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Terrestrial Trunked Radio (TETRA) Attachment requirements for TETRA terminal  
equipment; Part 1: Civil access

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# ETSI EN 301 435-1 V1.2.4 (2000-12)

*Candidate Harmonized European Standard (Telecommunications series)*

## **Terrestrial Trunked Radio (TETRA); Attachment requirements for TETRA terminal equipment; Part 1: Civil access**

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## Foreword

This Candidate Harmonized European Standard (Telecommunications series) has been produced by ETSI Project Terrestrial Trunked Radio (TETRA).

The present document has been produced by ETSI in response to a mandate from the European Commission issued under Council Directive 98/34/EC (as amended) laying down a procedure for the provision of information in the field of technical standards and regulations.

The present document, together with EN 301 435-2, is intended to become a Harmonized Standard, the reference of which will be published in the Official Journal of the European Communities referencing the Council Directive on the approximation of the laws of the Member States relating to telecommunications terminal equipment Directive 98/13/EC [41].

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<b>National transposition dates</b>	
Date of adoption of this EN:	24 November 2000
Date of latest announcement of this EN (doa):	28 February 2001
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 August 2001
Date of withdrawal of any conflicting National Standard (dow):	31 August 2001

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# 1 Scope

The present document specifies the technical characteristics to be provided by Terrestrial Trunked Radio (TETRA) terminal equipment, which uses the TETRA technology. It applies to terminal equipment operating within the frequency ranges, which are expected to be allocated to TETRA when member states have implemented ERC Decision ERC/DEC/(96)/4 [44].

The objective of the present document is to ensure that no disturbance occurs to the public telecommunications network, to ensure proper inter-working of TETRA terminals with TETRA networks, so that communication can be routed successfully through the applicable network(s), and to ensure interworking of TETRA terminal with TETRA terminal under control of a network management mechanism to avoid interference.

In addition to the present document, other Harmonized Standards may apply.

Requirements apply to the network interface and the Radio Frequency (RF) Air Interface of the equipment.

TETRA terminal equipment consists of several elements. The present document is structured to enable the approval of the individual elements as separate items. Because of the need for effective use of the radio spectrum, the essential air interface characteristics will always apply. For each essential requirement a test is given including measurement methods.

In the present document there are no Electromagnetic Compatibility (EMC) requirements in terms of the Terminal Directive 98/13/EC [41], article 5c.

NOTE: Technical requirements for EMC performance are covered by the relevant standards applicable to the EMC Directive 89/336/EEC [43] which also lays down the conformity assessment procedure.

The present document is based on the radio and protocol provisions of ETS 300 392, ETS 300 394 and ETS 300 396.

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# 2 References

[SIST EN 301 435-1 V1.2.4:2004](https://standards.iteh.ai/catalog/standards/sist/a3389807-c890-4790-8e93-30a01b332f51/sist-en-301-435-1-v1-2-4-2004)

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The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

- [1] ETSI EN 300 392-2: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 2: Air Interface (AI)".
- [2] ETSI EN 300 392-7: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 7: Security".
- [3] ETSI ETS 300 392-10: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 10: Supplementary services stage 1".
- [4] ETSI ETS 300 392-11: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 11: Supplementary services stage 2".
- [5] ETSI ETS 300 392-12: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 12: Supplementary services stage 3".
- [6] ETSI ETS 300 392-14: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 14: Protocol Implementation Conformance Statement (PICS) proforma specification".
- [7] ETSI TS 100 392-15: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 15: TETRA frequency bands, duplex spacings and channel numbering".

- [8] ETSI ETS 300 394-1: "Terrestrial Trunked Radio (TETRA); Conformance testing specification; Part 1: Radio".
- [9] ETSI ETS 300 394-2-1: "Terrestrial Trunked Radio (TETRA); Conformance testing specification; Part 2: Protocol testing specification for Voice plus Data (V+D); Sub-part 1: Test suite structure and test purposes".
- [10] ETSI ETS 300 394-2-2: "Terrestrial Trunked Radio (TETRA); Conformance testing specification; Part 2: Protocol testing specification for Voice plus Data (V+D); Sub-part 2: Abstract Test Suite (ATS) for Network (NWK) layer".
- [11] ETSI ETS 300 394-2-3: "Terrestrial Trunked Radio (TETRA); Conformance testing specification; Part 2: Protocol testing specification for Voice plus Data (V+D); Sub-part 3: Abstract Test Suite (ATS) for Logical Link Control (LLC)".
- [12] ETSI ETS 300 394-2-4: "Terrestrial Trunked Radio (TETRA); Conformance testing specification; Part 2: Protocol testing specification for Voice plus Data (V+D); Sub-part 4: Abstract Test Suite (ATS) for Medium Access Control (MAC)".
- [13] ETSI ETS 300 394-5-1: "Terrestrial Trunked Radio (TETRA); Conformance testing specification; Part 5: Security; Sub-part 1: Protocol Implementation Conformance Statement (PICS) proforma specification".
- [14] ETSI ETS 300 394-5-2: "Terrestrial Trunked Radio (TETRA); Conformance testing specification; Part 5: Security; Sub-part 2: Protocol testing specification for TETRA security".
- [15] ETSI ETS 300 394-5-3: "Terrestrial Trunked Radio (TETRA); Conformance testing specification; Part 5: Security; Sub-part 3: Abstract Test Suite (ATS)".
- [16] ETSI ETS 300 396-2: "Terrestrial Trunked Radio (TETRA); Technical requirements for Direct Mode Operation (DMO); Part 2: Radio aspects".
- [17] ETSI ETS 300 396-3: "Terrestrial Trunked Radio (TETRA); Technical requirements for Direct Mode Operation (DMO); Part 3: Mobile Station to Mobile Station (MS-MS) Air Interface (AI) protocol".
- [18] ETSI EN 300 396-4: "Terrestrial Trunked Radio (TETRA); Technical requirements for Direct Mode Operation (DMO); Part 4: Type 1 repeater air interface".
- [19] ETSI ETS 300 396-5: "Terrestrial Trunked Radio (TETRA); Technical requirements for Direct Mode Operation (DMO); Part 5: Gateway air interface".
- [20] ETSI ETS 300 396-6 (1996): "Terrestrial Trunked Radio (TETRA); Direct Mode Operation (DMO); Part 6: Security".
- [21] ETSI EN 300 396-7: "Terrestrial Trunked Radio (TETRA); Technical requirements for Direct Mode Operation (DMO); Part 7: Type 2 repeater air interface".
- [22] ETSI ETS 300 396-8-1: "Terrestrial Trunked Radio (TETRA); Technical requirements for Direct Mode Operation (DMO); Part 8: Protocol Implementation Conformance Statement (PICS) proforma specification; Sub-part 1: Mobile Station to Mobile Station (MS-MS) Air Interface (AI)".
- [23] ETSI EN 300 396-8-2: "Terrestrial Trunked Radio (TETRA); Technical requirements for Direct Mode Operation (DMO); Part 8: Protocol Implementation Conformance Statement (PICS) proforma specification; Sub-part 2: Type 1 repeater Air Interface (AI)".
- [24] ETSI ETS 300 396-8-3: "Terrestrial Trunked Radio (TETRA); Technical requirements for Direct Mode Operation (DMO); Part 8: Protocol Implementation Conformance Statement (PICS) proforma specification; Sub-part 3: Gateway Air Interface (AI)".
- [25] ETSI ETS 300 396-8-4: "Terrestrial Trunked Radio (TETRA); Technical requirements for Direct Mode Operation (DMO); Part 8: Protocol Implementation Conformance Statement (PICS) proforma specification; Sub-part 4: Type 2 Repeater Air Interface (AI)".

- [26] ETSI TS 100 396-10: "Terrestrial Trunked Radio (TETRA) Technical requirements for Direct Mode Operation (DMO) Part 10: Managed Direct Mode Operation (DMO)".
- [27] ETSI ETS 300 394-4-1: "Terrestrial Trunked Radio (TETRA); Conformance testing specification; Part 4: Protocol testing specification for Direct Mode Operation (DMO); Sub-part 1: Test suite structure and test purposes (TSS&TP) for Mobile Station to Mobile Station (MS-MS) Air Interface (AI)".
- [28] ETSI ETS 300 394-4-2: "Terrestrial Trunked Radio (TETRA); Conformance testing specification; Part 4: Protocol testing specification for Direct Mode Operation (DMO); Sub-part 2: Abstract Test Suite (ATS) for Mobile Station to Mobile Station (MS-MS) Air Interface (AI)".
- [29] ETSI EN 300 394-4-3: "Terrestrial Trunked Radio (TETRA); Conformance testing specification; Part 4: Protocol testing specification for Direct Mode Operation (DMO); Sub-part 3: Test suite structure and test purposes (TSS&TP) for Mobile Station (MS) Repeater type 1".
- [30] ETSI EN 300 394-4-4: "Terrestrial Trunked Radio (TETRA); Conformance testing specification; Part 4: Protocol testing specification for Direct Mode Operation (DMO); Sub-part 4: Test suite structure and test purposes (TSS&TP) for Direct Mode Repeater (DM-REP) type 1".
- [31] ETSI EN 300 394-4-5: "Terrestrial Trunked Radio (TETRA); Conformance testing specification; Part 4: Protocol testing specification for Direct Mode Operation (DMO); Sub-part 5: Abstract Test Suite (ATS) for Mobile Station (MS) Repeater type 1".
- [32] ETSI EN 300 394-4-6: "Terrestrial Trunked Radio (TETRA); Conformance testing specification; Part 4: Protocol testing specification for Direct Mode Operation (DMO); Sub-part 6: Abstract Test Suite (ATS) for Direct Mode Repeater (DM-REP) type 1".
- [33] ETSI ETS 300 394-4-7: "Terrestrial Trunked Radio (TETRA); Conformance testing specification; Part 4: Protocol testing specification for Direct Mode Operation (DMO); Sub-part 7: Test suite structure and test purposes (TSS&TP) for Mobile Station to Gateway (MS-GW) Air Interface (AI)".
- [34] ETSI ETS 300 394-4-8: "Terrestrial Trunked Radio (TETRA); Conformance testing specification; Part 4: Protocol testing specification for Direct Mode Operation (DMO); Sub-part 8: Test suite structure and test purposes (TSS&TP) for Direct Mode Gateway (DM-GATE)".
- [35] ETSI ETS 300 394-4-9: "Terrestrial Trunked Radio (TETRA); Conformance testing specification; Part 4: Protocol testing specification for Direct Mode Operation (DMO); Sub-part 9: Abstract Test Suite (ATS) for Mobile Station (MS) Gateway".
- [36] ETSI ETS 300 394-4-10: "Terrestrial Trunked Radio (TETRA); Conformance testing specification; Part 4: Protocol testing specification for Direct Mode Operation (DMO); Sub-part 10: Abstract Test Suite (ATS) for Direct Mode Gateway (DM-GATE)".
- [37] ETSI EN 300 394-4-11: "Terrestrial Trunked Radio (TETRA); Conformance testing specification; Part 4: Protocol testing specification for Direct Mode Operation (DMO); Sub-part 11: Test Suite Structure and Test Purposes (TSS&TP) for Mobile Station Repeater type 2".
- [38] ETSI EN 300 394-4-12: "Terrestrial Trunked Radio (TETRA); Conformance testing specification; Part 4: Protocol testing specification for Direct Mode Operation (DMO); Sub-part 12: Test Suite Structure and Test Purposes (TSS&TP) for Repeater type 2".
- [39] ETSI EN 300 394-4-13: "Terrestrial Trunked Radio (TETRA); Conformance testing specification; Part 4: Protocol testing specification for Direct Mode Operation (DMO); Sub-part 13: Abstract Test Suite (ATS) for Mobile station Repeater type 2".
- [40] ETSI EN 300 394-4-14: "Terrestrial Trunked Radio (TETRA); Conformance testing specification; Part 4: Protocol testing specification for Direct Mode Operation (DMO); Sub-part 14: Abstract Test Suite (ATS) for Repeater type 2".
- [41] Directive 98/13/EC of the European Parliament and of the Council of 12 February 1998 relating to telecommunications terminal equipment and satellite earth station equipment, including the mutual recognition of their conformity.

- [42] ISO/IEC 9646-3 (1991): "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 3: The tree and tabular combined notation". (See also CCITT Recommendation X.292 (1992)).
- [43] Council Directive 89/336/EEC of 3 May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility.
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## 3 Definitions, symbols and abbreviations

### 3.1 Definitions

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

**acknowledged data transfer:** service provided by the layer below which gives an acknowledgement back over the air interface from the lower layer peer entity. This service is used by the layer 3 entities to get a secure transmission including re-transmissions.

**announced cell re-selection:** cell re-selection where MS-MLE informs the SwMI both in the old cell (leaving cell) and in the new cell (arriving cell) that cell change is performed.

**Associated Control CHannel (ACCH):** dedicated signalling channel associated with a channel that has been assigned for circuit mode traffic. It comprises the Fast Associated Control Channel (FACCH) which uses frames 1 to 18 when there is no traffic in a given direction or the Slow Associated Control Channel (SACCH) which is always available in frame 18 when there is traffic.

**attached:** a MS is said to be attached to a cell when the MS is camped and registered on the cell. The MS may be in idle mode (i.e. not actively processing a transaction) or in active mode (i.e. actively processing a transaction in reception and/or in transmission). It is the MM which decides when a MS is said to be attached.

**basic link:** bi-directional connectionless path between one or several MS and a BS, with a provision of both unacknowledged and acknowledged services on a single message basis.

**Bit Error Ratio (BER):** limit ratio of the bits wrongly received to all bits received in a given logical channel.

**broadcast:** unidirectional point to multi-point mode of transmission.

**cell re-selection:** act of changing the serving cell from an old cell to a new cell. The cell re-selection is performed by procedures located in the MLE and in the MAC. When the re-selection is made and possible registration is performed, the MS is said to be attached to the cell.

**changeover:** within a call, the process of effecting a transfer of the master role (and hence transmitting MS) at the end of one call transaction so that another can commence.

**Common Cipher Key (CCK):** cipher key that is generated by the infrastructure to protect group addressed signalling and traffic.

**common control channels:** control channels transmitted by the infrastructure to control the MS population. They comprise the Main Control Channel (MCCH) and common Secondary Control Channels (SCCH).

**Direct Mode (DM):** mode of simplex operation where mobile subscriber radio units may communicate using radio frequencies which may be monitored by, but which are outside the control of, the TETRA V+D network. DM is performed without intervention of any base station.

**Direct Mode Call Control (DMCC):** layer 3 entity responsible for setting up and maintaining a call in DMO.

**Direct Mode channel:** specific grouping of timeslots in the DM multiplex structure related to a particular DM RF carrier i.e. DM frequency (or to a pair of duplex-spaced RF carriers for operation with a type 1B or type 2 DM-REP). The grouping may not always be fixed, but in DMO when operating in frequency efficient mode as an example, there are two DM channels, identified by the letters A and B.



**Direct Mode GATEway (DM-GATE):** device which provides gateway connectivity between a DM-MS and the TETRA V+D network. The gateway provides the interface between TETRA DMO and TETRA V+D mode.

**Direct Mode Mobility Management (DMMM):** layer 3 entity responsible for registration to a gateway in DMO.

**Direct Mode Mobile Station (DM-MS):** physical grouping that contains all of the mobile equipment that is used to obtain TETRA DM services.

**Direct Mode REPeater (DM-REP):** device that operates in TETRA DMO and provides a repeater function to enable two or more DM-MSs to extend their coverage range. It may be either a DM-REP type 1, supporting a single call on the air interface, or a DM-REP type 2, supporting two calls on the air interface. A DM-REP type 1 may operate on either a single RF carrier (DM-REP type 1A) or a pair of duplex-spaced RF carriers (DM-REP type 1B). A DM-REP type 2 operates on a pair of duplex-spaced RF carriers.

**direct set-up signalling:** signalling procedure where immediate communication can take place between the calling and the called users without the alerting process and without an explicit response from the called user that he has answered.

**DM-REP presence signal:** message transmitted by a DM-REP in order to indicate its presence on an RF carrier.

**DM-REP type 1:** DM repeater that supports a single call on the air interface. There are two varieties of type 1 DM-REP:

- **DM-REP type 1A:** which operates on a single RF carrier;
- **DM-REP type 1B:** which operates on a pair of duplex-spaced RF carriers, one used as the "uplink" from DM-MSs to the DM-REP and the other used as the "downlink" from the DM-REP to DM-MSs.

**DM-REP type 2:** DM repeater that is capable of supporting two simultaneous type 2 calls on the air interface. A type 2 DM-REP operates on a pair of duplex-spaced RF carriers, one used as the "uplink" from DM-MSs to the DM-REP and the other used as the "downlink" from the DM-REP to DM-MSs. The protocol for type 2 calls through a type 2 DM-REP is based on the protocol for frequency efficient mode in ETS 300 396-3 [17]. (A DM-REP type 2 may also optionally offer type 1B calls using the protocol defined in EN 300 396-4 [18]).

**duplex frequency spacing:** fixed frequency spacing between up and downlink frequencies directions.

**Group Cipher Key (GCK):** long lifetime cipher key known by the infrastructure and MS to protect group addressed signalling and traffic.

**Group TETRA Subscriber Identity (GTSD):** identity used to set up and receive group calls. A TETRA user may have multiple GTSDs associated to its ITSI. Multiple user may have the same GTSD as a valid reception address.

**Individual TETRA Subscriber Identity (ITSD):** identity used to specify an individual TETRA user. An ITSD cannot be shared by multiple users.

**initial cell selection:** act of choosing a first serving cell to register in. The initial cell selection is performed by procedures located in the MLE and in the MAC. When the cell selection is made and possible registration is performed, the MS is said to be attached to the cell.

**logical channel:** generic term for any distinct data path. Logical channels are considered to operate between logical endpoints.

**Main Control Channel (MCCH):** principal common control channel transmitted by the infrastructure to control the MSs in a cell. The frequency of the main carrier for the cell is broadcast by the infrastructure, and the MCCH is located on timeslot 1 of the main carrier.

**Managed DMO (M-DMO):** direct interworking between two DMO Mobile Stations under control of a network by a management mechanism to avoid interference

**master:** direct Mode equipment that is either active in a call transaction transmitting traffic or control data, or is reserving the channel by means of channel reservation signalling and hence is providing synchronization information to the channel.

**Message Erasure Rate (MER):** limit ratio of the messages detected as wrong by the receiver to all messages received in a given logical channel.