.2.2. 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). The character set used is specified using the command Select TE Character Set: AT+CSCS.

RENESAS

lasermarking
> String. The laser marking as engraved on the module's top casing.

4.7.4 Example

```
ATI
SEQUANS Communications
CB410L
UE4.1.6.0-53323


OK
ATI1
UE4.1.6.0-53323
LR4.1.6.0-53323

ATI2


SERIAL: G2Q2106160008013
IMEISV: 0157700008800111


OK
```

5. Device Upgrade Commands

5.1 Device Upgrade: AT+SQNSUPGRADE

5.1.1 Syntax

Command	Possible Response(s)
AT+SQNSUPGRADE=?	SQNSUPGRADE:<upgrade_state>[, …]

5.1.2 Description

This command triggers a device upgrade with a firmware fetched from an external server or from an external server or from a file already in the module's file system. In the latter case, the upgrade procedure leaves the local file untouched. Deletion is under user's responsibility. See `<firmware_url>` parameter below for syntax.

The parameters `<reboot>`, `<report_progress>` and `<command>` are optional. A device reboot is necessary to finalize the system upgrade. Any kind of reboot is acceptable (`AT^RESET`, `AT+SQNSSHDN`, hardware reset). The `<reboot>` parameter triggers an automatic reboot after the download firmware has been validated and installed. The upgrade can be launched in foreground or background as specified by `<command>` value. The user can cancel the upgrade by sending `cancel <command>` any time before device reboot. The device acknowledges the command with a `+SQNSUPGRADE: "cancelled"` URC (mind the two '1').

An unsolicited result code `+SQNSUPGRADE: "installed"` is sent as soon as the new firmware has been verified, indicating that the device is ready for reboot. `<report_progress>` controls the sending of the unsolicited result code `+SQNSUPGRADE: "downloading"`.

Note: The `+SQNSUPGRADE: "installed"` URC is sent only when using diff-image FOTA, and is not supported for full image FOTA.

In background upgrade mode, `AT+SQNSUPGRADE` returns immediately either OK if the upgrade has started or CME ERROR (see below for specific error codes). `+SQNSUPGRADE: "connecting"` notification is issued as soon as the connection to the FOTA server is established. Once the connection is secured, the firmware download starts and the `+SQNSUPGRADE` notification is used to report on progress ("downloading", "installed", and so forth.). If the connection to the FOTA server fails, the upgrade is aborted and "`+CME ERROR: 531`" (Upgrade failed: Network error) is sent back.

The write command is also used in case of manual network initiated firmware upgrade, to control firmware upgrade operation timings: the user calls this command to trigger the firmware upgrade and/or to cancel the operation.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

The read command returns the status of result code presentation corresponding to the current state of upgrade process.

Test command returns values supported as a compound value.

5.1.3 Defined Values

firmware_url

  String. URL (compliant with RFC1738) of the firmware (protocol://user:password@host:port/path).

- If the firmware is fetched from a remote source:

  <firmware_url> = "http(s)://…" or "ftp(s)://…"

- If the firmware is fetched from Sequans's server:

  <firmware_url> = https://name:pass@www.sequans.com/ private/firmware.dup

- If the firmware is fetched from the local file system:

  <firmware_url> = "file:///…" using an absolute path to the file

  This command supports FTP(S) and HTTP(S) protocols, in addition to direct file fetching.

reboot

  Integer 0 or 1.

Table 86. reboot

Value	Description
0	No reboot after the firmware is downloaded. The user must reboot the device to activate new firmware
1	Default value. Reboot triggered after the firmware is installed

report_progress

  Integer [0-100]

Table 87. report_progress

Value	Description
0	Default value. Don't report download progress.
1..100	report download progress using `+SQNSUPGRADE: "downloading",`<percent_downloaded> URC.

command
> integer [0-2]

Table 88. command

Value	Description
0	Default value. Synchronous upgrade.
1	Asynchronous upgrade. The command launches the upgrade and returns immediately OK if upgrade is started correctly or CME ERROR (see below for specific error codes). The command report upgrade progress with `+SQNSUPGRADE` URC.
2	Cancel upgrade. Cancel upgrade if any or do nothing, then returns `OK`. In case of Network Initiated firmware upgrade, then the network will be notified with upgrade cancel error code.

spID
> Integer: [0-6]. Security profile number (see `AT+SQNSPCFG` command) for https download.
>
> If the firmware is downloaded over a secure connection, SSL/ TLS properties settings should be provided through a secure profile managed by `AT+SQNSPCFG`. In such a scenario, the user should clearly identify which configuration to use by adding the mandatory `<spId>` parameter. Any attempt to open a secure connection without a valid security profile will fail.

upgrade_state
> String

Table 89. upgrade_state

Value	Description
"canceled"	The upgrade has been canceled
"connecting"	The device is currently waiting for the connection to be established
"downloading"	Report the downloading progress. This state is followed with `<percent_downloaded>`. This information is displayed only if `<report_progress>` has been set different than 0
"idle"	No upgrade is on going
"installed"	The upgraded is installed and will be effective after the next reboot. Unavailable when using a full firmware image.
"available"	A new firmware is available for download (network initiated firmware upgrade use cases only)
"rebooting"	This notification is sent just before the device reboot that finalizes the system upgrade.

percent_downloaded
> Integer [0-100]. Percentage of image downloaded.

5.1.4 Example

```
AT+SQNSUPGRADE?
+SQNSUPGRADE: "idle"
OK
```
The following error codes may be returned through `+CME ERROR`. They are also listed in Mobile Termination Error Result Code: +CME ERROR.

Table 90. AT+SQNSUPGRADE Specific Error Codes

Code	Description
528	Upgrade failed: General error
529	Upgrade failed: Corrupted image
530	Upgrade failed: Invalid signature
531	Upgrade failed: Network error
532	Upgrade failed: Upgrade already in progress
533	Upgrade cancel failed: No upgrade in progress

5.2 Device Upgrade Configuration AT+SQNSUPGRADECFG

5.2.1 Syntax

Command	Possible Response(s)
AT+SQNSUPGRADECFG **=<mode>,<reportStage>,<reportProgress>**	+CME ERROR:<err>
AT+SQNSUPGRADECFG?	SQNSUPGRADECFG:<mode>,<reportStage>,<reportProgress>
AT+SQNSUPGRADECFG=?	SQNSUPGRADECFG:(list of supported <mode>s),(list of supported <reportStage>s),(range of supported <reportProgress>)

5.2.2 Description

The write command is used to configure the device behavior in case of network-initiated firmware upgrade configuration. This is typically the case for OTADM FOTA. The level of interaction with the user or the external host is configured by the <mode> parameter. Two modes are defined: automatic (default) and manual.

- In "automatic" mode, firmware upgrade will operate in background of regular module operation. After new firmware download complete, module will automatically apply new firmware then reboot. User is notified of upgrade progress (firmware downloading, firmware installed, upgrade canceled rebooting...) by +SQNSUPGRADE unsolicited result code based on notification level configured by <reportStage> and <reportProgress> parameters.
- In "manual" mode, firmware upgrade takes place under user control. As soon as a new firmware is available for upgrade, an unsolicited result code +SQNSUPGRADE: "available" is sent. Then user triggers the firmware download using +SQNSUPGRADE command (without specifying any URL). The device reboots (automatic or manual reboot depending on +SQNSUPGRADE parameter).

Attention: A reboot of the device is necessary after every <mode> configuration change. Any form of reboot (AT^RESET, AT+SQNSSHDN, hardware reset) is acceptable.

Attention: The configuration set by this command is lost after the subsequent reboot. Therefore, this command must be used prior to every upgrade.

<reportStage> and <reportProgress> control presentation of unsolicited result code +SQNSUPGRADE.

The read command returns the current configuration.

Test command returns values supported as a compound value.

Note: +SQNSUPGRADECFG configuration is per channel specific.
See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

5.2.3   Defined Values

mode

    Integer

Table 91. mode

Value	Description
0	Default value. Automatic mode. Network initiated firmware upgrade is fully transparent for the user. Note that an unsolicited reboot can happen anytime to complete the upgrade procedure.
1	Manual mode. Host assisted: host can delay/cancel upgrade

reportStage

    Integer

Table 92. reportStage

Value	Description
0	Default value. Do not report any upgrade status.
1	Activate upgrade status main step reporting (see <upgrade_state> values of `+SQNSUPGRADE` URC)

reportProgress

    Integer

Table 93. reportProgress

Value	Description
0	Default value. Do not report download progress
1..100	Report download progress using `+SQNSUPGRADE: "downloading",`<percent_downloaded> URC.

5.2.4   Example

```
   AT+SQNSUPGRADECFG=?
+SQNSUPGRADECFG: (0),(0-1),(0-100)
OK

   AT+SQNSUPGRADECFG?
   +SQNSUPGRADECFG: 0,0,0
OK

AT+SQNSUPGRADECFG=0,1,1
OK

   AT+SQNSUPGRADECFG?
+SQNSUPGRADECFG: 0,1,1 OK
```

6. Manufacturing Commands

6.1 Downlink Continuous Wave Receiver: AT+SMCWRX

6.1.1 Warning

This is a manufacturing mode command. You need to enter manufacturing mode with AT +CFUN=5 before using it. Please refer to the introductory text at the top of this section.

6.1.2 Syntax

Command	Possible response(s)
AT+SMCWRX=earfcn	`+SMCWRX: <rssi0>` `+SMT ERROR: err`
AT+SMCWRX?	`ERROR`
AT+SMCWRX=?	`OK`

6.1.3 Description

This command starts a downlink continuous wave service. The input signal should be generated with a sine wave generator at the exact frequency and band.

Important: Because of the DC rejection, it is not possible to perform RX measurements at the center frequency. Use the AT command (`AT+SMCWRX=mid channel`) and set the signal generator at a ±100 kHz offset. For example, on band 19, use `AT+SMCWRX=6075` (corresponding to a center channel frequency of 882.5 MHz) and set the signal generator at 882.6 MHz.

6.1.4 Defined Values

The following values are defined:

earfcn
   Integer. An E-UTRA Absolute Radio Frequency Channel Number.

rssi0
   Integer. RSSI in hundredths of dBm at the main antenna.

6.2 Uplink Continuous Wave Transmitter: AT+SMCWTX

6.2.1 Warning

This is a manufacturing mode command. You need to enter manufacturing mode with `AT +CFUN=5` before using it. Please refer to the introductory text at the top of this section.

6.2.2 Syntax

Command	Possible Response(s)
AT+SMCWTX=<enable>,<earfcn>,<level>	`+SMT ERROR: err`
AT+SMCWTX?	`+SMCWTX:<enable>,<earfcn>,<level>`
AT+SMCWTX=?	

6.2.3 Description

This command start an uplink continuous wave service. When in Continuous Wave generation mode, the module does not perform any LTE activity. Starting a new Continuous Wave terminates the previous one.

6.2.4 Defined Values

The following values are defined:

enable
   Integer: 0 or 1. 1 to start the CW transmission, 0 to stop it.

earfcn

    Integer. An E-UTRA Absolute Radio Frequency Channel Number. This command should not be used to output a tone whose frequency is less than 300 kHz away from any band edge.

level

    Integer. RF output power level of the continuous wave signal, in hundredths of dBm.

6.2.5 Example

```
AT+SMCWTX=1,21790,2300
```

```
OK
```

1: Start RF Tone

21790: UL EARFCN

2300: Tx Power set to +23 dBm (max)

6.3   GPIO Input Tests: AT+SMGI

6.3.1 Warning

This is a manufacturing mode command. You need to enter manufacturing mode with AT +CFUN=5 before using it. Please refer to the introductory text at the top of this section.

6.3.2 Syntax

Command	Possible Response(s)
AT+SMGI=mHi, mMed, mLo, pHi, pMed, pLo	
AT+SMGI?	`+SMGI:vHi, vMed, vLo`
AT+SMGI=?	

6.3.3 Description

This command configures the general purpose I/O pins (GPIO) in input mode with arbitrary polarity. If mask only selected, pin from the mask will be configured as input (no change to others).

If the query syntax is used (+SMGI?), the returned value is the bitmask of GPIOs in input mode and active state (high or low depending on the polarity).

6.3.4 Defined Values

The following values are defined:

mHi, mMed, mLo

    Most and least significant 32 bits respectively of a mask denoting affected GPIOs with bit 0 corresponding to GPIO 0 and so on.

pHi, pMed, pLo

    Most and least significant 32 bits respectively of the polarities of the GPIO pins selected by above mask. If bit x is set to 1 then GPIO polarity pin x will be set as inverted; otherwise normal.

vHi, vMed, vLo

    Most and least significant 32 bits respectively of the values of GPIO pins. If bit x is set to 1 then GPIO pin x is enabled, configured as input and has an active input value; disabled GPIOs or GPIOs configured as output appears as a 0 in this bitmask.

RENESAS

6.4 GPIO Tests: AT+SMGT

6.4.1 Warning

This is a manufacturing mode command. You need to enter manufacturing mode with `AT +CFUN=5` before using it. Please refer to the introductory text at the top of this section.

6.4.2 Syntax

Command	Possible Response(s)
AT+SMGT=mHi,mMed,mLo,vHi,vMed,vLo,pHi,pMed,pLo	
AT+SMGT=?	

6.4.3 Description

This command allows general purpose I/O (GPIO) pins to be driven to arbitrary values and/or arbitrary polarity. If the mask parameter is the sole parameter, pin from the mask will be selected in open drain mode. There is no change for the other modes.

6.4.4 Defined Values

The following values are defined:

mHi, mMed, mLo

> Most, medium and least significant 32 bits, respectively, of a mask denoting the affected GPIOs, with bit 0 corresponding to GPIO 0, and so on. GPIOs selected in this way are enabled and set to output mode.

vHi, vMed, vLo

> Most, medium and least significant 32 bits, respectively, of the values to drive on GPIO pins selected by the mask. When bit x is set to 1, the corresponding GPIO pin x is driven high; otherwise low.

pHi, pMed, pLo

> Most and least significant 32 bits respectively of the polarities to drive on GPIO pins selected by above mask. If bit x is set to 1 then GPIO polarity pin x will be set as inverted; otherwise normal.

6.5 SIM Network Personalization: AT+SMNP

6.5.1 Warning

This is a manufacturing mode command. You need to enter manufacturing mode with AT +CFUN=5 before using it. Please refer to the introductory text at the top of this section.

6.5.2 Syntax

Command	Possible Response(s)
AT+SMNP=plmn0,plmn1[,...,plmn11]	`+SMNP:` `plmn0,plmn1[,...,plmn11]`
AT+SMNP?	

6.5.3 Description

This configuration allows up to 12 PLMNs. The chosen PLMN number survives resets and upgrades.

6.5.4 Defined Values

The following values are defined:

plmn

> The PLMN allowed.

6.6 SIM Test: AT+SMST

6.6.1 Warning

This is a manufacturing mode command. You need to enter manufacturing mode with AT +CFUN=5 before using it. Please refer to the introductory text at the top of this section.

6.6.2 Syntax

Command	Possible Response(s)
AT+SMST[=<interface>]	+SMST=*<status>* +SMT ERROR:*<err>*
AT+SMST=?	

6.6.3 Description

This command tests that the SIM card responds to basic solicitations. The UICC must be compatible with the tested device and have been inserted before powering up the device.

6.6.4 Defined Values

The following values are defined:

Interface

> Integer: 0 or 1. Optional parameter to select the SIM interface:

- 0: selects the external SIM (default interface)
- 1: selects the internal SIM
- 0: selects the SCI0 interface (default interface)
- 1: selects the SCI1 interface

Status

> String. Test result:

- OK: The test passed
- NO SIM: No SIM card was detected
- NOK: The test detected a problem

err

> String. Error code. The only possible error code is ITF

> UNKNOWN in case <interface> is out of range.

6.7 Hardware Function Configuration: AT+SQNHWCFG

6.7.1 Warning

This is a manufacturing mode command. You need to enter manufacturing mode with AT+CFUN = 5 before using it. Please refer to the introductory text at the top of this section.

6.7.2 Syntax

Command	Possible Response(s)
AT+SQNHWCFG=*<function> [,<enable>, [<polarity>]]*	OK
AT+SQNHWCFG="32khz_clk_out "*[,<enable>]*	OK
AT+SQNHWCFG="antennaTuning"*[,<enable> [,<defaultValue>[,"<minFreq>, <maxFreq>, <value> [,<minFreq>, <maxFreq>, <value> [,…]]…"]]]*	OK
AT+SQNHWCFG="dcd"*[,<enable>]*	OK
AT+SQNHWCFG="dsr"*[,<enable>]*	OK
AT+SQNHWCFG="dtr"*[,<enable>]*	OK
AT+SQNHWCFG="fff_ffh"*[,<enable>,[<polarity>]]*	OK
AT+SQNHWCFG="gpioId"*[,<enable> [,<polarity>,<direction>* *[,<value>]]]*	OK

Command	Possible Response(s)
AT+SQNHWCFG="i2c"*[,<enable>]*	OK
AT+SQNHWCFG="jtag"*[,<enable>]*	OK
AT+SQNHWCFG="ps_status"*[,<enable>]*	OK
AT+SQNHWCFG="pwmId"*[,<enable>]*	OK
AT+SQNHWCFG="ringId"*[,<enable>,[<polarity>]]*	OK
AT+SQNHWCFG="spi"*[,<enable>]*	OK
AT+SQNHWCFG="status_led"*[,<enable>,[<polarity>]]*	OK
AT+SQNHWCFG="txIndicator"*[,<enable>]*	OK
AT+SQNHWCFG="uartId"*[,<enable> [,<rtscts>[,<rate> [,<format>[,<parity> [,<stopbits>[,<application>]]]]]]]*	OK
AT+SQNHWCFG="wakeId"*[,<enable>,[<polarity>]]*	OK
AT+SQNHWCFG?	For each <function>: +SQNHWCFG:<function>, list of <values> OK

6.7.3 Description

The write command configure the primary/alternate module pin functions described in the module's data sheet.

The write command used with the sole <function> parameter is equivalent to the read command output restricted to the selected <function>.

The read command returns the list of supported pin functions state (1 function per line). For each function, it includes the state and detailed configuration, whenever applicable. The displayed information corresponds to the configuration applied at the next reboot. The current configuration is overridden at reboot by the changes, if any.

Notes: 1. Any configuration change is delayed until the next reboot.
      2. The configuration is non-volatile, survives device reboots and software upgrades.
      3. If given an unsupported function or an invalid configuration, the AT command returns ERROR and the +CME ERROR: <err> notification is sent.
      4. Multipurpose pins need their current function be disabled before a new function can be configured. Trying to enable a function on a pin already assigned to another function returns ERROR and the +CME ERROR: <err> notification is sent.
      5. Pins with unassigned functions are disabled, and at reset are configured as described in the data sheet. Please refer to the data sheet for details.

The following functions can currently be activated on RYZ014A module pins. More functions may be added in future software releases.

32 kHz clock out (32khz_clk_out). The corresponding pad is either connected to the internal 32 kHz frequency source or disabled. This clock signal may be shut off, depending on the power status of the module.

Write command:
AT+SQNHWCFG="32khz_clk_out"[,<enable>]

Read command output:

+SQNHWCFG:"32khz_clk_out"[,<enable>]
<enable>: either "enable" or "disable"

• Antenna tuning (antennaTuning) function control. Antenna tuning consists in associating the output value of the two signals (`ANT_TUNE0`, `ANT_TUNE1`) to a frequency range. The output value, which can be represented by numbers from 0 to 3, is then used by the board circuitry to select a specific matching circuit.

Write command:

AT+SQNHWCFG="antennaTuning"[,<enable>

[,<defaultValue>[,"<minFreq, maxFreq, value>[,<minFreq, maxFreq, value>[,…]]…"]]]

Read command output:

+SQNHWCFG:"antennaTuning"[,<enable>

[,<defaultValue>[,"<minFreq, maxFreq, value>[,<minFreq, maxFreq, value>[,…]]…"]]]

–   <enable>: "enable" or "disable" to activate/deactivate the function.

–   <defaultValue>: String. Default ANT_TUNE pattern (in hexadecimal), for all frequencies outside the defined ranges. See below.

The third optional parameter is composed of comma-separated triplets <minFreq>, <maxFreq>, <value>. Each triplet defines a frequency range and an ANT_TUNE pattern: <minFreq> and <maxFreq> (in MHz) set the frequency range, and <value> (in hexadecimal) is the pattern, where bit 0 corresponds to ANT_TUNE0, bit 1 to ANT_TUNE1 – for instance, 0x2 corresponds to ANT_TUNE1 set to 1, and ANT_TUNE0 to 0. Up to eight such triplets can be defined.

Note: For all frequencies outside the defined ranges, <defaultValue> is used.

Caution: Frequencies ranges as defined in the third parameter must not overlap. ANT_TUNE signals values are undefined in the overlapping parts.

Example: The following command sets ANT_TUNE0 to 1 and ANT_TUNE1 to 0 in the range (800, 900) MHz, and the opposite in the range (1000, 1500) MHz. Both ANT_TUNE signals are set to 0 elsewhere:

AT+SQNHWCFG="antennaTuning", "enable", "0x00", "800, 900, 0x1, 1000, 1500, 0x2"

• Modem UART I/O configuration:
Write commands:
AT+SQNHWCFG="dcd"[,<enable>]
AT+SQNHWCFG="dsr"[,<enable>]
AT+SQNHWCFG="dtr"[,<enable>]

Read commands outputs:
+SQNHWCFG:"dcd"[,<enable>]
+SQNHWCFG:"dsr"[,<enable>]
+SQNHWCFG:"dtr"[,<enable>]
– <enable>: "enable" or "disable" to enable or disable the I/O function.
• Boot source function control (Boot From Flash or Boot From Host):

Write command:
AT+SQNHWCFG="fff_ffh"[,<enable>[,<polarity>]]

Read command output:
+SQNHWCFG:"fff_ffh"[,<enable>[,<polarity>]]
–   <enable>: "enable" or "disable" to activate/deactivate the function activation
–   <polarity>: "normal" or "inversed". Default polarity is "normal".
• GPIO function control:
Write command:
AT+SQNHWCFG="gpioId"[,<enable>

[,<polarity>,<direction>[,<value>]]]

Read command output:
+SQNHWCFG:"gpioId"[,<enable>
[,<polarity>,<direction>[,<value>]]]
- gpioId: defines the GPIO function, for example "gpio4".
- <enable>: "enable" or "disable" to activate/deactivate the function.
- <polarity>: "normal" or "inversed". Default polarity is "normal".
- <direction>: "input" or "output". Default direction is "input".
- <value>: "high" or "low". Default value is "low".
- I²C interface function control:
  Write command:
  AT+SQNHWCFG="i2c"[,<enable>]
  Read command output:
  +SQNHWCFG:"i2c"[,<enable>]
  – <enable>: "enable" or "disable" to enable or disable the I²C interface.
- JTAG function control:
  Write command:
  AT+SQNHWCFG="jtag"[,<enable>]
  Read command output:
  +SQNHWCFG:"jtag"[,<enable>]
  – <enable>: "enable" to activate/deactivate the interface. It is not possible to turn JTAG off.
- PS_STATUS function control:
  Write command:
  AT+SQNHWCFG="ps_status"[,<enable>]
  Read command output:
  +SQNHWCFG:"ps_status"[,<enable>]
  - enable>: "enable" or "disable" to enable or disable the I/O function activation.
- PWM function control
  Write command:
  AT+SQNHWCFG="pwmId"[,<enable>]
  Read command output:
  +SQNHWCFG:"pwmId"[,<enable>]
  – pwmId: "pwm0" or "pwm1" to select PWM interface number 0 or 1.
  – <enable>: "enable" or "disable" to enable or disable the associated PWM.
- Ring function control
  Write command:
  AT+SQNHWCFG="ringId"[,<enable>[,<polarity>]]
  Read command output:
  +SQNHWCFG:"ringId"[,<enable>[,<polarity>]]
  – ringId: "ring0"
  – <enable>: "enable" or "disable" to activate/deactivate the function.
  – <polarity>: "normal" or "inversed".
- UICC interface ("simItf": sim0, sim1, sim2) function control:
  Write command:
  AT+SQNHWCFG="simItf"[,<enable>[,<polling>]]

Read command output:

+SQNHWCFG:"simItf"[,<enable>[,<polling>]]

–   sim0: card slot 0
–   sim1: card slot 1
–   <enable>: "enable" or "disable" to activate/deactivate the interface
–   <polling>: enables software SIM card detection method. If not specified, polling is disabled and the detection makes use of the SIM card detect pin.

Note: The number of available card slots as well as their mapping is hardware dependent.

- SPI interface function control:
  Write command:
  AT+SQNHWCFG="spi"[,<enable>]

  Read command output:
  +SQNHWCFG:"spi"[,<enable>]
  – <enable>: "enable" or "disable" to enable or disable the I/O function activation.
- STATUS_LED function control:
  Write command:
  AT+SQNHWCFG="status_led"[,<enable>[,<polarity>]]

  Read command output:
  +SQNHWCFG:"status_led"[,<enable>[,<polarity>]]
  –   <enable>: "enable" or "disable" to activate/deactivate the interface Default setting is "disable".
  –   <polarity>: "normal" or "inversed"
- TX Indicator function control:
  Write command:
  AT+SQNHWCFG="txIndicator"[,<enable>][,<threshold>]

  Read command output:
  +SQNHWCFG:"txIndicator"[,<enable>][,<threshold>]
  – <enable>: "enable" or "disable" to activate/deactivate the RF Psi Tx Indicator.
    This command will enable the "tx_ind" hardware pin.
  – <threshold>: Integer. A threshold value in hundredths of dBm. If the power output is under this threshold, the pin does not toggle from Rx to Tx. Default value is 3000, or +30 dBm.
- Change UART configuration (uartId: uart0, uart1, uart2) function control:
  Write command:

  AT+SQNHWCFG="uartId"[,<enable>[,<rtscts>[,<rate> [,<format>[,<parity>[,<stopbits>[,<application>]]]]]]]
  Read command output:
  +SQNHWCFG:"uartId"[,<enable>[,<rtscts>[,<rate>

  [,<format>[,<parity>[,<stopbits>[,<application>]]]]]]]
  — uart0: UART0 interface
  — uart1: UART1 interface
  — uart2: UART2 interface
  — <enable>: "enable" or "disable" to activate/deactivate the interface
  — <rtscts> represents the 'flow control'. Default is "none", use "rtscts" to enable hardware flow control
  — <rate> represents the baudrate. Default is 115200 for uart1 and 921600 for uart0/2
  — <format> represents the 'wordlength'. Default is 8, the value must be 5, 6, 7 or 8
  — <parity> represents the parity policy. Possible values are "none", "even", "odd", "mark", "space". Default is "none"
  — <stopBits> represents the number of stop bits. Possible values are "1", "1.5", "2". Default is "2"
  — <application>. This parameter can be "AT", "CONSOLE", "DCP" or "none". Default is "AT" for uart0, "CONSOLE" for uart1 and "DCP" for uart2

- Wake signal detection (wakeId = "wake0", "wake1", "wake2", "wake3", "wake4", "wakeRTS0", "wakeRTS1", "wakeSim0", "wakeSim1") function control:

  Write command:
  AT+SQNHWCFG="wakeId"[,<enable>[,<polarity>]]

  Read command output:
  +SQNHWCFG:"wakeId"[,<enable>[,<polarity>]]
  — wake0: WAKE0 interface
  — wake1: WAKE1 interface
  — wake2: WAKE2 interface
  — wake3: WAKE3 interface
  — wakeRTS0: WAKE on RTS0 interface (default: enabled)
  — wakeRTS1: WAKE on RTS1 interface
  — wakeSim0, wakeSim1: WAKE on SIM interface
  — <enable>: "enable" or "disable" to activate/deactivate the interface
  — <polarity> : "normal" or "inversed" if possible.

Note: Polarity setting is not available for wakeRTS0, and wakeRTS1.

Note: Polarity setting is not available for wakeRTS0 and wakeRTS1.
AT command usage and syntax depends on the function to activate/deactivate.
See also Mobile Termination Error Result Code: +CME ERROR for <err> values.

6.7.4 Defined Values
function
    String. Function name.

Table 94. function

Value	Description
32khz_clk_out	
antennaTuning	
dcd	
dsr	
dtr	
fff_ffh	
gpioId	
i2c	
jtag	
ps_status	
pwm0, pwm1	
ring0, ring1	
sim0, sim1	

Value	Description
spi	
status_led	
txIndicator	
uart0, uart1, uart2	
wake0, wake1, wake2, wake3, wakeRTS0, wakeRTS1, wakeSim0, wakeSim1	

enable

Integer: 0 or 1. Function enable state.

Table 95. enabled

Value	Description
0	Function is disabled
1	Function is enabled

defaultValue

String: Default AGC in hexadecimal (see above).

polling

Integer: 0 or 1. Activate SW polling or use SIM_DETECT pin activity.

Table 96. polling

Value	Description
0	SIM_DETECT pin activity
1	SW polling

rtscts

String. Flow control type.

Table 97. rtscts

Value	Description
none	No flow control
rtscts	RTS/CTS flow control

rate

Integer. Standard baudrate in (1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200). Default value is 115200.

format

Integer. Word length in (5, 6, 7, 8). Default value is 8.

parity

String. Parity possible values in (none, even, odd, mark, space). Default is "none"

stopBits

   Integer. Number of stop bits in (1, 1.5, 2). Default value is 2.

application

   String. Usage of the UART port in (none, AT, CONSOLE, DCP)

Table 98. application

Value	Description
none	
AT	
CONSOLE	
DCP	

6.8   Restore Module Configuration: AT +SQNHWCFGRESTORE

6.8.1   Warning

This is a manufacturing mode command. You need to enter manufacturing mode with `AT +CFUN=5` before using it. Please refer to the introductory text at the top of this section.

6.8.2   Syntax

Command	Possible Response(s)
AT+SQNHWCFGRESTORE=*<source>[,<force>]*	`OK`
AT+SQNHWCFGRESTORE=?	`+SQNHWCFGRESTORE:[SQN/OEM], [force]`

6.8.3   Description

This command restores the module configuration, including Renesas manufacturing board configuration.

6.8.4   Defined Values

source

   String.

Table 99. source

Value	Description
SQN	Restore Renesas's module configuration
QEM	Restore a client's module configuration

force

   Integer 0 or 1.

Table 100.   source

Value	Description
1	Force configuration to original hardware configuration if there is no saved configuration

6.9 Save Module Configuration: AT+SQNHWCFGSAVE

6.9.1 Warning

This is a manufacturing mode command. You need to enter manufacturing mode with AT+CFUN=5 before using it. Please refer to the introductory text at the top of this section.

6.9.2 Syntax

Command	Possible Response(s)
AT+SQNHWCFGSAVE=<type>[,<keepall>]	OK
AT+SQNHWCFGSAVE=?	+SQNHWCFGSAVE:("SQN","OEM"),[keepall]

6.9.3 Description

This command saves the full hardware configuration settings into a backup file. Two sets of configuration parameters can be defined and saved independently in the file system.

The set of configuration parameters labelled "SQN" (default) should include the initial updates after flash burn, including typically calibration and identities. This configuration will be used as a reference backup to restore the parameters during a factory reset.

The set of configuration parameters labelled "OEM" (OEM's default) should include additional updates on the hardware configuration, such as I/O configuration (GPIOs, UARTs…). This is a superset of the parameters present in the "SQN" backup file.

Note: All information will be written in the file system.

6.9.4 Defined Values

type

　　String. Selection of the type of backup.

Table 101.　　type

Value	Description
SQN	Saving configuration parameters defined at default, including calibration and identities. The configuration is saved in file sqn/psisqn.save.
QEM	Saving configuration parameters defined as OEM's default, including Renesas default, plus additional parameters such as IO configuration (GPIO, UART…). The configuration is saved in file sqn/psioem.save.

Keepall

　　Integer: 0 or 1.

Table 102.　　keepall

Value	Description
0 (default)	Keep only the changes applied since the initial software release configuration
1	Keep all the current configuration parameters set

7. Network Service Commands

7.1   Extended Error Report: AT+CEER

Note: This command is described in 3GPP TS 27.007. See Section References.

7.1.1   Syntax

Command	Possible Response(s)
AT+CEER	`+CEER:` <report>
AT+CEER=?	

7.1.2   Description

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

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

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

7.1.3   Defined Values

report
    String. The total number of characters, including line terminators, in the information text shall not exceed 2041 characters. Text shall not contain the sequence 0<S3> or OK<S3>. <S3> represents the value of the command line termination character. See Command Line Termination Character: ATS3.

7.2   EPS Network Registration Status: AT+CEREG

Note: This command is described in 3GPP TS 27.007. See Section References.

7.2.1   Syntax

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

7.2.2   Description

The set command controls the presentation of an unsolicited result code `+CEREG: <stat>` when `<n>=1` and there is a change in the MT's EPS network registration status in E-UTRAN, or unsolicited result code `+CEREG: <stat>[,[<tac>],[<ci>],[<AcT>]]` when `<n>=2` and there is a change of the network cell in E-UTRAN. The parameters `<AcT>`, `<tac>` and `<ci>` are sent 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.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

The read command returns the status of result code presentation and an integer `<stat>` which shows whether the network has currently indicated the registration of the MT. Location information elements `<tac>`,

`<ci>` and `<AcT>`, if available, are returned only when `<n>=2` and MT is registered in the network. The parameters `[,<cause_type>,<reject_cause>]`, if available, are returned when `<n>=3`.

The test command returns values supported as a compound value.

7.2.3 Defined Values

n

Integer.

Table 103. n

Value	Description
0	Disable network registration unsolicited result code
1	Enable network registration unsolicited result code `+CEREG: <stat>`
2	Enable network registration and location information unsolicited result code `+CEREG: <stat>[,[<tac>],[<ci>],[<AcT>]]`
3	Enable network registration, location information and EMM cause value information unsolicited result code `+CEREG:` `<stat>[,[<tac>],[<ci>],[<AcT>][,<cause_type>,<reject_cause >]]`
4	For a UE that 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>],[<re`
	`ject_cause>][,[<Active-Time>],[<Periodic-TAU>]]]]`

stat

Integer. Indicates the EPS registration status.

Table 104. stat

Value	Description
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 (for example, 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)

Value	Description
80	This code is a proprietary notification. Registered, temporary connection lost. A PLMN loss indication is received from RRC.

Note: 2. 3GPP TS 24.008 [8] and 3GPP TS 24.301 [83] specify the condition when the MS is considered as attached for emergency bearer services.

tac

   String type; two byte tracking area code in hexadecimal format (for example, "00C3" equals 195 in decimal).

ci

   String type; four byte E-UTRAN cell ID in hexadecimal format

AcT

   Integer. The parameter sets/shows the access technology of the serving cell.

Table 105.   AcT

Value	Description
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

Note: 3. 3GPP TS 44.060 [71] specifies the System Information messages which give the information about whether the serving cell supports EGPRS.
   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. Indicates the type of `<reject_cause>`.

Table 106.   cause_type

Value	Description
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>`.

Active-Time

　　String type; one byte in an 8 bit format. Indicates the Active Time value (T3324) allocated to the UE in E-UTRAN. The Active Time value is coded as one byte (octet 3) of the GPRS Timer 2 information element coded as bit format (for example, "00100100" equals 4 minutes). For the coding and the value range, see the GPRS Timer 2 IE in 3GPP TS 24.008 [8] Table 10.5.163/3GPP TS 24.008. See also 3GPP TS 23.682 [149] and 3GPP TS 23.401 [82].

Periodic-TAU

　　String type; one byte in an 8 bit format. Indicates the extended periodic TAU value (T3412) allocated to the UE in E-UTRAN. The extended periodic TAU value is coded as one byte (octet 3) of the GPRS Timer 3 information element coded as bit format (for example, "01000111" equals 70 hours). For the coding and the value range, see the GPRS Timer 3 IE in 3GPP TS 24.008 [8] Table 10.5.163a/3GPP TS 24.008. See also 3GPP TS 23.682 [149] and 3GPP TS 23.401 [82].

7.3　Extended Signal Quality: AT+CESQ

Note: This command is described in 3GPP TS 27.007. See Section References.

7.3.1　Syntax

Command	Possible Response(s)
AT+CESQ	+CESQ: <rxlev>,<ber>,<rscp>,<ecno>,<rsrq>,<rsrp> +CME ERROR: <err>
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)

7.3.2　Description

The command returns received signal quality parameters. The only meaningful parameters are $<rsrq>$ and $<rsrp>$. All other parameters are kept for compatibility reasons and either set to 99 (<rxlev>, <ber>) or 255 ($<rscp>$, $<ecno>$).

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

Test command returns values supported as compound values.

7.3.3　Defined Values

rxlev

　　Integer. Received signal strength level (see 3GPP TS 45.008 [20] subclause 8.1.4). Always set to 99 ('unknown').

ber

　　Integer. Channel bit error rate (in percent). Always set to 99 ('unknown').

rscp

　　Integer. Received signal code power (see 3GPP TS 25.133 [95] subclause 9.1.1.3 and 3GPP TS 25.123 [96] subclause 9.1.1.1.3). Always set to 225 ('unknown')

ecno

　　Integer. Ratio of the received energy per PN chip to the total received power spectral density (see 3GPP TS 25.133 [95] subclause). Always set to 255 ('unknown').

rsrq

　　Integer. Reference signal received quality (see 3GPP TS 36.133 [96] subclause 9.1.7).

Table 107.　　rsrq

Value	Description
0	rsrq < -19.5 dB
1	-19.5 dB ≤ rsrq < -19 dB
2	-19 dB ≤ rsrq < -18.5 dB

Value	Description
...	...
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. Reference signal received power (see 3GPP TS 36.133 [96] subclause 9.1.4).

Table 108. rsrp

Value	Description
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

7.4   Indicator Control: AT+CIND

Note: This command is described in 3GPP TS 27.007. See Section References.

7.4.1   Syntax

Command	Possible Response(s)
AT+CIND=[<ind>[,<ind>,[...]]]	+CME ERROR: <err>
AT+CIND?	+CIND: <ind>[,<ind>[...]] +CME ERROR: <err>
AT+CIND=?	+CIND: ("battchg",(0)),("signal",(0)), ("service",(0,1)),("sounder",(0)),("message",(0)), ("call",(0)),("vox",(0)),("roam",(0,1)), ("smsfull",(0)),("inputstatus",(0)), ("simsmsfull",(0-2))

7.4.2　Description

The command is used to set the values of MT indicators. `<ind>` value 0 means that the indicator is off (or in a state which can be identified as "off" state), 1 means that indicator is on (or in a state which is more active than the "off" state), 2 is more substantial than 1, and so on. If the indicator is a simple on/off style element, it has values 0 and 1. The number of elements is MT specific. If MT does not allow setting of indicators or MT is not currently reachable, `+CME ERROR: <err>` is returned.

If an indicator is not writable, its setting should be ignored. If parameter is empty field, the indicator is unchanged.

The read command returns the status of MT indicators. If MT is not currently reachable, `+CME ERROR: <err>` is returned.

The test command returns pairs, where string value `<descr>` is a maximum 16 character description of the indicator and compound value is the allowed values for the indicator. If MT is not currently reachable, `+CME ERROR: <err>` is returned.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

Note: MT manufacturer should offer the description of supported indicators not listed here and their value ranges and default values.

7.4.3　Defined Values

ind

　　Integer type value, which shall be in range of corresponding `<descr>`

descr

　　String values reserved by the present document and their `<ind>` ranges.

Note: "battchg", "sounder", "call", "vox", "inputstatus" are currently not supported.

Table 109.　　descr

Value	Description
"battchg"	battery charge level (0-5)
"signal"	signal quality (0-5)
"service"	service availability (0,1)
"sounder"	sounder activity (0,1)
"message"	message received (0,1)
"call"	call in progress (0,1)
"vox"	transmit activated by voice activity (0,1)
"roam"	roaming indicator (0,1)
"smsfull"	a short message memory storage in the MT is full and a short message has been rejected (2), is full (1), or not full (0)
"inputstatus"	keypad/touch screen status (0, 1)

7.5 Report Mobile Termination Error: AT+CMEE

Note: This command is described in 3GPP TS 27.007. See Section References.

7.5.1 Syntax

Command	Possible Response(s)
AT+CMEE=<n>	+CME ERROR: <err>
AT+CMEE?	+CMEE: <n>
AT+CMEE=?	+CMEE: (list of supported <n>s)

7.5.2 Description

This command disables or enables the use of final result code +CME ERROR: <err> as an indication of an error relating to the functionality of the MT.

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

The test command returns values supported as a compound value.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

7.5.3 Defined Values

n

Integer. 0,1, or 2. Defines the form of the final result code.

Table 110.   n

Value	Description
0	Disable +CME ERROR: <err> result code and use ERROR instead
1	Enable+CME ERROR: <err> result code and use numeric <err> values
2	Enable +CME ERROR: <err> result code and use verbose<err> values

7.6 Mobile Termination Error Result Code: +CME ERROR

Note: This command is described in 3GPP TS 27.007. The error codes reported here are from 3GPP TS 27.007 and 3GPP TS 27.005. See Section References.

7.6.1 Syntax

Command	Possible Response(s)
	+CME ERROR: <err>

7.6.2 Description

The +CME ERROR: <err> final result code is similar to the regular ERROR result code: if +CME ERROR: <err> is the result code for any of the commands in a command line, none of the following commands in the same command line is executed (neither ERROR nor OK result code shall be returned as a result of a completed command line execution). The format of <err> can be either numeric or verbose. This is set with command AT+CMEE, see Section 7.5 Report Mobile Termination Error: AT+CMEE on page 121.

7.6.3   CME/CMS Error Defined Values

err

   Integer. Error code.

Table 111.   General "CME ERROR" Codes (3GPP TS 27.007)

Code	Description
0	Equipment failure
1	No connection
2	Phone adaptor 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 (see note1)
11	SIM PIN required
12	SIM PUK required
13	SIM failure (See Note 1)
14	SIM busy (See Note 1)
15	SIM wrong (See Note 1)
16	Incorrect password
17	SIM PIN2 required
18	SIM PUK2 required
20	Memory full
21	Invalid index
22	Not found
23	Memory failure
24	Text string too long
25	Invalid characters in text string
26	Dial string too long
27	Invalid characters in dial string
30	No network service
31	Network timeout
32	Network not allowed - emergency calls only
40	Network 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

Code	Description
48	Hidden key required (See Note 2)
49	EAP method not supported
50	Incorrect parameters
60	System failure
100	Unknown error
528	Upgrade failed: General error
529	Upgrade failed: Corrupted image
530	Upgrade failed: Invalid signature
531	Upgrade failed: Network error
532	Upgrade failed: Upgrade already in progress
533	Upgrade cancel failed: No upgrade in progress
540	HW configuration failed: General error
541	HW configuration failed: Invalid function
542	HW configuration failed: Invalid function parameter
543	HW configuration failed: pin(s) already assigned to another function

Note: 1. This error code is also applicable to UICC.
      2. This key is required when accessing hidden phonebook entries.

Table 112.   **EPS related "CME ERROR" Codes (3GPP TS 27.007) – Perform an Attach**

Code	Description
103	Illegal MS (#3)
106	Illegal ME (#6)
107	GPRS services not allowed (#7)
108	GPRS Services and Non-GPRS Services Not Allowed (#8)
111	PLMN not allowed (#11)
112	Location area not allowed (#12)
113	Roaming not allowed in this location area (#13)
114	GPRS Services Not Allowed in This PLMN (#14)
115	No Suitable Cells in Location Area (#15)
122	Congestion (#22)
125	Not authorized for this CSG (#25)
172	Semantically Incorrect Message (#95)
173	Mandatory Information Element Error (#96)
174	Information Element Non-existent or not implemented (#97)
175	Conditional IE Error (#99)
176	Protocol Error, Unspecified (#111)

Note: Values in parentheses are 3GPP TS 24.008 [8] cause codes.

Table 113.   EPS related "+CMS ERROR" Codes (3GPP TS 27.005) – Activate a Context

Code	Description
126	Operation Temporarily Not Allowed
127	Missing or Unknown APN (#27)
128	Unknown PDP Address or PDP Type (#28)
129	User Authentication Failed (#29)
130	Activation Rejected by GGSN, Serving GW or PDN GW (#30)
131	activation Rejected, Unspecified (#31)
132	Service Option Not Supported (#32)
133	Requested Service Option Not Subscribed (#33)
134	Service Option Temporarily Out of Order (#34)
140	Feature Not Supported (#40)
141	Semantic Error in the TFT Operation (#41)
142	Syntax Error in the TFT Operation (#42)
143	Unknown PDP Context (#43)
144	Semantic Errors in Packet Filter(s) (#44)
145	Syntax Errors in Packet Filter(s) (#45)
146	PDP Context Without TFT Already Activated (#46)
149	PDP Authentication Failure
177	Operator Determined Barring (#8)
178	Maximum Number of PDP Contexts Reached (#65)
179	Requested APN Not Supported in Current RAT and PLMN Combination (#66)
180	Request Rejected, Bearer Control Mode Violation (#48)
181	Unsupported QCI Value (#83)

Note: 1. Values in parentheses are 3GPP TS 24.008 [8] cause codes.
      2. Values in parentheses for error code 181 are 3GPP TS 24.301 [83] cause codes.

Table 114.   EPS related "+CMS ERROR" Codes (3GPP TS 27.005) – Disconnect a PDN

Code	Description
171	Last PDN Disconnection Not Allowed (#49)

Note: 1. This error is returned when the MT detects an attempt to disconnect the last PDN or the network returns a response message with cause value #49.
      2. Values in parentheses are 3GPP TS 24.301 [83] cause codes.
      3. The numeric error code for 'Last PDN disconnection not allowed (#49)' changed to 171 since 3GPP Rel 11.

Table 115.   Other Proprietary Error Codes

Code	Description
550	Cell Info Reporting Failure, Incorrect/Inconsistent Parameters
551	Cell Info Reporting Failure, MT Not Registered and Not Searching
552	Cell Info Reporting Failure, MT Searching for Network
553	Cell Info Reporting Failure, MT out of Coverage
554	Cell Info Reporting Failure, Cell Measurements Temporary Unavailable
555	Cell Info Reporting Failure, Unknown Error
570	Coverage Enhancement Mode Information Not Available
580	HTTP Failure, Incorrect Connection HTTP Profile Parameters
581	HTTP Failure, Incorrect Connection Security Profile Parameters
582	HTTP Failure, MT not Registered and not Searching
583	HTTP Failure, MT Searching for Network
584	HTTP Failure, MT out of Coverage
585	HTTP Failure, Unknown Network Error
586	HTTP Failure, Connection Error (See the +SQNHTTPSH Notification for Failure Cause)
587	HTTP Failure, Internal Data Buffer Full
588	HTTP Failure, No Pending Data

7.7   Mobile Termination Event Reporting: AT+CMER

Note: This command is described in 3GPP TS 27.007. See Section References.
See the current implementation limitation in the parameter's description.

7.7.1   Syntax

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

7.7.2 Description

The command enables or disables sending of unsolicited result codes from TA to TE in the case of key strokes, 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.

Test command returns the modes supported as compound values.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

7.7.3 Defined Values

Caution: Restriction: only the following parameters are supported:

- `<mode>`: '3'
- `<keyp>`: '0'
- `<disp>`: '0'
- `<ind>`: '0' or '1' or '2'
  When `<ind>` is set to '1' or '2', the notification `+CIEV` is used (when supported). Only the notifications 'SERVICE', 'SMS FULL' and 'ROAMING' are supported. 'SMS FULL' is a proprietary notification.
- `<bfr>`: '0'
- `<tscrn>`: '0'

The parameter `<orientation>` is not supported.

mode

Integer. 0, 1, 2, or 3.

Table 116.   mode

Value	Description
0	Buffer unsolicited result codes in the TA; if the 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 (for example, in online data mode); otherwise forward them directly to the TE
2	Buffer unsolicited result codes in the TA when TA-TE link is reserved (for example, 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. 0, 1, or 2.

Table 117.   keyp

Value	Description
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 AT+CKPD") and <press> the action (1 for pressing and 0 for releasing). Only those key pressings, which are not caused by AT+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.

Value	Description
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. 0, 1, or 2.

Table 118.   disp

Value	Description
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 AT+CDIS) and <text> is the new value of text element. Only those display events, which are not caused by AT+CDIS shall be indicated by the TA to the TE. The character set used in <text> is as specified by command Select TE Character Set AT+CSCS
2	Display event reporting using unsolicited result code +CDEV: <elem>,<text>. All display events are directed from TA to TE. The character set used in <text> is as specified by command Select TE Character Set AT+CSCS

ind

Integer. 0,1, or 2. Event indicator.

Table 119.   ind

Value	Description
0	No indicator event reporting
1	Indicator event reporting using unsolicited result code AT+CIEV: <ind>,<value>. <ind> (when supported) 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 are indicated by the TA to the TE
2	Indicator event reporting using unsolicited result code AT+CIEV: <ind>,<value> (when supported). All indicator events shall be directed from TA to TE.

bfr

Integer. 0 or 1.

Table 120.   bfr

Value	Description
0	The TA buffer of unsolicited result codes defined within this command is cleared when <mode> 1...3 is entered.
1	The 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 [0-6]. Touch screen event.

Table 121.   tscrn

Value	Description
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 AT+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 AT+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 AT+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 mode. 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 AT+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 AT+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 AT+CTSA) and the <id> identifies any simultaneous touch (as specified for AT+CTSA). Only those touch screen events, which are not caused by AT+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 mode. 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 AT+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. 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 `AT+CSO`).

Table 122.   orientation

Value	Description
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.

7.8   Read Operator Names: AT+COPN

Note: This command is described in 3GPP TS 27.007. See Section References.

7.8.1   Syntax

Command	Possible Response(s)
AT+COPN	`+COPN:<numeric1>,<alpha1>[<S3><S4>+COPN:<numeric2>,<alpha2>[...]]` `+CME ERROR: <err>`
AT+COPN=?	

Note: `<S3>` and `<S4>` represent the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 and Response Formatting Character: ATS4.

7.8.2   Description

This command returns the list of operator names from the MT. Each operator code `<numericn>` that has an alphanumeric equivalent `<alphan>` in the MT memory shall be returned.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

7.8.3   Defined Values

numericn

String type; operator ID in numeric format (see `PLMN Selection: AT+COPS`).

alphan

String type; operator ID in long alphanumeric format (see `PLMN Selection: AT+COPS`).

7.9   PLMN Selection: AT+COPS

Note: This command is described in 3GPP TS 27.007. See Section References.

7.9.1   Syntax

Command	Possible Response(s)
AT+COPS[<mode>[,<format> [,<oper>[,<AcT>]]]]	`+CME ERROR: <err>`

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

RENESAS

7.9.2   Description

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

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

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

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

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

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

Note: The command is only available in operational mode (`CFUN =1`).

7.9.3   Defined Values

mode

Integer.0, 1, 2, 3, or 4.

Table 123.   mode

Value	Description
0	Automatic (`<oper>` field is ignored)
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. 0, 1, or 2.

Table 124. format

Value	Description
0	Long format alphanumeric `<oper>`
1	Short format alphanumeric `<oper>`
2	Numeric `<oper>`

oper

String type; `<format>` indicates that if the format is alphanumeric or numeric; long alphanumeric format can be up to 16 characters long and short format up to 8 characters (refer to GSM MoU SE.13 [9]); numeric format is the GSM Location Area Identification number (refer 3GPP TS 24.008 [8] 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. 0, 1, 2, or 3.

Table 125. stat

Value	Description
0	Unknown
1	Available
2	Current
3	Forbidden

AcT

Integer [0-9]. The parameter sets/shows the access technology selected.

Table 126. AcT

Value	Description
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

Value	Description
8	EC-GSM-IoT (A/Gb mode) (see Note 3)
9	E-UTRAN (NB-S1 mode) (see Note 4)

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

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

3. 3GPP TS 44.018 [156] specifies the EC-SCH INFORMATION message which, if present, indicates that the serving cell supports EC-GSM-IoT.

4. 3GPP TS 36.331 [86] specifies the System Information blocks which give the information about whether the serving cell supports NB-IoT, which corresponds to E-UTRAN (NB-S1 mode).

7.10 Phone Activity Status: AT+CPAS

Note: This command is described in 3GPP TS 27.007. See Section References.

7.10.1 Syntax

Command	Possible Response(s)
AT+CPAS	`+CPAS:` <pas>
	`+CME ERROR:` <err>
AT+CPAS=?	`+CPAS:` list of supported <pas>s
	`+CME ERROR:` <err>

7.10.2 Description

This command returns the activity status <pas> of the MT. It can be used to interrogate the MT before requesting action from the phone. Test command returns values supported by the MT as a compound value.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

7.10.3 Defined Values

pas
    Integer [0-128].

Caution: Only 0, 4 and 5 values are currently implemented. All other values are reserved.

Table 127.   pas

Value	Description
0	Ready (MT allows commands from TA/TE)
1	Unavailable (MT does not allow commands from TA/TE)
2	Unknown (MT is not guaranteed to respond to instructions)
3	Ringing (MT is ready for commands from TA/TE, but the ringer is active)
4	Call in progress (MT is ready for commands from TA/TE, but a call is in progress)
5	Asleep (MT is unable to process commands from TA/TE because it is in a low functionality state)
6..128	Reserved

7.11 Selection of Preferred PLMN List: AT+CPLS

Note: This command is described in 3GPP TS 27.007. See Section References.

7.11.1 Syntax

Command	Possible Response(s)
AT+CPLS<list>	`+CME ERROR: `<err>
AT+CPLS?	`+CPLS:`<list> `+CME ERROR: `<err>
AT+CPLS=?	`+CPLS:` (list of supported <list>s) `+CME ERROR: `<err>

7.11.2 Description

This command selects one PLMN selector with Access Technology list in the SIM card or active application in the UICC (GSM or USIM), that is used by `AT+CPOL` command.

The read command returns the selected PLMN selector list from the SIM/USIM.

The test command returns the whole index range supported lists by the SIM/USIM.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

7.11.3 Defined Values

list

Integer. 0, 1, or 2.

Table 128.   list

Value	Description
0	User controlled PLMN selector with Access Technology EFPLMNwAcT, if not found in the SIM/UICC then PLMN preferred list EFPLMNsel (this file is only available in SIM card or GSM application selected in UICC)
1	Operator controlled PLMN selector with Access Technology EFOPLMNwAcT
2	HPLMN selector with Access Technology EFHPLMNwAcT

7.12 Power Saving Mode Setting: AT+CPSMS

Note: This command is described in 3GPP TS 27.007. See Section References.

7.12.1 Syntax

Command	Possible Response(s)
+CPSMS=[<mode>[,<Request ed_Periodic-RAU>[,<Requested_GPRSREADYtimer>[,<Requested_Periodic-TAU>[,<Requested_Active- Time>]]]]]	`OK` `+CME ERROR: `<err>
+CPSMS?	`+CPSMS:`<mode>,[<Requested_Periodic-RAU>],[<Requested_GPRS-READYtimer>],[<Requested_Periodic-TAU>],[<Requested _Active-Time>]

Command	Possible Response(s)
+CPSMS=?	`+CPSMS:`(list of supported <mode>s),(list of supported <Requested_Periodic-RAU>s),(list of supported <Requested_GPRS-READY-timer>s),(list of supported <Requested_Periodic-TAU>s),(list of supported <Requested_Active-Time>s)

7.12.2 Description

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

A special form of the command can be given as `+CPSMS=2`. In this form, the use of PSM is disabled and the value of all parameters listed in the command `+CPSMS` are cleared or, if possible, set to the manufacturer specific default values.

The read command returns the current parameter values.

The test command returns the supported <mode>s and the value ranges for the requested extended periodic RAU value and the requested GPRS READY timer value in GERAN/UTRAN, the requested extended periodic TAU value in EUTRAN and the requested Active Time value as compound values.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

7.12.3 Defined Values

mode

    Integer [0-2]. Indication to disable or enable the use of PSM in the UE.

Table 129.   **mode**

Value	Description
0	Disable the use of PSM
1	Enable the use of PSM
2	Disable the use of PSM and discard all parameters for PSM or, if available, reset to the manufacturer specific default values.

Requested_Periodic-RAU

    String type; one byte in an 8-bit format. Requested extended periodic RAU value (T3312) to be allocated to the UE in GERAN/UTRAN. The requested extended periodic RAU value is coded as one byte (octet 3) of the GPRS Timer 3 information element coded as bit format (for example, "01000111" equals 70 hours). For the coding and the value range, see the GPRS Timer 3 IE in 3GPP TS 24.008 [8] Table 10.5.163a/3GPP TS 24.008. See also 3GPP TS 23.682 [149] and 3GPP TS 23.060 [47]. The default value, if available, is manufacturer specific.

Requested_GPRS-READY-timer

    String type; one byte in an 8-bit format. Requested GPRS READY timer value (T3314) to be allocated to the UE (byte 2) of the GPRS Timer information element coded as bit format (for example, "01000011" equals 3 decihours or 18 minutes). For the coding and the value range, see the GPRS Timer IE in 3GPP TS 24.008 [8] Table 10.5.172/3GPP TS 24.008. See also 3GPP TS 23.060 [47]. The default value, if available, is manufacturer specific.

Requested_Periodic-TAU

> String type; one byte in an 8-bit format. Requested extended periodic TAU value (T3412) to be allocated to the UE in E-UTRAN. The requested extended periodic TAU value is coded as one byte (octet 3) of the GPRS Timer 3 information element coded as bit format (for example, "01000111" equals 70 hours). For the coding and the value range, see the GPRS Timer 3 IE in 3GPP TS 24.008 [8] Table 10.5.163a/3GPP TS 24.008. See also 3GPP TS 23.682 [149] and 3GPP TS 23.401 [82]. The default value is set to 180 s.

Requested_Active-Time

> String type; one byte in an 8-bit format. Requested Active Time value (T3324) to be allocated to the UE. The requested Active Time value is coded as one byte (octet 3) of the GPRS Timer 2 information element coded as bit format (for example, "00100100" equals 4 minutes). For the coding and the value range, see the GPRS Timer 2 IE in 3GPP TS 24.008 [8] Table 10.5.163/3GPP TS 24.008. See also 3GPP TS 23.682 [149], 3GPP TS 23.060 [47] and 3GPP TS 23.401 [82]. The default value is set to 60 s.

7.13 Network Registration: +CREG

Note: This command is described in 3GPP TS 27.007. See Section References.

7.13.1 Syntax

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

7.13.2 Description

Set command controls the presentation of an unsolicited result code `+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 unsolicited result code `+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. The value `<n>=3` further extends the unsolicited result code with `[,<cause_type>,<reject_cause>]`, when available, when the value of `<stat>` changes.

Note: If the MT also supports GPRS services and/or EPS services, the `+CGREG` command and `+CGREG:` result codes and/or the `+CEREG` command and `+CEREG:` result codes apply to the registration status and location information for those services.

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`.

Test command returns values supported as a compound value.

See also #unique_195 for <err> values.

7.13.3 Defined Values

n

> Integer.

Table 130.　　n

Value	Description
0	disable network registration unsolicited result code
1	enable network registration unsolicited result code `+CREG: <stat>`

Value	Description
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. Indicates the circuit mode registration status.

Table 131.   stat

Value	Description
0	not registered, MT is not currently searching an 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 (for example, 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 below)
9	registered for "CSFB not preferred", home network (not applicable)
10	registered for "CSFB not preferred", roaming (not applicable)

Note: 2. 3GPP TS 24.008 [8] and 3GPP TS 24.301 [83] specify the condition when the MS is considered as attached for emergency bearer services.

tac

String type; two byte tracking area code in hexadecimal format (for example, "00C3" equals 195 in decimal).

ci

String type; four byte E-UTRAN cell ID in hexadecimal format

AcT

Integer. The parameter sets/shows the access technology of the serving cell.

Table 132.   AcT

Value	Description
0	GSM (not applicable)
1	GSM Compact (not applicable)
2	UTRAN (not applicable)
3	GSM w/EGPRS (see Note 3) (not applicable)

Value	Description
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

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

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

5. 3GPP TS 44.018 [156] specifies the EC-SCH INFORMATION message which, if present, indicates that the serving cell supports EC-GSM-IoT.

6. 3GPP TS 36.331 [86] specifies the System Information blocks which give the information about whether the serving cell supports NB-IoT, which corresponds to E-UTRAN (NB-S1 mode).

cause_type

Integer. Indicates the type of `<reject_cause>`.

Table 133.   cause_type

Value	Description
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>`.

7.14 Signal quality: AT+CSQ

Note: This command is described in 3GPP TS 27.007. See Section References.

7.14.1 Syntax

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

7.14.2 Description

This command returns received signal strength indication `<rssi>`. The channel bit error rate `<ber>` parameter is kept for compatibility reasons but is always set to 99.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

The test command returns values supported as compound values.

7.14.3 Defined Values
rssi

Integer. Received signal strength indicator.

Table 134.   **rssi**

Value	Description
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. Channel bit error rate (in percent). Always 99 ('unknown').

7.15 Time Zone Reporting: AT+CTZR

Note: This command is described in 3GPP TS 27.007. See Section References.

7.15.1 Syntax

Command	Possible Response(s)
AT+CTZR=<reporting>	`+CME ERROR:` <err>
AT+CTZR?	`+CTZR:` <reporting> `+CME ERROR:` <err>
AT+CTZR=?	`+CTZR:` (list of supported <reporting>s `+CME ERROR:` <err>

7.15.2 Description

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

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

The read command returns the current reporting settings in the MT.

The test command returns supported <reporting>-values.

Note: The Time Zone reporting is not affected by the Automatic Time Zone setting command, AT+CTZU.

7.15.3 Defined Values
reporting

Integer: 0, 1, or 2.

Table 135.   **reporting**

Value	Description
0	Disable time zone change event reporting.
1	Enable time zone change event reporting by unsolicited result code `+CTZV:` `<tz>`.

Value	Description
2	Enable extended time zone reporting by unsolicited result code `+CTZE: <tz>,<dst>,[<time>]`.

tz

> String type value representing the sum of the local time zone (difference between the local time and GMT expressed in quarters of an hour) plus daylight saving time. The format is "±zz", expressed as a fixed width, two digit integer with the range -48 ... +56. To maintain a fixed width, numbers in the range -9 ... +9 are expressed with a leading zero, for example, "-09", "+00" and "+09".

dst

> Integer. Value indicating whether `<tz>` includes daylight savings time (DST) adjustment.

Table 136.　dst

Value	Description
0	`<tz>` includes no adjustment for Daylight Saving Time
1	includes +1 hour (equals 4 quarters in `<tz>`) adjustment for Daylight Saving Time
2	`<tz>` includes +2 hours (equals 8 quarters in `<tz>`) adjustment for Daylight Saving Time

time

> String type value representing the local time. The format is "YYYY/MM/DD,hh:mm:ss", expressed as integers representing year (YYYY), month (MM), date (DD), hour (hh), minute (mm) and second (ss). This parameter can be provided by the network at the time of delivering time zone information and will be present in the extended time zone reporting unsolicited result code if provided by the network.

7.15.4 Unsolicited Result Codes: +CTSE, +CTZV

URC	Description
+CTZE:<tz>,<dst>,[<time>]	If reporting is enabled and according to the value of <reporting> (1 or 2), the MT returns the unsolicited result code `+CTZV: <tz>` or `+CTZE:<tz>,<dst>, [<time>]` whenever the time zone is changed or, for <reporting>=2, when a time adjustment results in a leap greater than 10 seconds. The MT also provides the time zone upon network registration, if provided by the network.
+CTZV:<tz>	

7.16 Automatic Time Zone Update: AT+CTZU

Note: This command is described in 3GPP TS 27.007. See Section References.

7.16.1 Syntax

Command	Possible Response(s)
AT+CTZU=<onoff>	`+CME ERROR: <err>`
AT+CTZU?	`+CTZU: <onoff>` `+CME ERROR: <err>`
AT+CTZU=?	`+CTZU: (list of supported <onoff>s` `+CME ERROR: <err>`

7.16.2 Description

This command enables and disables the automatic time zone update via NITZ/SIB16. If the setting fails, `+CME ERROR: <err>` is returned.

The new time zone information is applied immediately and survives resets, reboots and upgrades.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

The read command returns the current settings in the MT.

The test command returns supported on- and off-values.

7.16.3 Defined Values

onoff

　　Integer. 0 or 1. Boolean switch.

Table 137.   onoff

Value	Description
0	Disable automatic time zone update via NITZ.
1	Enable automatic time zone update via NITZ.

7.17 Retrieve Current GUTI: AT+SQNGUTI

7.17.1 Syntax

Command	Possible Response(s)
AT+SQNGUTI?	SQNGUTI:<mmeGrpId>,<mmeCode>,<mTmsi> OK

7.17.2 Description

This command reads Globally Unique Temporary ID (GUTI) assigned to the UE by the network.

This identifier is composed of:

- PLMN (3 Bytes), Public Land Mobile Network: <plmn>
- MME Group ID (2 Bytes), MME Group Identifier: <mmeGrpId>
- MME Code (1 Byte), MME Code: <mmeCode>
- M-TMSI (4 Bytes), MME temporary Mobile Subscriber Identity: <mTmsi>

7.17.3 Defined Values

plmn

　　Numeric. Public Land Mobile Network in hexadecimal format. Empty if unknown.

mmeGrpId

　　Numeric. MME Group Identifier in hexadecimal format. Empty if unknown.

mmeCode

　　Numeric. MME Code in hexadecimal format. Empty if unknown.

mTmsi

　　Numeric. 4 bytes MME temporary Mobile Subscriber Identity in hexadecimal format. Empty if unknown.

7.18 Read the Home PLMN: AT+SQNHPLMN

7.18.1 Syntax

Command	Possible Response(s)
AT+SQNHPLMN?	+SQNHPLMN:<num_oper>,<short_oper>, <long_oper>, OK

7.18.2 Description

This command reads the HPLMN.

7.18.3 Defined Values

num_oper

> Numeric format: the GSM Location Area Identification number (refer to 3GPP TS 24.008 [8] subclause 10.5.1.3). Country code with three BCD digits coded as in ITU-T Recommendation E.212 [10] Annex A, plus a two BCD digit network code, which is administration specific.

> The returned `<num_oper>` value is not in BCD format, but in IRA characters converted from BCD, so the number has the following format:

> `(country digit3)(country digit2)(country digit1)(network digit3)(network digit2)(network digit1)`

short_oper

> String. Short alphanumeric format of the operator name: up to 8 characters (refer to GSM MoU SE.13 [9]).

long_oper

> String. Long alphanumeric format of the operator name, up to 16 characters.

7.18.4 Example

```
AT+SQNHPLMN?
+SQNHPLMN: "00101","TEST","Aeroflex"
OK
```

7.19 Informal Network Scanning: AT+SQNINS

7.19.1 Syntax

Command	Possible Response(s)
AT+SQNINS=<action>	+SQNINS:<action>,<rb>,<ratINS>,<cell_Id>,<tac>,<plmn>,<earfcn>,<pci>,<bandwidth Download>, <rsrp>, <rsrq> [+SQNINS:...] +CME ERROR:**<err>** OK
AT+SQNINS=?	+SQNINS:<action range> OK
AT+SQNINS?	+CME ERROR:**<err>**

7.19.2 Description

The write command triggers an informal network scanning (INS).

This command scans all bands supported by the modem for surrounding cells, then collects information about them.

Refer to the AT Commands Use Cases manual for further information.

7.19.3 Defined Values

action

> Integer 0 or 1. Type of scan.

Table 138.   action

Value	Description
0	Full informal network scanning. This scanning enables a full reporting of information extracted from MIB (Master information Block) and SIB1 (System Information Block 1).

Value	Description
1	Fast informal network scanning. This scanning enables a reporting of information extracted from MIB (Master information Block) only.

rb

Integer. Radio band (band_id)

ratINS

Integer, 7. Radio Access Technology.

Table 139.   ratINS

Value	Description
7	E-UTRAN.

cell_Id

Integer. Cell ID

tac

Integer. Tracking Area Code

plmn

Integer. Numeric PLMN, including MCC(Mobile Country Code)+MNC(Mobile Network Code).

earfcn

Integer. Downlink E-UTRAN Absolute Radio Frequency Channel Number.

pci

Integer. Physical Cell ID.

bandwidthDownload

String. Downlink bandwidth in MHz. See the software release note for the list of supported bandwidths.

Note: Cat-M devices are able to decode 4G MIBs, but unable to decode SIB1 for non-Cat-M cells. In this case the cell_Id, PLMN and tac information is not provided.

Table 140.   bandwidthDownload

Value	Description
1.4	1400 kHz
3	3000 kHz
5	5000 kHz
10	10000 kHz
15	15000 kHz
20	20000 kHz

rsrp

Num float. Reference Signal Received Power in dBm.

rsrq

Num float. Reference Signal Received Quality in dB.

7.19.4 Examples

- Full scanning

```
AT+SQNINS=0

+SQNINS: 0,4,7,"1A2D006","0001","00101",2350,6,10,-107.80,-5.80
+SQNINS: 0,13,7,"1A2E005","0001","00101",5230,5,10,-94.90,-5.20
+SQNINS: 0,4,7,"0","0000","000000",2050,2,20,-107.50,-6.10

OK
```

- Fast scanning

```
AT+SQNINS=1

+SQNINS: 1,13,7,"1A2E005","0001","00101",5230,5,10,-94.50,-3.60
+SQNINS: 1,4,7,"0","0000","000000",2050,2,1.4,-104.90,-2.90
+SQNINS: 1,4,7,"1A2D006","0001","00101",2350,6,10,-107.90,-5.90

OK
```

- Test command

```
AT+SQNINS=?
(0-1)

OK
```

7.20 Support of Cell Monitoring: AT +SQNMONI

7.20.1 Syntax

7.20.2 Syntax

Command	Possible Response(s)

AT+SQNMONI=<n>	• When extracting data for the serving cell and the network name is known:
	`+SQNMONI: <netmame> RSRP:<rsrp> RSRQ:<rsrq> TAC:<tac>`
	
	`Id:<id> EARFCN:<earfcn> PWR:<dBm> PAGING:<drx>`
	
	• When the network name is unknown:
	`+SQNMONI: Cc:<cc> Nc:<nc> RSRP:<rsrp> RSRQ:<rsrq>`
	
	`TAC:<tac>`
	
	`Id:<id> EARFCN:<earfcn> PWR:<dBm> PAGING:<drx>`
	
	• When extracting data from neighbour cells:
	`+SQNMONI: RSRP:<rsrp> RSRQ:<rsrq> Id:<id> EARFCN:<earfcn>`
	
	`PWR:<dBm>`
	
	• If report type #8 is selected, "RSRP:<rsrp>" is replaced by RSRP/CINR per receiver, like "RSRP0:<rsrp0> RSRP1:<rsrp1> CINR0:<cinr0> CINR1:<cinr1>"
	• `+CME ERROR: <err>`

AT+SQNMONI?	`+SQNMONI:`**<n>** `OK`

AT+SQNMONI=?	`+SQNMONI:(0, 1, 2, 7, 9)`
	
	`OK`

7.20.3 Description

This command allows to get information on the serving and neighboring cells. The command returns an error if the <n> parameter is not supported.

Note: The command can also return an error if the modem is not attached to any cell, typically when the CEREG status is 0, 2, 4, or 80, or when the UE is in PSM state. An error can also be returned once in a while when the CEREG status code is 1 or 5 in RRC CONNECTED or RRC IDLE states (not in PSM): this is a temporary failure due to physical measurements retrieval delay. In such case, please retry the command after a few seconds.

The test command returns values supported as a compound value.

7.20.4 Defined Values

Table 141.   n

Value	Description
0	Report information for the serving cell only
1	Report information for the intra-frequency cells only
2	Report information for the inter-frequency cells only
7	Report information for all cells
8	Report information for the serving cell only with RSRP/CINR on main antenna.

Netname
  String. Name of network operator

Cc
  Country code

Nc
  Network operator code

N
  progressive number of adjacent cell

id
  cell identifier

dBm
  received signal strength (RSSI) in dBm

drx
  DRX cycle in number of radio frames (1 frame = 10ms).

Rsrp
  Float. Reference Signal Received Power

rsrp0
  Float. Reference Signal Received Power on antenna#0.

rsrp1
  Float. Reference Signal Received Power on antenna#1.

cinr0
  Float. Carrier to Interference-plus-Noise Ratio on antenna#0.

cinr1
  Float. Carrier to Interference-plus-Noise Ratio on antenna#1.

Rsrq
   Float. Reference Signal Received Quality

Tac
   Tracking Area Code

Earfcn
   E-UTRA Assigned Radio Channel

Paging
   DRX cycle in number of radio frames (1 frame = 10ms).

7.21 Select Wireless Network: AT+WS46

Note: This command is described in 3GPP TS 27.007. See Section References.

7.21.1 Syntax

Command	Possible Response(s)
AT+WS46<n>	
AT+WS46?	<n>
AT+WS46=?	[list of supported <n>s

7.21.2 Description

Set command selects the WDS side stack <n>to be used by the TA. Read command shows current setting and test command displays side stacks implemented in the TA.

7.21.3 Defined Values

n (read)
   Integer. The values in <n> for the read command are mutually exclusive. A single value is always returned.

Table 142.   n (read)

Value	Description
12	GSM Digital Cellular Systems (GERAN only)
22	UTRAN only
25	3GPP Systems (GERAN, UTRAN and E-UTRAN)
28	E-UTRAN only
29	GERAN and UTRAN
30	GERAN and E-UTRAN
31	UTRAN and E-UTRAN

n (Set)

　　Integer. Refer PCCA STD 101 [17] for other values.

Table 143.　　n (Set)

Value	Description
12	3GPP System
22	Not used. These value are treated as if 12 had been sent. An ERROR may be returned.
25	
28	
29	
30	
31	

8.　Packet Domain Related Commands

8.1　UE Modes of Operation for EPS: AT+CEMODE

Note:　This command is described in 3GPP TS 27.007. See Section References.
　　　　　See the current implementation limitation in `mode` parameter description.

8.1.1　Syntax

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

8.1.2　Description

This command sets the MT to operate according to the specified mode of operation for EPS, see 3GPP TS 24.301 [83]. If the requested mode of operation is not supported, an `ERROR` or `+CME ERROR` response is returned. Extended error responses are enabled by the `AT+CMEE` command.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

The read command returns the mode of operation set by the TE, independent of the current serving cell capability and independent of the current serving cell Access Technology.

The test command is used for requesting information on the supported MT mode of operation.

8.1.3　Defined Values

Caution: Only <mode> 0 and 2 are currently implemented.

mode
　　Integer [0-3]. Indicates the mode of operation.

Table 144.　　mode

Value	Description
0	PS mode 2 of operation
1	CS/PS mode 1 of operation
2	CS/PS mode 2 of operation
3	PS mode 1 of operation

Note: The definition for UE modes of operation can be found in 3GPP TS 24.301 [83]

8.2　PDP Context Activate or Deactivate: AT+CGACT

Note: This command is described in 3GPP TS 27.007. See Section References.

8.2.1　Syntax

Command	Possible Response(s)
AT+CGACT=[<state>[,<cid>[**,<cid>[,...]]]]**	+CME ERROR: <err>
AT+CGACT?	+CGACT: [<cid>,<state>] [<S3><S4>+CGACT:<cid>,<state> [...]]
AT+CGACT=?	+CGACT: (list of supported <state>s)

Note:　<S3> and <S4> represent the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 and Response Formatting Character: ATS4.

8.2.2　Description

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

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

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

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

For EPS, the activation request for an EPS bearer resource will be answered by the network by either an EPS dedicated bearer activation or EPS bearer modification request. The request must be accepted by the MT before the PDP context can be set in to established state.

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

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

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

Note: This command has the characteristics of both the V.250 action and parameter commands. Hence it has the read form in addition to the execution/set and test forms.

8.2.3   Defined Values

state

Integer. 0 or 1. Indicates the state of PDP context activation.

Table 145.   state

Value	Description
0	deactivated
1	activated

cid

Integer. Specifies a particular PDP context definition (see the AT+CGDCONT and AT+CGDSCONT commands).

8.3   PS Attach or Detach: AT+CGATT

Note: This command is described in 3GPP TS 27.007. See Section References.

8.3.1   Syntax

Command	Possible Response(s)
AT+CGATT=<state>	+CME ERROR: <err>
AT+CGATT?	+CGATT: <state>
AT+CGATT=?	+CGATT: (list of supported <state>s)

8.3.2   Description

This 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 AT+CMEE command.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

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

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

The read command returns the current Packet Domain service state.

The test command is used for requesting information on the supported Packet Domain service states.

Note: This command has the characteristics of both the V.250 action and parameter commands. Hence it has the read form in addition to the execution/set and test forms.

8.3.3   Defined Values

state

Integer 0 or 1. Indicates the state of PS attachment.

Note: AT+CGATT=1 will put the UE in automatic attach mode only if AT+CFUN=1 and until the next AT+CFUN=0.

Table 146.   state

Value	Description
0	Detached
1	Attached

8.4   Define PDP Context Authentication Parameters: AT+CGAUTH

Note: This command is described in 3GPP TS 27.007. See Section References.

8.4.1   Syntax

Command	Possible Response(s)
AT+CGAUTH=<cid>[,<auth_prot>[,<userid>[,<password>]]]	`+CME ERROR:` <err>
AT+CGAUTH?	`[+CGAUTH:`<cid>,<auth_prot>,<userid>,<password>]`[<S3><S4>+CGAUTH:`<cid>,<auth_prot>,<userid>,<password> [...]]
AT+CGAUTH=?	`+CGAUTH:` (range of supported <cid>s),(list of supported <auth_prot>s),(range of supported <userid>s),(range of supported <password>s)

Note: <S3> and <S4> represent the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 and Response Formatting Character: ATS4.

8.4.2   Description

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

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for `<err>` values.

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

The test command returns values supported as a compound value.

8.4.3   Defined Values

cid
   Integer type. Specifies a particular PDP context definition (see the AT+CGDCONT and AT+CGDSCONT commands).

auth_prot
   Integer type. 0,1, or 2. Authentication protocol used for this PDP context.

Table 147.   auth_prot

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

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

password
   String type. Password for access to the IP network.

8.5 PDP Context Modify: AT+CGCMOD

Note: This command is described in 3GPP TS 27.007. See Section References.

8.5.1 Syntax

Command	Possible Response(s)
AT+CGCMOD[=<cid>[,<cid>[,...]]]	+CME ERROR: <err>
AT+CGCMOD=?	+CGCMOD: (list of <cid>s with active contexts)

8.5.2 Description

This command is used to modify the QoS and TFTs of the specified PDP context(s). After the command has completed, the MT returns to V.250 online data state. If the requested modification cannot be achieved, an ERROR or +CME ERROR response is returned. Extended error responses are enabled by the AT+CMEE command.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

For EPS, the modification request for an EPS bearer resource will be answered by the network by an EPS bearer modification request. The request must be accepted by the MT before the PDP context is effectively changed.

If no <cid>s are specified the activation form of the command modifies all active contexts.

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

8.5.3 Defined Values

cid
   Integer. Specifies a particular PDP context definition (see the AT+CGDCONT and AT+CGDSCONT commands).

8.6 PDP Context Read Dynamic Parameters: AT+CGCONTRDP

Note: This command is described in 3GPP TS 27.007. See Section References.

8.6.1 Syntax

Command	Possible Response(s)
AT+CGCONTRDP[=<cid>]	[+CGCONTRDP: <cid>,<bearer_id>,<apn> [,<local_addr and subnet_mask>[,<gw_addr> [,<DNS_prim_addr>[,<DNS_sec_addr>[,<P-CSCF_prim_addr> [,<P-CSCF_sec_addr>[,<IM_CN_Signalling_Flag>[,<LIPA_indication>]]]]]]]] [<S3><S4>+CGCONTRDP:<cid>,<bearer_id>,<apn> [,<local_addr and subnet_mask> [,<gw_addr> [,<DNS_prim_addr>[,<DNS_sec_addr>[,<P-CSCF_prim_addr>[,<P-CSCF_sec_addr>[,<IM_CN_Signalling_Flag>[,<LIPA_indication>]]]]]]]][...]]
AT+CGCONTRDP=?	+CGCONTRDP: (list of <cid>s associated with active contexts)

Note: <S3> and <S4> represent the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 and Response Formatting Character: ATS4.

8.6.2　Description

This 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>` and `<LIPA_indication>` 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>` are returned.

If the MT has dual stack capabilities, at least one pair of lines with information is returned per `<cid>`: a first 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 does not have all the IP addresses to be included in a line, such as in case the UE received four IP addresses of DNS servers and two IP addresses of P-CSCF servers, the value corresponding to an unknown IP address 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.

8.6.3　Defined Values

cid

Integer. 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 `AT+CGDCONT` and `AT+CGDSCONT` commands).

bearer_id

Integer. Identifies the bearer, that is, the EPS bearer in EPS and the NSAPI in UMTS/GPRS.

apn

String. A logical name that was used to select the GGSN or the external packet data network.

local_addr, subnet_mask

String. 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 `AT+CGPIAF` is supported, its settings can influence the format of this parameter.

gw_addr

String. Shows the Gateway Address of the MT. The string is given as dot-separated numeric (0-255) parameters.

When `AT+CGPIAF` is supported, its settings can influence the format of this parameter.

DNS_prim_addr

String. Shows the IP address of the primary DNS server.

When `AT+CGPIAF` is supported, its settings can influence the format of this parameter.

DNS_sec_addr

String. Shows the IP address of the secondary DNS server.

When `AT+CGPIAF` is supported, its settings can influence the format of this parameter.

P_CSCF_prim_addr

String. Shows the IP address of the primary P-CSCF server.

When `AT+CGPIAF` is supported, its settings can influence the format of this parameter.

P_CSCF_sec_addr

> String . Shows the IP address of the secondary P-CSCF server.
>
> When `AT+CGPIAF` is supported, its settings can influence the format of this parameter.

IM_CN_Signalling_Flag

> Integer. 0 or 1. Shows whether the PDP context is for IM CN subsystem-related signaling only or not.

Table 148.   IM_CN_Signalling_Flag

Value	Description
0	PDP context is not for IM CN subsystem-related signaling only
1	PDP context is for IM CN subsystem-related signaling only

LIPA_indication

> Integer. 0 or 1. Indicates that the PDP context provides connectivity using a LIPA PDN connection. This parameter cannot be set by the TE.

Table 149.   LIPA_indication

Value	Description
0	No indication that the PDP context provides connectivity using a LIPA PDN connection
1	The PDP context provides connectivity using a LIPA PDN connection

8.7   Enter Data State: AT+CGDATA

Note: This command is described in 3GPP TS 27.007. See Section References.

8.7.1   Syntax

Command	Possible Response(s)

AT+CGDATA[=<L2P>[,<cid>[,<cid>[,...]]]]	`CONNECT`
	
	`ERROR`
	`+CME ERROR:`<err>

AT+CGDATA=?	`+CGDATA:` (list of supported <L2Ps>)

8.7.2   Description

The execution command causes the MT to perform whatever actions are necessary to establish communication between the TE and the network using one or more Packet Domain PDP types. This may include performing a PS attach and one or more PDP context activations. If the `<L2P>` parameter value is unacceptable to the MT, the MT shall return an `ERROR` or `+CME ERROR` response. Otherwise, the MT issues the intermediate result code `CONNECT` and enters V.250 online data state.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for `<err>` values.

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

Commands following `AT+CGDATA` command in the AT command line shall not be processed by the MT.

The detailed behavior after the online data state has been entered is dependent on the PDP type. It is described briefly in 3GPP TS 27.060 [34] and in more detail in 3GPP TS 29.061 [39] and the specifications for the relevant PDPs. PS 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 PS Attach or Detach: AT+CGATT and PDP Context Activate or Deactivate: AT+CGACT commands.

If context activation takes place during the PDP startup, one or more `<cid>`s may be specified in order to provide the information needed for the context activation request(s).

During each PDP startup procedure the MT may have access to some or all of the following information:

- The MT may have a priori knowledge, for example, it may implement only one PDP type.
- The command may have provided an `<L2P>` parameter value.
- The TE may provide a PDP type and/or PDP address to the MT during in the PDP startup procedure.

If any of this information is in conflict, the command fails.

Any PDP type and/or PDP address present in the above information shall be compared with the PDP type and/or PDP address in any context definitions specified in the command in the order in which their `<cid>`s appear. For a context definition to match:

- The PDP type must match exactly.
- The PDP addresses are considered to match if they are identical or if either or both addresses are unspecified. For example, a PPP NCP request specifying PDP type = IP and no PDP address would cause the MT to search through the specified context definitions for one with PDP type = IP and any PDP address.

The context shall be activated using the matched value for PDP type and a static PDP address if available, together with the other information found in the PDP context definition. If a static PDP address is not available then a dynamic address is requested.

If no `<cid>` is given or if there is no matching context definition, the MT shall attempt to activate the context with whatever information is available to the MT. The other context parameters shall be set to their default values.

If the activation is successful, data transfer may proceed.

After data transfer is complete, and the layer 2 protocol termination procedure has completed successfully, the V.250 command state is re-entered and the MT returns the final result code `OK`.

In the event of an erroneous termination or a failure to start up, the V.250 command state is re-entered and the MT returns the final result code NO CARRIER or, if enabled, `+CME ERROR`. Attach, activate and other errors may be reported.

Note: The module cannot enter Deep Sleep mode while the connection is active.

The test command is used for requesting information on the supported layer 2 protocols.

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

8.7.3   Defined Values

cid

Integer. This parameter specifies a particular PDP context definition (see Define PDP Context: AT+CGDCONT parameter `<cid>`).

Note: If this parameter is omitted, `<cid>`=3 (Internet PDN) is the default value for all implementations except CAT-M.
For CAT-M implementation, `<cid>`=1 (Internet PDN) is the default value.

L2P

String. Layer 2 protocol (L2P) to be used between the TE and MT.

Table 150.   L2P

Value	Description
"PPP"	Point-to-point protocol

Other values are obsolete or specific, and are not supported.

RENESAS

8.8 Define PDP Context: AT+CGDCONT

Note: This command is described in 3GPP TS 27.007. See Section References.

8.8.1 Syntax

Command	Possible Response(s)
AT+CGDCONT=[<cid>[,<P DP_type>[,<APN>[,<PDP_ad dr>[,<d_comp>[,<h_comp>[,<IPv4AddrAlloc> [,<request_type>[,<P-CSCF_discovery>[,<IM_CN_Signalling_Flag _Ind>[,<NSLPI>[,<securePCO>[,<I Pv4_MTU_discovery>][,<Loc al_Addr_Ind>][,<Non-IP_MT U_discovery>][,<Reliable_Dat a_Service>]]]]]]]]]]]]]]	`+CME ERROR: <err>`
AT+CGDCONT?	`[+CGDCONT:`<cid>,<PDP_type>,<APN>,<PDP_addr>,<d_comp>, <h_comp>[,<IPv4Ad drAlloc>[,<request_type>[,<P-CSCF_discovery>[,<IM_CN_Signalling_Flag_Ind>[,<NSLPI>[,<sec urePCO>[,<IPv4_MTU_discovery>[,<Local_Addr_Ind>[,<Non-IP_MTU_discovery>[,<Reliable_Data_Service>]]]]]]]]]]]`[<S3><S4>` `+CGDCONT:`<cid>,<PDP_typ e>,<APN>,<PDP_addr>,<d_comp>,<h_comp>[,<IPv4AddrAlloc>[, <request_type>[,<PCSCF_discovery>[,<IM_CN_Signalling_Flag_I nd>[,<NSLPI>[,<securePCO>[,<IPv4_ MTU_discovery>[,<Local_Addr_Ind>[,<Non-IP_MTU_discovery>[,<Reliable_Data_Service>]]]]]]]]]]]`[...]]`
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),(list of supported <NSLPI>s),(list of supported <securePCO>s),(list of supported <IPv4_MTU_discovery>s),(list of supported <Local_Addr_Ind>s),(list of supported <Non-IP_MTU_discovery>s),(list of supported <Reliable_Data_Service>s)`[<S3><S4>+CGDCONT:` (range of supported <cid>s),<PDP_type>,,,(list of supported <d_comp>s),(list of supported <h_comp>s),(list of supported <IPv4AddrAlloc>s),(list of supported <request_type>s),(list of supported <P-CSCF_discovery>s),(list of supported <IM_CN_Signalling_Flag_Ind>s),(list of supported <NSLPI>s),(list of supported <securePCO>s),(list of supported <IPv4_MTU_discovery>s),(list of supported <Local_Addr_Ind>s),(list of supported <Non-IP_MTU_discovery>s),(list of supported <Reliable_Data_Service>s)`[...]]`

Note: <S3> and <S4> represent the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 and Response Formatting Character: ATS4.

8.8.2 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.

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

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

8.8.3 Defined Values

cid

Integer type; specifies a particular PDP context definition. The parameter is local to the TE-MT interface and is used in other PDP context-related commands. The range of permitted values (minimum value = 1 or if the initial PDP context is supported (see subclause 10.1.0), minimum value = 0) 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`.

PDP_type

String. Specifies the type of packet data protocol

Table 151.   PDP_type

Value	Description
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])
Non-IP	Transfer of Non-IP data to external packet data network (see 3GPP TS 23.401 [82])

Note: Only IP, IPV6 and IPV4V6 values are supported for EPS services.

APN

String. 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. Identifies the MT in the address space applicable to the PDP.

If the parameter value is null or omitted, then a value may be provided by the TE during the PDP startup procedure or, failing that, a dynamic address will be requested.

The read form of the command will continue to return the null string even if an address has been allocated during the PDP startup procedure. The allocated address(es) may be read using the `+CGPADDR` command.

When `+CGPIAF` is supported, its settings can influence the format of this parameter returned with the read form of `+CGDCONT`.

Note: For EPS, this field or the parameter value of the field is omitted.

d_comp

Integer. Controls PDP data compression (applicable for SNDCP only) (refer 3GPP TS 44.065 [61])

Table 152.   d_comp

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

h_comp

Integer. Controls PDP header compression (refer 3GPP TS 44.065 [61] and 3GPP TS 25.323 [62])

Table 153.   h_comp

Value	Description
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. 0 or 1. Controls how the MT/TA requests to get the IPv4 address information.

Table 154.   IPv4AddrAlloc

Value	Description
0	IPv4 Address Allocation through NAS Signaling
1	IPv4 Address Allocated through DHCP

request_type

Integer. Indicates the type of PDP context activation request for the PDP context, see 3GPP TS 24.301 [83] (subclause 6.5.1.2) and 3GPP TS 24.008 [8] (subclause 10.5.6.17). If the initial PDP context is supported (see subclause 10.1.0) it is not allowed to assign `<cid>=0` for emergency bearer services. According to 3GPP TS 24.008 [8] (subclause 4.2.4.2.2 and subclause 4.2.5.1.4) and 3GPP TS 24.301 [83] (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 [82] subclause 4.3.12.9.

Note 5:   A PDP context established for handover of emergency bearer services from a non-3GPP access network has the same status as a PDP context for emergency bearer services.

Table 155.   request_type

Value	Description
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	DP 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
4	PDP context is for handover of emergency bearer services from a non-3GPP access network

P-CSCF_discovery

Integer. Influences how the MT/TA requests to get the P-CSCF address, see 3GPP TS 24.229 [89] annex B and annex L.

Caution: Value 2 for parameter P-CSCF_discovery is not supported.

Table 156.   P-CSCF_discovery

Value	Description
0	Preference of P-CSCF address discovery not influenced by `+CGDCONT`
1	Preference of P-CSCF address discovery through NAS Signaling

IM_CN_Signalling_Flag_Ind

Integer. 0 or 1. indicates to the network whether the PDP context is for IM CN subsystem-related signaling only or not.

Table 157.   IM_CN_Signalling_Flag_Ind

Value	Description
0	UE indicates that the PDP context is not for IM CN subsystem-related signaling only
1	UE indicates that the PDP context is for IM CN subsystem-related signaling only

NSLPI

Integer. Indicates the NAS signaling priority requested for this PDP context.

Note 6: The MT utilizes the provide NSLPI information as specified in 3GPP TS 24.301 [83] and 3GPP TS 24.008 [8].

Table 158.   NSLPI

Value	Description
0	Indicates that this PDP context is to be activated with the value for the low priority indicator configured in the MT.
1	Indicates that this PDP context is to be activated with the value for the low priority indicator set to "MS is not configured for NAS signaling low priority"

securePCO

    Integer. Specifies if security protected transmission of PCO is requested or not (applicable for EPS only, see 3GPP TS 23.401 [82] subclause 6.5.1.2).

Table 159.   securePCO

Value	Description
0	Security protected transmission of PCO is not requested
1	Security protected transmission of PCO is requested

IPv4_MTU_discovery

    Integer. Influences how the MT/TA requests to get the IPv4 MTU size, see 3GPP TS 24.008 [8] subclause 10.5.6.3.

Table 160.   IPv4_MTU_discovery

Value	Description
0	Preference of IPv4 MTU size discovery not influenced by `+CGDCONT`
1	Preference of IPv4 MTU size discovery through NAS signaling

Local_Addr_Ind

    Integer. 0 or 1. Indicates to the network whether or not the MS supports local IP address in TFTs (see 3GPP TS 24.301 [83] and 3GPP TS 24.008 [8] subclause 10.5.6.3).

Table 161.   Local_Addr_Ind

Value	Description
0	Indicates that the MS does not support local IP address in TFTs
1	Indicates that the MS supports local IP address in TFTs

Non-IP_MTU_discovery

    Integer. 0 or 1. Influences how the MT/TA requests to get the Non-IP MTU size, see 3GPP TS 24.008 [8] subclause 10.5.6.3.

Table 162.   Non-IP_MTU_discovery

Value	Description
0	Preference of Non-IP MTU size discovery not influenced by `+CGDCONT`
1	Preference of Non-IP MTU size discovery through NAS signaling

Reliable_Data_Service

    Integer. 0 or 1. Indicates whether the UE is using Reliable Data Service for a PDN connection or not, see 3GPP TS 24.301 [83] and 3GPP TS 24.008 [8] subclause 10.5.6.3.

Table 163.   Reliable_Data_Service

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

8.9   Define Secondary PDP Context: AT+CGDSCONT

Note: This command is described in 3GPP TS 27.007. See Section References.

8.9.1   Syntax

Command	Possible Response(s)
AT+CGDSCONT=[<cid>,<p_cid>[,<d_comp> [,<h_comp>[, <IM_CN_Signalling_Flag_In d>]]]]	
AT+CGDSCONT?	`[+CGDSCONT:`<cid>,<p_cid>,<d_comp>,<h_comp>,<IM_CN_Sign alling_Flag_Ind>]`[` `<S3><S4>+CGDSCONT:`<cid>,<p_cid>,<d_comp>,<h_comp>,<IM _CN_Signalling_Fl ag_Ind>[...]]
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)

Note: <S3> and <S4> represent the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 and Response Formatting Character: ATS4.

8.9.2   Description

This command specifies PDP context parameter values for a Secondary PDP context identified by the (local) context identification parameter, `<cid>`. 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. In EPS the command is used to define traffic flows.

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

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

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

The test command returns values supported as a compound value.

8.9.3   Defined Values

cid

   Integer. 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 `AT+CGDCONT` and `AT+CGDSCONT`.

p_cid

   Integer. Specifies a particular PDP context definition which has been specified by use of the `AT+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. 0, 1,2, or 3. Controls PDP data compression (applicable for SNDCP only) (refer 3GPP TS 44.065 [61])

Table 164.   d_comp

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

h_comp

Integer [0-4]. Controls PDP header compression (refer 3GPP TS 44.065 [61] and 3GPP TS 25.323 [62])

Table 165.   h_comp

Value	Description
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: 0 or 1. Indicates to the network whether the PDP context is for IM CN subsystem-related signaling only or not.

Table 166.   IM_CN_Signalling_Flag_Ind

Value	Description
0	UE indicates that the PDP context is not for IM CN subsystem-related signaling only
1	UE indicates that the PDP context is for IM CN subsystem-related signaling only

8.10 Define EPS Quality Of Service: AT+CGEQOS

Note: This command is described in 3GPP TS 27.007. See Section References.

8.10.1 Syntax

Command	Possible Response(s)
AT+CGEQOS=[<cid>[,<QCI>[,<DL_GBR>,<UL_GBR>[,<DL_MBR>,<UL_MBR>]]]]	`+CME ERROR:`<err>
AT+CGEQOS?	`[+CGEQOS:`<cid>,<QCI>,[<DL_GBR>,<UL_GBR>],[<DL_MBR>,<UL_MBR>]] `[`<S3><S4>`+CGEQOS:`<cid>,<QCI>,[<DL_GBR>,<UL_GBR>],[<DL_MBR>,<UL_MBR>] [...]]

Command	Possible Response(s)
AT+CGEQOS=?	`+CGEQOS:` (range of supported <cid>s),(list of supported <QCI>s),(list of supported <DL_GBR>s),(list of supported <UL_GBR>s),(list of supported <DL_MBR>s),(list of supported <UL_MBR>s)

Note: <S3> and <S4> represent the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 and Response Formatting Character: ATS4.

8.10.2 Description

The set command allows the TE to specify the EPS Quality of Service parameters `<cid>`, `<QCI>`, `[<DL_GBR>` and `<UL_GBR>]` and `[<DL_MBR>` and `<UL_MBR>]` for a PDP context or Traffic Flows (see 3GPP TS 24.301 [83] and 3GPP TS 23.203 [85]). When in UMTS/GPRS the MT applies a mapping function to UTMS/GPRS Quality of Service.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for `<err>` values.

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

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

The test command returns the ranges of the supported parameters.

8.10.3 Defined Values

cid

Integer. Specifies a particular EPS Traffic Flows definition in EPS and a PDP Context definition in UMTS/GPRS (see the `AT+CGDCONT` and `AT+CGDSCONT` commands).

QCI

Integer [0-254]. Specifies a class of EPS QoS (see 3GPP TS 24.301 [83]).

Table 167.   QCI

Value	Description
0	QCI is selected by network
1 to 4	Value range for guaranteed bit rate Traffic Flows
5 to 9	Value range for non-guaranteed bit rate Traffic Flows
128 to 254	Value range for Operator-specific QCIs

DL_GBR

Integer type; indicates DL GBR in case of GBR QCI. The value is in kbit/s. This parameter is omitted for a non-GBR QCI (see 3GPP TS 24.301 [83]).

UL_GBR

Integer type; indicates UL GBR in case of GBR QCI. The value is in kbit/s. This parameter is omitted for a non-GBR QCI (see 3GPP TS 24.301 [83]).

DL_MBR

Integer type; indicates DL MBR in case of GBR QCI. The value is in kbit/s. This parameter is omitted for a non-GBR QCI (see 3GPP TS 24.301 [83]).

UL_MBR

Integer type; indicates UL MBR in case of GBR QCI. The value is in kbit/s.

This parameter is omitted for a non-GBR QCI (see 3GPP TS 24.301 [83]).

8.11 EPS Quality of Service Read Dynamic Parameters: AT+CGEQOSRDP

Note: This command is described in 3GPP TS 27.007. See Section References.

8.11.1 Syntax

Command	Possible Response(s)
AT+CGEQOSRDP	[+CGEQOSRDP:<cid>,<QCI>,[<DL_GBR>,<UL_GBR>],[<DL_MBR>,<UL_MBR>][,<DL_AMBR>,<UL_AMBR>]] [<S3><S4>+CGEQOSRDP:<cid>,<QCI>,[<DL_GBR>,<UL_GBR>],[<DL_MBR>,<UL_MBR>][,<DL_AMBR>,<UL_AMBR>] [...]]
AT+CGEQOSRDP=?	+CGEQOSRDP: (list of <cid>s associated with active contexts)

Note: <S3> and <S4> represent the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 and Response Formatting Character: ATS4.

8.11.2 Description

The execution command returns the Quality of Service parameters $<QCI>$, [$<DL\_GBR>$ and $<UL\_GBR>$] and [$<DL\_MBR>$ and $<UL\_MBR>$] of the active secondary or non-secondary PDP context associated to the provided context identifier $<cid>$.

If the parameter $<cid>$ is omitted, the Quality of Service parameters for all secondary and non-secondary active PDP contexts are returned.

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

Parameters of both network and MT/TA initiated PDP contexts will be returned.

8.11.3 Defined Values

cid
    Integer. Specifies a particular Traffic Flows definition in EPS and a
    PDP Context definition in UMTS/GPRS (see the AT+CGDCONT and AT+CGDSCONT commands).

QCI
    Integer [0-254]. Specifies a class of EPS QoS (see 3GPP TS 24.301 [83]).

Table 168.   QCI

Value	Description
0	QCI is selected by network
1 to 4	Value range for guaranteed bit rate Traffic Flows
5 to 9	Value range for non-guaranteed bit rate Traffic Flows
128 to 254	Value range for Operator-specific QCIs

DL_GBR
    Integer. Indicates DL GBR in case of GBR QCI. The value is in kbit/s. This parameter is omitted for a non-GBR QCI (see 3GPP TS 24.301 [83]).

UL_GBR
    Integer. Indicates UL GBR in case of GBR QCI. The value is in kbit/s. This parameter is omitted for a non-GBR QCI (see 3GPP TS 24.301 [83]).

DL_MBR

Integer. Indicates DL MBR in case of GBR QCI. The value is in kbit/s. This parameter is omitted for a non-GBR QCI (see 3GPP TS 24.301 [83]).

UL_MBR

Integer type. Indicates UL MBR in case of GBR QCI. The value is in kbit/s. This parameter is omitted for a non-GBR QCI (see 3GPP TS 24.301 [83]).

DL_AMBR

Integer. Indicates DL APN aggregate MBR (see 3GPP TS 24.301 [83]). The value is in kbit/s.

UL_AMBR

Integer. Indicates UL APN aggregate MBR (see 3GPP TS 24.301 [83]). The value is in kbit/s.

Note: If multiple lines in a response belong to the same PDN connection they contain the same `<DL_AMBR>` `<UL_AMBR>` values.

8.12 Packet Domain Event Reporting: AT+CGEREP

Note: This command is described in 3GPP TS 27.007. See Section References.

8.12.1 Syntax

Command	Possible Response(s)
AT+CGEREP=[<mode>[,<bfr>]]	`+CME ERROR:` <err>
AT+CGEREP?	`+CGEREP:` <mode>,<bfr>
AT+CGEREP=?	`+CGEREP:` (list of supported <mode>s),(list of supported <bfr>s)

8.12.2 Description

Set command enables or disables sending of unsolicited result codes, `+CGEV: XXX` from MT to TE in the case of certain events occurring in the Packet Domain MT or the network. `<mode>` controls the processing of unsolicited result codes specified within this command. `<bfr>` controls the effect on buffered codes when `<mode>` 1 or 2 is entered. If a setting is not supported by the MT, `ERROR` or `+CME ERROR:` is returned.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for `<err>` values.

The read command returns the current mode and buffer settings.

The test command returns the modes and buffer settings supported by the MT as compound values.

8.12.3 Defined Values

mode

Integer. 0,1, or 2.

Table 169.   mode

Value	Description
0	Buffer unsolicited result codes in the MT; if MT result code buffer is full, the oldest ones can be discarded. No codes are forwarded to the TE.
1	Discard unsolicited result codes when MT TE link is reserved (for example, in on line data mode); otherwise forward them directly to the TE
2	Buffer unsolicited result codes in the MT when MT TE link is reserved (e.g. in on line data mode) and flush them to the TE when MT TE link becomes available; otherwise forward them directly to the TE

bfr
> Integer 0 or 1.

Table 170.   bfr

Value	Description
0	The MT buffer of unsolicited result codes defined within this command is cleared when `<mode>` 1 or 2 is entered
1	The MT buffer of unsolicited result codes defined within this command is flushed to the TE when `<mode>` 1 or 2 is entered (OK response shall be given before flushing the codes)

8.12.4 Event Notification URC: +CGEV

1. For network attachment, the following unsolicited result codes and the corresponding events are defined:
   - `+CGEV: NW DETACH`

     The network has forced a PS detach. This implies that all active contexts have been deactivated. These are not reported separately.

   - `+CGEV: ME DETACH`

     The mobile termination has forced a PS detach. This implies that all active contexts have been deactivated. These are not reported separately.

2. For MT class, the following unsolicited result codes and the corresponding events are defined:
   - `+CGEV: NW CLASS <class>`

     The network has forced a change of MT class. The highest available class is reported (see +CGCLASS in 3GPP 27.007 specification). The format of the parameter `<class>` is found in command `AT+CGCLASS`.

   - `+CGEV: ME CLASS <class>`

     The mobile termination has forced a change of MT class. The highest available class is reported (see +CGCLASS in 3GPP 27.007 specification). The format of the parameter <class> is found in command `AT+CGCLASS`.

3. For PDP context activation, the following unsolicited result codes and the corresponding events are defined:
   - `+CGEV: NW PDN ACT <cid>[,<WLAN_Offload>]`

     The network has activated a context. The context represents a Primary PDP context in GSM/UMTS. The <cid> for this context is provided to the TE. The format of the parameter <cid> is found in command `AT+CGDCONT`.

     `<WLAN_Offload>`: An integer [0-3]. An integer that indicates whether traffic can be offloaded using the specified PDN connection via a WLAN or not. This refers to bit 1 (E-UTRAN offload acceptability value) and bit 2 (UTRAN offload acceptability value) in the WLAN offload acceptability IE as specified in 3GPP TS 24.008 [8] subclause 10.5.6.20.

Table 171.   WLAN_Offload

Value	Description
0	Offloading the traffic of the PDN connection via a WLAN when in S1 mode or when in Iu mode is not acceptable.
1	Offloading the traffic of the PDN connection via a WLAN when in S1 mode is acceptable, but not acceptable in Iu mode.
2	Offloading the traffic of the PDN connection via a WLAN when in Iu mode is acceptable, but not acceptable in S1 mode.
3	Offloading the traffic of the PDN connection via a WLAN when in S1 mode or when in Iu mode is acceptable.

Note: This event is not applicable for EPS.

—— `+CGEV: ME PDN ACT`
`<cid>[,<reason>[,<cid_other>]][,<WLAN_Offload>]`

The mobile termination has activated a context. The context represents a PDN connection in LTE or a Primary PDP context in GSM/UMTS. The `<cid>` for this context is provided to the TE. This event is sent either in result of explicit context activation request (`AT+CGACT`), or in result of implicit context activation request associated to attach request (`AT+CGATT=1`). The format of the parameters `<cid>` and `<cid_other>` are found in command `AT+CGDCONT`. The format of the parameter `<WLAN_Offload>` is defined above.

`<reason>`: Integer [0-3]. Indicates the reason why the context activation request for PDP type IPv4v6 was not granted. This parameter is only included if the requested PDP type associated with `<cid>` is IPv4v6, and the PDP type assigned by the network for `<cid>` is either IPv4 or IPv6.

Table 172.   **reason**

Value	Description
0	IPv4 only allowed
1	IPv6 only allowed
2	Single address bearers only allowed.
3	Single address bearers only allowed and MT initiated context activation for a second address type bearer was not successful.

`<cid_other>`: integer type; indicates the context identifier allocated by MT for an MT initiated context of a second address type. MT shall only include this parameter if <reason> parameter indicates single address bearers only allowed, and MT supports MT initiated context activation of a second address type without additional commands from TE, and MT has activated the PDN connection or PDP context associated with `<cid_other>`.

Note: For legacy TEs supporting MT initiated context activation without TE requests, there is also a subsequent event `+CGEV: ME PDN ACT <cid_other>` returned to TE.

—— `+CGEV: NW ACT <p_cid>, <cid>,`
`<event_type>[,<WLAN_Offload>]`

The network has activated a context. The <cid> for this context is provided to the TE in addition to the associated primary <p_cid>. The format of the parameters <p_cid> and <cid> are found in command `AT+CGDSCONT`. The format of the parameter <WLAN_Offload> is defined above.

<event_type>: Integer 0 or 1. Indicates whether this is an informational event or whether the TE has to acknowledge it.

Table 173.   **event_type**

Value	Description
0	Informational event
1	Information request: Acknowledgement required. The acknowledgement can be accept or reject, see `AT+CGANS`.

— +CGEV: ME ACT <p_cid>, <cid>, <event_type>[,<WLAN_Offload>]

The network has responded to an ME initiated context activation. The <cid> for this context is provided to the TE in addition to the associated primary <p_cid>. The format of the parameters <p_cid> and <cid> are found in command AT+CGDSCONT. The format of the parameters <event_type> and <WLAN_Offload> are defined above.

4. For PDP context deactivation, the following unsolicited result codes and the corresponding events are defined:

— +CGEV: NW DEACT <PDP_type>, <PDP_addr>, [<cid>]

The network has forced a context deactivation. The <cid> that was used to activate the context is provided if known to the MT. The format of the parameters <PDP_type>, <PDP_addr> and <cid> are found in command AT+CGDCONT.

— +CGEV: ME DEACT <PDP_type>, <PDP_addr>, [<cid>]

The mobile termination has forced a context deactivation. The <cid> that was used to activate the context is provided if known to the MT. The format of the parameters <PDP_type>, <PDP_addr> and <cid> are found in command AT+CGDCONT.

— +CGEV: NW PDN DEACT <cid>[,<WLAN_Offload>]

The network has deactivated a context. The context represents a PDN connection in LTE or a Primary PDP context in GSM/UMTS. The associated <cid> for this context is provided to the TE. The format of the parameter <cid> is found in command AT+CGDCONT. The format of the parameter <WLAN_Offload> is defined above.

Note: Occurrence of this event replaces usage of the event +CGEV: NW DEACT <PDP_type>, <PDP_addr>, [<cid>].

— +CGEV: ME PDN DEACT <cid>

The mobile termination has deactivated a context. The context represents a PDN connection in LTE or a Primary PDP context in GSM/UMTS. The <cid> for this context is provided to the TE. The format of the parameter <cid> is found in command AT+CGDCONT.

Note: Occurrence of this event replaces usage of the event +CGEV: ME DEACT <PDP_type>, <PDP_addr>, [<cid>].

— +CGEV: NW DEACT <p_cid>, <cid>, <event_type>[,<WLAN_Offload>]

The network has deactivated a context. The <cid> for this context is provided to the TE in addition to the associated primary <p_cid>. The format of the parameters <p_cid> and <cid> are found in command +CGDSCONT. The format of the parameters <event_type> and <WLAN_Offload> are defined above.

   Note: Occurrence of this event replaces usage of the event +CGEV: NW DEACT <PDP_type>, <PDP_addr>, [<cid>].

— +CGEV: ME DEACT <p_cid>, <cid>, <event_type>

The network has responded to an ME initiated context deactivation request. The associated <cid> is provided to the TE in addition to the associated primary <p_cid>. The format of the parameters <p_cid> and <cid> are found in command AT+CGDSCONT. The format of the parameter <event_type> is defined above.

Note: Occurrence of this event replaces usage of the event +CGEV: ME DEACT <PDP_type>, <PDP_addr>, [<cid>].

5. For PDP context modification, the following unsolicited result codes and the corresponding events are defined:

— +CGEV: NW MODIFY <cid>, <change_reason>, <event_type>[,<WLAN_Offload>]

The network has modified a context. The associated <cid> is provided to the TE in addition to the <change_reason> and <event_type>. The format of the parameter <cid> is found in command AT+CGDCONT or AT+CGDSCONT. The format of the parameters <change_reason>, <event_type>, and <WLAN_Offload> are defined above.

<change_reason>: integer type; a bitmap that indicates what kind of change occurred. The <change_reason> value is determined by summing all the applicable bits. For example if both the

values of QoS changed (Bit 2) and WLAN_Offload changed (Bit 3) have changed, then the
<change_reason> value is 6.

Note: The WLAN offload value will change when bit 1 or bit 2 or both of the indicators in the WLAN offload
acceptability IE change, see the parameter <WLAN_Offload> defined above.

Table 174.   change_reason

Value	Description
Bit 1	TFT changed
Bit 2	Qos changed
Bit 3	WLAN Offload changed

— `+CGEV: ME MODIFY <cid>, <change_reason>, <event_type>[,<WLAN_Offload>]`

The mobile termination has modified a context. The associated <cid> is provided to the TE in
addition to the <change_reason> and <event_type>. The format of the parameter <cid> is found in
command `AT+CGDCONT` or `AT+CGDSCONT`. The format of the parameters <change_reason>,
<event_type> and <WLAN_Offload> are defined above.

6. For other PDP context handling, the following unsolicited result codes and the corresponding events are
    defined:

— `+CGEV: REJECT <PDP_type>, <PDP_addr>`

A network request for context activation occurred when the MT was unable to report it to the TE with
a `+CRING` unsolicited result code and was automatically rejected. The format of the parameters
`<PDP_type>` and `<PDP_addr>` are found in command `AT+CGDCONT`.

Note: This event is not applicable for EPS.

— `+CGEV: NW REACT <PDP_type>, <PDP_addr>, [<cid>]`

The network has requested a context reactivation. The <cid> that was used to reactivate the context
is provided if known to the MT. The format of the parameters `<PDP_type>`, `<PDP_addr>` and
`<cid>` are found in command `AT+CGDCONT`.

Note: This event is not applicable for EPS.

8.13 Show PDP Address(es): AT+CGPADDR

Note: This command is described in 3GPP TS 27.007. See Section References.

8.13.1 Syntax

Command	Possible Response(s)
AT+CGPADDR[=<cid>[,<cid>[,...]]]	`[+CGPADDR:` `<cid>[,<PDP_addr_1>[,<PDP_addr_2>]]]`[<S3><S4>+CGPADDR:` `<cid>,[<PDP_addr_1>[,<PDP_addr_2>]] [...]]`
AT+CGPADDR=?	`+CGPADDR:` (list of defined <cid>s)

Note: <S3> and <S4> represent the value of the command line termination character and the response
formatting character, respectively. See Command Line Termination Character: ATS3 and Response
Formatting Character: ATS4.

8.13.2 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.

The test command returns a list of defined `<cid>`s.

8.13.3 Defined Values

cid

> Integer type; specifies a particular PDP context definition (see the `AT+CGDCONT` and `AT+CGDSCONT` commands).

PDP_addr_1, 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 `AT+CGDCONT` and `AT+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 `AT+CGPIAF` is supported, its settings can influence the format of the IPv6 address in parameter `<PDP_addr_1>` or `<PDP_addr_2>` returned with the execute form of `AT+CGPADDR`.

Note: In dual-stack terminals (<PDP_type> IPV4V6), the IPv6 address will be provided in <PDP_addr_2>. For terminals with a single IPv6 stack (<PDP_type> IPV6) or due to backwards compatibility, the IPv6 address can be provided in parameter <PDP_addr_1>.

8.14 Printing IP Address Format: AT+CGPIAF

Note: This command is described in 3GPP TS 27.007. See Section References.

8.14.1 Syntax

Command	Possible Response(s)
AT+CGPIAF=[<IPv6_AddressFormat>[,<IPv6_SubnetNotation>[,<IPv6_LeadingZeros>[, <IPv6_CompressZeros>]]]]	
AT+CGPIAF?	`+CGPIAF:`<IPv6_AddressFormat>,<IPv6_SubnetNotation>,<IPv6_LeadingZeros>,<IP v6_CompressZeros>
AT+CGPIAF=?	`+CGPIAF:`(list of supported <IPv6_AddressFormat>s), (list of supported <IPv6_SubnetNotation>s), (list of supported <IPv6_LeadingZeros>s),(list of supported <IPv6_CompressZeros>s)

8.14.2 Description

This command decides what format to print IPV6 address parameters of other AT commands. See RFC 4291 [88] for details of the IPv6 address format.

The `AT+CGPIAF` parameters `<IPv6_AddressFormat>`, `<IPv6_SubnetNotation>`, `<IPv6_LeadingZeros>` and `<IPv6_CompressedZeros>` affect the following commands and parameters:

1. In `AT+CGTFT` and `AT+CGTFTRDP`, the `<remote address and subnet mask>`;
2. In `AT+CGDCONT`, the `<PDP_addr>`;
3. In `AT+CGPADDR`, the `<PDP_addr_1>` and `<PDP_addr_2>`;
4. In `AT+CGCONTRDP`, the `<local address and subnet mask>`, `<DNS_prim_addr>`, `<DNS_sec_addr>`, `<P_CSCF_prim_addr>` and `<P_CSCF_sec_addr>`; and
5. In `AT+CRC`, the `<PDP_addr>` of unsolicited result code GPRS `<PDP_type>, <PDP_addr>[, [<L2P>][,<APN>]]`.

The read command returns the current command parameter settings.

The test command returns values supported as compound values.

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8.14.3 Defined Values

IPv6_AddressFormat

Integer. 0 or 1. Decides the IPv6 address format. Relevant for all AT command parameters that can hold an IPv6 address.

Table 175.   IPv6_AddressFormat

Value	Description
0	Use IPv4-like dot-notation. IP address, and subnetwork mask if applicable, are dot-separated.
	Example: For <remote address and subnet mask>:`"32.1.13.184.0.0.205.48.0.0.0.0.0.0.0.0.255.255.255.255.255.255.255.255.240.0.0.0.0.0.0.0.0"`
	For other IP address
	parameters:`"32.1.13.184.0.0.205.48.0.0.0.0.0.0.0.0"`
1	Use IPv6-like colon-notation. IP address, and subnetwork mask if applicable and when given explicitly, are separated by a space. Example: For `<remote address and subnet mask>`:`"2001:0DB8:0000:CD30:0000:0000:0000:0000 FFFF:FFFF:FFFF:FFF0:0000:0000:0000:0000"`
	For other IP address parameters:`"2001:0DB8:0000:CD30:0000:0000:0000:0000"`

IPv6_SubnetNotation

Integer. 0 or 1. Decides the subnet-notation for `<remote address and subnet mask>`. Setting does not apply if `<IPv6_AddressFormat>` = 0.

Table 176.   IPv6_SubnetNotation

Value	Description
0	Both IP Address and subnet mask are stated explicitly, separated by a space.
	Example:`"2001:0DB8:0000:CD30:0000:0000:0000:0000 FFFF:FFFF:FFFF:FFF0:0000:0000:0000:0000"`
1	The format uses / (forward slash) subnet-prefix Classless Inter-Domain Routing (CIDR) notation. Example:`"2001:0DB8:0000:CD30:0000:0000:0000:0000/60"`

IPv6_LeadingZeros

Integer.) or 1. Decides whether leading zeros are omitted or not. Setting does not apply if `<IPv6_AddressFormat>` = 0.

Table 177.   IPv6_LeadingZeros

Value	Description
0	Leading zeros are omitted. Example: `"2001:DB8:0:CD30:0:0:0:0"`
1	Leading zeros are included. Example: `"2001:0DB8:0000:CD30:0000:0000:0000:0000"`

IPv6_CompressZeros

Integer. 0 or 1. Authorizes the use of the double colon ':: ' standing for any number of consecutive zeros. This applies only once. Setting does not apply if `<IPv6_AddressFormat>` = 0.

Table 178.   IPv6_CompressZeros

Value	Description
0	No zero compression.Example:`"2001:DB8:0:CD30:0:0:0:1"`
1	Use zero compression.Example:`"2001:DB8:0:CD30::1"`

8.15 Secondary PDP Context Read Dynamic Parameters: AT+CGSCONTRDP

Note: This command is described in 3GPP TS 27.007. See Section References.

8.15.1 Syntax

Command	Possible Response(s)
AT+CGSCONTRDP[=<cid>]	`[+CGSCONTRDP:<cid>,<p_cid>,<bearer_id>[,<IM_CN_Signalling_Flag>]]`<S3><S4>+C GSCONTRDP: <cid>,<p_cid>,<bearer_id>[,<IM_CN_Signalling_Flag>][...]]
AT+CGSCONTRDP=?	`+CGSCONTRDP:` (list of <cid>s associated with active contexts)

Note: <S3> and <S4> represent the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 and Response Formatting Character: ATS4.

8.15.2 Description

This command returns `<p_cid>`, `<bearer_id>` and

`<IM_CN_Signalling_Flag>` 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.

8.15.3 Defined Values

cid

Integer. 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 `AT+CGDCONT` and `AT+CGDSCONT` commands).

p_cid

Integer. Specifies a particular PDP context definition or default EPS context Identifier which has been specified by use of the `AT+CGDCONT` command. The parameter is local to the TE-MT interface (see the `AT+CGDSCONT` command).

bearer_id

Integer. Identifies the bearer, EPS Bearer in EPS and NSAPI in UMTS/GPRS.

IM_CN_Signalling_Flag
Integer 0 or 1. Shows whether the PDP context is for IM CN subsystem-related signaling only or not.

Table 179.   IM_CN_Signalling_Flag

Value	Description
0	PDP context is not for IM CN subsystem-related signaling only
1	PDP context is for IM CN subsystem-related signaling only

8.16 Select Service for MO SMS Messages: AT+CGSMS

Note: This command is described in 3GPP TS 27.007. See Section References.
See the current implementation limitation in `service` parameter description.

8.16.1 Syntax

Command	Possible Response(s)
AT+CGSMS=[<service>]	
AT+CGSMS?	`+CGSMS:` <service>
AT+CGSMS=?	`+CGSMS:` (list of supported <service>s)

8.16.2 Description

This command is used to specify the service or service preference that the MT will use to send MO SMS messages.

The read command returns the currently selected service or service preference.

The test command is used for requesting information on the currently available services and service preferences.

8.16.3 Defined Values

Restriction: Only `<service>` 0 and 2 are currently implemented.

service
Integer. 0,1,2, or 3. Indicates the service or service preference to be used.

Table 180.   service

Value	Description
0	Packet Domain
1	Circuit switched
2	Packet Domain preferred (use circuit switched if GPRS not available)
3	Circuit switched preferred (use Packet Domain if circuit switched not available)

8.17 Traffic Flow Template: AT+CGTFT

Note: This command is described in 3GPP TS 27.007. See Section References.

8.17.1 Syntax

Command	Possible Response(s)
AT+CGTFT=[<cid>,[<packet filter identifier>,<evaluation precedence index>[,<remote address and subnet mask>[,<protocol number (ipv4) / next header (ipv6)>[,<local port range>[,<remote port range>[,<ipsec security parameter index (spi)>[,<type of service (tos) (ipv4) and mask / traffic class (ipv6) and mask>[,<flow label (ipv6)>[,<direction>]]]]]]]]]]	`+CME ERROR`: <err>
AT+CGTFT?	`[+CGTFT`: <cid>,<packet filter identifier>,<evaluation precedence index>,<remote address and subnet mask>,<protocol number (ipv4) / next header (ipv6)>,<local port range>,<remote port range>,<ipsec security parameter index (spi)>,<type of service (tos) (ipv4) and mask / traffic class (ipv6) and mask>,<flow label (ipv6)>,<direction>]`[<S3><S4>+CGTFT`: <cid>,<packet filter identifier>,<evaluation precedence index>,<remote address and subnet mask>,<protocol number (ipv4) / next header (ipv6)>,<local port range>, <remote port range>,<ipsec security parameter index (spi)>,<type of service (tos) (ipv4) and mask / traffic class (ipv6) and mask>,<flow label (ipv6)>,<direction> [...]]
AT+CGTFT=?	`+CGTFT`:<PDP_type>,(list of supported <packet filter identifier>s),(list of supported <evaluation precedence index>s),(list of supported <remote address and subnet mask>s),(list of supported <protocol number (ipv4) / next header (ipv6)>s),(list of supported <local port range>s),(list of supported <remote port range>s),(list of supported <ipsec security parameter index (spi)>s),(list of supported <type of service (tos) (ipv4) and mask / traffic class (ipv6) and mask>s),(list of supported <flow label (ipv6)>s),(list of supported <direction>s)`[<S3><S4>+CGTFT`:<PDP_type>,(list of supported <packet filter identifier>s),(list of supported <evaluation precedence index>s),(list of supported <remote address and subnet mask>s),(list of supported <protocol number (ipv4) / next header (ipv6)>s),(list of supported <local port range>s),(list of supported <remote port range>s),(list of supported <ipsec security parameter index (spi)>s),(list of supported <type of service (tos) (ipv4) and mask / traffic class (ipv6) and mask>s),(list of supported <flow label (ipv6)>s),(list of supported <direction>s) [...]]

Note: <S3> and <S4> represent the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 and Response Formatting Character: ATS4.

8.17.2 Description

This command allows the TE to specify a Packet Filter - PF for a Traffic Flow
Template - TFT that is used in the GGSN in UMTS/GPRS and Packet GW in EPS for routing of packets onto different QoS flows towards the TE. The concept is further described in the 3GPP TS 23.060 [47]. A TFT consists of from one and up to 16 Packet Filters, each identified by a unique <packet filter identifier>. A Packet Filter also has an <evaluation precedence index> that is unique within all TFTs associated with all PDP contexts that are associated with the same PDP address.

The set command specifies a Packet Filter that is to be added to the TFT stored in the MT and used for the context identified by the (local) context identification parameter, <cid>. The specified TFT will be stored in the GGSN in UMTS/GPRS and Packet GW in EPS only at activation or MS-initiated modification of the related context. Since this is the same parameter that is used in the `AT+CGDCONT` and `AT+CGDSCONT` commands, the `AT+CGTFT` command is effectively an extension to these commands. The Packet Filters consist of a number of parameters, each of which may be set to a separate value.

A special form of the set command, `AT+CGTFT=<cid>` causes all of the Packet Filters in the TFT for context number <cid> to become undefined. At any time there may exist only one PDP context with no associated TFT amongst all PDP contexts associated to one PDP address. At an attempt to delete a TFT, which would violate this rule, an `ERROR` or +CME ERROR response is returned. Extended error responses are enabled by the +CMEE command.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for `<err>` values.

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

The test command returns values supported as a compound value. If the MT supports several PDP types, the parameter value ranges for each PDP type are returned on a separate line. TFTs shall be used for PDP-type IP and PPP only.

For PDP-type PPP a TFT is applicable only when IP traffic is carried over PPP.

If PPP carries header-compressed IP packets, then a TFT cannot be used.

8.17.3 Defined Values

cid

Integer. Specifies a particular PDP context definition (see the `AT+CGDCONT` and `AT+CGDSCONT` commands).

PDP_type

String type. Specifies the type of packet data protocol (see the `AT+CGDCONT` command).

packet filter identifier

Integer type. Value range is from 1 to 16. See also 3GPP TS 23.060 [47]

evaluation precedence index

Integer type. The value range is from 0 to 255. See also 3GPP TS 23.060 [47]

remote address, 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 `AT+CGPIAF` is supported, its settings can influence the format of this parameter returned with the read form of `AT+CGTFT`.

protocol number (ipv4) / next header (ipv6)

Integer. Value range is from 0 to 255.

local port range

String. The string is given as dot-separated numeric (0-65535) parameters on the form "from.to".

remote port range

String. The string is given as dot-separated numeric (0-65535) parameters on the form "from.to".

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. 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 [0 or 3]. Specifies the transmission direction in which the packet filter shall be applied.

Table 181.   direction

Value	Description
0	Pre-Release 7 TFT filter (see 3GPP TS 24.008 [8], table 10.5.162)
1	Uplink
2	Downlink
3	Bi-directional (Up & Downlink)

Some of the above listed attributes may coexist in a Packet Filter while others mutually exclude each other, the possible combinations are shown in 3GPP TS 23.060 [47].

8.18 Traffic Flow Template Read Dynamic Parameters: AT+CGTFTRDP

Note: This command is described in 3GPP TS 27.007. See Section References.

8.18.1 Syntax

Command	Possible Response(s)
AT+CGTFTRDP[=<cid>]	`[+CGTFTRDP:` <cid>,<packet filter identifier>,<evaluation precedence index>,<remote address and subnet mask>,<protocol number (ipv4) / next header (ipv6)>,<local port range>,<remote 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>]`[<S3><S4>+CGTFTRDP:` <cid>,<packet filter identifier>,<evaluation precedence index>,<remote address and subnet mask>,<protocol number (ipv4) / next header (ipv6)>,<local port range>, <remote 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)

Note: <S3> and <S4> represent the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 and Response Formatting Character: ATS4.

8.18.2 Description

The execution command returns the relevant information about Traffic Flow Template for an active secondary or non-secondary PDP context specified by <cid> together with the additional network assigned values when established by the network. If the parameter <cid> is omitted, the Traffic Flow Templates for all active secondary and non-secondary PDP contexts are returned.

Parameters of both network and MT/TA initiated PDP contexts will be returned.

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

8.18.3 Defined Values

cid

Integer. Specifies a particular secondary or non-secondary PDP context definition or Traffic Flows definition (see `AT+CGDCONT` and `AT+CGDSCONT` commands).

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.

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remote address, 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 `AT+CGPIAF` is supported, its settings can influence the format of this parameter returned with the execute form of `AT+CGTFTRDP`.

protocol number (ipv4) / next header (ipv6)

> Integer. The value range is from 0 to 255.

local port range

> String. The string is given as dot-separated numeric (0-65535) parameters on the form "from.to".

remote port range

> String. The string is given as dot-separated numeric (0-65535) parameters on the form "from.to".

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. The string is given as dot-separated numeric (0-255) parameters on the form `"type.mask"`.

flow label (ipv6)

> Numeric value in hexadecimal format. The value range is from 00000 to FFFFF. Valid for IPv6 only.

direction

> Integer. 0,1,2,or 3. Specifies the transmission direction in which the Packet Filter shall be applied.

Table 182.   direction

Value	Description
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 [1-16]. In EPS the value is assigned by the network when established

Note: Some of the above listed attributes can coexist in a Packet Filter while others mutually exclude each other. The possible combinations are shown in 3GPP TS 23.060 [47].

9.　Phonebook Commands

9.1　Subscriber Number: AT+CNUM

Note: This command is described in 3GPP TS 27.007. See Section References.

9.1.1　Syntax

Command	Possible Response(s)
AT+CNUM	`+CNUM:` [<alpha1>],<number1>,<type1>[,<speed>,<service>[,<itc>]]][<S3><S4>`+CNUM:` [<alpha2>],<number2>,<type2>[,<speed>,<service>[,<itc>]]][...]] `+CME ERROR:` <err>
AT+CNUM=?	

Note: <S3> and <S4> represent the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 and Response Formatting Character: ATS4.

9.1.2　Description

Action command returns the MSISDNs related to the subscriber (this information can be stored in the SIM/UICC or in the MT). When storing information in the SIM/UICC, if the currently selected card slot contains a SIM card or a UICC with an active GSM application, the information is stored in the EFMSISDN under DFTelecom. If the currently selected card slot contains a UICC with an active USIM application, the information is stored in the EFMSISDN under ADFUSIM). If subscriber has different MSISDN for different services, each MSISDN is returned in a separate line. See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

9.1.3　Defined Values

alphax

　　String. Associated with `<numberx>`; used character set should be the one selected with command Select TE Character Set: AT+CSCS.

numberx

　　String. Phone number of format specified by `<typex>`.

typex

　　Integer. Type of address octet (refer 3GPP TS 24.008 [8] subclause 10.5.4.7)

speed

　　As defined in subclause 6.7

service

　　Integer [0-5]. Service related to the phone number.

Table 183.　　service

Value	Description
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	

itc

Integer 0 or 1. Information transfer capability.

Table 184.   itc

Value	Description
0	3.1 kHz
1	UDI

10. Short Message Service (SMS) Commands

10.1 Send Command: AT+CMGC

Note: This command is described in 3GPP TS 27.005. See Section References.

10.1.1 Syntax

Command	Possible Response(s)

if text mode (+CMGF=1):
+CMGC=<fo>,<ct>[,<pid>[,<mn>[,<da>[,<toda>]]]]
`<S3>text <ctrl-Z/ESC>`
	if text mode (+CMGF=1) and delivery OK:
	
	`+CMGC:<mr>[,<scts>]`
	If delivery fails::
	`+CMS ERROR: <err>`

AT+CMGC=?	

Note: <S3> represents the value of the command line termination character. See Command Line
Termination Character: ATS3.

10.1.2 Description

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

See also 10.9 Message Service Failure Result Code: +CMS ERROR on page 183 for `<err>` values.

10.2 Delete Message: AT+CMGD

Note: This command is described in 3GPP TS 27.005. See Section References.
See the current implementation limitation in `delflag` parameter description.

10.2.1 Syntax

Command	Possible Response(s)
AT+CMGD=<index>[,<delflag>]	`+CMS ERROR: <err>`
AT+CMGD=?	`+CMGD:`(list of supported <index>s)[,(list of supported <delflag>s)]

10.2.2 Description

This command deletes message from preferred message storage <mem1> location `<index>`. If `<delflag>` is present and not set to 0 then the ME ignores `<index>` and follow the rules for `<delflag>` shown below.

If deleting fails, final result code `+CMS ERROR: <err>` is returned.

The test command shows the valid memory locations and optionally the supported values of `<delflag>`.

See also 10.9 Message Service Failure Result Code: +CMS ERROR on page 183 for `<err>` values.

10.2.3 Defined Values

index

Integer. Index of the message to be deleted.

delflag

Integer [0-4]. Indicates multiple message deletion request as follows:

Caution: Only the <delflag> 0 and 4 are currently implemented.

Table 185.   delflag

Value	Description
0 (or omitted)	Default value if not specified. 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.

10.3 Message Format: AT+CMGF

Note: This command is described in 3GPP TS 27.005. See Section References.

10.3.1 Syntax

Command	Possible Response(s)
AT+CMGF?	`+CMGF:`<mode>
AT+CMGF=?	`+CMGF:` (list of supported <index>s)[,(list of supported <mode>s)]

10.3.2 Description

This command tells the TA, which input and output format of messages to use. `<mode>` indicates the format of messages used with send, list, read and write commands and unsolicited result codes resulting from received messages. The mode can be either PDU mode (entire TP data units used) or text mode (headers and body of the messages given as separate parameters). Text mode uses the value of parameter `<chset>` specified by command Select TE Character Set `AT+CSCS`.

The test command returns supported modes as a compound value.

See also 10.9 Message Service Failure Result Code: +CMS ERROR on page 183 for `<err>` values.

10.3.3 Defined Values

mode

Integer [0-1]. Indicates multiple message deletion request as follows:

Table 186.   mode

Value	Description
0	PDU mode (default when implemented)
1	Text mode

RENESAS

10.4 List Messages: AT+CMGL

Note: This command is described in 3GPP TS 27.005. See Section References.

10.4.1 Syntax

Command	Possible Response(s)
AT+CMGL=<stat>	• If text mode (`AT+CMGF`=1), command successful and SMS-SUBMITs and/or SMS-DELIVERs: `+CMGL:`**<index>,<stat>,<oa/da>,[<alpha>],[<scts>][,<tooa/toda>,<length>]<S3><S4>** **<data>**`[<S3><S4>+CMGL:`**<index>,<stat>,<da/oa>,[<alpha>],[<scts>][,<tooa/toda>,** **<length>]<S3><S4><data>[...]]** • If text mode (`AT+CMGF`=1), command successful and SMS-STATUS-REPORTs: `+CMGL:`**<index>,<stat>,<fo>,<mr>,[<ra>],[<tora>],<scts>,<dt>,<st>**`[<S3><S4>+CM` `GL:`**<index>,<stat>,<fo>,<mr>,[<ra>],[<tora>],<scts>,<dt>,<st>[...]]** • If text mode (`AT+CMGF`=1), command successful and SMS-COMMANDs: `+CMGL:`**<index>,<stat>,<fo>,<ct>**`[<S3><S4>+CMGL:`**<index>,<stat>,<fo>,<ct>[...]]** • If text mode (`AT+CMGF`=1), command successful and CBM storage: `+CMGL:` **<index>,<stat>,<sn>,<mid>,<page>,<pages>** **<S3><S4><data>**`[<S3><S4>+CMGL:`**<index>,<stat>,<sn>,<mid>,<page>,<pages>**`<S3` `><S4>`**<data>[...]]** • Otherwise: `+CMS ERROR:`**<err>**
AT+CMGL=?	`+CMGL:`(list of supported <stat>s)

Note:　<S3> and <S4> represent the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 and Response Formatting Character: ATS4.

10.4.2 Description

This command returns messages with status value `<stat>` from message storage `<mem1>` to the TE. Text mode parameters in italics, are detailed in `Show Text Mode Parameters AT+CSDH`. If status of the message is 'received unread', status in the storage changes to 'received read'. If the listing fails, final result code `+CMS ERROR: <err>` is returned.

Note: If the selected `<mem1>` can contain different types of SMs (for example, SMS-DELIVERs, SMS-SUBMITs, SMS-STATUS-REPORTs and SMS-COMMANDs), the response may be a mix of the responses of different SM types. TE application can recognize the response format by examining the third response parameter.

Test command shall give a list of all status values supported by the TA.

See also 10.9 Message Service Failure Result Code: +CMS ERROR on page 183 for `<err>` values.

10.4.3 Defined Values

stat
　　Integer [0-4].

Table 187.　　stat

Value	Description
0	"REC UNREAD": received unread message (that is, new message)
1	"REC READ": received read message
2	"STO UNSENT": stored unsent message (only applicable to SMs)
3	"STO SENT": stored sent message (only applicable to SMs)
4	"ALL": all messages (only applicable to `AT+CMGL` command)

10.5 Read Message: AT+CMGR

Note: This command is described in 3GPP TS 27.005. See Section References.

10.5.1 Syntax

Command	Possible Response(s)
AT+CMGR=<index>	• If text mode (`AT+CMGF=1`), command successful and SMS-DELIVER: +CMGR: **<stat>,<oa>,[<alpha>],<scts>[,<tooa>,<fo>,<pid>,<dcs>,** **<sca>,<tosca>,<length>]**`<S3><S4><data>` • If text mode (`+CMGF=1`), command successful and SMS-SUBMIT: +CMGR:**<stat>,<da>,[<alpha>][,<toda>,<fo>,<pid>,<dcs>,[<vp>],<sca>,<tosca>,<length>]**`<S3><S4><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>**`<S3><S4><cdata>`] • If text mode (`+CMGF=1`), command successful and CBM storage: +CMGR:**<stat>,<sn>,<mid>,<dcs>,<page>,<pages>**`<S3><S4>`**<data>** otherwise:+CMS ERROR:**<err>**
AT+CMGR=?	

Note: <S3> and <S4> represent the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 and Response Formatting Character: ATS4.

10.5.2 Description

Execution command returns message with location value `<index>` from message storage `<mem1>` to the TE. For further information on text mode parameters in italics, refer command Show Text Mode Parameters `AT+CSDH`. If status of the message is 'received unread', status in the storage changes to 'received read'. If reading fails, final result code `+CMS ERROR: <err>` is returned.

See also 10.9 Message Service Failure Result Code: +CMS ERROR on page 183 for `<err>` values.

10.5.3 Defined Values

index

    Integer. Index of the message to be read.

10.6 Send Message: AT+CMGS

Note: This command is described in 3GPP TS 27.005. See Section References.

10.6.1 Syntax

Command	Possible Response(s)
if text mode (`AT+CMGF=1`): **AT+CMGS=<da>[,<toda>]<S3>text <Ctrl-Z/ESC>**	• if text mode (`AT+CMGF=1`) and delivery successful: +CMGS: **<mr>[,<scts>]** • If delivery fails:+CMS ERROR:**<err>**
AT+CMGS=?	

Note: In this description, <S3> and <S4> represent the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 and Response Formatting Character: ATS4.

10.6.2 Description

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

See also 10.9 Message Service Failure Result Code: +CMS ERROR on page 183 for `<err>` values.

- The entered text (3GPP TS 23.040 [3] TP-Data-Unit) is sent to address `<da>` and all current settings (refer Set Text Mode Parameters `AT+CSMP` and Service Centre Address `AT+CSCA`) are used to construct the actual PDU in ME/TA.
- the TA shall send a four character sequence `<S3><S4><greater_than><space>` (IRA 13, 10, 62, 32) after command line is terminated with `<S3>`; after that text can be entered from TE to ME/TA.
  The DCD signal shall be in ON state while text is entered.
- The echoing of entered characters back from the TA is controlled by V.25ter echo command `ATE`.
- The entered text should be formatted as follows:
  — If `<dcs>` (set with `AT+CSMP`) indicates that 3GPP TS 23.038 [2] GSM 7 bit default alphabet is used and `<fo>` indicates that 3GPP TS 23.040 [3] `TP-User-Data-Header-Indication` is not set:
  — If TE character set other than "HEX" (refer command Select TE Character Set `AT+CSCS` in 3GPP TS 27.007 [9]): ME/TA converts the entered text into the GSM 7 bit default alphabet according to rules of Annex A; backspace can be used to delete last character and carriage returns can be used (previously mentioned four character sequence shall be sent to the TE after every carriage return entered by the user);
  — -if TE character set is "HEX": the entered text should consist of two IRA character long hexadecimal numbers which ME/TA converts into the GSM 7 bit default alphabet characters. (for example, 17 (IRA 49 and 55) will be converted to character (GSM 7 bit default alphabet #23)).
- If <dcs> indicates that 8-bit or UCS2 data coding scheme is used or <fo> indicates that 3GPP TS 23.040 [3] `TP-User-Data-Header-Indication` is set: the entered text should consist of two IRA character long hexadecimal numbers which ME/TA converts into 8-bit octet (for example, two characters 2A (IRA 50 and 65) will be converted to an octet with integer value 42).
- Sending can be cancelled by giving <ESC> character (IRA 25).
- <Ctrl-Z> (IRA 26) must be used to indicate the ending of the message body.

10.7 Write Message to Memory: AT+CMGW

Note: This command is described in 3GPP TS 27.005. See Section References.

10.7.1 Syntax

Command	Possible Response(s)
If text mode (+CMGF=1)	`+CMGW:<index>`
AT+CMGW=[<oa/da>[,<tooa/toda>[,<stat>]]]`<S3>`**text to entered**`<ctrl-Z/ESC>`	`+CMS ERROR:<err>`
AT+CMGW=?	

Note: <S3> represents the value of the command line termination character. See Command Line Termination Character: ATS3

10.7.2 Description

This command stores a message (either SMS-DELIVER or SMS-SUBMIT) to memory storage `<mem2>`. Memory location `<index>` of the stored message is returned. By default, the message status will be set to `'stored unsent'`, but parameter `<stat>` allows also other status values to be given. The text transmission is done similarly as specified in command Send Message: `AT+CMGS`. If the writing fails, the final result code `+CMS ERROR: <err>` is returned.

Note that all data are entered first. Parameters analysis and data check are performed only after all data are received.

See also 10.9 Message Service Failure Result Code: +CMS ERROR on page 183 for `<err>` values.

Note: SMS-COMMANDs and SMS-STATUS-REPORTs cannot be stored in text mode.

10.7.3 Defined Values

oa

    String: TP-Originating-Address Address Value

da

    String: TP-Destination-Address Address-Value

tooa

    Integer: TP-Originating-Address Type-of-Address byte (default: refers to <toda>)

toda

    Integer: TP-Destination-Address Type-of-Address byte (when first character of <da> is + (IRA 43), the default is 145, otherwise, the default is 129)

stat

    Integer: [0-4] (PDU mode) or string (text mode). Indicates the status of message in memory

Table 188.   mode

Value	Description
0 or "REC UNREAD"	Received unread message (that is, new message)
1 or "REC READ"	Received read message
2 or "STO UNSENT"	Stored unsent message (only applicable to SMs)
3 or "STO SENT"	Stored sent message (only applicable to SMs)
4 or "ALL"	All messages (only applicable to AT+CMGL command)

Index

    Integer. Value in the range of location numbers supported by the associated memory.

10.8 More Messages to Send: AT+CMMS

Note: This command is described in 3GPP TS 27.005. See Section References.

10.8.1 Syntax

Command	Possible Response(s)
AT+CMMS=<n>	
AT+CMMS?	+CMMS:<n>

10.8.2 Description

This command controls the continuity of SMS relay protocol link. When feature is enabled (and supported by network) multiple messages can be sent at once, which results in a higher throughput.

Test command returns supported values as a compound value.

10.8.3 Defined Values

n

Integer [0 -2].

Table 189.   n

Value	Description
0	Disable
1	Keep enabled until the time between the response of the latest message send command (`AT+CMGS`, `AT+CMSS`, and so forth) 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)

10.9 Message Service Failure Result Code: +CMS ERROR

Note: This command is described in 3GPP TS 27.005. See Section References.

10.9.1 Syntax

Command	Possible Response(s)
	`+CMS ERROR:` <err>

10.9.2 Description

Final result code `+CMS ERROR:` `<err>` indicates an error related to mobile equipment or network. The operation is similar to `ERROR` result code. None of the following commands in the same command line is executed. Neither `ERROR` nor `OK` result code shall be returned. `ERROR` is returned normally when error is related to syntax or invalid parameters.

10.9.3 Defined Values

err

Integer [0-512]. The values used by common messaging commands are as follows:

Table 190.   err

Value	Description
0...127	3GPP TS 24.011 [6] clause E.2 values
128...255	3GPP TS 23.040 [3] clause 9.2.3.22 values.
300	ME failure
301	SMS service of ME reserved
302	Operation not allowed
303	Operation not supported
304	Invalid PDU mode parameter
305	Invalid text mode parameter
310	(U)SIM not inserted
311	(U)SIM PIN required
312	PH-(U)SIM PIN required
313	(U)SIM failure
314	(U)SIM busy

Value	Description
315	(U)SIM wrong
316	(U)SIM PUK required
317	(U)SIM PIN2 required
318	(U)SIM PUK2 required
320	Memory failure
321	Invalid memory index
322	Memory full
330	SMSC address unknown
331	No network service
332	Network timeout
340	No +CNMA acknowledgement expected
500	Unknown error
...511	Other values in range 256...511 are reserved
512	Manufacturer specific

10.10 Send Message from Storage: AT+CMSS

Note: This command is described in 3GPP TS 27.005. See Section References.

10.10.1   Syntax

Command	Possible Response(s)
AT+CMSS=<index>[,<da>[,<toda>]]	• If in text mode (+CMGF=1) and sending successful: +CMSS: <mr>[,<scts>] • If sending fails:+CMS ERROR:<err>
AT+CMSS=?	

10.10.2   Description

This command sends a message with location value <index> from preferred message storage <mem2> to the network (SMS-SUBMIT or SMS-COMMAND). If a new recipient address <da> is given for SMS-SUBMIT, it is used instead of the one stored with in the message. Reference value <mr> is returned to the TE on successful message delivery. Optionally (when +CSMS <service> value is 1 and network supports) <scts> is returned. Values can be used to identify message upon unsolicited delivery status report result code. If sending fails in a network or an ME error, final result code +CMS ERROR: <err> is returned.

See also 10.9 Message Service Failure Result Code: +CMS ERROR on page 183 on page 183 for <err> values.

10.10.3   Defined Values
index
   Integer. Index of the message to send.

10.11 New SMS Reception URC: +CMTI

Note: This command is described in 3GPP TS 27.005. See Section References.

10.11.1 Syntax

Command	Possible Response(s)
	`+CMTI:<mem>,<index>`

10.11.2 Description

This URC is sent when a new SMS is received.

10.11.3 Defined Values

mem

    String. Message storage area selected to store the message.

index

    Integer. Index of the message in the message storage area <mem>.

10.12 New Message Acknowledgement to ME/TA: AT+CNMA

Note: This command is described in 3GPP TS 27.005. See Section References.
    See the current implementation limitation in command description.

10.12.1 Syntax

Command	Possible Response(s)
If PDU mode (`AT+CMGF=0`): **AT+CNMA**[=<n>[,<length><S3>PDU is given<ctrl-Z/ESC>	`+CMS ERROR:<err>`
if Text mode (`AT+CMGF=1`): **AT+CNMA**	`+CMS ERROR:<err>`

AT+CNMA=?	If PDU mode (`+CMGF=0`):
	 `+CNMA:`(list of supported <n>s)
	 if Text mode (`+CMGF=1`):
	 `OK`

Note: <S3> represents the value of the command line termination character. See Command Line Termination Character: ATS3.

10.12.2 Description

- PDU Mode

Caution: Only parameter `<n>` is currently supported in PDU mode.

This command confirms the reception of a new message (SMS-DELIVER or SMS-STATUS-REPORT) which is routed directly to the TE (refer command `+CNMI` tables 2 and 4). This acknowledgement command shall be used when `+CSMS` parameter `<service>` equals 1. In PDU mode, it is possible to send either positive (RP-ACK) or negative (RP-ERROR) acknowledgement to the network. The parameter `<n>` defines which one will be sent. Optionally (when `<length>` is greater than zero) an acknowledgement TPDU (SMS-DELIVER-REPORT for RP-ACK or RP-ERROR) may be sent to the network. The specification of the PDU is done similarly as specified in command Send Message `+CMGS`, except that the format of `<ackpdu>` is used instead of `<pdu>` (that is, SMSC address field is not present). PDU shall not be bounded by double quotes. TA shall not send another `+CMT` or `+CDS` result code to TE before previous one is acknowledged.

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

- Text Mode

  The command confirms the correct reception of a new message

  (SMS-DELIVER or SMS-STATUS-REPORT) which is routed directly to the TE (refer command `+CNMI` table 3.4.1-3 and table 3.4.1-5). This acknowledgement command (causing ME to send RP-ACK to the network) shall be used when `+CSMS` parameter `<service>` equals 1. The TA shall not send another `+CMT` or `+CDS` result code to TE before previous one is acknowledged.

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

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

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

See also 10.9 Message Service Failure Result Code: +CMS ERROR on page 183 for `<err>` values.

10.13 New Message Indications to TE: AT+CNMI

Note: This command is described in 3GPP TS 27.005. See Section References.
    See the current implementation limitation in `mode` and `mt` parameters description.

Note: <S3> and <S4> represent the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 and Response Formatting Character: ATS4.

10.13.1   Syntax

Command	Possible Response(s)
AT+CNMI==[<mode>[,<mt>[,<bm>[,<ds>[,<bfr>]]]]]	`+CMS ERROR:<err>`
AT+CNMI?	`+CNMI: <mode>,<mt>,<bm>,<ds>,<bfr>`
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)

10.13.2   Description

Set command selects the procedure, how receiving of new messages from the network is indicated to the TE when TE is active, for example, DTR signal is ON. If TE is inactive (for example, DTR signal is OFF), message receiving should be done as specified in 3GPP TS 23.038 [2].

Note: When DTR signal is not available or the state of the signal is ignored (V.25ter command &D0), reliable message transfer can be assured by using `AT+CNMA` acknowledgement procedure.

`<mode>` controls the processing of unsolicited result codes specified within this command, `<mt>` sets the result code indication routing for SMS-DELIVERs, `<bm>` for CBMs and `<ds>` for SMS-STATUS-REPORTs.

`<bfr>` defines the handling method for buffered result codes when `<mode>` 1, 2 or 3 is enabled. If the ME does not support the requested item (although TA does), final result code `+CMS ERROR: <err>` is returned.

See also 10.9 Message Service Failure Result Code: +CMS ERROR on page 183 for `<err>` values.

See also Message Service Failure Result Code: +CMS ERROR for <err> values.

Test command gives the settings supported by the TA as compound values.

Note: Command Select Message Service `AT+CSMS` should be used to detect ME support of mobile terminated SMs and CBMs, and to define whether a message routed directly to TE should be acknowledged or not (refer command `AT+CNMA`).

10.13.3　　　Defined Values

Caution: The following parameters are NOT supported:

- <mode>: '3'
- <bm>: '1' (broadcast is not supported)

mode
　　Integer [0-3]. The buffering mechanism may as well be located in the ME; the setting affects only to unsolicited result codes specified within this command).

Table 191.　　　mode

Value	Description
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 (for example, 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 (for example 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.

Note: The ME/TA result code buffer is in volatile memory. In this case, messages may get lost if the power of ME/TA is switched off before codes are sent to TE. Thus, it is not recommended to use direct message routing (`<mt>`=2 or 3, `<bm>`=2 or 3, or `<ds>`=1) with <mode> value 0 or 2.

mt
　　Integer [0-3]. The rules for storing received SMs depend on its data coding scheme (refer 3GPP TS 23.038 [2]), preferred memory storage (`AT+CPMS`) setting and this value;

Note: If the AT command interface is acting as the only display device, the ME must support storing of class 0 messages and messages in the message waiting indication group (discard message).

Table 192.　　　mt

Value	Description
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><S3><S4><pdu>` (PDU mode enabled); or `+CMT: <oa>,` [<alpha>],<scts>[,<tooa>,<fo>,<pid>,<dcs>,<sca>,<tosca>,

Value	Description
	<length>]<S3><S4>**<data>** (text mode enabled; about parameters in italics, refer command Show Text Mode Parameters `AT+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 (refer table 2). Class 2 messages and messages in the message waiting indication group (store message) result in indication as defined in `<mt>=1`.
3	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`.

bm

Integer [0-3]. The rules for storing received CBMs depend on its data coding scheme (refer 3GPP TS 23.038 [2]), the setting of Select CBM Types (`AT+CSCB`) and this value;

Table 193.   bm

Value	Description
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><S3><S4><pdu>` (PDU mode enabled) or `+CBM:` `<sn>,<mid>,<dcs>,<page>,<pages><S3><S4><data>` (text mode enabled) If ME supports data coding groups which define special routing also for messages other than class 3 (for example, (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	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`.

ds

Integer.

Table 194.   ds

Value	Description
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><S3><S4><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>`

RENESAS

bfr

Integer: 0 or 1. TA buffer of URC flushing policy.

Table 195.   bfr

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

10.14 Preferred Message Storage: AT+CPMS

Note: This command is described in 3GPP TS 27.005. See Section References.

10.14.1   Syntax

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

10.14.2   Description

The command selects memory storages `<mem1>`, `<mem2>` and `<mem3>` to be used for reading, writing, and so forth. If chosen storage is not appropriate for the ME (but is supported by the TA), final result code `+CMS ERROR: <err>` shall be returned.

The test command returns lists of memory storages supported by the TA.

See also 10.9 Message Service Failure Result Code: +CMS ERROR on page 183 for `<err>` values.

10.15 Restore Settings: AT+CRES

Note: This command is described in 3GPP TS 27.005. See Section References.
See the current implementation limitation in the parameters' description.

10.15.1   Syntax

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

10.15.2   Description

This command restores the message service settings from the non-volatile memory to active memory. A TA can contain several profiles of settings. The settings specified in commands Service Centre Address `AT+CSCA`, Set Message Parameters `AT+CSMP` and Select Cell Broadcast Message Types `AT+CSCB` (if implemented) are restored. Certain settings may not be supported by the storage (for example, (U)SIM SMS parameters) and therefore cannot be restored.

See also 10.9 Message Service Failure Result Code: +CMS ERROR on page 183 for `<err>` values.

10.15.3   Defined Values

profile

Integer. Value in range 0...255. Manufacturer specific profile number from where settings are to be restored.

10.16 Save Settings: AT+CSAS

Note: This command is described in 3GPP TS 27.005. See Section References.

See the current implementation limitation in the parameters' description.

10.16.1   Syntax

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

10.16.2   Description

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

See also 10.9 Message Service Failure Result Code: +CMS ERROR on page 183 for <err> values.

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

10.16.3   Defined Values

profile

Integer. Value in range 0...255. Manufacturer specific profile number where settings are to be stored.

10.17 Service Centre Address: AT+CSCA

Note: This command is described in 3GPP TS 27.005. See Section References.

10.17.1   Syntax

Command	Possible Response(s)
AT+CSCA=<sca>[, <tosca>]	OK
AT+CSCA?	+CSCA:<sca>,<tosca> OK
AT+CSCA=?	OK

10.17.2   Description

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

Important: It is recommended to back up the Service Center Address in SMS profile1 with AT+CSAS=1. It can then be restored by AT+CRES=1.

10.17.3   Defined Values

sca

Decimal digits. Service center address (phone number)

tosca

Integer. Type of address, TS 24.011 compliant.

10.18 Select TE Character Set: AT+CSCS

Note: This command is described in 3GPP TS 27.007. See Section References.

10.18.1   Syntax

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

10.18.2   Description

The "Set" command informs TA which character set <chset> is used by the TE. The TA can then convert strings correctly between TE and MT character sets.

When TA-TE interface is set to 8 bit operation and used TE charset is 7 bit wide, the highest bit is set to zero.

Note: It is manufacturer specific how the internal alphabet of MT is converted to/from the TE alphabet. Read command shows current setting and test command displays conversion schemes implemented in the TA.

10.18.3   Defined Values

chset
    String.

Caution: The "GSM", "UCS2" and "UTF-8" types are currently implemented.

Table 196.   chset

Value	Description
"GSM"	GSM 7 bit default alphabet (3GPP TS 23.038 [25]); this setting is not compatible with software flow control (XON/XOFF). Note: If MT is using GSM 7 bit default alphabet, its characters shall be padded with 8th bit (zero) before converting them to hexadecimal numbers (that is, no SMS style packing of 7 bit alphabet).
"HEX"	Character strings consist only of hexadecimal numbers from 00 to FF; for example, "032FE6" equals three 8-bit characters with decimal values 3, 47 and 230; no conversions to the original MT character set are attempted.
"IRA"	International reference alphabet (see ITU T Recommendation T.50 [13]).
"PCCPxxx"	IBM PC character set Code Page xxx
"PCDN"	IBM PC Danish/Norwegian character set
"UCS2"	16-bit universal multiple-octet coded character set (see ISO/IEC10646 [32]); UCS2 character strings are converted to hexadecimal numbers from 0000 to FFFF; e.g. "004100620063" equals three 16-bit characters with decimal values 65, 98 and 99.
"UTF-8"	Byte (8-bit) based variable length encoding of Unicode (see RFC 3629 [69]); UTF-8 encodes each Unicode character as a variable number of bytes, where the number of bytes depends on the character code point. The input format must be a stream of bytes. It shall not be converted to hexadecimal numbers as in "HEX" or "UCS2". This character set requires an 8-bit TA - TE interface.

Value	Description
"8859-n"	ISO 8859-n Latin n (1≤ n ≤ 6) character set
"8859-C"	ISO 8859 Latin/Cyrillic character set
"8859-A"	ISO 8859 Latin/Arabic character set
"8859-G"	ISO 8859 Latin/Greek character set
"8859-H"	ISO 8859 Latin/Hebrew character set

10.19 Show Text Mode Parameters: AT+CSDH

Note: This command is described in 3GPP TS 27.005. See Section References.

10.19.1   Syntax

Command	Possible Response(s)
AT+CSDH[=<show>]	
AT+CSDH?	`+CSDH:`<show>
AT+CSDH=?	`+CSDH:` (list of supported <show>s)

10.19.2   Description

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

The test command returns supported values as a compound value.

10.19.3   Defined Values

show

Integer. 0 or 1.

Table 197.   show

Value	Description
0	Do not show header values defined in commands `AT+CSCA` and `AT+CSMP` (<sca>, <tosca>, <fo>, <vp>, <pid> and <dcs>) nor <length>, <toda> or <tooa> in `AT+CMT`, `AT+CMGL`, `AT+CMGR` result codes for SMSDELIVERs and SMS-SUBMITs in text mode; for SMS-COMMANDs in `AT+CMGR` result code, do not show <pid>, <mn>, <da>, <toda>, <length> or <cdata>.
1	Show the values in result codes

10.20 Set Text Mode Parameters: AT+CSMP

Note: This command is described in 3GPP TS 27.005. See Section References.

10.20.1   Syntax

Command	Possible Response(s)
AT+CSMP=[<fo>[,<vp>[,<pid>[,<dcs>]]]]	
AT+CSMP?	`+CSMP:` <fo>,<vp>,<pid>,<dcs>
AT+CSMP=?	

10.20.2   Description

This command is used to select values for additional parameters needed when SM is sent to the network or placed in a storage when text format message mode is selected. It is possible to set the validity period starting from when the SM is received by the SMSC (`<vp>` is in range 0... 255) or define the absolute time of the validity period termination (`<vp>` is a string). The format of `<vp>` is given by `<fo>`. If TA supports the EVPF, see 3GPP TS 23.040 [3], it shall be given as a hexadecimal coded string (see for example, `<pdu>`) with double quotes.

Note: When storing a SMS-DELIVER from the TE to the preferred memory storage in text mode (refer command Write Message to Memory +CMGW), `<vp>` field can be used for `<scts>`.

10.21 Select Message Service: AT+CSMS

Note: This command is described in 3GPP TS 27.005. See Section References.

See the current implementation limitation in the parameters description.

10.21.1   Syntax

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

10.21.2   Description

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

See also 10.9 Message Service Failure Result Code: +CMS ERROR on page 183 for `<err>` values.

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

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

10.21.3   Defined Values

Caution: Restriction: cannot disable `<mt>`, `<mo>` and `<bm>` services.

service

   Integer. 0 to 128.

Table 198.   service

Value	Description
0	3GPP TS 23.040 [3] and 3GPP TS 23.041 [4]
1	3GPP TS 23.040 [3] and 3GPP TS 23.041 [4]. The requirement of <service> setting 1 is mentioned under corresponding command descriptions)
2...127	Reserved
128	Manufacturer specific

mt, mo, bm
Integer. 0 or 1.

Table 199.   mt, mo, bm

Value	Description
0	Type not supported
1	Type supported

10.22 Stored SMS Statistics: AT+SQNSMSCOUNT

10.22.1   Syntax

Command	Possible Response(s)
AT+SQNSMSCOUNT=[=<mem>[,<stat>]]	+SQNSMSCOUNT:<count>,<mem>,<stat> OK
AT+SQNSMSCOUNT=?	+SQNSMSCOUNT:(list of possible <mem>s),(list of possible <stat>s) OK

10.22.2   Description

This command returns the number of SMS of status <stat> stored in the given <mem>.

If <mem> is omitted, then current mem1 is used. If <stat> is omitted, then result is returned for all possible <stat>.

The command has no impact on the status of messages (UNREAD or READ).

10.22.3   Defined Values

mem
String type. Memory from which the messages are read.

Table 200.   mem

Value	Description
"ME"	ME message storage
"SM"	(U)SIM message storage
"SR"	Status report storage

stat

String. Indicates the status of message in memory.

Table 201.   stat

Value	Description
"REC UNREAD"	Received unread message
"REC READ"	Received read message
"STO UNSENT"	Stored unsent message
"STO SENT"	Stored sent message
"ALL"	All messages

count

Integer. The number of SMS in storage `<mem>` with status `<stat>`.

10.22.4   Example

- Example 1

```
AT+SQNSMSCOUNT="ME","REC READ"
+SQNSMSCOUNT: 1,ME,REC READ OK
```

- Example 2

```
AT+SQNSMSCOUNT
+SQNSMSCOUNT: 0,ME,REC UNREAD +SQNSMSCOUNT: 1,ME,REC READ
+SQNSMSCOUNT: 0,ME,STO UNSENT
+SQNSMSCOUNT: 1,ME,STO SENT
+SQNSMSCOUNT: 2,ME,ALL OK
```

10.23 Delete Long SMS: AT+SQNSMSDELETE

10.23.1   Syntax

Command	Possible Response(s)
AT+SQNSMSDELETE=<index>	OK +CME ERROR: <err>

10.23.2   Description

This command deletes the message <index> from the message storage <mem1>. If the message is segmented, all its segments are deleted.

10.23.3   Defined Values

index

Integer. Index of the message to delete.

10.23.4   Example

The first command deletes the SMS of index 0. Attempting another deletion of the same index returns an error 321 (Invalid Index).

```
AT+SQNSMSDELETE=1
OK

AT+SQNSMSDELETE=1
+CMS ERROR: 321
```

10.24 Get List of Indexes of Received SMS: AT+SQNSMSLIST

10.24.1   Syntax

Command	Possible Response(s)

AT+SQNSMSLIST	`+SQNSMSLIST: <index> [,<index>[, ... ] ]`
	
	`+CMS ERROR: <err>`

10.24.2   Description

This command returns the indexes of all stored messages. For segmented messages, it returns only one index (of one of its segment).

10.24.3   Defined Values

index
   Integer. Index of the message in memory.

10.24.4   Example

In the following example, 7 SMS fragments (#0 to #6) are in memory, and the last 3 belong to the same SMS (fragments #4, #5 and #6).

```
AT+SQNSMSLIST
+SQNSMSLIST: 0,1,2,3,4
OK
```

10.25 Send Multiline SMS: AT+SQNSMSMLSEND

10.25.1   Syntax

Command	Possible Response(s)

AT+SQNSMSMLSEND=<to>[,<save> [,<priority>
[,<cbkNumber>]]]<S3>Text is entered <CTRL+Z/ESC>
	`+SQNSMSMLSEND:ID,<internalId>`
	
	`[+SQNSMSMLSEND: STORED,<mem>,<storageId>]`

AT+SQNSMSMLSEND=?	`+SQNSMSMLSEND:`<to>[,<save> [,<priority> [,<cbkNumber>]]]<S3>Text is entered <CTRL+Z/ESC>

Note: <S3> and <S4> represent the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 and Response Formatting Character: ATS4.

10.25.2   Description

This command (optionally stores, and) sends a message from a TE to the network.

Message reference value `<mr>` is returned to the TE via URC on successful message delivery. Command behaves as `AT+SQNSMSSEND` except that text is entered at separate lines after prompt `<S3><S4><greater_than><space>` (IRA 13, 10, 62, 32).

Final result `OK` or `ERROR` is returned immediately, not waiting for Network response.

The command has an auto-segmentation feature. If necessary, the entered text is split to chunks and sent in several consecutive SMS.

The operation can be cancelled by entering `<ESC>` character (IRA 25). The `<ctrl-Z>` (IRA 26) must be used to conclude the message body.

10.25.3   Defined Values

to
   String. Destination address.

save
   Integer. 0 or 1.

Table 202.   save

Value	Description
0	Don't store the SMS before sending.
1	Store the SMS before sending.

priority

  Integer. 3GPP2 only. 0, 1, 2, or 3.

Note: This parameter is ignored in the current implementation.

Table 203.   priority

Value	Description
0	NORMAL
1	INTERACTIVE
2	URGENT
3	EMERGENCY

cbkNumber

  String. 3GPP2 only. Number to call back.

Note: This parameter is ignored in the current implementation.

internalId

  Integer. Internal identifier used to bind intermediate response with subsequent URC.

10.25.4   Defined URCs

For each SMS segment, two URC are notified.

The first URC is the status of sending attempt and the second is the status of network response.

```
+SQNSMSSENDRES: SENT OK | SENT
ERROR,<internalId>,<mr>|<errorCause>
+SQNSMSSENDRES: ACK OK | ACK
ERROR,<internalId>[,<errorCause>]
```
With:

- `<mr>`: integer type, TPDU message reference.
- `<errorCause>`: integer type, error cause

10.25.5   Example

- Send message:

```
AT+SQNSMSMLSEND="+11325476980"
> This the first line.
> This is the last line.
+SQNSMSMLSEND: ID,4
OK
+SQNSMSMLSEND: SENT OK,4,44
+SQNSMSMLSEND: ACK OK,4
```

- Store and send message:

```
AT+SQNSMSMLSEND="+11325476980",1
> test quotes "abc"
+SQNSMSMLSEND: STORED,ME,1
+SQNSMSMLSEND: 14
OK
+SQNSMSMLSEND: SENT OK,14,49
+SQNSMSMLSEND: ACK OK,14
```

10.26 Read Long SMS: AT+SQNSMSREAD

10.26.1 Syntax

Command	Possible Response(s)
AT+SQNSMSREAD=<index>	**+SQNSMSREAD:** <stat>, <send-status>, <oa>, <scts>,<local-ts>, <priority>, <cbk-xnumber><S3><S4><text>

Note: <S3> and <S4> represent the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 and Response Formatting Character: ATS4.

10.26.2 Description

This command reads the message <index> from the message storage location.

If the message is segmented, then it performs an automatic reconstruction of the full message from available segments in the storage.

10.26.3 Defined Values

index
  Integer. Index of the message to read.

stat
  Same usage as `AT+CMGR`.

send_status
  String.

Note: Only value "UNUSED" is currently supported.

scts
  Integer. Service center time stamp.

local_ts
  String.

Note: Only value "00/00/00,00:00:00+00" is currently supported.

oa
  String. Originating address.

priority
  Integer. Message priority.

Note: Only value '0' is currently supported.

cbk_number
  String. Call back number.

Note: Only value "" is currently supported.

10.26.4   Example

```
AT+SQNSMSREAD=2
+SQNSMSREAD: "REC READ","SEND
UNSET","5714550728","12/12/04,03:48:20+00","00/00/00,00:00:00+00",0,""
Test msg to check Priority and Call-Back
OK
```

10.27 Send SMS: AT+SQNSMSSEND

10.27.1   Syntax

Command	Possible Response(s)
AT+SQNSMSSEND=<to>, <text>[, <save>[, <priority>[, <cbk number>]]]	+SQNSMSSEND: ID,<internalId> [<S3><S4>+SQNSMSSEND:STORED ,<mem>,<storageId>] OK

Note: Quotes are not supported.

Note: <S3> and <S4> represent the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 and Response Formatting Character: ATS4.

10.27.2   Description

This command (optionally stores, and) sends message from a TE to the network.

The message reference value <mr> is returned to the TE via +SQNSMSSENDRES URC on successful message delivery.

The final result codes OK or ERROR are sent immediately, regardless of the eventual network response.

The command has auto-segmentation feature - if necessary, the text is split into chunks and sent in several consequtive SMS.

10.27.3   Defined Values

to
　　String. Destination number for the SMS message.

text
　　String. Text of the SMS message.

save
　　Integer. 0 or 1. Optional parameter.

Table 204.   save

Value	Description
0	(Default value) Do not save the SMS message.
1	Save the SMS message.

priority

   Integer. 0, 1, 2, or 3.

Note: This parameter is ignored in the current implementation.

Table 205.   priority

Value	Description
0	Normal
1	Interactive
2	Urgent
3	Emergency

cbk number

   String. Callback number.

Note: This parameter is ignored in the current implementation.

internalId

   Integer. Internal identifier used to bind the intermediate response with the subsequent URC.

Note: This parameter is ignored in the current implementation.

10.27.4   +SQNSMSSENDRES URC

For each SMS segment, two URCs are sent back. The first URC is the status of the sending attempt. The second URC is the status of the network response.

1. +SQNSMSSEND:
    SENT OK | SENT ERROR,`<internalId>`,`<mr>`|`<errorCause>`
    `+SQNSMSSEND: SENT OK,0,132`

2. +SQNSMSSEND:
    ACK OK | ACK ERROR,`<internalId>`[,`<errorCause>`]
    `+SQNSMSSEND: ACK OK,0`

With:

- `mr`: integer. TPDU message reference.

- `errorCause`: integer. Error cause.

10.27.5   Examples

- Send message
  `AT+SQNSMSSEND="123456789","This is the SMS content"`
- Send message and save
  `AT+SQNSMSSEND="123456789","This is the SMS content",1`
- Send message without saving and with callback number 11111
  `AT+SQNSMSSEND="123456789","This is the SMS content",0,,"11111"`
- Full example with Error
  `AT+SQNSMSSEND="1234","01234567890123456789012345678901234567890"`
  `+SQNSMSSEND: ID,6`
  `+SQNSMSSEND: ID,7`
  `OK`
  `+SQNSMSSEND: SENT ERROR,6,500`
  `+SQNSMSSEND: SENT ERROR,7,500`
- Full example with OK+ACK
  `AT+SQNSMSSEND="1234","01234567890123456789012345678901234567890"`
  `+SQNSMSSEND: ID,6`

```
+SQNSMSSEND: ID,7
OK
+SQNSMSSEND: SENT OK,6,1
+SQNSMSSEND: SENT OK,7,2
+SQNSMSSEND: ACK OK,6 or +SQNSMSSEND: ACK ERROR,6,1 +SQNSMSSEND: ACK OK,7 or
+SQNSMSSEND: ACK ERROR,7,1
```

11. USIM Application Toolkit (USAT) Commands

11.1 Activate USAT Profile: AT+CUSATA

Note: This command is described in 3GPP TS 27.007. See Section References.

11.1.1 Syntax

Command	Possible Response(s)
+CUSATA[=<activation>]	`+CUSATA:`<UICC_state>[,<additional_profile_support>] `+CME ERROR:` <err>
AT+CUSATA=?	`+CUSATA:`(list of supported <activation>s)

11.1.2 Description

The command `AT+CUSATA` retrieves the current UICC state or downloads a profile to the UICC and/or activates handling of the TE profile facilities.

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, that is, 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 `AT+CFUN` to get back to an initial non-active UICC state. The `AT+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].

The test command returns values supported as a compound value.

Refer to section 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for details on `<err>`.

11.1.3 Defined Values

activation

Integer: 0, 1, 2, or 3.

Table 206.   activation

Value	Description
0	Return status information only, in information response: `AT+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 `AT+CUSATD=1`).
2	Download MT default profile.
3	Download the combined TE and MT profile (merger of the profiles written by `AT+CUSATW`) an enable TE profile facility handling. The rules for merging profiles are defined in 3GPP TS 31.111 [92].

UICC_state

Integer: [0-4]. Parameter reports that the UICC entered a new state during start-up or that the UICC ended startup and entered active state.

Table 207.   UICC_state

Value	Description
0	UICC start-up in progress, before profile download.
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: 0 or 1. 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.

Table 208.   additional_profile_support

Value	Description
0	No support.
1	Supported.

proactive_command

String type in hexadecimal character format. Proactive command as defined in 3GPP TS 31.111 [92], consisting of the full BER-TLV data object.

11.2 Profile Download upon Start-Up: AT+CUSATD

Note: This command is described in 3GPP TS 27.007. See Section References.

11.2.1 Syntax

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

11.2.2 Description

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 AT+CUSATD settings have not been altered, then the default settings determine the behavior upon start-up. However, if the parameters of AT+CUSATD has been set to other than default and then a restart is performed (for example, by AT+CFUN), these values determine the behavior. This is true for one restart only after altering AT+CUSATD parameters, as they are always reset to default at the end of the next UICC start-up (that is, 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 only be used if the UICC is already in active state (<UICC_state> 4, for example, upon AT+CUSATA) or in download completed state (<UICC_state> 2) and the UICC does not support the "Additional TERMINAL PROFILE after UICC activation" feature (see 3GPP TS 31.111 [92]). In all other cases the command responds with +CME ERROR: 14 (SIM busy).

AT+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 AT+CUSATD=1, the AT+CUSATA=1 command has to be used to enable TE profile facility handling after restart. In the time between profile download and issuance of AT+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 AT+CUSATA=1 command arrives late.

Note: Care has to be taken when using AT+CUSATD=2. If no AT+CUSATA=2 or AT+CUSATA=3 is sent during startup, USAT is also blocked for the MT.

The test command returns supported values as compound values.

Refer to section 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for details on <err>.

11.2.3 Defined Values

download

Integer: 0, 1, or 5. Parameter decides when/if to perform a profile download to UICC and which profile to download. The default value is implementation specific.

Table 209.   download

Value	Description
0	Download MT default profile automatically during next start-up.
1	Download the combined TE and MT profile (merger of the profiles written by `AT+CUSATW`) automatically during next start-up. The rules for merging profiles are defined in 3GPP TS 31.111 [92].
5	Halt next UICC start-up when ready for profile download. Profile to download will be selected and download will be triggered by `AT+CUSATA`.

reporting

Integer: 0 or 1. Enable/disable unsolicited result code `+CUSATS: <UICC_state>` to notify the TE about a new state during start-up.

Table 210.   reporting

Value	Description
0	Disable `+CUSATS`, that is, no notification.
1	Enable `+CUSATS`, that is, notify TE.

UICC_state

Integer [0-4]. Parameter reports that the UICC entered a new state during start-up or that the UICC ended startup and entered active state.

Table 211.   UICC_state

Value	Description
0	UICC start-up in progress, before profile download.
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.

11.3 Send USAT Envelope Command: AT+CUSATE

Note: This command is described in 3GPP TS 27.007. See Section References.

11.3.1 Syntax

Command	Possible Response(s)
AT+CUSATE=<envelope_command>	`+CME ERROR:`<err>
AT+CUSATT=?	

11.3.2 Description

This command sends a USAT terminal response to the MT as an answer to a preceding USAT proactive command sent from the UICC with unsolicited result code AT+CUSATP: <proactive_command> (see AT+CUSATA command description).

Refer to section 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for details on <err>.

11.3.3 Defined Values

envelope_command

> Hexadecimal character format. Envelope command as defined in 3GPP TS 31.111 [92], consisting of the full BER-TLV data object.

envelope_response

> Hexadecimal character format. Response to the envelope command as defined in 3GPP TS 31.111 [92], consisting of the full BER-TLV data object. An empty string is provided if the UICC does not have any response data to provide.

busy

> Integer: 0, 1, or 2.

Table 212.   busy

Value	Description
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.

sw1

> Integer. Status word information from the envelope response returned by the UICC as defined in ETSI TS 102 221 [60], subclause 10.2. The parameter can be delivered to the TE both in the case of successful and failed execution of the envelope command.

sw2

> Integer. For description, see <sw1>.

11.4 Read USAT Profile: AT+CUSATR

Note: This command is described in 3GPP TS 27.007. See Section References.

11.4.1 Syntax

Command	Possible Response(s)
AT+CUSATR [=<profile_storage>]	[+CUSATR: <profile_storage>,<profile>][<S3><S4>+CUSATR:<profile_storage>,<profile>[...]] +CME ERROR: <err> OK
AT+CUSATR=?	+CUSATR:(list of supported <profile_storage>s)

Note: <S3> and <S4> represent the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 and Response Formatting Character: ATS4.

11.4.2 Description

The command `AT+CUSATR=<profile_storage>` returns the profile specified by `<profile_storage>`.

The command issued without parameter `AT+CUSATR` returns all profiles.

The test command returns values supported as a compound value.

Refer to 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for details on `<err>`.

11.4.3 Defined Values

profile_storage

    Integer [0-5].

Table 213.   profile_storage

Value	Description
0	TE profile that can be set with `AT+CUSATW`.
1	MT profile that can be set with `AT+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 EF$_{UST}$. 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 in 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].

11.5 Send USAT Terminal Response: AT+CUSATT

Note: This command is described in 3GPP TS 27.007. See Section References.

11.5.1 Syntax

Command	Possible Response(s)

AT+CUSATT=<terminal_response>	`+CUSATE:<envelope_response>[,<busy>] [<S3><S4>+CUSATE2:<sw1>,<sw2>]`
	
	 `+CME ERROR: <err>`

AT+CUSATE=?	

Note: <S3> and <S4> represent the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 and Response Formatting Character: ATS4.

11.5.2 Description

This command allows the TE to send a USAT envelope command to the MT. If the UICC provides response data to the command or indicates that USAT is busy, the information response `+CUSATE:<envelope_response>[,<busy>]` is returned. A second line of information response `+CUSATE2:<sw1>,<sw2>` may be provided if the MT presents the status words provided by the UICC.

Refer to 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for details on `<err>`.

11.5.3 Defined Values

terminal_response

String type in 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.

11.6 Write USAT Profile: AT+CUSATW

Note: This command is described in 3GPP TS 27.007. See Section References.

11.6.1 Syntax

Command	Possible Response(s)
AT+CUSATW [=<profile_storage>[,<profile>]]	+CUSATW: <profile_storage>,< <conflict_profile> +CME ERROR: <err> OK
AT+CUSATW=?	+CUSATW:(list of supported <profile_storage>s)

11.6.2 Description

The command `AT+CUSATR=<profile_storage>` returns the profile specified by `<profile_storage>`.

The same command issued without parameter `AT+CUSATR` returns all profiles.

The test command returns values supported as a compound value.

Refer to section 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for details on `<err>`.

11.6.3 Defined Values

profile_storage

Integer [0-2].

Table 214.   profile_storage

Value	Description
0	TE. The profile is stored in the facilities supported by the TE. The default value is a blank profile with all bits set to zero. This value is applicable both in the command and in the information response.
1	MT. Refers profile storage for the facilities to be supported by MT, which can be a subset of the default MT facilities. The TE can choose to register a subset of the MT default profile, typically omitting facilities also supported by the TE profile. Default value is the MT default profile. This value is applicable both in the execution command and in the information response.
5	Refers to a conflict between the TE profile and the list of MT only facilities. This value is not applicable in the execution command.

profile

String type in 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 in 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 [92].

RENESAS

11.7 Change STK APN Configuration: AT+SQNSTKAPNE

11.7.1 Syntax

Command	Possible Response(s)
AT+SQNSTKAPNE= <apnname>, <iptype>, <enabled>	OK
AT+SQNSTKAPNE?	+SQNSTKAPNE:<apnname>, <iptype>, <enabled> OK
AT+SQNSTKAPNE=?	+SQNSTKAPNE:<apnname>, (ip, ipv6, ipv4v6), (0,1) OK

11.7.2 Description

This command changes the STK APN configuration. If the UICC STK application does not provide the APN in the open channel, this configuration will be used instead.

This setting is lost during reboots.

The read command returns the current configuration.

The test command returns the possible values.

Note: The maximum usable length for <apnname> is 127 bytes. Any longer string is internally truncated to the first 127 bytes.

11.7.3 Defined Values

iptype

 String. IP type description.

Table 215. iptype

Value	Description
ip	IPv4 only
ipv6	IPv6 only
ipv4v6	IPv4 and IPv6

enabled

 Integer:0 or 1. Status.

Table 216. enabled

Value	Description
0	APN is disabled
1	APN is enabled

11.7.4 Example

- Set STK APN:

```
AT+SQNSTKAPNE="stktest","ipv4v6",1
OK
```

- Read the current autoconnect setting:

```
AT+SQNSTKAPNE?
+SQNSTKAPNE: stktest,ipv4v6,1 OK
```

12. USIM Related Commands

12.1 Close Logical Channel: AT+CCHC

Note: This command is described in 3GPP TS 27.007. See Section References.

12.1.1 Syntax

Command	Possible Response(s)
AT+CCHC=<sessiondd>	+CCHC +CME ERROR: **<err>**
AT+CCHC=?	+CME ERROR: **<err>**

12.1.2 Description

This command asks the ME to close a communication session with the active UICC. The ME shall close the previously opened logical channel. The TE will no longer be able to send commands on this logical channel. The UICC will close the logical channel when receiving this command.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

12.1.3 Defined Values

sessionid

Integer type value, a session Id to be used in order to target a specific application on the smart card (for example, (U)SIM, WIM, ISIM) using logical channels mechanism.

12.2 Open Logical Channel: AT+CCHO

Note: This command is described in 3GPP TS 27.007. See Section References.

12.2.1 Syntax

Command	Possible Response(s)
AT+CCHO=<dfname>	<sessionid> +CME ERROR: **<err>**
AT+CCHO=?	+CME ERROR: **<err>**

12.2.2 Description

This command causes the MT to return <sessionid> to allow the TE to identify a channel that is being allocated by the currently selected UICC, which is attached to ME. The currently selected UICC will open a new logical ETSI 3GPP TS 27.007 version 12.10.0 Release 12 141 ETSI TS 127 007 V12.10.0 (2015-10) channel; select the application identified by the <dfname> received with this command and return a session Id as the response. The ME shall restrict the communication between the TE and the UICC to this logical channel.

This <sessionid> is to be used when sending commands with Restricted UICC Logical Channel access AT+CRLA or Generic UICC Logical Channel Access: AT+CGLA commands.

Note: The logical channel number is contained in the CLASS byte of an APDU command, thus implicitly contained in all APDU commands sent to a UICC. In this case it will be up to the MT to manage the logical channel part of the APDU CLASS byte and to ensure that the chosen logical channel is relevant to the <sessionid> indicated in the AT command. See 3GPP TS 31.101 [65] for further information on logical channels in APDU commands protocol.
See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 on page 121 for <err> values.

12.2.3 Defined Values

dfname

All selectable applications in the UICC are referenced by a DF name coded on 1 to 16 bytes

sessionid

Integer type value, a session Id to be used in order to target a specific application on the smart card (for example, (U)SIM, WIM, ISIM) using logical channels mechanism

12.3 Generic UICC Logical Channel Access: AT+CGLA

Note: This command is described in 3GPP TS 27.007. See Section References.

12.3.1 Syntax

Command	Possible Response(s)
AT+CGLA=<sessionid>,<length>,<command>	+CGLA:<length>, <response> +CME ERROR: <err>
AT+CGLA=?	+CME ERROR: <err>

12.3.2 Description

This command transmits to the MT the `<command>` it then shall send as it is to the selected UICC. In the same manner, the UICC `<response>` is forwarded back by the MT to the TA as it is.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 on page 121 for <err> values.

This command allows a direct control of the currently selected UICC by a distant application on the TE. The TE shall then take care of processing UICC information within the frame specified by GSM/UMTS.

Although the Generic UICC Logical Channel Access command `AT+CGLA` allows TE to take control over the UICC-MT interface, there are some functions of the UICC-MT interface that logically do not need to be accessed from outside the TA/MT. Moreover, for security reasons, the GSM network authentication should not be handled outside the TA/MT. Therefore execution of a Run GSM Algorithm command or an Authenticate command in GSM ETSI 3GPP TS 27.007 version 12.10.0 Release 12 139 ETSI TS 127 007 V12.10.0 (2015-10) context from the TE using `AT+CGLA` is forbidden at all times regardless of whether the `+CGLA` is locked or unlocked. This policy does not forbid the TE to send Authenticate commands in other security contexts (for example, EAP security context).

For example, the TA/MT forbids the transfer of the Authenticate command to a USIM application when parameters P2 = 0 (GSM security context). See 3GPP TS 31.102 [59] for USIM authenticate command definition.

Note: Compared to Restricted UICC Access command `AT+CRLA`, the definition of `AT+CGLA` allows TE to take more control over the UICC-MT interface. The locking and unlocking of the interface may be done by a special <command> value or automatically by TA/MT (by interpreting <command> parameter). In case that TE application does not use the unlock command (or does not send a <command> causing automatic unlock) within a certain timeout value, MT can release the lock.

12.3.3 Defined Values

sessionid

Integer: Identifier of the session to be used in order to send the APDU commands to the UICC. This ID is mandatory in order to send commands to the UICC when targeting applications on the smart card using a logical channel other than the default channel (channel "0").

length

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

command

Command passed on by the MT to the UICC in the format as described in 3GPP TS 31.101 [65] (hexadecimal character format; refer Select TE Character Set: AT+CSCS)

response

Response to the command passed on by the UICC to the MT in the format as described in 3GPP TS 31.101 [65] (hexadecimal character format; refer Select TE Character Set: AT+CSCS)

12.3.4 Example

- Lock the SIM interface

  `AT+CGLA=<sessionId>,1,"1"`

- Unlock the SIM interface

  `AT+CGLA=<sessionId>,1,"0"`

12.4 Facility Lock: AT+CLCK

Note: This command is described in 3GPP TS 27.007. See Section References.

See the current implementation limitation in `fac` parameter description.

12.4.1 Syntax

Command	Possible Response(s)

AT+CLCK=<fac>,<mode>[,<passwd>[,<class>]]	`+CME ERROR: <err>`
	when <mode>=2 and
	command successful:
	
	`+CLCK:`
	<status>[,<class1>[<S3><S4>`+CLCK:`<status>,<class2> [...]]

AT+CLCK=?	`+CLCK:` (list of supported <fac>s)

Note: <S3> and <S4> represent the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 and Response Formatting Character: ATS4.

12.4.2 Description

Tis command is used to lock, unlock or interrogate a MT or a network facility `<fac>`. Password is normally needed to do such actions. When querying the status of a network service (`<mode>=2`) the response line for 'not active' case (`<status>=0`) should be returned only if service is not active for any `<class>`.

Call barring facilities are based on GSM/UMTS supplementary services (refer 3GPP TS 22.088 [6]). The interaction of these with other commands based on other GSM/UMTS supplementary services is described in the GSM/UMTS standard.

The test command returns facility values supported as a compound value.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

12.4.3 Defined Values

fac

   String. Facility.

Caution: Only the "SC", "FD", "PN" and "PS" facilities are currently implemented.

Table 217.   fac

Value	Description
"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)
"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 [6] clause 1)

Value	Description
"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 [6] 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)
"FD"	SIM card or active application in the UICC (GSM or USIM) fixed dialing 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])

mode

Integer: 0, 1, 2. Mode.

Table 218.   mode

Value	Description
0	unlock
1	lock
2	query status

status

Integer: 0 or 1. Status.

Table 219.   status

Value	Description
0	Not active
1	Active

passwd

String. Password set for the facility from the MT user interface or with command `AT+CPWD`.

classx

8-bit field. Each bit represents a class of information. Default is 7 = voice + data + fax.

Table 220.   classx

Value	Description
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

Value	Description
16	Data circuit sync
32	Data circuit async
64	Dedicated packet access
128	Dedicated PAD access

12.5 Enter PIN: AT+CPIN

Note: This command is described in 3GPP TS 27.007. See Section References.

12.5.1 Syntax

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

12.5.2 Description

This command sends to the MT a password which is necessary before it can be operated (SIM PIN, SIM PUK, PH SIM PIN, and so forth). 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.

Notes: 1. SIM PIN, SIM PUK, PH-SIM PIN, PH-FSIM PIN, PH-FSIM PUK, SIM PIN2 and SIM PUK2, refer to the PIN of the selected application on the UICC. For example, in an UTRAN context, the selected application on the currently selected UICC should be a USIM and the SIM PIN then represents the PIN of the selected USIM. See 3GPP TS 31.101 [65] for further details on application selection on the UICC.
If the PIN required is SIM PUK or SIM PUK2, the second pin is required. This second pin, <newpin>, is used to replace the old pin in the SIM.
2. Commands which interact with MT that are accepted when MT is pending SIM PIN, SIM PUK, or PH SIM are: AT+CGMI, AT+CGMM, AT+CGMR, AT+CGSN, ATD112; (emergency call), AT+CPAS, AT+CFUN, AT+CPIN, AT+CPINR, AT+CDIS (read and test command only), and AT+CIND (read and test command only).

The read command returns an alphanumeric string indicating whether some password is required or not. See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

12.5.3 Defined Values

pin
> String. PIN code.

newpin
> String. New PIN code.

code

    String. Specific code:

Table 221.   code

Value	Description
READY	MT is not waiting for any password
SIM PIN	MT is waiting for the SIM PIN to be given
SIM PUK	MT is waiting for the SIM PUK to be given
PH-SIM PIN	MT is waiting for the phone to SIM card password to be given
PH-FSIM PIN	MT is waiting for the phone-to-very first SIM card password to be given
PH-FSIM PUK	MT is waiting for the phone-to-very first SIM card unblocking password to be given
SIM PIN2	MT is waiting for the SIM PIN2 to be given (this <code> is recommended to be returned only when the last executed command resulted in PIN2 authentication failure (that is, `+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 for the SIM PUK2 to be given (this <code> is recommended to be returned only when the last executed command resulted in PUK2 authentication failure (that is, `+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 for the network personalization password to be given
PH-NET PUK	MT is waiting for the network personalization unblocking password to be given
PH-NETSUB PIN	MT is waiting for the network subset personalization password to be given
PH-NETSUB PUK	MT is waiting for the network subset personalization unblocking password to be given
PH-SP PIN	MT is waiting for the service provider personalization password to be given
PH-SP PUK	MT is waiting for the service provider personalization unblocking password to be given
PH-CORP PIN	MT is waiting for the corporate personalization password to be given
PH-CORP PUK	MT is waiting for the corporate personalization unblocking password to be given

12.6 Enter PIN2: AT+CPIN2

12.6.1 Syntax

Command	Possible Response(s)
AT+CPIN2=<pin>[,<newPin>[,<aid>]]	`+CME ERROR:`err

12.6.2 Description

This command allows sending to the USIM the PIN2 and the PUK2 if the SIM supports PUK2. If the PUK2 is sent it must be followed by the new PIN2.

12.6.3 Defined Values

pin

    Integer. Value of PIN2 or PUK2.

newpin

Integer. Value of the new PIN2 if SIM contains PUK2.

aid

Application ID, if omitted USIM application is used.

12.6.4 Example

- Enter PIN2 without aid:

    AT+CPIN2=1234
    OK

- Enter PUK2 and update PIN2 without aid:

    AT+CPIN2=12345678,1234
    OK

12.7 Remaining PIN Retries: AT+CPINR

Note: This command is described in 3GPP TS 27.007. See Section References.

See the current implementation limitation in `sel_code` parameter description.

12.7.1 Syntax

Command	Possible Response(s)
AT+CPINR= [<sel_code>]	+CME ERROR: <err>
AT+CPINR=?	

12.7.2 Description

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

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

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

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

12.7.3 Defined Values

Caution: Restriction for `sel_code` parameter: only "SIM PIN" and "SIM PUK" codes are supported. Wildcard matching by "*" is not supported.

retries

Integer type. Number of remaining retries per PIN.

default_retries

Integer type. Number of default/initial retries per PIN.

code

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

ext_code

String. Manufacturer specific codes.

sel_code

String type. Same values as for the <code> and <ext_code> parameters. These values are strings and shall be indicated within double quotes.

12.8 Preferred PLMN List: AT+CPOL

Note: This command is described in 3GPP TS 27.007. See Section References.

12.8.1 Syntax

Command	Possible Response(s)
AT+CPOL[[<index>][, <format> [,<oper> [,<GSM_AcT>, <GS M_Compact_AcT>,<UTRAN _AcT>, <E-UTRAN_AcT>]]]]	`+CME ERROR: <err>`
AT+CPOL?	`+CPOL:`[<index1>,<format>,<oper1>[,<GSM_AcT1>,<GSM_Compact_A cT1>,<UTRAN_AcT1>,<EUTRAN_AcT1>]`[<S3><S4>+CPOL:`<index2>, <format>,<oper2>[,<GSM_AcT2>,<GSM_Compact_AcT2>,<UTRAN_Ac T2>,<EUTRAN_AcT2>] [...]]`    `+CME ERROR: <err>`
AT+CPOL=?	`+CPOL:` (list of supported <index>s),(list of supported <format>s) `+CME ERROR: <err>`

Note: <S3> and <S4> represent the value of the command line termination character and the response formatting character, respectively. See Command Line Termination Character: ATS3 and Response Formatting Character: ATS4.

12.8.2 Description

This command is used to edit the PLMN selector with Access Technology lists in the SIM card or active application in the UICC (GSM or USIM).

Execute command writes an entry in the SIM/USIM list of preferred PLMNs, previously selected by the command `AT+CPLS`. If no list has been previously selected, the User controlled PLMN selector with Access Technology, EFPLMNwAcT, is the one accessed by default. If `<index>` is given but `<oper>` is left out, entry is deleted. If `<oper>` is given but `<index>` is left out, `<oper>` is put in the next free location. If only `<format>` is given, the format of the `<oper>` in the read command is changed. The Access Technology selection parameters, `<GSM_AcT>`, `<GSM_Compact_AcT>` and `<UTRAN_AcT>` and `<EUTRAN_AcT>` are required when writing User controlled PLMN selector with Access Technology, EFPLMNwAcT, Operator controlled PLMN selector with Access Technology EFOPLMNwAcT and HPLMN selector with Access Technology EFHPLMNwAcT, see 3GPP TS 31.102 [59].

Notes: 1. MT can also update the User controlled PLMN selector with Access Technology, `EFPLMNwAcT`, automatically when new networks are selected.
2. The Operator controlled PLMN selector with Access Technology `EFOPLMNwAcT`, can only be written if the write access condition in the SIM/USIM has been previously verified.

Read command returns all used entries from the SIM/USIM list of preferred PLMNs, previously selected by the command `AT+CPLS`, with the Access Technologies for each PLMN in the list.

Test command returns the whole index range supported by the SIM.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for `<err>` values.

12.8.3 Defined Values

indexn

Integer type. The order number of operator in the SIM/USIM preferred operator list

format

Integer: 0, 1, or 2

Table 222.　format

Value	Description
0	Long format alphanumeric <oper>
1	Short format alphanumeric <oper>
2	Numeric <oper>

opern

String. <format> indicates if the format is alphanumeric or numeric (see PLMN Selection: AT+COPS)

GSM_AcTn

Integer: 0 or 1. GSM access technology

Table 223.　GSM_AcTn

Value	Description
0	Access technology not selected
1	Access technology selected

GSM_Compact_AcTn

Integer: 0 or 1. GSM compact access technology

Table 224.　GSM_Compact_AcTn

Value	Description
0	Access technology not selected
1	Access technology selected

UTRAN_AcTn

Integer: 0 or 1. UTRAN access technology

Table 225.　UTRAN_AcTn

Value	Description
0	Access technology not selected
1	Access technology selected

E-UTRAN_AcTn

Integer: 0 or 1. E-UTRAN access technology

Table 226.   E-UTRAN_AcTn

Value	Description
0	Access technology not selected
1	Access technology selected

12.9 Change Password: AT+CPWD

Note: This command is described in 3GPP TS 27.007. See Section References.
See the current implementation limitation in `fac` parameter description.

12.9.1 Syntax

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

12.9.2 Description

This command sets a new password for the facility lock function defined by command Facility Lock `AT+CLCK`.

Test command returns a list of pairs which present the available facilities and the maximum length of their password.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

12.9.3 Defined Values

fac

String. Facility. See 13.4 Facility Lock: AT+CLCK on page 211 for other values.

Caution: Only the "SC" and "P2" facilities are currently implemented.

Table 227.   fac

Value	Description
"P2"	SIM PIN2
"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)

oldpwd, newpwd

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

pwdlength

Integer. Maximum length of the password for the facility.

12.10 Restricted UICC Logical Channel Access: AT+CRLA

Note: This command is described in 3GPP TS 27.007. See Section References.

12.10.1 Syntax

Command	Possible Response(s)
AT+CRLA= =<sessionid>,<com mand>[,<fileid>[,<P1>,<P2>,< P3>[,<data>[,<pathid>]]]],	+CRLA: <sw1>,<sw2>[,<response>] +CME ERROR: <err>
AT+CRLA =?	

12.10.2 Description

By using this command instead of Generic UICC Access AT+CGLA TE, the TE application has easier but more limited access to the UICC database. The command transmits to the MT the UICC <command> and its required parameters. MT handles internally, for the selected UICC, all UICC MT interface locking and file selection routines. As response to the command, MT sends the actual UICC information parameters and response data. MT error result code +CME ERROR may be returned when the command cannot be passed to the UICC, but failure in the execution of the command in the UICC is reported in <sw1> and <sw2> parameters.

The coordination between command requests to UICC and commands issued by GSM/UMTS application inside the MT is implementation dependent. However the TE should be aware of the precedence of the GSM/UMTS application commands to the TE commands.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

12.10.3 Defined Values

sessionid

Integer: Identifier of the session to be used in order to send the APDU commands to the UICC. It is mandatory in order to send commands to the UICC when targeting applications on the smart card using a logical channel other than the default channel (channel "0").

command

Integer. Command passed on by the MT to the UICC; refer 3GPP TS 31.101 [65].

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

12.10.4 command

Value	Description
176	READ BINARY
178	READ RECORD
192	GET RESPONSE
214	UPDATE BINARY
220	UPDATE RECORD
242	STATUS
203	RETRIEVE DATA
219	SET DATA

Value	Description
Other values	Reserved

fileid

Integer: Identifier of an elementary datafile on UICC. Mandatory for every command except XXXXXXX.

Note: The range of valid file identifiers depends on the actual UICC and is defined in 3GPP TS 31.101 [65]. Optional files may not be present at all.

P1, P2, P3

Integer: Parameters passed on by the MT to the UICC. These parameters are mandatory for every command, except `GET RESPONSE` and `STATUS`. The values are described in 3GPP TS 31.101 [65].

data

Hexadecimal characters. Information which shall be written to the SIM (hexadecimal character format; refer `AT+CSCS`)

pathid

String type. Contains the path of an elementary file on the UICC in hexadecimal format (for example, "5F704F30" for DFSoLSA/EFSAI). The `<pathid>` shall only be used in the mode "select by path from current DF" as defined in ETSI TS 102 221 [60].

sw1, sw2

Integers. Information from the UICC about the execution of the actual command. These parameters are delivered to the TE on successful or failed execution of the command.

response

Hexadecimal characters. Response of a successful completion of the command previously issued (hexadecimal character format; refer `AT+CSCS`).

`STATUS` and `GET RESPONSE` return data, which gives information about the current elementary datafield. This information includes the type of file and its size (refer 3GPP TS 31.101 [65]). 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.

12.11 Restricted SIM Access: AT+CRSM

Note: This command is described in 3GPP TS 27.007. See Section References.

12.11.1 Syntax

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

12.11.2 Description

By using this command instead of Generic SIM Access `AT+CSIM`, the TE application has an easier but more limited access to the SIM database. The command transmits to the MT the SIM `<command>` and its required parameters. If a SIM is installed in the currently selected card slot, the MT handles internally all SIM MT interface locking and file selection routines. As response to the command, MT sends the actual SIM information parameters and response data. An MT error result code `+CME ERROR` may be returned when the command cannot be passed to the SIM, but failure in the execution of the command in the SIM is reported in

`<sw1>` and `<sw2>` parameters. Refer to 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for details on `<err>`.

Coordination of command requests to SIM and the ones issued by GSM/UMTS application inside the MT is implementation dependent. However, the TE should be aware of the precedence of the GSM/UMTS application commands over the TE commands.

12.11.3　　　Defined Values

command

Integer. Command passed on by the MT to the SIM. Refer 3GPP TS 51.011 [28].

Table 228.　　　command

Value	Description
176	READ BINARY
178	READ RECORD
192	GET RESPONSE
214	UPDATE BINARY
220	UPDATE RECORD
242	STATUS
203	RETRIEVE DATA
219	SET DATA

Note: All other values are reserved.

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

fileid

Integer. Identifier of a elementary datafile on SIM. Mandatory for every command except STATUS.

Note: 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. 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.

data

Hexadecimal. Information to be written to the SIM. See also section Select TE Character Set: AT+CSCS.

pathid

String. Path of an elementary file on the SIM/UICC in hexadecimal format as defined in ETSI TS 102 221 [60] (for example, "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: 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, the selection was implementation specific.

sw1, sw2

Integer. Information from the SIM about the execution of the actual command. These parameters are delivered to the TE on successful or failed execution of the command

response

Hexadecimal. Response of a successful completion of the command previously issued. See also Section Select TE Character Set: AT+CSCS. `STATUS` and `GET RESPONSE` return data, which gives information about the current elementary datafield. 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 is returned.

`<response>` is not returned after a successful `UPDATE BINARY`, `UPDATE RECORD` or `SET DATA` command.

12.12 Generic SIM Access: AT+CSIM

Note: This command is described in 3GPP TS 27.007. See Section References.

12.12.1 Syntax

Command	Possible Response(s)

AT+CSIM= <length>, <command>	`+CSIM: <length>,<response>`
	
	`+CME ERROR: <err>`
	
	`OK`

AT+CSIM=?	

12.12.2 Description

This command transmits `<command>` to the SIM. In the same manner, the SIM `<response>` is sent back by the MT to the TA as it is. See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

This command allows a direct control of the SIM by a distant application. Care must be taken to process SIM information within the frame specified by GSM/UMTS.

Note: Compared to Restricted SIM Access command `AT+CRSM`, the definition of `AT+CSIM` allows the TE to take more control over the SIM MT interface. The locking and unlocking of the interface can be done by a special `<command>` value or automatically by TA/MT (by interpreting `<command>` parameter). If the TE application does not use the unlock command (or does not send a `<command>` causing automatic unlock) before a certain timeout value, the MT can release the lock.

12.12.3 Defined Values

length

Integer. Length of the characters that are sent to TE in `<command>` or `<response>` (two times the actual length of the command or response).

command

Hexadecimal. Command passed on by the MT to the SIM in the format as described in 3GPP TS 51.011 [28]. See also Section Select TE Character Set: AT+CSCS.

response

Hexadecimal. response to the command passed on by the SIM to the MT in the format as described in 3GPP TS 51.011 [28]. See also Section Select TE Character Set: AT+CSCS.

12.13 Change PIN with <aid>: AT+SCPWD

12.13.1 Syntax

Command	Possible Response(s)
AT+SCPWD=<fac>, <pin>,<newPin>[,<aid>]	`+CME ERROR:err`

12.13.2　　　Description

This command allows changing PIN using the Application ID aid.

12.13.3　　　Defined Values

fac
> String. Facility type. Only the facility "SC" is supported.

pin
> Integer. Value of PIN code.

newpin
> Integer. Value of new PIN code.

aid
> Application ID. If omitted, USIM application is used.

12.13.4　　　Example

`AT+SCPWD="SC", 1234,5678,A0000000871004010203040506070809 OK`

12.14　ICCID Read: AT+SQNCCID

12.14.1　　　Syntax

Command	Possible Response(s)

AT+SQNCCID	`+SQNCCID:<iccid>[,<euiccid>]`
	
	`OK`
	
	`+CME ERROR:`<err>

AT+SQNCCID?	`+SQNCCID:`<iccid>`[,`<euiccid>`]`
	
	`OK`
	`+CME ERROR:`<err>

AT+SQNCCID=?	`OK`

12.14.2　　　Description

The command reads the ICCID (card identification number) and the eUICCID on the SIM card.

Caution:　Reading the CCID of the SIM card is only possible under `AT+CFUN=1` and `AT+CFUN=4`. Any reading attempt while the modem is not in one of those cases will be unsuccessful and return no error.
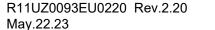
The test command returns `OK` result code.

12.14.3　　　Defined Values

iccid
> String. USIM integrated circuit card ID.

euiccid
> String. eUICCID of the SIM card.

12.15 USIM Data Download Status: AT+SQNSIMDD

12.15.1 Syntax

Command	Possible Response(s)
AT+ SQNSIMDD=<enable>	OK
AT+ SQNSIMDD=?	+ SQNSIMDD:(0-1)
AT+ SQNSIMDD?	+ SQNSIMDD:<enable>,<status>
Unsolicited Notification (URC)	+ SQNSIMDD:<status>

12.15.2 Description

The read command should be used to retrieve current USIM data download status. This status is maintained until modem shutdown.

Write command should be used to activate +SQNSIMDD USIM data download notification. If activated, an URC will be issued when an USIM data download starts or stops.

Notes:

- enable: The configuration persists over reset. The configuration also survives every modem LPM state (suspend state).
- status: survives every modem LPM state (suspend state).

12.15.3 Defined Values

enable

Integer in [0-1]. USIM data download activity notification enable state.

Table 229. enable

Value	Description
0	(default): Notification disabled
1	Notification enabled

status

Integer in [0-2]. USIM data download status.

Table 230. status

Value	Description
0	None (No USIM data download activity since modem power up)
1	USIM data download in progress
2	USIM data download completed

12.16 SIM State: AT+SQNSIMST

12.16.1   Syntax

Command	Possible Response(s)
AT+SQNSIMST=<enable>	OK
AT+SQNSIMST?	+SQNSIMST: <enable>, <status>
AT+SQNSIMST=?	+SQNSIMST:(0-1)
URC	+SQNSIMST: <status>[,<code>]

12.16.2   Description

This command enables or disables the URC +SQNSIMST that returns the SIM state.

The read command returns the current URC configuration.

The test command returns the supported entry values.

This command should be used to activate +SQNSIMST SIM state change notification. If activated, an +SQNSIMST URC will be issued at every SIM state change.

<enable> configuration is volatile and should be refreshed after device reboot. <enable> configuration persists during low power states.

See also 7.6 Mobile Termination Error Result Code: +CME ERROR on page 121 for <err> values.

12.16.3   Defined Values

enable

Integer in [0-1]. SIM status change notification enable state.

Table 231.   enable

Value	Description
0	(default): Notification disabled
1	Notification enabled

status

Integer in [0-10]. SIM card status.

Table 232.   status

Value	Description
0	No SIM card
1	SIM card under initialization
2	SIM locked (PIN/PUK) required
3	Invalid SIM card
4	SIM card failure
5	SIM card ready

Value	Description
6	PH-NET PIN (network personalization password) required
7	PH-SIM PIN (phone-to-SIM card password) required
8	Invalid SIM card in PS domain
9	Invalid SIM card in PS and CS domains
10	Invalid SIM card in CS domain

13. Appendix: Abbreviations

Table 233.   List of Abbreviations

Abbreviation	Description
A-PDU	Application Protocol Data Unit
DVI	Digital Voice Interface
GPIO	General Purpose Input output
I2C	Inter-Integrated Circuit
I2S	Integrated Interchip Sound
IMSI	International Mobile Subscriber Identification
MO	Mobile Originated
MT	Mobile Termination
PCM	Pulse Code Modulation
SCL	I2C Serial Clock Line
SDA	I2C Serial Data Line
SIM	Subscriber identity module
SMS	Short Message Service
TA	Terminal adapter
TDM	Time Division Multiplexing
TE	Terminal Equipment
UE	User Equipment
UICC	Universal Integrated Circuit Card (SIM)

Revision History

		Description	
Rev.	**Date**	**Page**	**Summary**
1.00	Mar.17.20	—	First release document
1.01	Mar.03.22	—	Made the following updates: • Added the following sections: — 3.13 Multiplexing Mode: +CMUX — 1.1 — 11 Positioning PoLTE Services — 12.10 Restricted UICC Logical Channel Access: AT+CRLA — 12.15 USIM Data Download Status: AT+SQNSIMDD • Removed the following section: — 13.12 Set Card Slot: +CSUS
2.00	Aug.04.22	—	— Corrected AT+SQNHWCFG command ("antenna tunning" section) — Removed the following section: — Multiplexing Mode: +CMUX — Positioning PoLTE Services • Overall update
2.10	Oct. 27.22	—	• Deleted AT+CEDRXRDP, AT+CEDRXS, and AT+SQNEDRX
2.20	May.22.23	—	• Corrections to the AT+SQNSUPGRADE, AT+SQNFGET, AT+SQNSD, AT+HTTPSND, AT+SQNFACTORYRESET, • AT+SQNHWCFG, AT+SMCWRX commands • Editing changes to standardize syntax through commands. • New navigation links added.

RENESAS

AT Command User's Manual

RENESAS

Renesas Electronics Corporation