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**Digital cellular telecommunications system (Phase 2);
AT command set for GSM Mobile Equipment (ME)
(GSM 07.07)**

ETSI

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Foreword

This European Telecommunication Standard (ETS) has been produced by the Special Mobile Group (SMG) Technical Committee of the European Telecommunications Standards Institute (ETSI).

This ETS specifies a profile of AT commands and recommends that this profile be used for controlling Mobile Equipment (ME) functions and GSM network services from a Terminal Equipment (TE) through Terminal Adaptor (TA) for the Digital cellular telecommunications system. This ETS corresponds to GSM technical specification, GSM 07.07, version 4.1.0

NOTE: TC-SMG has produced documents which give the technical specifications for the implementation of the Digital cellular telecommunications system. Historically, these documents have been identified as GSM Technical Specifications (GSM-TS). These TSs may have subsequently become Interim European Telecommunication Standards (I-ETSS), (Phase 1), or European Telecommunication Standards (ETSS), (Phase 2), whilst others may become ETSI Technical Reports (ETRs).

Transposition dates	
Date of adoption of this ETS:	15 September 1996
Date of latest announcement of this ETS (doa):	15 December 1996
Date of latest publication of new National Standard or endorsement of this ETS (dop/e):	15 June 1997
Date of withdrawal of any conflicting National Standard (dow):	15 June 1997

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1 Scope

This European Telecommunications Standard (ETS) specifies a profile of AT commands and recommends that this profile be used for controlling Mobile Equipment (ME) functions and GSM network services from a Terminal Equipment (TE) through Terminal Adaptor (TA). The command prefix +C is reserved for Digital Cellular in ITU-T Recommendation V.25ter [14]. This ETS has also the syntax details used to construct these extended GSM commands. Commands from ITU-T Recommendation V.25ter [14] and existing digital cellular standards (TIA IS-99 [15] and TIA IS-135 [16]) are used whenever applicable. Some of the new commands are defined such way that they can be easily applied to ME of networks other than GSM. ITU-T T.31 [11] and ITU-T T.32 [12] fax AT commands may be used for GSM fax transmission from TE.

This ETS assumes an abstract architecture comprising a TE (e.g. a computer) and a ME interfaced by a TA (see figure 1). The span of control of the defined commands should allow to handle any physical implementation that this abstract architecture may lead to:

- TA, ME and TE as three separate entities;
- TA integrated under the ME cover, and the TE implemented as a separate entity;
- TA integrated under the TE cover, and the ME implemented as a separate entity;
- TA and ME integrated under the TE cover as a single entity.

The commands described in this ETS may be observed on the link between the TE and the TA. However, most of the commands retrieve information about the ME, not about the TA.

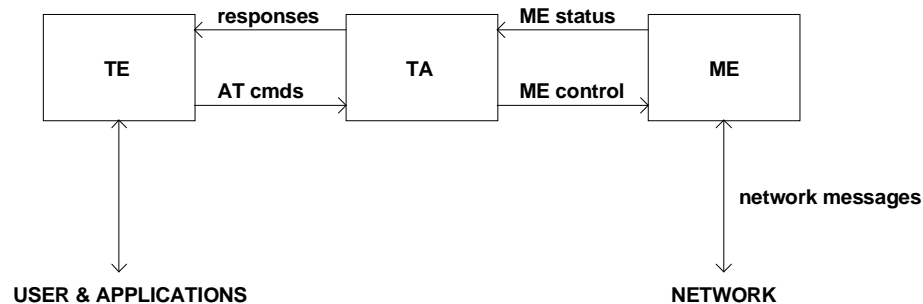


Figure 1: Setup

Interface between TE and TA is intended to operate over existing serial (ITU-T Recommendation V.24) cables, infrared link, and all link types with similar behaviour. For correct operation many of the defined commands require eight bit data and therefore it is recommended that TE-TA link is set to eight bits/ byte mode. (For infrared operation implementation refer informative references IrDA and TIA-617.) Interface between TA and ME is dependent on the interface in the ME.

2 Normative references

This ETS incorporates by dated and undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this ETS only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

- [1] GSM 02.02 (ETS 300 501): "Digital cellular telecommunication system (Phase 2); Bearer Services (BS) supported by a GSM Public Land Mobile Network (PLMN)".
- [2] GSM 02.03 (ETS 300 502): "Digital cellular telecommunication system (Phase 2); Teleservices supported by a GSM Public Land Mobile Network (PLMN)".
- [3] GSM 02.81 (ETS 300 514): "Digital cellular telecommunication system (Phase 2); Line identification supplementary services - Stage 1".

- [4] GSM 02.82 (ETS 300 515): "Digital cellular telecommunication system (Phase 2); Call Forwarding (CF) supplementary services - Stage 1".
- [5] GSM 02.83 (ETS 300 516): "Digital cellular telecommunication system (Phase 2); Call Waiting (CW) and Call Hold (HOLD) supplementary services - Stage 1".
- [6] GSM 02.88 (ETS 300 520): "Digital cellular telecommunication system (Phase 2); Call Barring (CB) supplementary services - Stage 1".
- [7] GSM 03.03 (ETS 300 523): "Digital cellular telecommunication system (Phase 2); Numbering, addressing and identification".
- [8] GSM 04.08 (ETS 300 557): "Digital cellular telecommunication system (Phase 2); Mobile radio interface layer 3 specification".
- [9] GSM MoU SE.13, GSM MoU Association Permanent Reference Document SE.13 (October 1994): "GSM Mobile Network Codes and Names".
- [10] ITU-T Recommendation E.212: "Identification plan for land mobile stations".
- [11] ITU-T Recommendation T.31: "Asynchronous facsimile DCE control, service class 1".
- [12] ITU-T Recommendation T.32: "Asynchronous facsimile DCE control, service class 2".
- [13] ITU-T Recommendation T.50: "International Reference Alphabet (IRA) (Formerly International Alphabet No. 5 or IA5) - Information technology - 7-bit coded character set for information exchange".
- [14] ITU-T Draft new Recommendation V.25ter: "Serial asynchronous automatic dialling and control".
- [15] Telecommunications Industry Association TIA IS-99: "Data Services Option Standard for Wideband Spread Spectrum Digital Cellular System".
- [16] Telecommunications Industry Association TIA IS-135: "800 MHz Cellular Systems, TDMA Services, Async Data and Fax".
- [17] Portable Computer and Communications Association PCCA STD-101 Data Transmission Systems and Equipment: "Serial Asynchronous Automatic Dialling and Control for Character Mode DCE on Wireless Data Services".
- [18] GSM 04.22 (ETS 300 563): "Digital cellular telecommunication system (Phase 2); Radio Link Protocol (RLP) for data and telematic services on the Mobile Station - Base Station System (MS - BSS) interface and the Base Station System - Mobile-services Switching Centre (BSS - MSC) interface".
- [19] GSM 02.30 (ETS 300 511): "Digital cellular telecommunication system (Phase 2); Man Machine Interface (MMI) of the Mobile Station (MS)".
- [20] GSM 05.08 (ETS 300 578): "Digital cellular telecommunication system (Phase 2); Radiosubsystem link control".
- [21] GSM 02.85 (ETS 300 518): "Digital cellular telecommunication system (Phase 2); Closed User Group (CUG) supplementary services - Stage 1".
- [22] GSM 02.84 (ETS 300 517): "Digital cellular telecommunication system (Phase 2); MultiParty (MPY) supplementary services - Stage 1".

3 Abbreviations and definitions

3.1 Abbreviations

For the purposes of this ETS the following abbreviations apply:

AT	ATtention; this two-character abbreviation is always used to start a command line to be sent from TE to TA
BCD	Binary Coded Decimal
ETSI	European Telecommunications Standards Institute
IMEI	International Mobile station Equipment Identity
IRA	International Reference Alphabet (ITU-T T.50 [13])
IrDA	Infrared Data Association
ISO	International Standards Organization
ITU-T	International Telecommunication Union - Telecommunications Standardization Sector
ME	Mobile Equipment, e.g. a GSM phone (equal to MS; Mobile Station)
MoU	Memorandum of Understanding (GSM operator joint)
PCCA	Portable Computer and Communications Association
RLP	Radio Link Protocol
SIM	Subscriber Identity Module
TA	Terminal Adaptor, e.g. a GSM data card (equal to DCE; Data Circuit terminating Equipment)
TE	Terminal Equipment, e.g. a computer (equal to DTE; Data Terminal Equipment)
TIA	Telecommunications Industry Association

3.2 Definitions

For the purposes of this ETS the following syntactical definitions apply (refer also clause 4):

<CR>	Carriage return character, which value is specified with command S3.
<LF>	Linefeed character, which value is specified with command S4.
<...>	Name enclosed in angle brackets is a syntactical element. Brackets themselves do not appear in the command line.
[...]	Optional subparameter of a command or an optional part of TA information response is enclosed in square brackets. Brackets themselves do not appear in the command line. When subparameter is not given in <i>parameter type</i> commands, new value equals to its previous value. In <i>action type</i> commands, action should be done on the basis of the recommended default setting of the subparameter.
<u>underline</u>	Underlined defined subparameter value is the recommended default setting of this subparameter. In <i>parameter type</i> commands, this value should be used in factory settings which are configured by V.25ter [14] command &F0. In <i>action type</i> commands, this value should be used when subparameter is not given.

4 AT command syntax

This clause summarizes general aspects on AT commands and issues related to them. For further information refer ITU-T Recommendation V.25ter [14].

4.1 Command line

See figure 2 for general structure of a command line. Standardized *basic* commands are found only in V.25ter [14]. GSM commands use syntax rules of *extended* commands. Every extended command has a *test command* (trailing =?) to test the existence of the command and to give information about the type of its subparameters. *Parameter type* commands also have a *read command* (trailing ?) to check the current values of subparameters. *Action type* commands do not store the values of any of their possible subparameters, and therefore do not have a read command.

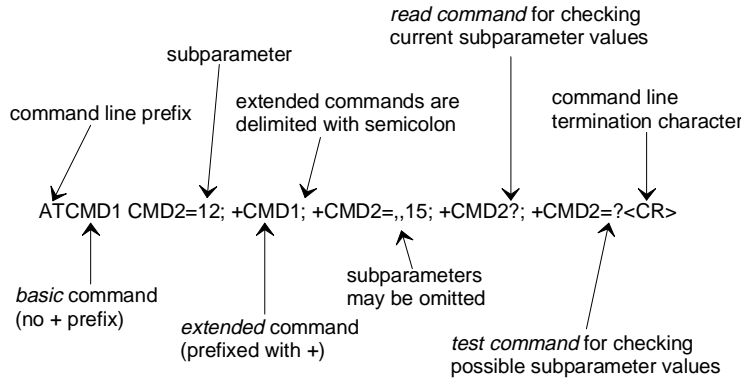


Figure 2: Basic structure of a command line

If verbose responses are enabled with command V1 and all commands in a command line has been performed successfully, result code <CR><LF>OK<CR><LF> is sent from the TA to the TE. If numeric responses are enabled with command V0, result code 0<CR> is sent instead.

If verbose responses are enabled with command V1 and subparameter values of a command are not accepted by the TA (or command itself is invalid, or command cannot be performed for some reason), result code <CR><LF>ERROR<CR><LF> is sent to the TE and no subsequent commands in the command line are processed. If numeric responses are enabled with command V0, result code 4<CR> is sent instead. ERROR (or 4) response may be replaced by +CME ERROR: <err> (refer clause 9) when command was not processed due to an error related to ME operation.

4.2 Information responses and result codes

The TA response for the example command line of figure 2 could be as shown in figure 3. Here, verbose response format is enabled with command V1. If numeric format V0 would have been used, <CR><LF> headers of *information responses* would have been left out and *final result code* changed to 0<CR>.

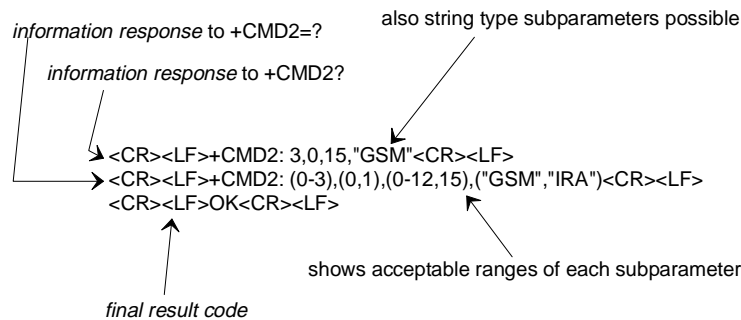


Figure 3: Response to a command line

So called *intermediate result codes* inform about progress of TA operation (e.g. connection establishment CONNECT), and so called *unsolicited result codes* indicate occurrence of an event not directly associated with issuance of a command from TE (e.g. ring indication RING).

4.3 ITU-T V.25ter [14] TE-TA interface commands

Table 1 summarizes V.25ter [14] commands relating to command line and response formatting, and TA-TE interface operation. All are applicable to GSM terminals.

Table 1: V.25ter commands relating to TE-TA interface

Command	Section	Impl.	Use in GSM
S3=[<value>]	6.2.1	mand.	command line termination character (mandatory default setting IRA 13)
S4=[<value>]	6.2.2	mand.	response formatting character (recommended default IRA 10)
S5=[<value>]	6.2.3	mand.	command line editing character (recommended default IRA 8)
E[<value>]	6.2.4	mand.	command echo (recommended default 1 i.e. TA echoes commands back)
Q[<value>]	6.2.5	mand.	result code suppression (recommended default 0 i.e. TA transmits result codes)
V[<value>]	6.2.6	mand.	TA response format (recommended default 1 i.e. verbose format)
X[<value>]	6.2.7	mand.	defines CONNECT result code format; values manufacturer specific
&C[<value>]	6.2.8	mand.	determines how ITU-T V.24 circuit 109 (or equivalent) relates to the detection of received line signal from remote end (recommended default 1 i.e. 109 operation relates to detection of received signal)
&D[<value>]	6.2.9	mand.	determines how TA responds when ITU-T V.24 circuit 108/2 (or equivalent) is changed from ON to OFF condition during on-line data state
+IPR=[<value>]	6.2.10	opt.	fixed TE data rate (recommended default 0 i.e. automatic detection)
+ICF=[<format> [, <parity>]]	6.2.11	opt.	TE-TA character framing (recommended default 3,3 i.e. eight data bits, no parity, 1 stop bit)
+IFC=[<by_te> [, <by_ta>]]	6.2.12	opt.	TE-TA local flow control (recommended default 2,2 i.e. TE uses ITU-T V.24 circuit 133 (or equivalent), and TA circuit 106 (or equivalent))
+ILRR=[<value>]	6.2.13	opt.	determines whether the used local TE-TA data rate is informed using intermediate result code +ILRR: <rate> before going on-line data state after call answering or originating

5 General commands

ITU-T Recommendation V.25ter [14] includes "Generic DCE Control" commands with the prefix +G. These commands are for the identification of the TA. Four of those commands are adapted here to be the identification commands of the ME. Syntax is otherwise similar but the prefix is +CG. TIA IS-99 [15] uses same commands for ME identification.

5.1 Request manufacturer identification +CGMI

Table 2: +CGMI action command syntax

Command	Possible response(s)
+CGMI	<manufacturer> +CME ERROR: <err>
+CGMI=?	

Description

Execution command causes the TA to return one or more lines of information text <manufacturer>, determined by the ME manufacturer, which is intended to permit the user of the TA to identify the manufacturer of the ME 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. Refer subclause 9.2 for possible <err> values.

Defined values

<manufacturer>: the total number of characters, including line terminators, in the information text shall not exceed 2 048 characters.

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

Implementation

Optional.

5.2 Request model identification +CGMM

Table 3: +CGMM action command syntax

Command	Possible response(s)
+CGMM	<model> +CME ERROR: <err>
+CGMM=?	

Description

Execution command causes the TA to return one or more lines of information text <model>, determined by the ME manufacturer, which is intended to permit the user of the TA to identify the specific model of the ME 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. Refer subclause 9.2 for possible <err> values.

Defined values

<model>: the total number of characters, including line terminators, in the information text shall not exceed 2 048 characters.

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

Implementation

Optional.

5.3 Request revision identification +CGMR**Table 4: +CGMR action command syntax**

Command	Possible response(s)
+CGMR	<revision> +CME ERROR: <err>
+CGMR=?	

Description

Execution command causes the TA to return one or more lines of information text <revision>, determined by the ME 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 ME 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. Refer subclause 9.2 for possible <err> values.

Defined values

<revision>: the total number of characters, including line terminators, in the information text shall not exceed 2 048 characters.

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

Implementation

Optional.

5.4 Request product serial number identification +CGSN**Table 5: +CGSN action command syntax**

Command	Possible response(s)
+CGSN	<sn> +CME ERROR: <err>
+CGSN=?	

Description

Execution command causes the TA to return one or more lines of information text <sn>, determined by the ME manufacturer, which is intended to permit the user of the TA to identify the individual ME to which it is connected to. Typically, the text will consist of a single line containing the IMEI (International Mobile station Equipment Identity; refer GSM 03.03 [7]) number of the ME, but manufacturers may choose to provide more information if desired. Refer subclause 9.2 for possible <err> values.

Defined values

<sn>: the total number of characters, including line terminators, in the information text shall not exceed 2 048 characters.

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

Implementation

Optional.

5.5 Select TE character set +CSCS

Table 6: +CSCS parameter command syntax

Command	Possible response(s)
+CSCS=[<chset>]	
+CSCS?	+CSCS: <chset>
+CSCS=?	+CSCS: (list of supported <chset>s)

Description

Set command informs TA which character set <chset> is used by the TE. TA is then able to convert character strings correctly between TE and ME character sets.

When TA-TE interface is set to 8-bit operation and used TE alphabet is 7-bit, the highest bit shall be set to zero.

NOTE 1: It is manufacturer specific how the internal alphabet of ME is converted to/from the TE alphabet.

Read command shows current setting and test command displays conversion schemes implemented in the TA.

Defined values

<chset> (conversion schemes not listed here can be defined by manufacturers):

- "GSM" GSM default alphabet (GSM 03.38 subclause 6.2.1); this setting causes easily software flow control (XON/XOFF) problems;
- "HEX" character strings consist only of hexadecimal numbers from 00 to FF; e.g. "032FE6" equals three characters with decimal values 3, 47 and 230.

NOTE 2: If ME is using GSM default alphabet, its characters shall be padded with 8th bit (zero) before converting them to hexadecimal numbers (i.e. no SMS-style packing of 7-bit alphabet).

- "IRA" international reference alphabet (ITU-T T.50 [13])
- "PCCP_{xxx}" PC character set Code Page _{xxx}
- "PCDN" PC Danish/Norwegian character set
- "8859-*n*" ISO 8859 Latin *n* (1-6) 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

Implementation

Mandatory when a command using the setting of this command is implemented.

5.6 ITU-T V.25ter [14] generic TA control commands

Table 7: V.25ter generic TA control commands

Command	Section	Impl.	Use in GSM
Z[<value>]	6.1.1	mand.	TA sets all parameters to their defaults as specified by a user memory profile or by the manufacturer, and resets TA
&F[<value>]	6.1.2	mand.	TA sets all parameters to their defaults as specified by the manufacturer
I[<value>]	6.1.3	opt.	request manufacturer specific information about the TA (software cannot use this command to determine the

			capabilities of a TA)
+GMI	6.1.4	mand.	request TA manufacturer identification (may equal to +CGMI)
+GMM	6.1.5	mand.	request TA model identification (may equal to +CGMM)
+GMR	6.1.6	mand.	request TA revision identification (may equal to +CGMR)
+GSN	6.1.7	opt.	request TA serial number identification (may equal to +CGSN)
+GOI	6.1.8	opt.	request ISO system global object identification of the TA (general format defined in ITU-T Recommendation X.208; encoding rules in ITU-T Recommendation X.209)
+GCAP	6.1.9	mand.	request overall capabilities of TA; the response code for a TA building on this document shall be +CGSM
+GCI=<T.35>	6.1.10	opt.	selects the country of installation for the TA using ITU-T Recommendation T.35 annex A country codes

5.7 PCCA STD-101 [17] select wireless network +WS46

PCCA STD-101 [17] includes a command to select the cellular network (Wireless Data Service; WDS) to operate with the TA. PCCA calls this as WDS-Side Stack Selection. This command may be used when TA is asked to indicate the networks in which it can operate.

Table 8: +WS46 parameter command syntax

Command	Possible response(s)
+WS46=[<n>]	
+WS46?	<n>
+WS46=?	(list of supported <n>s)

Description

Set command selects to 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.

Defined values

<n>:
 12 GSM digital cellular
 refer PCCA STD-101 [17] for other values

Implementation

Mandatory in PCCA STD-101, but optional for GSM.

5.8 Informative examples

When beginning to build a communication link, a general TE application controlling a TA needs to determine the TA and the ME to which it is connected. V.25ter [14] has seven commands for TA identification from which four are mandatory to be implemented in a TA. An example of this command sequence requesting manufacturer (+GMI), model (+GMM), revision (+GMR) and serial number (+GSN) information would be:

```
AT+GMI
Manufacturer ABC
OK
AT+GMM
GSM Ultimate Data Device
OK
AT+GMR
1.00
OK
AT+GSN
987612345-123
OK
```

The maximum lengths of the information responses are defined to be 2 048 characters, but it is recommended that they are kept as simple as in the example. The serial number command is defined as optional. Another optional command is Global Object Identification command (+GOI) which should return the object identifiers of ITU-T Recommendation X.208 as numeric strings delimited by periods. The Complete Capabilities List command (+GCAP) should indicate the major capability areas of the TA. The support of different areas is presented in the response of +GCAP command. Each area may be presented by the selection command name of a specific capability area (e.g. +FCLASS for fax support) or some other predefined response. For instance, a GSM TA with fax capabilities could respond as follows:

```
AT+GCAP
+GCAP: +CGSM,+FCLASS,+W
OK
```

The first supported area in the response is presented with +CGSM. It is the proposed response text to show that some or all GSM commands of this ETS are supported. Second response text (+FCLASS) informs that some fax or voice capabilities are present, and the third text (+W) about the presence of wireless commands as specified by PCCA STD-101 [17]. Command +FCLASS=? (refer e.g. ITU-T T.31 [11] and T.32 [12]) should be used to query the supported fax capabilities and +WS46=? to query the wireless data services available:

```
AT+FCLASS=?;+WS46=?
0,1,2,2.0
(12)
OK
```

The TA of this example supports GSM data services, and fax service class 1 (TIA-578-A), 2 (manufacturer specific) and 2.0 (ITU-T T.32 [12]/ TIA-592).

This ETS defines commands for ME identification which are similar to those for TA identification in V.25ter [14], for an example:

```
AT+CGMI
Mobile Manufacturer XYZ
OK
AT+CGMM
GSM Phone 1234
OK
AT+CGMR
1.00
OK
AT+CGSN
123456121234561
OK
```

Manufacturer, model and version commands work similarly as for TA, except that the serial number query returns the International Mobile Station Equipment Identity (IMEI) number. IMEI is fifteen digits long and consists of a type approval code, a final assembly code, a serial number and a spare digit (refer GSM 03.03 [7]). When the TA is implemented inside ME, the responses for both TA and ME queries will most likely follow the responses of ME identification.

6 Call control commands and methods

This clause describes the control of GSM calls. Normal data and fax call control is done as in ITU-T Recommendations V.25ter [14], T.31 [11] and T.32 [12]. For voice call originating, refer subclause "ITU-T V.25ter dial command D".

6.1 Select type of address +CSTA

Table 9: +CSTA parameter command syntax

Command	Possible response(s)
+CSTA=[<type>]	
+CSTA?	+CSTA: <type>
+CSTA=?	+CSTA: (list of supported <type>s)

Description

Set command selects the type of number for further dialling commands (D) according to GSM specifications. Test command returns values supported by the TA as a compound value.

Defined values

<type>: type of address octet in integer format (refer GSM 04.08 [8] subclause 10.5.4.7); default 145 when dialling string includes international access code character "+", otherwise 129.

Implementation

Mandatory when other than default value allowed.

6.2 ITU-T V.25ter [14] dial command D

V.25ter [14] dial command D (subclause 6.3.1) lists characters that may be used in a dialling string. Their use in GSM is listed in this subclause, as well as new dial modifiers applicable only to GSM are introduced.

V.25ter dialling digits

1 2 3 4 5 6 7 8 9 0 * # + A B C (implementation of these characters is mandatory for GSM).

D (implementation of this character is optional for GSM, and it is ignored).

V.25ter modifier characters

, (implementation of this character is mandatory for GSM, but it may be ignored).

T P (implementation of these characters is mandatory for GSM, but they are ignored).

! W @ (implementation of these characters is optional for GSM, and they are ignored).

V.25ter semicolon character

In GSM, when semicolon character is given after dialling digits (or modifiers), a voice call originated to the given address. TA returns to command state immediately (or after possible +COLP result code; refer subclause "Connected line identification presentation +COLP"). Refer annex G for a detailed example.

GSM modifier characters

> (refer subclause "Direct dialling from phonebooks")

I or i (override the CLIR supplementary service subscription default value for this call; refer subclause "Calling line identification restriction +CLIR").

G or g (control the CUG supplementary service information for this call; uses index and info values set with command +CCUG; refer subclause "Closed user group +CCUG").

6.3 Direct dialling from phonebooks

GSM ME and SIM can contain phonebooks which have a phone number and an alphanumeric field for each phonebook entry location. The use of V.25ter [14] dialling command ensures that direct dialling from ME and SIM phonebook is possible through ordinary communications software which just gives the phone number field to be filled and then use the D command to originate the call. Available memories may be queried with Select Phonebook Storage test command +CPBS=?, and location range for example with Read Phonebook Entries test command +CPBR=?.

Execute commands

1. `D><str>[I][G][;]` originate call to phone number which corresponding alphanumeric field is `<str>` (if possible, all available memories should be searched for the correct entry).
2. `D>mem<n>[I][G][;]` originate call to phone number in memory `mem` entry location `<n>` (available memories may be queried with Select Phonebook Storage test command `+CPBS=?`; `mem` could be e.g. ME or SIM).
3. `D><n>[I][G][;]` originate call to phone number in entry location `<n>` (it is manufacturer specific which memory storage of ME, SIM and TA is used; command Select Phonebook Memory Storage `+CPBS` setting is recommended to be used).

Semicolon character shall be added when voice call is originated. CLIR and CUG per call base modifiers may also be present.

Responses

Possible error responses include `+CME ERROR: <err>` when error is related to ME functionality. Refer subclause 9.2 for possible error values. Otherwise TA responses can have values defined by V.25ter [14] and commands Service Reporting Control `+CR` and Connected Line Identification Presentation `+COLP`. Detailed error report of an unsuccessful originated call failed in a GSM network error can be obtained with command Extended Error Report `+CEER` (if implemented).

Defined values

`<str>`: string type value, which should equal to an alphanumeric field in at least one phonebook entry in the searched memories; used character set should be the one selected with Select TE Character Set `+CSCS`.

`<n>`: integer type memory location should be in the range of locations available in the memory used.

Implementation

Mandatory when direct dialling is implemented. Also phonebook commands implementation is required.

6.4 Call mode `+CMOD`

Table 10: `+CMOD` parameter command syntax

Command	Possible response(s)
<code>+CMOD=[<mode>]</code>	
<code>+CMOD?</code>	<code>+CMOD: <mode></code>
<code>+CMOD=?</code>	<code>+CMOD: (list of supported <mode>s)</code>

Description

Set command selects the call mode of further dialling commands (D) or for next answering command (A). Mode can be either single or alternating (in this ETS, terms "alternating mode" and "alternating call" refer to all GSM bearer and teleservices that incorporate more than one basic service (voice, data, fax) within one call). When single mode is selected the call originating and hang-up procedures are similar to procedures specified in ITU-T Recommendations V.25ter [14], T.31 [11] and T.32 [12]. In GSM there can be voice followed by data (refer GSM 02.02 [1]), alternating voice/data (refer GSM 02.02 [1]) and alternating voice/fax calls (refer GSM 02.03 [2]). Refer next two subclauses for alternating call control methods.

Test command returns values supported by the TA as a compound value.

NOTE: +CMOD shall be set to zero after a successfully completed alternating mode call. It shall be set to zero also after a failed answering. The power-up, factory (&F) and user resets (Z) shall also set the value to zero. This reduces the possibility that alternating mode calls are originated or answered accidentally.

Defined values

<mode>:

- 0 single mode
- 1 alternating voice/fax (teleservice 61)
- 2 alternating voice/data (bearer service 61)
- 3 voice followed by data (bearer service 81)

Also all other values below 128 are reserved by this ETS.

Implementation

Mandatory when alternating mode calls are implemented in the TA.

6.5 Hang-up call +CHUP

Table 11: +CHUP action command syntax

Command	Possible response(s)
+CHUP	
+CHUP=?	

Description

Execution command causes the TA to hang-up the current GSM call of the ME.

NOTE: The purpose of this command is not to replace the V.25ter [14] command H, but to give an assured procedure to terminate an alternating mode call (refer next subclause).

Implementation

Mandatory when alternating mode calls implemented in the TA.

6.6 Alternating mode call control method

This subclause describes the procedure to handle alternating mode calls with AT commands. Procedures are mandatory when alternating mode calls are implemented in the TA.

Voice followed by data call (bearer service 81)

Figure 4 shows commands to start the call, to switch from voice to data (In-Call Modification) and to hang up the call. +CMOD and +FCLASS commands indicate the current settings before dialling or answering command, not that they shall be given just before D or A command. Refer subclause "Cellular result codes +CRC" for possible +CRING result code values. Refer annex F for a detailed example.

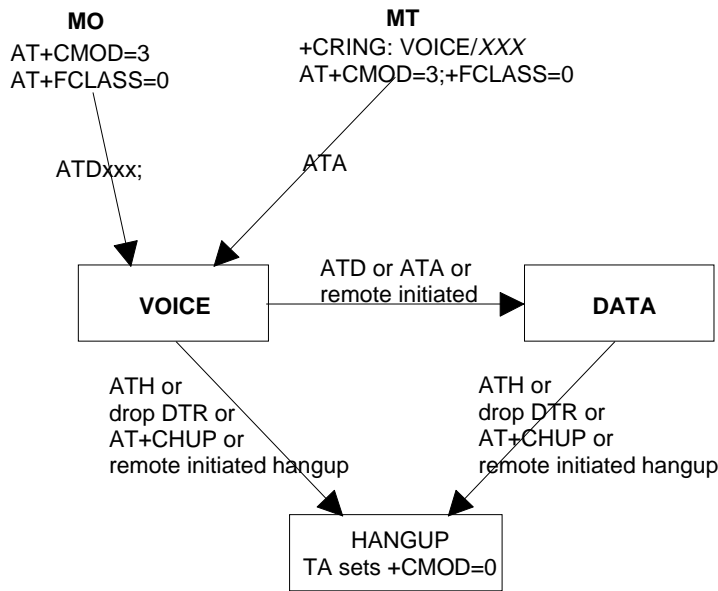


Figure 4: Voice followed by data call

Voice/ data call (bearer service number 61)

Figure 5 shows the commands to start the call, to switch between modes (In-Call Modification) and to hang up the call. +CMOD and +FCLASS commands indicate the current settings before dialling or answering command, not that they shall be given just before D or A command. Refer subclause "Cellular result codes +CRC" for possible +CRING result code values (refer annex E for a detailed example).

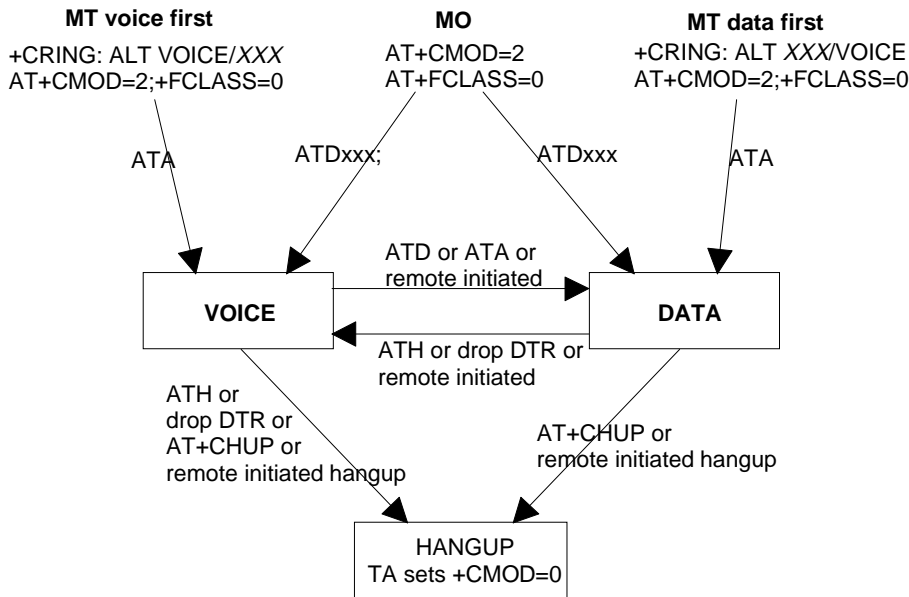


Figure 5: Alternating voice and data call

Voice/ fax call (teleservice number 61)

Figure 6 shows the commands to start the call, to switch between modes (In-Call Modification) and to hang up the call. +CMOD and +FCLASS commands indicate the current settings before dialling or answering command, not that they shall be given just before D or A command. The parameter "x" of +FCLASS command can be 1, 1.0, 2 or 2.0.

NOTE: The transition from fax mode to voice mode is for further study.

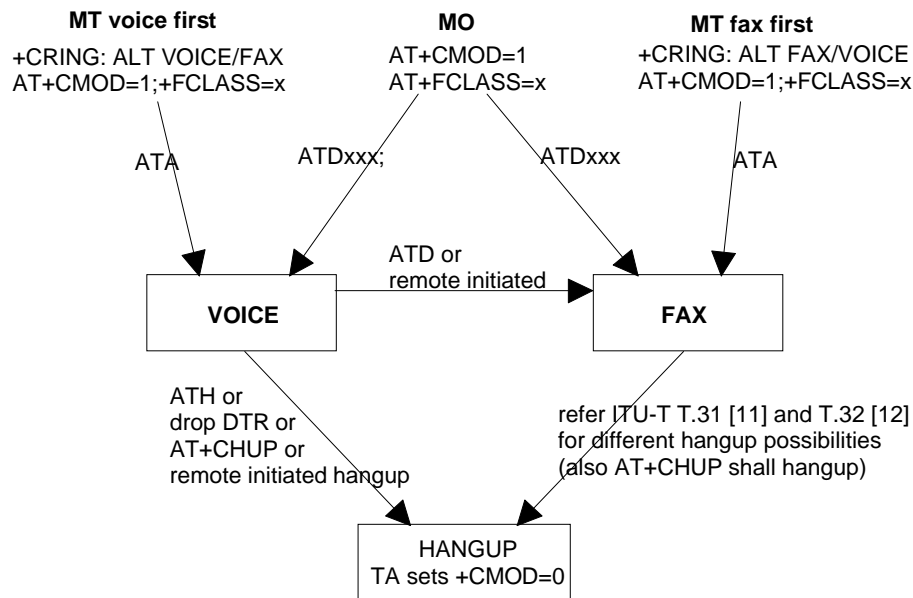


Figure 6: Alternating voice and fax call

6.7 Select bearer service type +CBST

Table 12: +CBST parameter command syntax

Command	Possible response(s)
+CBST=[<speed>[, <name>[, <ce>]]]	
+CBST?	+CBST: <speed>[, <name> , <ce>]
+CBST=?	+CBST: (list of supported <speed>s) , (list of supported <name>s) , (list of supported <ce>s)

Description

Set command selects the bearer service <name> with data rate <speed>, and the connection element <ce> to be used when data calls are originated (refer GSM 02.02 [1]).

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

Defined values

<speed>:

- 0 autobaoding (automatic selection of the speed)
- 1 300 bps (V.21)
- 2 1 200 bps (V.22)
- 3 1 200/75 bps (V.23)
- 4 2 400 bps (V.22bis)
- 5 2 400 bps (V.26ter)
- 6 4 800 bps (V.32)
- 7 9 600 bps (V.32)
- 8 unknown or network specific (no speed specification needed)
- 9 7 200 bps (V.32bis)
- 10 12 000 bps (V.32bis)
- 11 14 400 bps (V.32bis)
- 12 9 600 bps (V.34)
- 13 12 000 bps (V.34)
- 14 14 400 bps (V.34)
- 15 19 200 bps (V.34)
- 16 28 800 bps (V.34)
- 65 300 bps (V.110)

66	1 200 bps (V.110)
68	2 400 bps (V.110)
70	4 800 bps (V.110)
71	9 600 bps (V.110)
74	12 000 bps (V.110)
75	14 400 bps (V.110)
79	19 200 bps (V.110)
81	38 400 bps (V.110)

Also all other values below 128 are reserved by this ETS.

<name>:

0	asynchronous modem
1	synchronous modem
2	PAD Access (asynchronous)
3	Packet Access (synchronous)

Also all other values below 128 are reserved by this ETS.

<ce>:

0	transparent
1	non-transparent

Implementation

Mandatory when data calls implemented.

6.8 Radio link protocol +CRLP

Table 13: +CRLP parameter command syntax

Command	Possible response(s)
+CRLP=[<iws>[,<mws>[,<T1>[,<N2>]]]]	
+CRLP?	+CRLP: <iws> , <mws> , <T1> , <N2>
+CRLP=?	+CRLP: (list of supported <iws>s) , (list of supported <mws>s) , (list of supported <T1>s) , (list of supported <N2>s)

Description

Radio link protocol parameters may be altered with set command.

NOTE: If radio link protocol is not used, but some other error correcting protocol, V.25ter [14] Error Control Selection test command +ES=? may be used to indicate the presence of the protocol.

Test command returns values supported by the TA as a compound value.

Defined values

<iws>, <mws>, <T1>, <N2>: IWF to MS window size (default 61), MS to IWF window size (default 61), acknowledgement timer T1 (default 48), and retransmission attempts N2 (default 6) in integer format (refer GSM 04.22 [18] subclause 5.4.3).

Implementation

Mandatory when RLP implemented.

6.9 Service reporting control +CR

Table 14: +CR parameter command syntax

Command	Possible response(s)
+CR=[<mode>]	
+CR?	+CR: <mode>
+CR=?	+CR: (list of supported <mode>s)

Description

Set command controls whether or not intermediate result code +CR: <serv> is returned from the TA to the TE. If enabled, the intermediate result code is transmitted at the point during connect negotiation at which the TA has determined which speed and quality of service will be used, before any error control or data compression reports are transmitted, and before any final result code (e.g. CONNECT) is transmitted.

NOTE: This command replaces V.25ter [14] command Modulation Reporting Control +MR, which is not appropriate for use in the GSM network. Possible error control (other than radio link protocol) and data compression reporting can be enabled with V.25ter commands Error Control Reporting +ER and Data Compression Reporting +DR.

Test command returns values supported by the TA as a compound value.

Defined values

<mode>:

0 disables reporting
1 enables reporting

<serv>:

ASYN asynchronous transparent
SYN synchronous transparent
REL ASYN asynchronous non-transparent
REL SYN synchronous non-transparent

Implementation

Mandatory when data calls implemented.

6.10 Extended error report +CEER

Table 15: +CEER action command syntax

Command	Possible response(s)
+CEER	+CEER: <report>
+CEER=?	

Description

Execution command causes the TA to return one or more lines of information text <report>, determined by the ME manufacturer, which should offer the user of the TA an extended report of the reason of the failure in the last unsuccessful call setup (originating or answering) or in-call modification, or the reason for last call release. Typically, the text will consist of a single line containing the failure information given by GSM network in textual format.

Defined values

<report>: the total number of characters, including line terminators, in the information text shall not exceed 2 041 characters.

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

Implementation

Optional.

6.11 Cellular result codes +CRC

Table 16: +CRC parameter command syntax

Command	Possible response(s)
+CRC=[<mode>]	
+CRC?	+CRC: <mode>
+CRC=?	+CRC: (list of supported <mode>s)

Description

Set command controls whether or not the extended format of incoming call indication is used. When enabled, an incoming call is indicated to the TE with unsolicited result code +CRING: <type> instead of the normal RING.

Test command returns values supported by the TA as a compound value.

NOTE: Similar command may be found in TIA IS-99 [15] and TIA IS-135 [16].

Defined values

<mode>:

0 disables extended format
1 enables extended format

<type>:

ASYNC asynchronous transparent
SYNC synchronous transparent
REL ASYNC asynchronous non-transparent
REL SYNC synchronous non-transparent
FAX facsimile (TS 62)
VOICE normal voice (TS 11)
VOICE/XXX voice followed by data (BS 81) (XXX is ASYNC, SYNC, REL ASYNC or REL SYNC)
ALT VOICE/XXX alternating voice/data, voice first (BS 61)
ALT XXX/VOICE alternating voice/data, data first (BS 61)
ALT VOICE/FAX alternating voice/fax, voice first (TS 61)
ALT FAX/VOICE alternating voice/fax, fax first (TS 61)

Implementation

Mandatory when data or fax calls implemented.

6.12 ITU-T V.25ter [14] call control commands

Table 17: V.25ter call control commands

Command	Section	Impl.	Use in GSM
D[<dial_string>][;]	6.3.1	mand.	originates a call
T	6.3.2	mand.	ignored (select tone dialling)
P	6.3.3	mand.	ignored (select pulse dialling)
A	6.3.5	mand.	answer a call
H[<value>]	6.3.6	mand.	hang-up a single mode call; for alternate mode call refer subclause "Hang-up call +CHUP" (only value equal to zero needed)
O[<value>]	6.3.7	mand.	returns TA to on-line data state from on-line command mode (only value equal to zero needed)
S0=[<value>]	6.3.8	mand.	sets the number of call indications (rings) before automatically answering the call; value equalling zero disables automatic answering and is the default
S6=[<value>]	6.3.9	mand.	ignored (pause before blind dialling)
S7=[<value>]	6.3.10	mand.	sets number of seconds to wait for completion of call answering or originating procedure before giving up and disconnecting
S8=[<value>]	6.3.11	mand.	sets number of seconds to wait when comma dial modifier encountered in dial string of D command (default is 2 seconds)
S10=[<value>]	6.3.12	mand.	sets number of tenths of seconds to wait before disconnecting after TA has indicated the absence of received line signal
L[<value>]	6.3.13	mand.	ignored (monitor speaker loudness)
M[<value>]	6.3.14	mand.	ignored (monitor speaker mode)

6.13 ITU-T V.25ter [14] data compression commands

Table 18: V.25ter data compression commands

Command	Section	Impl.	Use in GSM
+DS=[<dir>[,<neg>[,<P1>[,<P2>]]]]	6.6.1	mand. when V.42bis	controls ITU-T Recommendation V.42bis data compression functions; for subparameter defaults in GSM refer GSM 04.22 [18]
+DR=[<value>]	6.6.2	mand. when V.42bis	determines whether the use of V.42bis is informed using intermediate result code +DR: <type> before going on-line data state after call answering or originating

6.14 Informative examples

Two major areas covered in this subclause are the alternating mode call handling (voice and fax, or voice and data) and the data call setup. The definition of the commands is made such that the dialling command of V.25ter [14] (D) still always originates a call. The purpose is to support all current TE applications using the dialling command as default. Fax calls are controlled following the rules of ITU-T T.31 [11] and T.32 [12] standards.

An example where a voice call is originated:

```
ATD+1 812 5556731; (type of address defaults to 145, CLIR subscription is overridden for this call)
OK (call setup was successful)
```

An example where a voice call is attempted from a phonebook:

```
ATD="Doe Joe"G; (enable CUG control for this call)
+CME ERROR: 22 (entry "Doe Joe" is not found)
```

Also supplementary services can be controlled using dial command according to GSM 02.30 [19]. An example of Call Forwarding on no reply for telephony with the adjustment of the no reply condition timer on 25 seconds:

```
ATD**61*+1812555673*11*25#
OK (modification was successful)
```

Two new commands are created for controlling the alternating mode calls. First one, Call Mode (+CMOD), selects between single and alternating mode. Because this is a crucial command, it is defined that the value is set back to zero (single mode) after every successfully originated alternating mode call. Also on power-up and factory or user resets, the value is set to zero. The second new command, Hang-up Call (+CHUP), is not a replacement of V.25ter [14] command H, but a command which reliably disconnects the call in GSM network. This is defined because the H command is used to switch from fax or data mode to voice mode.

The setting of GSM bearer service (data circuit duplex asynchronous and synchronous, PAD access circuit asynchronous, or data packet duplex synchronous), is done with Select Bearer Service Type (+CBST). It chooses one of the four mentioned bearer services, the data rate of the service (or actually the modulation when modem IWFs are used), and enables or disables RLP. Command Radio Link Protocol (+CRLP) is used to set the RLP parameters in the radio path.

Service Reporting Control command (+CR) is defined similarly as the reporting of modulation, V.18, error control, and data compression which are V.25ter [14] features used to show information about the type of the established connection before the CONNECT intermediate result code. +CR command has one subparameter which specifies whether the intermediate result code +CR: <serv> is returned or not. The result code should be returned before any V.25ter [14] reporting result codes. An example of setting up an asynchronous 9 600 bit/s modem connection with service reporting:

```
AT+CBST=7,0,1 (asynchronous modem 9600 bit/s and RLP)
OK
AT+CR=1 (enable reporting)
OK
ATD1234567890
+CR: REL ASYNC
CONNECT 9600
```

As GSM network offers more information about the reason of the failure in call originating and answering than normal PSTN, it is useful to add an extra command to return this information to the TE. This information should not be returned always after unsuccessful call originating or answering, because many TE applications look for just the regular NO CARRIER, BUSY, NO ANSWER and CONNECT messages. Action command Extended Error Report (+CEER) does not have any subparameters, and it returns the cause of the latest call setup failure. This information may be the textual presentation of the GSM network failure code (refer GSM specification 04.08 [8] annex H), or some other information defined by the TA manufacturer.

7 Network service related commands

This clause describes GSM network related commands, which are not covered in call control clause of this ETS. Commands include GSM supplementary service handling, MSISDN query, ME and network facility locking, and network registration information query.

7.1 Subscriber number +CNUM

Table 19: +CNUM action command syntax

Command	Possible response(s)
+CNUM	+CNUM: [<alpha1>], <number1>, <type1>[, <speed>, <service>[, <itc>]] [<CR><LF>+CNUM: [<alpha2>], <number2>, <type2>[, <speed>, <service>[, <itc>]] [...]] +CME ERROR: <err>
+CNUM=?	

Description

Action command returns the MSISDNs related to the subscriber (this information can be stored in the SIM or in the ME). If subscriber has different MSISDN for different services, each MSISDN is returned in a separate line. Refer subclause 9.2 for possible `<err>` values.

Defined values

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

`<number>`: string type phone number of format specified by `<type>`.

`<type>`: type of address octet in integer format (refer GSM 04.08 [8] subclause 10.5.4.7).

`<speed>`: as defined in subclause 6.7.

`<service>` (service related to the phone number):

- 0 asynchronous modem
- 1 synchronous modem
- 2 PAD Access (asynchronous)
- 3 Packet Access (synchronous)
- 4 voice
- 5 fax

Also all other values below 128 are reserved by this ETS.

`<itc>` (information transfer capability):

- 0 3.1 kHz
- 1 UDI

Implementation

Optional.

7.2 Network registration +CREG

Table 20: +CREG parameter command syntax

Command	Possible response(s)
+CREG=[<n>]	
+CREG?	+CREG: <n>, <stat> +CME ERROR: <err>
+CREG=?	+CREG: (list of supported <n>s)

Description

Set command controls the presentation of an unsolicited result code `+CREG: <stat>` when there is a change in the ME network registration status.

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 ME. Refer subclause 9.2 for possible `<err>` values.

Defined values

`<n>`:

- 0 disable network registration unsolicited result code
- 1 enable network registration unsolicited result code

<stat>:

- 0 not registered, ME is not currently searching a new operator to register to
- 1 registered, home network
- 2 not registered, but ME is currently searching a new operator to register to
- 3 registration denied
- 4 unknown
- 5 registered, roaming

Implementation

Optional.

7.3 Operator selection +COPS

Table 21: +COPS parameter command syntax

Command	Possible response(s)
+COPS=[<mode>[,<format>[,<oper>]]]	+CME ERROR: <err>
+COPS?	+COPS: <mode>[,<format>,<oper>] +CME ERROR: <err>
+COPS=?	+COPS: list of supported (<stat>,long alphanumeric <oper> , short alphanumeric <oper> , numeric <oper>)s +CME ERROR: <err>

Description

Set command forces an attempt to select and register the GSM network operator. <mode> is used to select whether the selection is done automatically by the ME or is forced by this command to operator <oper> (it shall be given in format <format>). If the selected operator is not available, no other operator shall be selected (except <mode>=4). The selected operator name format shall apply to further read commands (+COPS?) also. <mode>=2 forces an attempt to deregister from the network. The selected mode affects to all further network registration (e.g. after <mode>=2, ME shall be unregistered until <mode>=0 or 1 is selected). Refer subclause 9.2 for possible <err> values. This command should be abortable when registration/deregistration attempt is made.

Read command returns the current mode and the currently selected operator. If no operator is selected, <format> and <oper> are omitted.

Test command returns a list of quadruplets, each representing an operator present in the network. Quadruplet consists of an integer indicating the availability of the operator <stat>, long and short alphanumeric format of the name of the operator, and numeric format representation of the operator. Any of the formats may be unavailable and should then be an empty field. The list of operators shall be in order: home network, networks referenced in SIM, and other networks.

Defined values

<mode>:

- 0 automatic (<oper> field is ignored)
- 1 manual (<oper> field shall be present)
- 2 deregister from network
- 3 set only <format> (for read command +COPS?), do not attempt registration/deregistration (<oper> field is 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>:

- 0 long format alphanumeric <oper>
- 1 short format alphanumeric <oper>
- 2 numeric <oper>

<oper>: string type; <format> indicates if the format is alphanumeric or numeric; long alphanumeric format can be up to 16 characters long and short format up to 8 characters (refer GSM MoU SE.13 [9]); numeric format is the GSM Location Area Identification number (refer GSM 04.08 [8] subclause 10.5.1.3) which consists of a three BCD digit country code coded as in ITU-T E.212 annex A [10], 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 2)(network code digit 1)

<stat>:
 0 unknown
 1 available
 2 current
 3 forbidden

Implementation

Optional.

7.4 Facility lock +CLCK

Table 22: +CLCK action command syntax

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

Description

Execute command is used to lock, unlock or interrogate a ME or a network facility <fac>. Password is normally needed to do such actions. Refer subclause 9.2 for possible <err> values. This command should be abortable when network facilities are set or interrogated.

Call barring facilities are based on GSM supplementary services (refer GSM 02.88 [6]). The interaction of these with other commands based on other GSM supplementary services is described in the GSM standard.

Test command returns facility values supported by the TA as a compound value.

Defined values

<fac> values reserved by this ETS:

"CS" CNTRL (lock CoNTRoL surface (e.g. phone keyboard))
 "PS" PH-SIM (lock PHone to SIM card) (ME asks password when other than current SIM card inserted)
 "SC" SIM (lock SIM card) (SIM asks password in ME power-up and when this lock command issued)
 "AO" BAOc (Barr All Outgoing Calls) (refer GSM 02.88 [6] clause 1)
 "OI" BOIC (Barr Outgoing International Calls) (refer GSM 02.88 [6] clause 1)
 "OX" BOIC-exHC (Barr Outgoing International Calls except to Home Country) (refer GSM 02.88 [6] clause 1)
 "AI" BAIC (Barr All Incoming Calls) (refer GSM 02.88 [6] clause 2)
 "IR" BIC-Roam (Barr Incoming Calls when Roaming outside the home country) (refer GSM 02.88 [6] clause 2)
 "NT" barr incoming calls from numbers Not stored to TA memory

"NM" barr incoming calls from numbers Not stored to ME memory
 "NS" barr incoming calls from numbers Not stored to SIM memory
 "NA" barr incoming calls from numbers Not stored in Any memory
 "AB" All Barring services (refer GSM 02.30 [19])
 "AG" All outGoing barring services (refer GSM 02.30 [19])
 "AC" All inComing barring services (refer GSM 02.30 [19])

<mode>:
 0 unlock
 1 lock
 2 query status

<status>:
 0 not active
 1 active

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

<classx> is a sum of integers each representing a class of information (default 7 equals to all classes):
 1 voice
 2 data
 4 fax

Also all other values below 128 are reserved by this ETS.

Implementation

Optional.

7.5 Change password +CPWD

Table 23: +CPWD action command syntax

Command	Possible response(s)
+CPWD=<fac>, <oldpwd>, <newpwd>	+CME ERROR: <err>
+CPWD=?	+CPWD: list of supported (<fac>, <pwdlength>)s +CME ERROR: <err>

Description

Action command sets a new password for the facility lock function defined by command Facility Lock +CLCK. Refer subclause 9.2 for possible <err> values.

Test command returns a list of pairs which present the available facilities and the maximum length of their password.

Defined values

<fac>: refer Facility Lock +CLCK

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

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

Implementation

Optional.

7.6 Calling line identification presentation +CLIP

Table 24: +CLIP parameter command syntax

Command	Possible response(s)
+CLIP=[<n>]	
+CLIP?	+CLIP: <n>, <m>
+CLIP=?	+CLIP: (list of supported <n>s)

Description

This command refers to the GSM supplementary service CLIP (Calling Line Identification Presentation) that enables a called subscriber to get the calling line identity (CLI) of the calling party when receiving a mobile terminated call. Set command enables or disables the presentation of the CLI at the TE. It has no effect on the execution of the supplementary service CLIP in the network.

When the presentation of the CLI at the TE is enabled (and calling subscriber allows), +CLIP: <number>, <type>[, <subaddr>, <satype>[, <alpha>]] response is returned after every RING (or +CRING: <type>; refer subclause "Cellular result codes +CRC") result code sent from TA to TE. It is manufacturer specific if this response is used when normal voice call is answered.

Read command gives the status of <n>, and also triggers an interrogation of the provision status of the CLIP service according GSM 02.81 [3] (given in <m>). Test command returns values supported by the TA as a compound value.

Defined values

<n> (parameter sets/shows the result code presentation status in the TA):

- 0 disable
- 1 enable

<m> (parameter shows the subscriber CLIP service status in the network):

- 0 CLIP not provisioned
- 1 CLIP provisioned
- 2 unknown (e.g. no network, etc.)

<number>: string type phone number of format specified by <type>.

<type>: type of address octet in integer format (refer GSM 04.08 [8] subclause 10.5.4.7).

<subaddr>: string type subaddress of format specified by <satype>.

<satype>: type of subaddress octet in integer format (refer GSM 04.08 [8] subclause 10.5.4.8).

<alpha>: optional string type alphanumeric representation of <number> corresponding to the entry found in phonebook; used character set should be the one selected with command Select TE Character Set +CSCS.

Implementation

Optional.

7.7 Calling line identification restriction +CLIR

Table 25: +CLIR parameter command syntax

Command	Possible response(s)
+CLIR=[<n>]	
+CLIR?	+CLIR: <n> , <m>
+CLIR=?	+CLIR: (list of supported <n>s)

Description

This command refers to CLIR-service according to GSM 02.81 [3] that allows a calling subscriber to enable or disable the presentation of the CLI to the called party when originating a call.

Set command overrides the CLIR subscription (default is restricted or allowed) when temporary mode is provisioned as a default adjustment for all following outgoing calls. This adjustment can be revoked by using the opposite command.. If this command is used by a subscriber without provision of CLIR in permanent mode the network will act according GSM 02.81 [3].

Read command gives the default adjustment for all outgoing calls (given in <n>), and also triggers an interrogation of the provision status of the CLIR service (given in <m>). Test command returns values supported by the TA as a compound value.

NOTE: On a per call base CLIR functionality is explained in subclause "ITU-T V.25ter [14] dial command".

Defined values

<n> (parameter sets the adjustment for outgoing calls):

- 0 presentation indicator is used according to the subscription of the CLIR service
- 1 CLIR invocation
- 2 CLIR suppression

<m> (parameter shows the subscriber CLIR service status in the network):

- 0 CLIR not provisioned
- 1 CLIR provisioned in permanent mode
- 2 unknown (e.g. no network, etc.)
- 3 CLIR temporary mode presentation restricted
- 4 CLIR temporary mode presentation allowed

Implementation

Optional.

7.8 Connected line identification presentation +COLP

Table 26: +COLP parameter command syntax

Command	Possible response(s)
+COLP=[<n>]	
+COLP?	+COLP: <n> , <m>
+COLP=?	+COLP: (list of supported <n>s)

Description

This command refers to the GSM supplementary service COLP (Connected Line Identification Presentation) that enables a calling subscriber to get the connected line identity (COL) of the called party after setting up a mobile originated call. The command enables or disables the presentation of the COL at the TE. It has no effect on the execution of the supplementary service COLR in the network.

When enabled (and called subscriber allows), +COLP:

<number>, <type>[, <subaddr>, <satype> [, <alpha>]] intermediate result code is returned from TA to TE before any +CR or V.25ter [14] responses. It is manufacturer specific if this response is used when normal voice call is established.

Read command gives the status of <n>, and also triggers an interrogation of the provision status of the COLP service according GSM 02.81 [3] (given in <m>).

Test command returns values supported by the TA as a compound value.

Defined values

<n> (parameter sets/shows the result code presentation status in the TA):

0 disable
1 enable

<m> (parameter shows the subscriber COLP service status in the network):

0 COLP not provisioned
1 COLP provisioned
2 unknown (e.g. no network, etc.)

<number>, <type>, <subaddr>, <satype>, <alpha>: refer +CLIP.

Implementation

Optional.

7.9 Closed user group +CCUG

Table 27: +CCUG parameter command syntax

Command	Possible response(s)
+CCUG=[<n>[, <index>[, <info>]]]	
+CCUG?	+CCUG: <n>, <index>, <info>
+CCUG=?	

Description

This command allows control of the Closed User Group supplementary service (refer GSM 02.85 [21]). Set command enables the served subscriber to select a CUG index, to suppress the Outgoing Access (OA), and to suppress the preferential CUG.

Set command with <n>=1 enables to control the CUG information on the air interface as a default adjustment for all following outgoing calls. The interaction of this command with other commands based on other GSM supplementary services is described in the GSM standard.

Test command returns values supported by the TA as a compound value.

NOTE: On a per call base CUG functionality is explained in subclause "ITU-T V.25ter [14] dial command".

Defined values

<n>:

0 disable CUG temporary mode
1 enable CUG temporary mode

<index>:

0...9 CUG index
10 no index (preferred CUG taken from subscriber data)

- <info>:
- 0 no information
 - 1 suppress OA
 - 2 suppress preferential CUG
 - 3 suppress OA and preferential CUG

Implementation

Optional.

7.10 Call forwarding number and conditions +CCFC

Table 28: +CCFC action command syntax

Command	Possible response(s)
+CCFC=<reason>,<mode> [,<number>[,<type> [,<class> [,<subaddr>[,<satype> [,<time>]]]]]]	+CME ERROR: <err> when <mode>=2 and command successful: +CCFC: <status>,<class1>[,<number>,<type> [,<subaddr>,<satype>[,<time>]]][<CR><LF>+CCFC: <status>,<class2>[,<number>,<type> [,<subaddr>,<satype>[,<time>]] [...]]
+CCFC=?	+CCFC: (list of supported <reason>S)

Description

This command allows control of the call forwarding supplementary service according to GSM 02.82 [4]. Registration, erasure, activation, deactivation, and status query are supported.

Test command returns reason values supported by the TA as a compound value.

Defined values

- <reason>:
- 0 unconditional
 - 1 mobile busy
 - 2 no reply
 - 3 not reachable
 - 4 all call forwarding (refer GSM 02.30 [19])
 - 5 all conditional call forwarding (refer GSM 02.30 [19])

- <mode>:
- 0 disable
 - 1 enable
 - 2 query status
 - 3 registration
 - 4 erasure

<number>: string type phone number of forwarding address in format specified by <type>.

<type>: type of address octet in integer format (refer GSM 04.08 [8] subclause 10.5.4.7); default 145 when dialling string includes international access code character "+", otherwise 129.

<subaddr>: string type subaddress of format specified by <satype>.

<satype>: type of subaddress octet in integer format (refer GSM 04.08 [8] subclause 10.5.4.8); default 128.

<classx> is a sum of integers each representing a class of information (default 7 equals to all classes):

1 voice
2 data
4 fax

Also all other values below 128 are reserved by this ETS.

<time>:

1...30 when "no reply" is enabled or queried, this gives the time in seconds to wait before call is forwarded, default value 20.

<status>:

0 not active
1 active

Implementation

Optional.

7.11 Call waiting +CCWA

Table 29: +CCWA parameter command syntax

Command	Possible response(s)
+CCWA=[<n>[,<mode>[,<class>]]]	+CME ERROR: <err> when <mode>=2 and command successful +CCWA: <status>,<class1> [<CR><LF>+CCWA: <status>,<class2> [...]]
+CCWA?	+CCWA: <n>
+CCWA=?	+CCWA: (list of supported <n>s)

Description

This command allows control of the Call Waiting supplementary service according to GSM 02.83 [5]. Activation, deactivation and status query are supported. Parameter <n> is used to disable/enable the presentation of an unsolicited result code +CCWA: <number>,<type>,<class>[,<alpha>] to the TE when call waiting service is enabled. Command should be abortable when network is interrogated.

The interaction of this command with other commands based on other GSM supplementary services is described in the GSM standard.

Test command returns values supported by the TA as a compound value.

Defined values

<n> (sets/shows the result code presentation status in the TA):

0 disable
1 enable

<mode> (when <mode> parameter is not given, network is not interrogated):

0 disable
1 enable
2 query status

<classx> is a sum of integers each representing a class of information (default 7 equals to all classes):

1 voice
2 data
4 fax

Also all other values below 128 are reserved by this ETS.

<status>:
 0 not active
 1 active

<number>: string type phone number of calling address in format specified by <type>.

<type>: type of address octet in integer format (refer GSM 04.08 [8] subclause 10.5.4.7).

<alpha>: optional string type alphanumeric representation of <number> corresponding to the entry found in phonebook; used character set should be the one selected with command Select TE Character Set +CSCS.

Implementation

Optional.

7.12 Call hold and multiparty +CHLD

Table 30: +CHLD parameter command syntax

Command	Possible response(s)
+CHLD=[<n>]	+CME ERROR: <err>
+CHLD=?	

Description

This refers to a service that allows a call to be temporarily disconnected from the ME but the connection to be retained by the network, and to a service that allows multiparty conversation. Calls can be put on hold, recovered, released, and added to conversation similarly as defined in GSM 02.30 [19] (refer subclause 9.2 for possible <err> values).

This is based on the GSM supplementary services HOLD (Call Hold) (refer GSM 02.83 [5] clause 2) and MPTY (MultiParty; refer GSM 02.84 [22]). The interaction of this command with other commands based on other GSM supplementary services is described in the GSM standard.

NOTE 1: Call Hold and MultiParty are only applicable to teleservice 11.

Defined values

<n>: integer type; equals to numbers entered before SEND button in GSM 02.30 [19] subclause 4.5.5.1.

NOTE 2: The "directory number" case shall be handled with dial command D, and the END case with hang-up command H (or +CHUP).

Implementation

Optional.

7.13 Call transfer +CTFR

Table 31: +CTFR action command syntax

Command	Possible response(s)
+CTFR=<number>[,<type>]	+CME ERROR: <err>
+CTFR=?	

Description

This refers to a service that causes the present or incoming call to be forwarded to a specified number. Action command does this. Refer subclause 9.2 for possible <err> values.

NOTE: Call Transfer is only applicable to teleservice 11.

Defined values

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

<type>: type of address octet in integer format (refer GSM 04.08 [8] subclause 10.5.4.7); default 145 when dialling string includes international access code character "+", otherwise 129.

Implementation

Optional.

7.14 Unsupported GSM supplementary services

Unsupported GSM Phase 2 supplementary services:

AoC (Advice of Charge) (refer GSM 02.86).

USSD (Unstructured Supplementary Service Data) (refer GSM 02.90).

7.15 Informative examples

This subclause includes all the GSM supplementary service related commands, additional commands to lock ME and SIM capabilities, and commands to check the network registration status.

An example where MSISDNs of a ME are queried, calls are forwarded to different numbers when mobile is busy (CFB) or when it does not answer (CFNRy). The status of CFNRy is read:

```
AT+CNUM
+CNUM: , "+358501234567" , 145 , , 4 (voice number)
OK
AT+CCFC=1,1, "931123456" (enable CFB)
OK
AT+CCFC=2,1, "921654321" (enable CFNRy)
OK
AT+CCFC=1,2 (query CFNRy)
+CCFC: 1,7, "+35821654321" , 145 , , 20 (forward after 20 seconds)
OK
```

An example of Call Waiting (+CCWA), Call Hold and Multiparty (+CHLD), and Connected Line Identification Presentation (+COLP) usage:

```
AT+CCWA=1,1;+COLP=1 (enable call waiting and COLP result codes)
OK
ATD9311234567; (originate a voice call)
+COLP: "+358311234567" , 145
OK
...conversation...
+CCWA: "+358317654321" , 145 (another call is waiting)
AT+CHLD=2 (put first call on hold and answer the second one)
OK
...conversation...
AT+CHLD=1 (release the second (active) call and recover the first (held) call)
OK
ATH (release the first call)
OK
```

Call barring supplementary services are combined in one command, Facility Lock (+CLCK), which is also used to restrict ME and SIM functionality. Some of the facilities require a password when enabled or disabled. An additional command, Change Password (+CPWD), is defined for changing the password of different barring and restriction facilities. An example where locking status of outgoing international calls is interrogated and then barred, and the password of the SIM card lock (Personal Identity Number, PIN) is changed:

```
AT+CLCK="OI",2
+CLCK: 0,7
OK
AT+CLCK="OI",1,"1234"
OK
AT+CPWD="SC","4321","1234"
OK
```

Operator Selection (+COPS) command is used for querying the status of all GSM operators detected in the area, and switching between operators.

Following example illustrates the current operator situation in Finland. Two operators networks are found, the status of Tele is unknown and Radiolinja is currently selected. Read command shows that automatic selection mode is on and that Radiolinja is selected. Then an attempt is made to access Tele, but it is denied (shown by +CME ERROR).

```
AT+COPS=?
+COPS: (2,"RADIOLINJA","RL","24405"),(0,"TELE","TELE","24491")
OK
AT+COPS?
+COPS: 0,0,"RADIOLINJA"
OK
AT+COPS=1,0,"TELE"
+CME ERROR: 3
```

When a terminal wanders between countries (i.e. networks), an application may follow this e.g. with the following scenario:

```
AT+CREG=1                (enable +CREG: <stat> unsolicited result code)
OK
AT+CREG?
+CREG: 1,1                (ME is registered in home PLMN)
OK
AT+COPS=3,2;+COPS?;+COPS=3,0;+COPS?
+COPS: 0,2,"24405"        (get the country...)
+COPS: 0,0,"RADIOLINJA"  ...and operator name)
OK
...user wanders to another PLMN...
+CREG: 2                  (deregistered, roaming ongoing)
+CREG: 5                  (registered again, not home PLMN)
AT+COPS=3,2;+COPS?;+COPS=3,0;+COPS?
+COPS: 0,2,"24001"        (get the country...)
+COPS: 0,0,"TELIA MOBITEL" ...and operator name)
OK
...user loses connection, no other PLMNs around...
+CREG: 0
```


8 Mobile Equipment control and status commands

This clause includes commands for ME keypad, display and indicator handling. Also commands for selecting, reading and writing of phonebooks are specified.

Figure 7 illustrates the effect of these commands. Command Phone Activity Status `+CPAS` indicates the current general activity status of the ME. Command Set Phone Functionality `+CFUN` is used to set the ME to different power consumption states. Command Enter PIN `+CPIN` is used to enter ME passwords which are needed before any other functionality of the ME can be used (e.g. SIM PIN, PUK). Commands Battery Charge `+CBC` and Signal Quality `+CSQ` are same as in TIA IS-135 [16] and they are used to query the battery charge of the ME and the current RSSI of the ME. Command Mobile Equipment Control Mode `+CMEC` is used to select the controlling unit of ME keypad, display and indicators. Controlling commands for the TE are Keypad Emulation `+CKPD`, Display Control `+CDIS` and Indicator Control `+CIND`. If corresponding event reporting is enabled with command Mobile Equipment Event Reporting `+CMER`, `+CKEV` is the result code of a keypad event, `+CDEV` is the result code of a display event, and `+CIEV` is the result code of an indicator event. Phonebook commands are Select Phonebook Memory Storage `+CPBS`, Read Phonebook Entries `+CPBR`, Find Phonebook Entries `+CPBF` and Write Phonebook Entry `+CPBW`. Additional command Clock `+CCLK` can be used to control the real-time clock of the ME if available. Command Alarm `+CALA` sets possible alarm clock facilities of the ME.

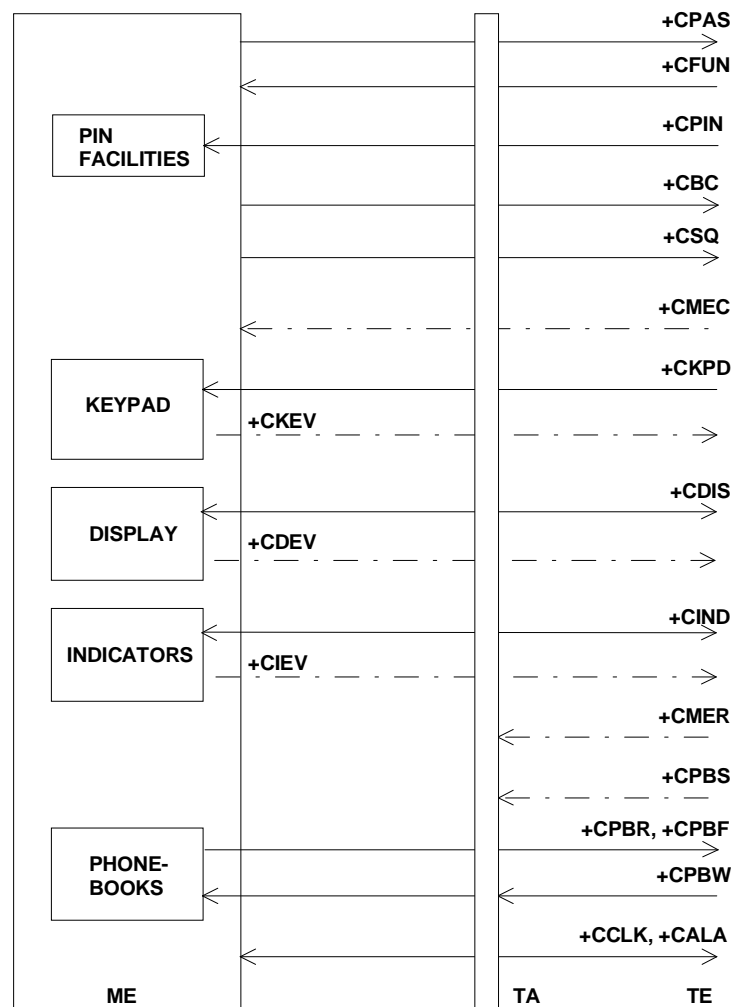


Figure 7: Mobile equipment control and status commands

8.1 Phone activity status +CPAS

Table 32: +CPAS action command syntax

Command	Possible response(s)
+CPAS	+CPAS: <pas> +CME ERROR: <err>
+CPAS=?	+CPAS: (list of supported <pas>s) +CME ERROR: <err>

Description

Execution command returns the activity status <pas> of the ME. It can be used to interrogate the ME before requesting action from the phone (refer subclause 9.2 for possible <err> values).

Test command returns values supported by the ME as a compound value.

<pas>:

- 0 ready (ME allows commands from TA/TE)
- 1 unavailable (ME does not allow commands from TA/TE)
- 2 unknown (ME is not guaranteed to respond to instructions)
- 3 ringing (ME is ready for commands from TA/TE, but the ringer is active)
- 4 call in progress (ME is ready for commands from TA/TE, but a call is in progress)
- 5 asleep (ME is unable to process commands from TA/TE because it is in a low functionality state)

Also all other values below 128 are reserved by this ETS.

Implementation

Mandatory when ME can be operated from TE (refer subclause "Mobile Equipment control mode +CMEC").

8.2 Set phone functionality +CFUN

Table 33: +CFUN parameter command syntax

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

Description

Set command selects the level of functionality <fun> in the ME. Level "full functionality" is where the highest level of power is drawn. "Minimum functionality" is where minimum power is drawn. Level of functionality between these may also be specified by manufacturers. When supported by manufacturers, ME resetting with <rst> parameter may be utilized. Refer subclause 9.2 for possible <err> values.

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

Test command returns values supported by the ME as a compound value.

Defined values

<fun>:

- 0 minimum functionality
- 1 full functionality
- 2 disable phone transmit RF circuits only
- 3 disable phone receive RF circuits only
- 4 disable phone both transmit and receive RF circuits
- 5...127 reserved for manufacturers as intermediate states between full and minimum functionality

<rst>:

- 0 do not reset the ME before setting it to <fun> power level

NOTE 2: This shall be always default when <rst> is not given.

- 1 reset the ME before setting it to <fun> power level

Implementation

Optional.

8.3 Enter PIN +CPIN**Table 34: +CPIN parameter command syntax**

Command	Possible response(s)
+CPIN=<pin>[, <newpin>]	+CME ERROR: <err>
+CPIN?	+CPIN: <code> +CME ERROR: <err>
+CPIN=?	

Description

Set command sends to the ME a password which is necessary before it can be operated (SIM PIN, SIM PUK, PH-SIM PIN, etc.). If the PIN is to be entered twice, the TA shall automatically repeat the PIN. If no PIN request is pending, no action is taken towards ME and an error message, +CME ERROR, is returned to TE. Refer subclause 9.2 for possible <err> values.

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

NOTE: Commands which interact with ME that are accepted when ME is pending SIM PIN, SIM PUK, or PH-SIM are: +CGMI, +CGMM, +CGMR, +CGSN, D112; (emergency call), +CPAS, +CFUN, +CPIN, +CDIS (read and test command only), and +CIND (read and test command only).

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

Defined values

<pin>, <newpin>: string type values

<code> values reserved by this ETS:

- READY ME is not pending for any password
- SIM PIN ME is waiting SIM PIN to be given
- SIM PUK ME is waiting SIM PUK to be given
- PH-SIM PIN ME is waiting PHOne-to-SIM card password to be given

Implementation

Optional.

8.4 Battery charge +CBC

Table 35: +CBC action command syntax

Command	Possible response(s)
+CBC	+CBC: <bc>, <bcl> +CME ERROR: <err>
+CBC=?	+CBC: (list of supported <bc>s), (list of supported <bcl>s)

Description

Execution command returns battery connection status <bc> and battery charge level <bcl> of the ME. Refer subclause 9.2 for possible <err> values.

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

Defined values

<bc>:

- 0 ME is powered by the battery
- 1 ME has a battery connected, but is not powered by it
- 2 ME does not have a battery connected
- 3 Recognized power fault, calls inhibited

<bcl>:

- 0 battery is exhausted, or ME does not have a battery connected
- 1...100 battery has 1-100 percent of capacity remaining

Implementation

Optional.

8.5 Signal quality +CSQ

Table 36: +CSQ action command syntax

Command	Possible response(s)
+CSQ	+CSQ: <rssi>, <ber> +CME ERROR: <err>
+CSQ=?	+CSQ: (list of supported <rssi>s), (list of supported <ber>s)

Description

Execution command returns received signal strength indication <rssi> and channel bit error rate <ber> from the ME. Refer subclause 9.2 for possible <err> values.

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

Defined values

<rssi>:

- 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> (in percent):

- 0...7 as RXQUAL values in the table in GSM 05.08 [20] subclause 8.2.4
- 99 not known or not detectable

Implementation

Optional.

8.6 Mobile Equipment control mode +CMEC

Table 37: +CMEC parameter command syntax

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

Description

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

Test command returns the modes supported by the TA as compound values.

Defined values

<keyp>:

- 0 ME can be operated only through its keypad (execute command of +CKPD cannot be used)
- 1 ME can be operated only from TE (with command +CKPD)
- 2 ME can be operated from both ME keypad and TE

<disp>:

- 0 only ME can write to its display (command +CDIS can only be used to read the display)
- 1 only TE can write to ME display (with command +CDIS)
- 2 ME display can be written by both ME and TE

<ind>:

- 0 only ME can set the status of its indicators (command +CIND can only be used to read the indicators)
- 1 only TE can set the status of ME indicators (with command +CIND)
- 2 ME indicators can be set by both ME and TE

Implementation

Mandatory when any of keypad, display or indicator commands is implemented.

8.7 Keypad control +CKPD

Table 38: +CKPD action command syntax

Command	Possible response(s)
+CKPD=<keys>[,<time>[,<pause>]]	+CME ERROR: <err>
+CKPD=?	

Description

Execution command emulates ME keypad by giving each keystroke as a character in a string <keys>. <time>*0.1 seconds is the time to stroke each key and <pause>*0.1 seconds is the length of pause between two strokes. If emulating fails in an ME error, +CME ERROR: <err> is returned. Refer subclause 9.2 for <err> values. This command should be accepted (OK returned) before actually starting to press the keys. Thus unsolicited result codes of key pressings and display events can be returned (refer subclause "Mobile Equipment event reporting +CMER").

Defined values

<keys>: string of characters representing keys as listed in the following table (based on PCCA XANX-101-I table I-3). Colon character (IRA 58) followed by one character can be used to indicate a manufacturer specific key not listed here. All characters from a semicolon character (IRA 59) to the next single semicolon character are treated as alpha entries and are not converted to key equivalents. All semicolon characters inside alpha entries should be duplicated in the TE and stripped to one before entering to the ME. Pause character (IRA 87 or 119) can be used to pause between key pressings for a time specified by <pause>. All IRA values not listed here are reserved.

Table 39: Character codes

Char	IRA (dec)	Comment (+ some known key symbols)
#	35	hash (number sign)
%	37	percent sign (P)
*	42	star (*)
0... 9	48... 57	number keys
:	58	escape character for manufacturer specific keys
;	59	escape character for string entering
<	60	left arrow
>	62	right arrow
@	64	alpha key (α/ABC)
A/a	65/97	channel A (A)
B/b	66/98	channel B (B)
C/c	67/99	clear display (C/CLR)
D/d	68/100	volume down
E/e	69/101	connection end (END)
F/f	70/102	function (FCN)
L/l	76/108	phone lock (LOCK)
M/m	77/109	menu (MENU)
P/p	80/112	power (PWR)
Q/q	81/113	quiet/mute (MUTE)
R/r	82/114	recall last number (R/RCL/MR)
S/s	83/115	connection start (SEND)
T/t	84/116	store/ memory (STO/M/M+)
U/u	85/117	volume up
V/v	86/118	down arrow
W/w	87/119	pause character
X/x	88/120	auxiliary (AUX)
Y/y	89/121	delete last character (C)
[91	soft key 1
]	93	soft key 2
^	94	up arrow

<time>, <pause>:

0...255 0... 25.5 seconds (default values are manufacturer specific, but should be so long that a normal ME can handle keystrokes correctly)

Implementation

Optional.

8.8 Display control +CDIS

Table 40: +CDIS parameter command syntax

Command	Possible response(s)
+CDIS=[<text>[,<text>[,...]]]	+CME ERROR: <err>
+CDIS?	+CDIS: <text>[,<text>[,...]] +CME ERROR: <err>
+CDIS=?	+CDIS: <length>[,<length>[,...]] +CME ERROR: <err>

Description

Set command is used to write the contents of ME text type display elements. An element can consist of one character or several characters. The order of element parameters `<text>` should follow the rule: first is the element in upper left corner, second is the next element to the right and so on. The last element is the element in lower right corner. The number of elements is ME specific. If ME does not allow writing to its display or ME is not currently reachable, `+CME ERROR: <err>` is returned. Refer subclause 9.2 for `<err>` values. If certain element is not writable, setting of it should be ignored. If element parameter is empty field, element shall remain in the previous value.

NOTE 1: This command cannot be used to write to a display which sum of element lengths exceed the length of the command line buffer of the TA.

Read command returns the contents of ME display elements. If `<text>` field is empty (not empty string), ME does not allow the reading of corresponding element. If ME is not currently reachable, `+CME ERROR: <err>` is returned. Refer subclause 9.2 for `<err>` values.

Test command returns maximum length of each display element. If ME does not offer the length of elements, `<length>` fields should be empty. If ME is not currently reachable, `+CME ERROR: <err>` is returned. Refer subclause 9.2 for `<err>` values.

NOTE 2: ME manufacturer should offer the order and maximum length of elements.

Defined values

`<text>`: string type parameter using character set specified by command Select TE Character Set `+CSCS`

`<length>`: integer type parameter giving the maximum length of corresponding `<text>` parameter

Implementation

Optional.

8.9 Indicator control `+CIND`

Table 41: `+CIND` parameter command syntax

Command	Possible response(s)
<code>+CIND=[<ind>[,<ind>[,...]]]</code>	<code>+CME ERROR: <err></code>
<code>+CIND?</code>	<code>+CIND: <ind>[,<ind>[,...]]</code> <code>+CME ERROR: <err></code>
<code>+CIND=?</code>	<code>+CIND: (<descr>,(list of supported <ind>s)) [,<descr>,(list of supported <ind>s)][,...]</code> <code>+CME ERROR: <err></code>

Description

Set command is used to set the values of ME indicators. `<ind>` value 0 means that the indicator is off (or in state which can be identified as "off"-state), 1 means that indicator is on (or in a state which is more substantial than "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 ME specific. If ME does not allow setting of indicators or ME is not currently reachable, `+CME ERROR: <err>` is returned. Refer subclause 9.2 for `<err>` values. If certain indicator is not writable, setting of it should be ignored. If parameter is empty field, indicator shall remain in the previous value.

Read command returns the status of ME indicators. If ME is not currently reachable, `+CME ERROR: <err>` is returned. Refer subclause 9.2 for `<err>` values.

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 ME is not currently reachable, +CME ERROR: <err> is returned. Refer subclause 9.2 for <err> values.

NOTE: ME manufacturer should offer the description of supported indicators not listed here and their value ranges and default values.

Defined values

<ind>: integer type value, which shall be in range of corresponding <descr>

<descr> values reserved by this ETS and their <ind> ranges:

"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)

Implementation

Optional.

8.10 Mobile Equipment event reporting +CMER

Table 42: +CMER parameter command syntax

Command	Possible response(s)
+CMER=[<mode>[,<keyp>[,<disp>[,<ind>[,<bfr>]]]]]	+CME ERROR: <err>
+CMER?	+CMER: <mode>,<keyp>,<disp>,<ind>,<bfr>
+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)

Description

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

Test command returns the modes supported by the TA as compound values.

Defined values

<mode>:

- 0 buffer unsolicited result codes in the TA; if TA result code buffer is full, codes can be buffered in some other place or the oldest ones can be discarded
- 1 discard unsolicited result codes when TA-TE link is reserved (e.g. in on-line data mode); otherwise forward them directly to the TE
- 2 buffer unsolicited result codes in the TA when TA-TE link is reserved (e.g. in on-line data mode) and flush them to the TE after reservation; otherwise forward them directly to the TE
- 3 forward unsolicited result codes directly to the TE; TA-TE link specific inband technique used to embed result codes and data when TA is in on-line data mode

<keyp>:

- 0 no keypad event reporting
- 1 keypad event reporting using result code +CKEV: <key>,<press>. <key> indicates the key (refer IRA values defined in table in subclause "Keypad control +CKPD") and <press> if the key is pressed or released (1 for pressing and 0 for releasing). Only those key pressings, which are not caused by +CKPD shall be indicated by the TA to the TE.

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

- 2 keypad event reporting using 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 should be flushed to the TA regardless of <bfr> setting.

<disp>:

- 0 no display event reporting
- 1 display event reporting using result code +CDEV: <elem>,<text>. <elem> indicates the element order number (as specified for +CDIS) and <text> is the new value of text element. Only those display events, which are not caused by +CDIS shall be indicated by the TA to the TE. Character set used in <text> is as specified by command Select TE Character Set +CSCS
- 2 display event reporting using result code +CDEV: <elem>,<text>. All display events shall be directed from TA to TE. Character set used in <text> is as specified by command Select TE Character Set +CSCS

<ind>:

- 0 no indicator event reporting
- 1 indicator event reporting using result code +CIEV: <ind>,<value>. <ind> indicates the indicator order number (as specified for +CIND) and <value> is the new value of indicator. Only those indicator events, which are not caused by +CIND shall be indicated by the TA to the TE
- 2 indicator event reporting using result code +CIEV: <ind>,<value>. All indicator events shall be directed from TA to TE

<bfr>:

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

Implementation

Mandatory when any of the keypad, display, or indicator result codes is implemented.

8.11 Select phonebook memory storage +CPBS

Table 43: +CPBS parameter command syntax

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

Description

Set command selects phonebook memory storage `<storage>`, which is used by other phonebook commands. If setting fails in an ME error, `+CME ERROR: <err>` is returned. Refer subclause 9.2 for `<err>` values.

Read command returns currently selected memory, and when supported by manufacturer, number of used locations and total number of locations in the memory.

Test command returns supported storages as compound value.

Defined values

`<storage>` values reserved by this ETS:

"FD"	SIM fixdialling-phonebook
"LD"	SIM last-dialling-phonebook
"ME"	ME phonebook
"MT"	combined ME and SIM phonebook
"SM"	SIM phonebook
"TA"	TA phonebook

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

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

Implementation

Mandatory when phonebook read, find or write command, or direct dialling (refer subclause "Direct dialling from phonebooks") is implemented.

8.12 Read phonebook entries +CPBR

Table 44: +CPBR action command syntax

Command	Possible response(s)
+CPBR=<index1>[,<index2>]	+CPBR: <index1>,<number>,<type>,<text>[[...] <CR><LF>+CPBR: <index2>,<number>,<type>,<text>] +CME ERROR: <err>
+CPBR=?	+CPBR: (list of supported <index>s),<nlength>,<tlength> +CME ERROR: <err>

Description

Execution command returns phonebook entries in location number range `<index1>... <index2>` from the current phonebook memory storage selected with +CPBS. If `<index2>` is left out, only location `<index1>` is returned. Entry fields returned are location number `<indexn>`, phone number stored there `<number>` (of format `<type>`) and text `<text>` associated with the number. If listing fails in an ME error, `+CME ERROR: <err>` is returned. Refer subclause 9.2 for `<err>` values.

Test command returns location range supported by the current storage as a compound value and the maximum lengths of `<number>` and `<text>` fields. If ME is not currently reachable, `+CME ERROR: <err>` is returned. Refer subclause 9.2 for `<err>` values.

Defined values

<index1>, <index2>, <index>:

integer type values in the range of location numbers of phonebook memory.

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

<type>: type of address octet in integer format (refer GSM 04.08 [8] subclause 10.5.4.7).

<text>: string type field of maximum length <tlength>; character set as specified by command Select TE Character Set +CSCS.

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

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

Implementation

Optional.

8.13 Find phonebook entries +CPBF

Table 45: +CPBF action command syntax

Command	Possible response(s)
+CPBF=<findtext>	+CPBF: <index1>, <number>, <type>, <text>[[...] <CR><LF>+CBPF: <index2>, <number>, <type>, <text>] +CME ERROR: <err>
+CPBF=?	+CPBF: <nlength>, <tlength> +CME ERROR: <err>

Description

Execution command returns phonebook entries (from the current phonebook memory storage selected with +CPBS) which alphanumeric field start with string <findtext>. Entry fields returned are location number <indexn>, phone number stored there <number> (of format <type>) and text <text> associated with the number. If listing fails in an ME error, +CME ERROR: <err> is returned. Refer subclause 9.2 for <err> values.

Test command returns the maximum lengths of <number> and <text> fields. If ME is not currently reachable, +CME ERROR: <err> is returned. Refer subclause 9.2 for <err> values.

Defined values

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

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

<type>: type of address octet in integer format (refer GSM 04.08 [8] subclause 10.5.4.7).

<findtext>, <text>: string type field of maximum length <tlength>; character set as specified by command Select TE Character Set +CSCS.

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

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

Implementation

Optional.

8.14 Write phonebook entry +CPBW

Table 46: +CPBW action command syntax

Command	Possible response(s)
+CPBW=[<index>][,<number> [,<type>[,<text>]]]	+CME ERROR: <err>
+CPBW=?	+CPBW: (list of supported <index>s),<nlength>,(list of supported <type>s),<tlength> +CME ERROR: <err>

Description

Execution command writes phonebook entry in location number <index> in the current phonebook memory storage selected with +CPBS. Entry fields written are phone number <number> (in the format <type>) and text <text> associated with the number. If those fields are omitted, phonebook entry is deleted. If <index> is left out, but <number> is given, entry is written to the first free location in the phonebook (the implementation of this feature is manufacturer specific). If writing fails in an ME error, +CME ERROR: <err> is returned. Refer subclause 9.2 for <err> values.

Test command returns location range supported by the current storage as a compound value, the maximum length of <number> field, supported number formats of the storage, and the maximum length of <text> field. If ME is not currently reachable, +CME ERROR: <err> is returned. Refer subclause 9.2 for <err> values. If storage does not offer format information, the format list should be empty parenthesis.

Defined values

<index>:	integer type values in the range of location numbers of phonebook memory.
<number>:	string type phone number of format <type>.
<type>:	type of address octet in integer format (refer GSM 04.08 [8] subclause 10.5.4.7); default 145 when dialling string includes international access code character "+", otherwise 129.
<text>:	string type field of maximum length <tlength>; character set as specified by command Select TE Character Set +CSCS.
<nlength>:	integer type value indicating the maximum length of field <number>.
<tlength>:	integer type value indicating the maximum length of field <text>.

Implementation

Optional.

8.15 Clock +CCLK

Table 47: +CCLK parameter command syntax

Command	Possible response(s)
+CCLK=<time>	+CME ERROR: <err>
+CCLK?	+CCLK: <time> +CME ERROR: <err>
+CCLK=?	

Description

Set command sets the real-time clock of the ME. If setting fails in an ME error, +CME ERROR: <err> is returned. Refer subclause 9.2 for <err> values.

Read command returns the current setting of the clock.

Defined values

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

Implementation

Optional.

8.16 Alarm +CALA

Table 48: +CALA parameter command syntax

Command	Possible response(s)
+CALA=<time>[, <n>[, <type>[, <text>]]]	+CME ERROR: <err>
+CALA?	+CALA: <time>, <n>, <type>, <text> [<CR><LF>+CALA: <time>, <n>, <type>, <text> [...]] +CME ERROR: <err>
+CALA=?	+CALA: (list of supported <n>s), (list of supported <type>s), <tlength> +CME ERROR: <err>

Description

Set command sets an alarm time in the ME. There can be an array of different types of alarms, and each alarm may cause different text to be displayed in the ME display. If setting fails in an ME error, +CME ERROR: <err> is returned. Refer subclause 9.2 for <err> values.

Read command returns the list of current alarm settings in the ME.

Test command returns supported array index values, alarm types, and maximum length of the text to be displayed.

Defined values

<time>:	refer +CCLK.
<n>:	integer type value indicating the index of the alarm; default is manufacturer specific.
<type>:	integer type value indicating the type of the alarm (e.g. 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>.
<tlength>:	integer type value indicating the maximum length of <text>.

Implementation

Optional.

8.17 Generic SIM access +CSIM**Table 49: +CSIM action command syntax**

Command	Possible response(s)
+CSIM=<length>,<command>	+CSIM: <length>,<response> +CME ERROR: <err>
+CSIM=?	

Description

Set command transmits to the ME the <command> it then shall send as it is to the SIM. In the same manner the SIM <response> shall be sent back by the ME to the TA as it is. Refer subclause 9.2 for <err> values.

This command allows a direct control of the SIM by an distant application on the TE. The TE shall then take care of processing SIM information within the frame specified by GSM.

Defined values

<length>:	integer type; length of the characters that are sent to TE in <command> or <response> (two times the actual length of the command or response).
<command>:	command passed on by the ME to the SIM in the format as described in TS GSM 11.11 (hexadecimal character format; refer +CSCS).
<response>:	response to the command passed on by the SIM to the ME in the format as described in TS GSM 11.11 (hexadecimal character format; refer +CSCS).

Implementation

Optional.

8.18 Informative examples

Phone Activity Status (+CPAS) is a general command used to detect the presence of the ME, if there is an incoming call, or if there is a call in progress. This command should be used before trying to operate the ME from the TE. Note that the activity status may change at any time after the execution of +CPAS, and hence the returned value may be obsolete. Detachment of the ME from the TA is indicated with a special final result code that indicates all errors related to the operation of the ME. Result code is +CME ERROR: <err>, where <err> is an integer or verbose value giving useful information about the reason for the command failure (refer subclause "Mobile Equipment error result code +CME ERROR").

Set Phone Functionality (+CFUN) can be used to reset the ME or set the power consumption level of the ME by disabling certain parts of the ME (e.g. the transmit and receive RF circuits). Mobile Equipment Control Mode (+CMEC) is a command which manages access sharing between the ME and the TE to operate the user interface of the ME. It has three subparameters which describe the access to keypad, display and indicators. Each subparameter has values for restricting the operation of the corresponding user interface part only to the ME or only to the TE, or to give the access for both of them.

Keypad Control command (+CKPD) is used to operate the keypad of the ME. Here lies the problem of different keypad types between manufacturers, and also between their ME models. The keypresses are sent to the ME as a string type subparameter of this command. Each character in that string represents a key which will be logically pressed. A special character (colon) followed by any character can be used by manufacturers (or TE application programmers) to represent a key which is not defined in this profile. An escape character (semicolon) for direct string entering is also defined. All text between single semicolon characters is treated as an alphanumeric entry and is not converted to keypressings. All semicolon characters inside the text shall be duplicated in the TE and stripped back to one before entering them to the ME. Command has also optional second and third parameters which can be used to alter the time to strike each key, and the pause to wait between keystrokes (in tenths of a second). A special pause character (W or w) may be added in the string type subparameter for an extra pause of the same length as given by the third subparameter. In the following example alphanumeric mode is entered and a person predefined in the ME phonebook, "Ilkka", is called; each key is struck for half a second and pauses between strokes are a tenth of a second:

```
AT+CKPD="@:Ilkka:S",5,1
OK
```

Display Control command (+CDIS) is used both for writing to the display text fields and for reading the current status of the fields. Mobile equipment usually have a character set of their own, so the TA shall be able to do a conversion between the TE and the ME character sets. TE can have several character sets and the TA must be informed of the character set in use before starting to write or read the display. Character set is set with general command Select TE Character Set +CSCS. The +CDIS=? query command is a way to get information about the length of the fields. In the following example an ME is first queried about the supported conversions and the lengths of the fields. The response shows there are three ten character long and two six character long fields. Then the TE character set is set to be IRA and the current status of the display is read. The last command writes the text "Hello, I'm writing to display" in the three fields, and keeps the contents of the two other fields same (the last two commas could also be left out).

```
AT+CSCS=?;+CDIS=?
+CSCS: ("IRA","PCCP850","8859-1")
+CDIS: 10,10,10,6,6
OK
AT+CSCS="IRA"
OK
AT+CDIS?
+CDIS: "RADIOLINJA",",",",", "Menu", "Memory"
OK
AT+CDIS="IRA","Hello, I'm","writing to","display",,
OK
```


The writing is possible only when it is permitted by the Mobile Equipment Control Mode command (and by the manufacturer). If a certain field is not writable (but is readable), writing to it should be ignored. The order of the text fields should be determined by manufacturers and follow the rule: first field is in the upper left corner, second in the next field to the right, and so on, until to the last field in the lower right corner.

Indicators can be handled with Indicator Control command (+CIND). Its query command returns a short description (abbreviation) of the purpose of the indicators and the supported values for each indicator. The setting and reading is done similarly as with Display Control command. In the following example the indicators of a phone are queried, their current value is read, and the value of message indicator is tried to set (but it is forbidden). Although the battery charge indicator has only four different states, five are emulated by giving two integers for the two most charged states.

```
AT+CIND=?
+CIND: ("memory",(0-2)),("call",(0,1)),("data",(0,1)),("roam",(0,1)),
("alpha",(0,1)),("message",(0,1)),("index1",(0-11)),("index2",(0-11)),
("index3",(0-11)),("signal",(0-5)),("service",(0,1)),("sel1",(0,1)),
("sel2",(0,1)),("sel3",(0,1)),("battchg",(0-5))
OK
AT+CIND?
+CIND: 1,0,0,0,0,1,0,0,0,3,1,0,0,0,5
OK
AT+CIND=,,,,,0
+CME ERROR: 10
```

The subparameter order in the command is defined by the query command order, not by the actual display order. The zero value of an indicator means that it is off (or in state which can be identified as "off"-state), value one means that the indicator is on (or in a state which is more substantial than "off"-state), value two is more substantial than one, and so on.

To this point, only operating through the TE is covered. But when ME can be operated also through its keypad, or there are changes in the status of the display elements, the information about these actions shall be given to the TE also. This can be solved only with unsolicited result codes which return keypad, display text and indicator events. Each event group has a result code of its own: +CKEV returns the key code and if the key pressed (1) or released (0), +CDEV returns the display text field running number (as specified by command +CDIS) and the new status of the field, and +CIEV returns the running number of the indicator (refer +CIND) and the new value of it. In the following example number key 1 is pressed, updated on the display, released, and signal strength changes its state to five:

```
+CKEV: 49,1
+CDEV: 1,"1"
+CKEV: 49,0
+CIND: 10,5
```

Mobile Equipment Event Reporting command (+CMER) has been specified for the purpose of controlling the sending of these unsolicited result codes to the TE. Four ways are provided to handle the buffering of the result codes (see figure 8). The first is to buffer them always. The second possibility is to discard them when in on-line data mode and otherwise forward them directly to the TE. The third possibility is to buffer them in data mode and otherwise forward them to the TE. The last possibility is to send them always to the TE (some inband technique shall be used in data mode to send the result codes within the data). This is the first subparameter of +CMER command. Next three subparameters are used to enable or disable each of the keypad, text field and indicator result codes. Sending codes can be enabled either so that only events generated from the ME user interface are returned, or so that also events caused by Keypad, Display and Indicator Control commands are returned. The fifth subparameter controls the flushing of the buffer when the value of the first subparameter is changed to a value from one to three.

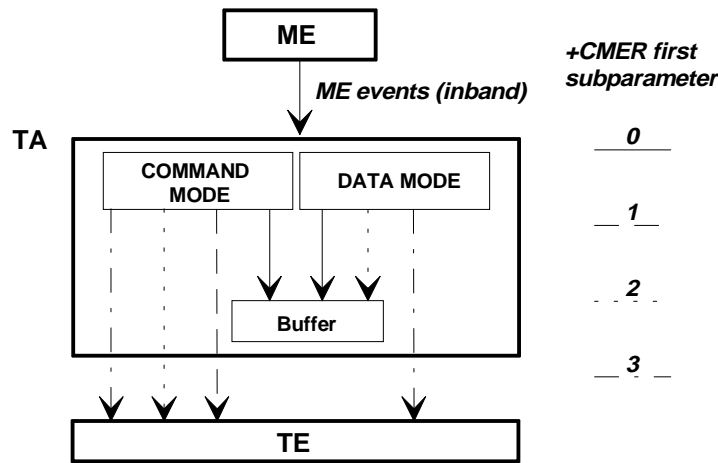


Figure 8: Mobile equipment event reporting

An example of complete setup of the TA where TE takes the control of keypad, but does not want to write to display nor control the indicators (in the start ME is powered off):

```

AT+CMEE=2;+CREG=1      (use verbose <err> values; report registration)
OK
AT+CPAS                (query ME status)
+CPAS: 5               (ME is asleep)
OK
AT+CFUN=1              (set ME to full functionality state)
+CME ERROR: SIM PIN required (SIM requests PIN)
AT+CPIN="1234"
+CME ERROR: incorrect password (user entered wrong PIN)
AT+CPIN="4321"
OK                      (correct PIN)
AT+COPS=0,0            (ask for automatic operator selection and registration)
OK
+CREG: 1                (registered in the network)
AT+COPS?
+COPS: 0,0,"RADIOLINJA" (get the operator name)
OK
AT+CMEC=1,0,0          (take over the keypad, leave display to ME)
OK
AT+CDIS=?;+CIND=?      (query display text and indicator formats)
+CDIS: 10,10,10,6,6
+CIND: ("memory",(0-2)),("call",(0,1)),("data",(0,1)),("roam",(0,1)),
("alpha",(0,1)),("message",(0,1)),("index1",(0-11)),("index2",(0-11)),
("index3",(0-11)),("signal",(0-5)),("service",(0,1)),("sel1",(0,1)),
("sel2",(0,1)),("sel3",(0,1)),("battchg",(0-5))
OK
AT+CSCS="IRA"          (set TE character set for display text results)
OK
AT+CMER=1,0,2,2,0      (return display text and indicator result codes when
OK                      in command state, in data mode discard them)
AT+CDIS?;+CIND?        (read current state of display texts and indicators)
+CDIS: " "," "," " 12345,"Menu","Memory" (user had pressed number buttons before
+ CIND: 1,0,0,0,0,1,0,0,0,3,1,0,0,0,5    TE took control with +CMEC)
OK
AT+CKPD="C",20         (clear main display text '12345' by holding the
OK                      'clear' button down two seconds)
+CDEV: 3,"1234"        (first only one character deleted)
+CDEV: 3," "           (while holding continues, whole display is cleared)
+CDEV: 1,"RADIOLINJA" (operator name comes to the display)
    
```

The start of the previous example could go as follows when ME has already been powered on but is waiting for the PIN:

```
AT+CMEE=2;+CREG=1      (use verbose <err> values; report registration)
OK
AT+CPAS                (query ME status)
+CPAS: 0                (ME is ready to receive commands)
OK
AT+CPIN?                (is ME asking passwords?)
+CPIN: SIM PIN          (yes, SIM PIN required)
AT+CPIN="4321"
OK                       (correct PIN)
```

One of the most regular operations done through the ME user interface is phonebook control. To lessen the workload of the TE, some direct commands for phonebook reading and writing are practical. A TA manufacturer may even drop the implementation of other user interface commands when only phonebook control is wanted to be allowed from the TE. Command Select Phonebook Memory Storage +CPBS query version returns supported phonebook memories, read version returns current settings, and set version selects the memory. For GSM, the normal storages are SIM, ME and TA.

Read Phonebook Entries (+CPBR) can be used to read either one or many phonebook locations at the same time. A regular phonebook entry consists of three elements: memory index number, the phone number and its alphanumeric equivalent given by the user. Query version of this returns supported index values of the selected memory, and the maximum lengths of the number and alphanumeric elements. The query version of the Write Phonebook Entry command (+CPBW) is similar, but the action version sets or clears an entry in the phonebook. Find Phonebook Entries (+CPBF) may be used to search alphanumeric entries starting with specific string. An example where the whole phonebook of the ME is read, index number four is cleared, and number three is written:

```
AT+CPBS=?
+CPBS: ("ME", "SM")    (ME and SIM have phonebooks)
OK
AT+CPBS="ME"           (select ME memory)
OK
AT+CPBR=?              (read index range and element lengths)
+CPBR: (1-99), 30, 30
OK
AT+CPBR=1, 99          (read all entries but only the ones set are returned)
+CPBR: 1, "931123456", 129, "Ilkka"
+CPBR: 2, "9501234567", 129, ""
+CPBR: 4, "901234567", 129, "Hesari"
OK
AT+CPBW=4;+CPBW=3, "921123456", , "TS" (clear index 4 and write index 3)
OK
```

9 Mobile Equipment errors

9.1 Report Mobile Equipment error +CMEE

Table 50: +CMEE parameter command syntax

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

Description

Set command disables or enables the use of result code +CME ERROR: <err> as an indication of an error relating to the functionality of the ME. When enabled, ME 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.

Test command returns values supported by the TA as a compound value.

Defined values

<n>:

- 0 disable +CME ERROR: <err> result code and use ERROR instead
- 1 enable +CME ERROR: <err> result code and use numeric <err> values (refer next subclause)
- 2 enable +CME ERROR: <err> result code and use verbose <err> values (refer next subclause)

Implementation

Mandatory for <n> values 0 and 1.

9.2 Mobile Equipment error result code +CME ERROR

The operation of +CME ERROR: <err> 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 +CMEE (refer previous subclause).

NOTE: ITU-T V.25ter [14] command v does not affect the format of this result code.

<err> values (numeric format followed by verbose format):

- 0 phone failure
- 1 no connection to phone
- 2 phone-adaptor link reserved
- 3 operation not allowed
- 4 operation not supported
- 5 PH-SIM PIN required
- 10 SIM not inserted
- 11 SIM PIN required
- 12 SIM PUK required
- 13 SIM failure
- 14 SIM busy
- 15 SIM wrong
- 16 incorrect password
- 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
- 100 unknown

also all other values below 256 are reserved by this ETS

Implementation

Mandatory for numeric format codes applicable to implemented command set.

9.3 Informative examples

An example of TA responses with all three +CMEE values when ME manufacturer identification is requested but ME is not connected to the TA:

```
AT+CMEE=0    (+CME ERROR shall not be used)
OK
AT+CGMI
ERROR
AT+CMEE=1    (use numeric <err>)
OK
AT+CGMI
+CME ERROR: 1
AT+CMEE=2    (use verbose <err>)
OK
AT+CGMI
+CME ERROR: no connection to phone
```

Annex A (normative): Summary of commands from other standards

Summary of ITU-T Recommendation V.25ter [14] commands applicable to GSM:

Table A.1: V.25ter commands applicable to GSM

Name	V.25ter section	Description	Subclauses in this ETS
&C	6.2.8	Circuit 109 (Received line signal detector) Behaviour	4.3.
&D	6.2.9	Circuit 108 (Data terminal ready) Behaviour	4.3.
&F	6.1.2	Set to Factory-defined Configuration	5.6./ 3.
+DR	6.6.2	Data Compression Reporting	6.13.
+DS	6.6.1	Data Compression	6.13.
+GCAP	6.1.9	Request Complete Capabilities List	5.6.
+GCI	6.1.10	Country of Installation	5.6.
+GMI	6.1.4	Request Manufacturer Identification	5.6./ 5.1.
+GMM	6.1.5	Request Model Identification	5.6./ 5.2.
+GMR	6.1.6	Request Revision Identification	5.6./ 5.3.
+GOI	6.1.8	Request Global Object Identification	5.6.
+GSN	6.1.7	Request Product Serial Number Identification	5.6./ 5.4.
+ICF	6.2.11	DTE-DCE Character Framing	4.3.
+IFC	6.2.12	DTE-DCE Local Flow Control	4.3.
+ILRR	6.2.13	DTE-DCE Local Rate Reporting	4.3.
+IPR	6.2.10	Fixed DTE Rate	4.3.
A	6.3.5	Answer	6.12./ 6.6.
D	6.3.1	Dial	6.1.-6.4./ 6.6.
E	6.2.4	Command Echo	4.3.
H	6.3.6	Hook Control	6.12./ 6.5./ 6.6.
I	6.1.3	Request Identification Information	5.6.
L	6.3.13	Monitor Speaker Loudness	6.12.
M	6.3.14	Monitor Speaker Mode	6.12.
O	6.3.7	Return to On-line Data State	6.12.
P	6.3.3	Select Pulse Dialling	6.12.
Q	6.2.5	Result Code Suppression	4.3.
S0	6.3.8	Automatic Answer	6.12.
S10	6.3.12	Automatic Disconnect Delay	6.12.
S3	6.2.1	Command Line Termination Character	4.3.
S4	6.2.2	Response Formatting Character	4.3.
S5	6.2.3	Command Line Editing Character	4.3.
S6	6.3.9	Pause Before Blind Dialling	6.12.
S7	6.3.10	Connection Completion Timeout	6.12.
S8	6.3.11	Comma Dial Modifier Time	6.12.
T	6.3.2	Select Tone Dialling	6.12.
V	6.2.6	DCE Response Format	4.3./ 3./ 4.1./ 4.2.
X	6.2.7	Result Code Selection and Call Progress Monitoring Control	4.3.
Z	6.1.1	Reset To Default Configuration	5.6.

The use of ITU-T Recommendation V.42 error control protocol is not specified for GSM, but if a manufacturer chooses to implement it over transparent data service, +E prefixed commands of V.25ter [14] shall be used.

ITU-T T.31 [11] and T.32 [12] may be used as facsimile TA-TE protocols without deletions or additions to the command set.

TIA IS-99 [15] commands referenced in this ETS:

Table A.2: TIA IS-99 commands in this ETS

Command	IS-99 section	Description	Subclause in this ETS
+CBC	5.6.5	Battery Charge	8.4.
+CGMI	5.6.10	Request Manufacturer Identification	5.1.
+CGMM	5.6.10	Request Model Identification	5.2.
+CGMR	5.6.10	Request Revision Identification	5.3.
+CGSN	5.6.10	Request Product Serial Number Identification	5.4.
+CRC	5.6.7	Cellular Result Codes	6.11.

TIA IS-135 [16] commands referenced in this ETS:

Table A.3: TIA IS-135 commands in this ETS

Command	IS-135 section	Description	Subclause in this ETS
+CBC	4.1.24	Battery Charge	8.4.
+CRC	4.1.29	Cellular Result Codes	6.11.
+CSQ	4.1.31	Signal Quality	8.5.

PCCA STD-101 commands referenced in this ETS:

Table A.4: PCCA STD-101 commands in this ETS

Command	STD-101 section	Description	Subclause in this ETS
+WS46	5.2.47	WDS-side Stack Selection	5.7.

Annex B (normative): Summary of result codes

V.25ter [14] result codes which can be used in GSM and codes defined in this ETS:

Table B.1: Result codes

Verbose result code (V.25ter command v1 set)	Numeric (v0 set)	Type	Description
+CCWA: <number>, <type> , <class>[, <alpha>]	as verbose	unsolicited	refer subclause 7.11.
+CDEV: <elem>, <text>	as verbose	unsolicited	refer subclause 8.10.
+CIEV: <ind>, <value>	as verbose	unsolicited	refer subclause 8.10.
+CKEV: <key>, <press>	as verbose	unsolicited	refer subclause 8.10.
+CLIP: <number> , <type>[, <subaddr> , <satype>[, <alpha>]]	as verbose	unsolicited	refer subclause 7.6.
+CME ERROR: <err>	as verbose	final	refer subclause 9.2.
+COLP: <number> , <type>[, <subaddr> , <satype>[, <alpha>]]	as verbose	intermediate	refer subclause 7.8.
+CR: <type>	as verbose	intermediate	refer subclause 6.8.
+CREG: <stat>	as verbose	unsolicited	refer subclause 7.2.
+CRING: <type>	as verbose	unsolicited	refer subclause 6.11.
+DR: <type>	as verbose	intermediate	refer subclause 6.13.
+ILRR: <rate>	as verbose	intermediate	refer subclause 4.3.
BUSY	6	final	busy signal detected
CONNECT	1	intermediate	connection has been established
CONNECT <text>	manufacturer specific	intermediate	as CONNECT but manufacturer specific <text> gives additional information (e.g. connection data rate)
ERROR	4	final	command not accepted
NO ANSWER	7	final	connection completion timeout
NO CARRIER	3	final	connection terminated
NO DIALTONE	5	final	no dialtone detected
OK	0	final	acknowledges execution of a command line
RING	2	unsolicited	incoming call signal from network

Annex C (informative): Commands from TIA IS-101

The "Voice Control Interim Standard for Asynchronous DCE", TIA IS-101, contains some commands that are useful when passing audio "data" (that is, data which represents audio information) between the computer and the TA.

Some of the following subclauses describe commands from IS-101 which are central to this TA application. However, with the exception of necessary extensions, these descriptions are not intended to replace the definitions found in IS-101. Other novel commands from the interim standard are not included because they are peripheral to TA operation.

NOTE 1: IS-101 also uses V.25ter [14] AT commands, but these are not mentioned here.

The standard specifies the following modes:

- Command mode, where there is no transfer of audio "data" between the TA and the computer. In command mode, the computer is neither sending audio data to the TA nor receiving audio data from the TA.
- Transmit mode, where audio "data" is being transferred from the computer to the TA. No audio "data" is transferred from the TA to the computer in this state. A transition back to command mode occurs when an embedded command indicates "end of play" or "flush data", or an inactivity timer times out.
- Receive mode, where audio "data" is being transferred from the TA to the computer. No audio "data" is transferred from the computer to the TA in this state. A transition back to command mode occurs when any command is sent from the computer, or an inactivity timer times out. During the receive mode, the TA embeds result codes into the audio "data". These result codes indicate permanent events such as "silence detected", "busy detected", and so on.

Strictly, the standard specifies another mode (translation), but this is not directly of interest here.

NOTE 2: The TA "knows" the type of an incoming call (whether it is voice, data, fax, whatever), and certain POTS events cannot occur. Hence some standard result codes for indication of events and discrimination of call type are unnecessary.

There are three possible levels of service:

- A TA supporting level A performs the following operations and detects the following events: audio transmit, audio receive, DTMF detection, DTMF generation and single tone generation. The following indications are supported:

<u>Event</u>	<u>Description</u>	<u>Handset state</u>
3	ring	idle
4	DTMF received	idle
5	receive buffer overrun	receive
6	unsolicited fax request	idle
8	phone on/off hook	idle
9	presumed hang-up	receive
10	presumed end of message	receive
18	ringback	idle
19	busy	idle
23	playback buffer underrun	transmit
25	fax or data request acknowledged	idle

- A TA supporting level B performs the operations and events of level A, and also supports DTMF detection while in the transmit state.
- A TA supporting level C performs the operations and events of level B, and also supports double DTMF tone generation.

Since DTMF detection and generation cannot be guaranteed over current digital networks, it follows that none of the three levels of service can be supported.

C.1 Select mode +FCLASS

This command puts the TA into a particular mode of operation (data, fax, voice etc.). This causes the TA to process information in a manner suitable for that type of information (rather than for other types of information). The values and meanings of parameter <n> are specified in the following table.

<n>	Mode
0	data
1	fax class 1 (TIA-578-A)
1.0	fax class 1 (ITU-T T.31 [11])
2	fax (manufacturer specific)
2.0	fax class 2 (ITU-T T.32 [12] and TIA-592)
3...7	reserved for other fax modes
8	voice
9...15	reserved for other voice modes
16..79	reserved
80	VoiceView (Radish)
81..255	reserved

Table C.1: +FCLASS

Command	Return
+FCLASS=<n>	
+FCLASS?	<n>
+FCLASS=?	(list of supported <n>s)

Voice mode is of particular interest here, and has an additional result code +VCON. Specifically, +VCON indicates that the TA is entering the voice command mode and there is a voice connection to at least one audio input or output. This presupposes that some mechanism has previously initiated a connection to that audio I/O.

C.2 Buffer threshold setting +VBT

This refers to integers <lo> and <hi> that indicate levels within the TA transmit buffer at which flow control is asserted and de-asserted. The buffer is used for averaging out the irregular timing of data from the computer, so that the data becomes synchronous and may be sent to some audio device.

Table C.2: +VBT

Command	Return
+VBT=<lo>, <hi>	
+VBT?	<lo>, <hi>
+VBT=?	(list of supported <lo>s), (list of supported <hi>s), (buffer size)

C.3 Calling number ID presentation +VCID

The command refers to an integer that allows a called party to enable or disable (<n>=0) the reporting of the ID of calling parties, and specifies the method of presentation of the ID. This is basically the same as GSM supplementary service CLIP (Calling Line Identification Presentation). The presentation may be either formatted (<n>=1) or unformatted (<n>=2):

- Formatted presentation : data items are reported in the form of <tag>=<value> pairs.

<u><tag></u>	<u><value></u>
DATE	MMDD (month, day)
TIME	HHMM (hour, minute)
NMBR	calling number or P or O (P = number is private, O = number is unavailable)
NAME	subscription listing name
MESG	data from other (unknown) tags

- Unformatted presentation : here the data is presented in ASCII hex as printable numbers.

Table C.3: +VCID

Command	Return
+VCID=<n>	
+VCID?	<n>
+VCID=?	(0-2)

C.4 Receive gain selection +VGR

This refers to the amplification by the TA of audio samples sent from the TA to the computer. The command operates on an integer <n>, range 0...255. Values larger than 128 indicate a larger gain than nominal. Values less than 128 indicate a smaller gain than nominal. The entire range of 0...255 does not have to be provided. A value of zero implies the use of automatic gain control by the TA.

Table C.4: +VGR

Command	Return
+VGR=<n>	
+VGR?	<n>
+VGR=?	(list of supported <n>s)

C.5 Transmit gain selection +VGT

This refers to the amplification by the TA of audio samples sent from the computer to the TA. The command operates on an integer <n>, range 0...255. Values larger than 128 indicate a larger gain than nominal. Values less than 128 indicate a smaller gain than nominal. The entire range of 0...255 does not have to be provided. A value of zero implies the uses of automatic gain control by the TA.

Table C.5: +VGT

Command	Return
+VGT=<n>	
+VGT?	<n>
+VGT=?	(list of supported <n>s)

C.6 Initialize voice parameters +VIP

This recalls manufacturer determined settings <n> of voice parameters. The command is write only. The effect of the command is manufacturer specific.

Table C.6: +VIP

Command	Return
+VIP=<n>	
+VIP=?	(list of supported <n>s)

C.7 Inactivity timer +VIT

This refers to the value of the inactivity timer in the TA. It is used to monitor activity on the connection between the computer and the TA when the computer is in "transmit" mode and sending audio data to the TA. When the connection has been inactive for the time set by this command, the TA leaves "transmit" mode and reverts to command mode. An integer <n> different than zero implies a time of <n>/10 seconds. A value of zero disables the timer.

Table C.7: +VIT

Command	Return
+VIT=<n>	
+VIT?	<n>
+VIT=?	(list of supported <n>s)

C.8 Line selection +VLS

This determines the selection of sources and destinations of audio samples. An integer is used to label a particular combination of sources and destinations. The integer is defined in an entry in IS-101 which assumes as a model a TA, a local phone and a phone line. Two additional "manufacturer specific" configurations (16,17) are defined.

- label=0: this is the idle state - the phone is not connected to the radio network and no audio paths are used;
- label=1: the phone is connected to the radio network and no audio paths involving the internal microphone or internal loudspeaker are selected. This allows the computer to transmit audio data over the radio transmitter by selecting "transmit mode":

Table C.8: +VLS label 1a

	loudspeaker	computer i/p	transmit stage
microphone -->			
computer o/p -->			*
receiver stage -->			

This also allows the computer to receive audio data from the radio receiver by selecting "receive mode":

Table C.9: +VLS label 1b

	loudspeaker	computer i/p	transmit stage
microphone -->			
computer o/p -->			
receiver stage -->		*	

- label=4: the phone is not connected to the radio network but there is an audio path to the internal speaker. This allows the computer to play sound by selecting "transmit mode".

Table C.10: +VLS label 4

	loudspeaker	computer i/p	transmit stage
microphone -->			
computer o/p -->	*		
receiver stage -->			

- label=6: the phone is not connected to the radio network but there is an audio path to the internal microphone. This allows the computer to record sound by selecting "receive mode";

Table C.11: +VLS label 6

	loudspeaker	computer i/p	transmit stage
microphone -->		*	
computer o/p -->			
receiver stage -->			

- label=7: the phone is connected to the radio network. The internal microphone is connected to the radio transmitter. The radio receiver is connected to the internal loudspeaker. This allows the computer to enable normal phone operation (a human holding a conversation) by selecting command mode;

Table C.12: +VLS label 7

	loudspeaker	computer i/p	transmit stage
microphone -->			*
computer o/p -->			
receiver stage -->	*		

Table C.13: +VLS

Command	Return
+VLS=<n>	+VCON
+VLS?	<n>
+VLS=?	<i>complex; refer IS-101</i>

+VCON is returned if an audio path is established or if a connection is made to the radio network.

Manufacturer specific extension (reserved as such by IS-101)

- label=16: the phone is connected to the radio network. There is a path to the internal microphone, which is also connected to the radio transmitter. There is a path to the radio receiver, which is also connected to the internal loudspeaker. This allows the computer to record the sum of transmitted and received audio by selecting "receive mode";

Table C.14: +VLS label 16

	loudspeaker	computer i/p	transmit stage
microphone -->		*	*
computer o/p -->			
receiver stage -->	*	*	

- label=17: the phone is connected to the radio system and there is a path to the internal loudspeaker and to the radio transmitter. This allows the computer to simultaneously play sound and send audio over the radio by selecting "transmit mode";

Table C.15: +VLS label 17

	loudspeaker	computer i/p	transmit stage
microphone -->			
computer o/p -->	*		*
receiver stage -->			

C.9 Receive data state +VRX

This action command causes the TA to get audio data from a source determined by the +VLS command, and send it to the computer. Once the datastream has started, any result codes will be embedded in the data and shielded using the normal <DLE> methods. The receive process is terminated when the computer sends any command to the TA, or by time-out of the inactivity timer. The command is write only.

Table C.16: +VRX

Command	Return
+VRX	CONNECT

C.10 Select compression method +VSM

This selects the voice compression method <n1>, the voice sampling rate <n2>, the silence compression sensitivity <n3>, and a parameter related to silence expansion <n4>. There are several choices of compression method. IS-101 does not specify methods, but here is a list of some usual compression methods:

Name	Communications system
GSM/full-rate	GSM
GSM/half-rate	GSM
ADPCM/G.721	DECT, CT2
ADPCM/G.723	DECT, CT2
ADPCM/G.726	DECT, CT2
ADPCM/G.727	DECT, CT2
SIGNED PCM	POTS

Table C.17: +VSM

Command	Return
+VSM=<n1>, <n2>, <n3>, <n4>	
+VSM?	<n1>, <n2>, <n3>, <n4>
+VSM=?	<i>complex; refer IS-101</i>

NOTE: A value of <n3>=0 implies no silence compression sensitivity. A value of <n4>=0 implies no silence expansion.

C.11 DTMF and tone generation +VTS

This command allows the transmission of DTMF tones and arbitrary tones (see note). These tones may be used (for example) when announcing the start of a recording period. The command is write only. In this profile of commands, this command does not operate in data or fax modes of operation (+FCLASS=0,1,2-7).

NOTE 1: D is used only for dialling.

The string parameter of the command consists of combinations of the following separated by commas:

- 1) <DTMF>. A single ASCII character in the set 0-9, #,*,A-D. This is interpreted as a single ASCII character whose duration is set by the +VTD command.

NOTE 2: In GSM this operates only in voice mode.

- 2) [<tone1>,<tone2>,<duration>]. This is interpreted as a dual tone of frequencies <tone1> and <tone2>, lasting for a time <duration> (in 10 ms multiples).

NOTE 3: This does not operate in GSM.

- 3) {<DTMF>,<duration>}. This is interpreted as a DTMF tone of different duration from that mandated by the +VTD command.

NOTE 4: In GSM this operates only in voice mode.

Table C.18: +VTS

Command	Return
+VTS= <i>as above</i>	
+VTS=?	(list of supported <tone1>s) , (list of supported <tone2>s) , (list of supported <duration>s)

C.12 Tone duration +VTD

This refers to an integer <n> that defines the length of tones emitted as a result of the +VTS command. This does not affect the D command. A value different than zero causes a tone of duration <n>/10 seconds. The value zero causes a "manufacturer specific" value.

Table C.19: +VTD

Command	Return
+VTD=<n>	
+VTD?	<n>
+VTD=?	(list of supported <n>s)

NOTE: In GSM the value of tone duration is preset and cannot be altered.

C.13 Transmit data state +VTX

This action command causes the TA to receive audio data from the computer and send it to a destination determined by the +VLS command. Once the audio datastream has started, commands to the TA shall be embedded in the data stream, and shielded using the normal <DLE> methods. The transmit process is terminated by the use of embedded commands or by the time-out of an inactivity timer. It is recommended that the TA has a buffer to allow the TA to convert potentially bursty data from the computer into synchronous data for "transmission". The command is write only.

Table C.20: +VTX

Command	Return
+VTX	CONNECT

Annex D (informative): Bibliography

Informative references:

- 1) IrDA Serial Infrared Physical Layer Specification.
IrDA Serial Infrared MAC and Link Protocol.
IrDA Serial Infrared Link Access Protocol.
- 2) PCCA XANX-101-I Data Transmission Systems and Equipment - Serial Asynchronous Automatic Dialling and Control for Character Mode DCE on Wireless Data Services - Annex I: Command Extensions for Analog Cellular Data Modems.
- 3) TIA IS-101 Facsimile Digital Interfaces - Voice Control Interim Standard for Asynchronous DCE.
- 4) TIA-578-A Facsimile Digital Interfaces - Asynchronous Facsimile DCE Control Standard, Service Class 1.
- 5) TIA-592 Facsimile Digital Interfaces - Asynchronous Facsimile DCE Control Standard, Service Class 2.
- 6) TIA-617 Data Transmission Systems and Equipment - In-Band DCE Control.

Annex E (informative): Mobile originated alternating voice/data call example

Figure E.1 illustrates the possible transitions in MO BS 61 call. Responses and result codes generated by TA are in bold face. In this example, data part of the call is asynchronous non-transparent 9 600 bps service.

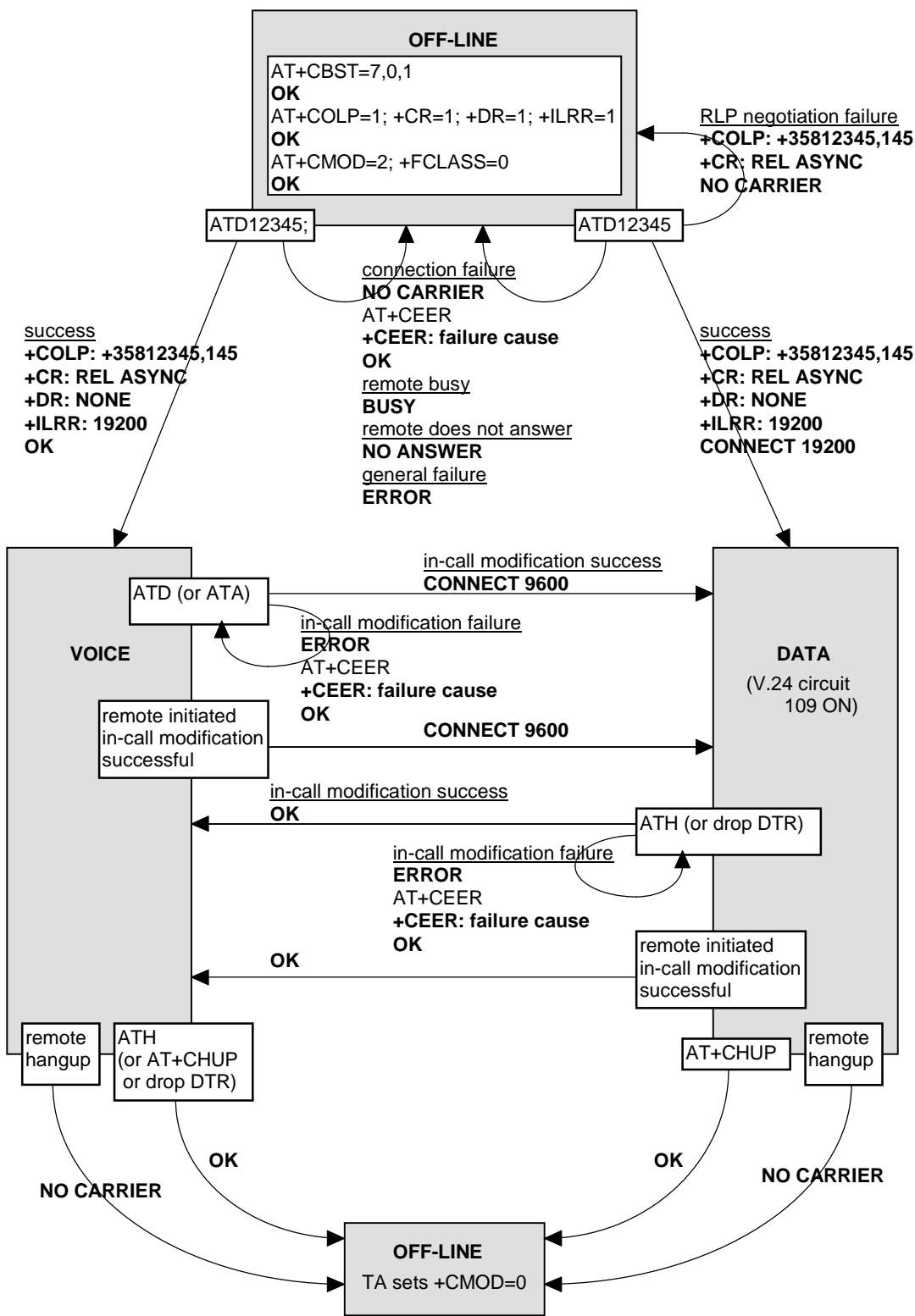


Figure E.1: MO BS 61 call

Annex F (informative): Mobile terminated voice followed by data call example

Figure F.1 illustrates the possible transitions in MT BS 81 call. Responses and result codes generated by TA are in bold face. In this example, data part of the call is asynchronous non-transparent 9 600 bps service.

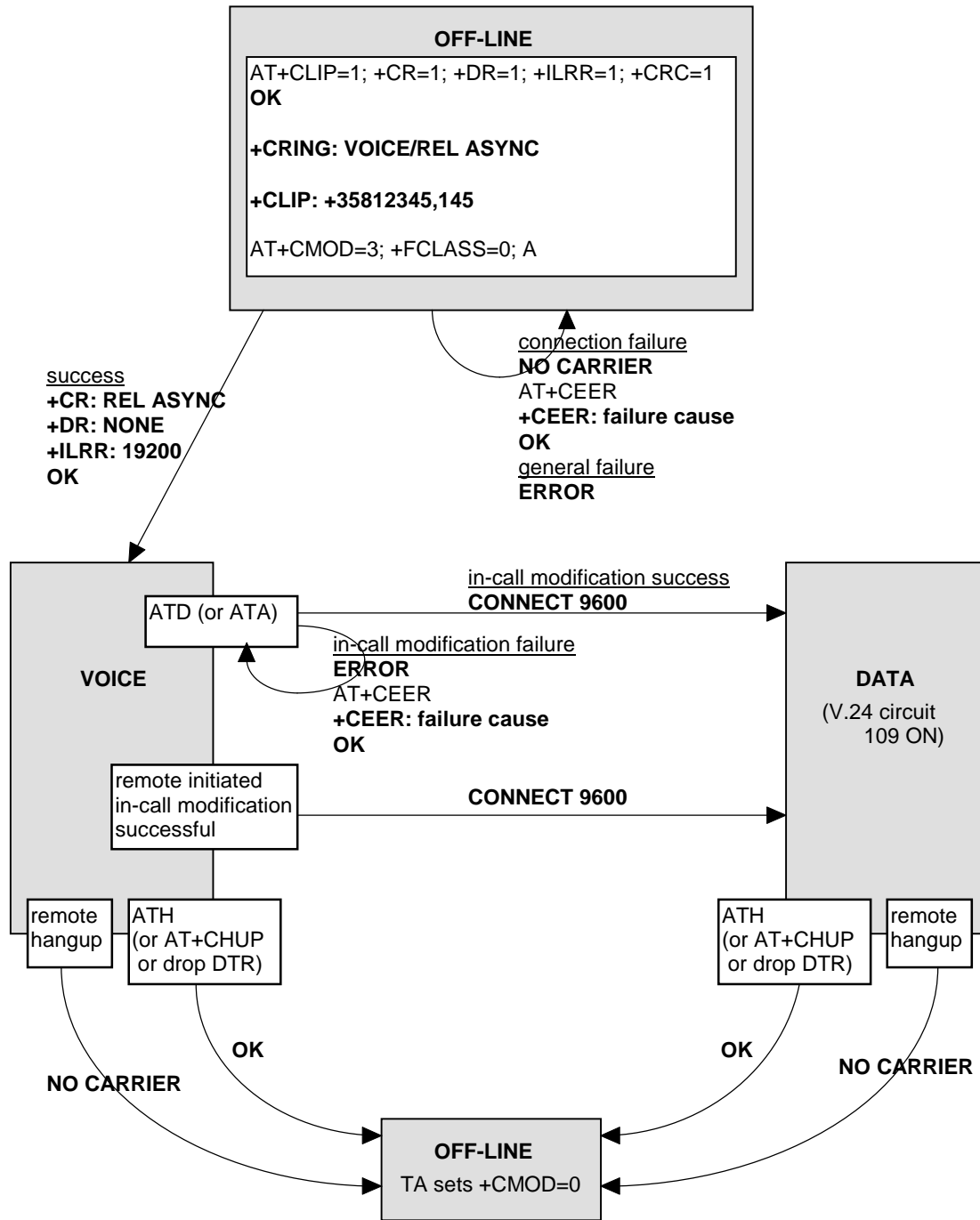


Figure F.1: MT BS 81 call

Annex G (informative): Voice call example

Figure G.1 illustrates the possible transitions in both MT and MO TS 11 calls. Responses and result codes generated by TA are in bold face.

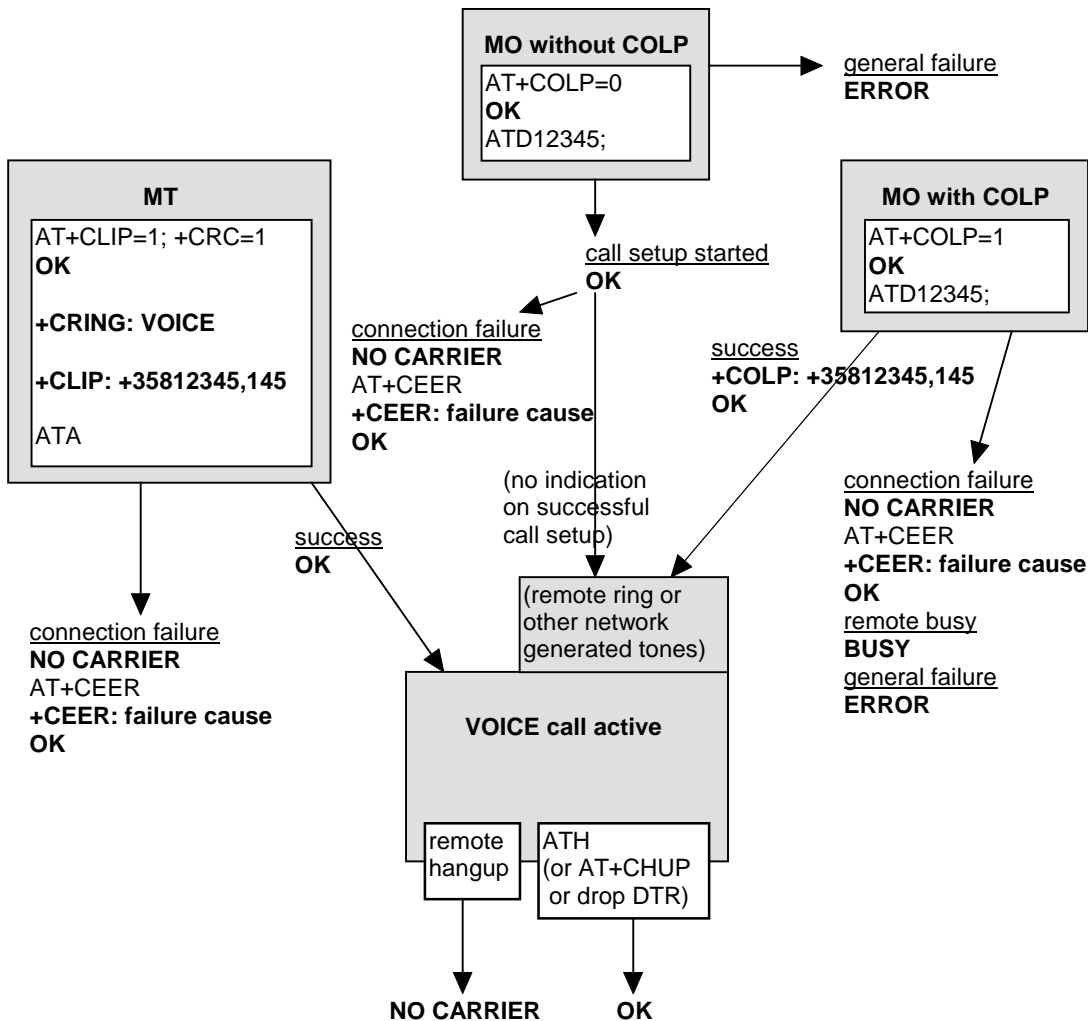


Figure G.1: TS 11 calls

History

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