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Rail Telecommunications; Commands necessary for mobile radio equipment operation on railways

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Railway Telecommunications (RT).

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

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1 Scope

The present document defines the minimum set of commands necessary for mobile radio systems operation on Railways. The following operational cases are addressed within the present document:

- GSM-R Circuit Switched Voice (including ASCI calls, Enhanced Railway Emergency Call, etc.).
- GSM-R Circuit Switched Data (CS) bearer service.
- GSM-R Packet Switched (PS) bearer service.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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The following referenced documents are necessary for the application of the present document.

[1] ETSI TS 127 007 (V4.7.0): "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; AT command set for User Equipment (UE) (3GPP TS 27.007 version 4.7.0 Release 4)".

[2] Recommendation ITU-T V.250 (07/2003): "Serial asynchronous automatic dialling and control".

[3] Void.

[4] ETSI TS 122 011 (V4.8.0): "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Service accessibility (3GPP TS 22.011 version 4.8.0 Release 4)".

[5] ETSI TS 127 010 (V4.2.0): "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); Terminal Equipment to Mobile Station (TE-MS) multiplexer protocol (3GPP TS 27.010 version 4.2.0 Release 4)".

[6] ETSI TS 127 005 (V4.2.1): " Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Use of Data Terminal Equipment - Data Circuit terminating Equipment (DTE-DCE) interface for Short Message Service (SMS) and Cell Broadcast Service (CBS) (3GPP TS 27.005 version 4.2.1 Release 4)".

[7] ETSI TS 122 030 (V4.1.0): " Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); Man-Machine Interface (MMI) of the User Equipment (UE) (3GPP TS 22.030 version 4.1.0 Release 4)".

[8] ETSI TS 127 007 (V13.4.0): " Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); LTE; AT command set for User Equipment (UE) (3GPP TS 27.007 version 13.4.0 Release 13)".

2.2 Informative references

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The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] ETSI TS 127 060 (V4.3.1): "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); Packet domain; Mobile Station (MS) supporting Packet Switched services (3GPP TS 27.060 version 4.3.1 Release 4)".

[i.2] EIRENE SRS: "System Requirements Specification", version 16.0.0".

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the following terms apply:

ETCS application(s): application(s) comprising the EuroRadio protocol suite

non-ETCS application(s): application(s) comprising any other protocol suites than EuroRadio

3.2 Symbols

Void.

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

APN	Access Point Name
ASCI	Advanced Speech Call Items
AT	ATtention
CS	Circuit Switch
CTS	Clear To Send
DCD	Data Carrier Detect
DCE	Data Circuit Equipment
DTE	Data Terminal Equipment
DTR	Data Terminal Ready
EDOR	ETCS Data Only Radio
EGPRS	Enhanced GPRS
ERTMS	European Rail Traffic Management System
ETCS	European Train Control System
ETSI	European Telecommunication Standardisation Institute
GMM	GPRS Mobility Management
GPRS	General Packet Radio Service
GSM	Global System Mobile
GSM-R	lobal System for Mobile - Railways
HLR	Home Location Register
IMEI	International Mobile Equipment Identifier
IP	Internet Protocol
ITU-T	International Telecommunication Union - Telecommunications Standardization Sector

ME	Mobile Equipment
MOC	Mobile Originated Call
MSISDN	Mobile Station International Subscriber Directory Number
MT	Mobile Termination
NCH	Notification CHannel
PDP	Packet Data Protocol
PLMN	Public Land Mobile Network
PPP	Point to Point Protocol
PS	Packet Switched
QoS	Quality of Service
RTS	Ready To Send
SGSN	Serving GPRS Support Node
SIM	Subscriber Identity Module
TA	Terminal Adaptor
TA/TE	Terminal Adapter / Terminal Equipment
TE	Terminal Equipment
UE	User Equipment
VBS	Voice Broadcast Service
VGCS	Voice Group Call Service

4 General requirements for AT commands

4.1 AT command syntax

4.1.1 Alphabet

Clause 5.1 of Recommendation ITU-T V.250 [2] shall apply.

4.1.2 Command Lines

Clause 5.2 of Recommendation ITU-T V.250 [2] shall apply.

4.1.3 Basic Syntax Commands

Clause 5.3 of Recommendation ITU-T V.250 [2] shall apply.

4.1.4 Extended Syntax Commands

Clause 5.4 of Recommendation ITU-T V.250 [2] shall apply.

4.1.5 Issuing Commands

Clause 5.5 of Recommendation ITU-T V.250 [2] shall apply.

4.1.6 Executing Commands

Clause 5.6 of Recommendation ITU-T V.250 [2] shall apply.

4.1.7 MT Responses

MT Responses shall be as defined in clause 5.7 of Recommendation ITU-T V.250 [2] with the exception of DIALTONE and NO ANSWER result codes which are not applicable.

4.2 TE-TA interface commands

4.2.1 Escape code character used to switch from Online Data state to Online Command state: S2

Description and Operation

S2 register defines the character used to build the escape sequence to exit from online data state and return to command state or online command state. The escape sequence is built by repeating three time the escape character defines by the S2 register (e.g. if the escape character is '+ ', the escape sequence will be "+++").

The escape character code shall be comprised between 0 and 127. Values from 128 to 255 are reserved to disable the escape sequence mechanism.

Define value:

S2=0..127	Define the escape character code
S2=128..255	Disable the escape sequence mechanism

The default value for operation on Railways shall be set to S2=128. (Escape sequence mechanism is disabled).

Implementation

Mandatory.

4.2.2 Command line termination character: S3

Description and Operation

Clause 6.2.1 of Recommendation ITU-T V.250 [2] shall apply.

The default value for operation on Railways shall be set to S3=13 (Carriage return).

Implementation

Mandatory.

4.2.3 Response formatting character: S4

Description and Operation

Clause 6.2.2 of Recommendation ITU-T V.250 [2] shall apply.

The default value for operation on Railways shall be set to S4=10 (Line feed).

Implementation

Mandatory.

4.2.4 Command echo: E

Description and Operation

Clause 6.2.4 of Recommendation ITU-T V.250 [2] shall apply.

The default value for operation on Railways shall be set to E1 (Echo enabled).

Implementation

Mandatory.

4.2.5 Result code suppression: Q

Description and Operation

Clause 6.2.5 of Recommendation ITU-T V.250 [2] shall apply.

The default value for operation on Railways shall be set to Q0 (TA transmit result codes).

Implementation

Mandatory.

4.2.6 TA response format: V

Description and Operation

Clause 6.2.6 of Recommendation ITU-T V.250 [2] shall apply.

The default value for operation on Railways shall be set to V1 (DCE transmits full headers and trailers and verbose response text).

Implementation

Mandatory.

4.2.7 Defines CONNECT result code format and dial tone and busy detection: X

Description and Operation

Clause 6.2.7 of Recommendation ITU-T V.250 [2] shall apply.

The default value for operation on Railways shall be set to X3 (CONNECT is shown with speed; recognition of dialling tone is disabled and busy detection is enabled).

Implementation

Mandatory.

4.2.8 Behaviour of circuit 109 DCD: &C

Description and Operation

Clause 6.2.8 of Recommendation ITU-T V.250 [2] shall apply.

The default value for operation on Railways shall be set to &C1 (Circuit 109 changes physical layer functions in accordance with the underlying DCE).

Implementation

Mandatory.

4.2.9 Behaviour of circuit 108/2 DTR: &D

Description and Operation

Clause 6.2.9 of Recommendation ITU-T V.250 [2] shall apply.

The default value for operation on Railways shall be set to &D2 (Upon an on-to-off transition of circuit 108/2, the DTE instructs the underlying DCE to perform an orderly clear down of the call).

Implementation

Mandatory.

4.2.10 Data rate command at which the DCE will accept commands: +IPR

Description and Operation

Clause 6.2.10 of Recommendation ITU-T V.250 [2] shall apply.

The default value for operation on Railways shall be set to +IPR=9 600.

NOTE: The Railway application may have to increase it to a value equal or higher to 19 200 in case of PS-mode operation.

4.2.11 DTE-DCE character framing: +ICF

Description and Operation

Clause 6.2.11 of Recommendation ITU-T V.250 [2] shall apply.

The default value for operation on Railways shall be set to +ICF=3 (Sets 8 data bit, no parity, 1 stop bit).

Implementation

Mandatory.

4.2.12 Select DTE-DCE flow control mechanism: +IFC

Description and Operation

Clause 6.2.12 of Recommendation ITU-T V.250 [2] shall apply.

The default value for operation on Railways shall be set to +IFC=2,2 (Hardware (based on RTS and CTS) flow control mechanism enabled).

NOTE: The default value for the operation on Railways is similar of the use of the former command &K3. However, +IFC command offers more configuration options.

Implementation

Mandatory.

4.3 Result Codes

Table 1 shows the most important result codes, in the call control procedures and during the ME status change: (Information).

Result Codes are described in table 1. More details can be found in clause 5.7 of Recommendation ITU-T V.250 [2] and in ETSI TS 127 007 [1] and annex B of ETSI TS 127 007 [1].

Table 1: Result Codes

Type of Result Code	Result Code [Response]	Defined Values	Applicable to CS-Mode/ PS-Mode	Description
final	OK	---	CS/PS	acknowledges the execution of a command
unsolicited	RING	---	CS	(if AT+CRC=0) the MT has detected an incoming call signal from the network

Type of Result Code	Result Code [Response]	Defined Values	Applicable to CS-Mode/ PS-Mode	Description
unsolicited	+CRING: ASYNC [,<priority>[,<subaddr>,<satype>]]	Values are defined in ETSI TS 127 007 [1], clause 6.11	CS	(if AT+CRC=1) the MT has detected an incoming call from the network → asynchronous transparent
unsolicited	+CCWA: <number>,<type>,<class> [,<alpha>[,<CLI validity>[,<subaddr>,<satype>[,<priority>]]]]	Values are defined in ETSI TS 127 007 [1], clause 7.12	CS	(if AT+CCWA=1) Call waiting information to the TE
intermediate	CONNECT <data rate>	<data rate>: 1 200 2 400 4 800 9 600	CS/PS	the connection has been established; the MT is moving from command state to online data state
final	NO CARRIER	---	CS/PS	The connection has been terminated The call setup failed before the alerting phase
final	NO ANSWER	---	CS	The called party did not answer the call: the connection completion has time-out
final	BUSY	---	CS	
unsolicited	+CLIP: <number>,<type> [,<subaddr>,<satype>]	Values are defined in ETSI TS 127 007 [1], clause 7.6	CS	(if AT+CLIP=1) calling line identification presentation
intermediate/ unsolicited	+COLP: <number>,<type> [,<subaddr>,<satype>]	Values are defined in ETSI TS 127 007 [1], clause 7.8	CS	(if AT+COLP=1) connected line identification presentation
final	ERROR +CME ERROR: <err>	---	CS/PS	The AT command was not accepted
unsolicited	+CREG: <stat>	Values are defined in ETSI TS 127 007 [1], clause 7.2	CS	(if AT+CREG=1) Change in the MT's network registration status
unsolicited	+CREG: <stat>[,<lac>,<ci>]	Values are defined in ETSI TS 127 007 [1], clause 7.2	CS	(if AT+CREG=2) Change in the MT's network registration status
unsolicited	+CGREG: <stat>	Values are defined in ETSI TS 127 007 [1], clause 10.1.19	PS	(if AT+CGREG=1) Change in the MT's GPRS network registration status. If the GPRS MT also supports circuit mode services, the +CREG command and +CREG: result codes apply to the registration status and location information for those services.
unsolicited	+CGREG: <stat>[,<lac>,<ci>]	Values are defined in ETSI TS 127 007 [1], clause 10.1.19	PS	(if AT+CGREG=2) Change in the MT's GPRS network registration status. If the GPRS MT also supports circuit mode services, the +CREG command and +CREG: result codes apply to the registration status and location information for those services.