

**Terrestrial Trunked Radio (TETRA);
Voice plus Data (V+D);
Designers' guide;
Part 5: Guidance on numbering and addressing**

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Reference

RTR/TETRA-03197

Keywords

addressing, TETRA

ETSI

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Foreword

This Technical Report (TR) has been produced by ETSI Technical Committee Terrestrial Trunked Radio (TETRA).

The present document is part 5 of a multi-part deliverable covering TETRA Voice plus Data designer's guide, as identified below:

- ETR 300-1: "Overview, technical description and radio aspects";
- ETR 300-2: "Radio channels, network protocols and service performance";
- TR 102 300-3: "Direct Mode Operation (DMO)";
- ETR 300-4: "Network management";
- TR 102 300-5: "Guidance on numbering and addressing"**;
- TR 102 300-6: "Air Ground Air";

The present document, respect to the previous version, reflects an increased understanding about the role of TETRA numbering E.218 [i.16], and the perception of its relationship with other numbering resources, such as E.212 [i.5], Public Land Mobile Network codes, and E.164 [i.4], telephone Numbers. The versatility of TETRA numbering to support implementations that are both public and private has created the need to extend the scope of the present document by including, in explicit recognition of the versatility, additional concepts such as Private Numbering Plans. The versatility of TETRA numbering brought with it a number of concerns regarding the impact of its implementation in a public arena. The changes in the present document are meant to directly address those concerns by advising implementors how they can best avoid the issues.

1 Scope

The present document gives guidance on TETRA numbering.

The TETRA technology is a method of mobile communication that meets the needs of a broad range of applications. In order to support these roles it offers an increased range of methods of numbering by comparison with the widely used GSM technology. Whilst GSM is optimized to carry out a limited range of functions both cheaply and efficiently, TETRA offers an alternative for those operations for which the requirements are more complex.

The present document offers a summary of:

- The most widely used methods of numbering and addressing which are available in TETRA E.218 [i.16].
- The relationship to the numbering systems of the other major mobile and fixed technologies (E.164 [i.4] and E.212 [i.5]).
- The manner in which the numbers should be used in private and public applications.
- How the numbers are dialled in various applications of the technology.

Two stage signalling, as described in ETS 300 392-4-1 [i.2], annex A and DTMF signalling for any purpose as described in EN 300 392-2 [i.9], clause 14.5.1.2.5, is outside the scope of the present document.

The User Interfaces that may exist to support the user entering the numbers that may exist are outside the scope of the present document.

2 References

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2.1 Normative references

The following referenced documents are indispensable for the application of the present document. For dated references, only the edition cited applies. For non-specific references, the latest edition of the referenced document (including any amendments) applies.

Not applicable.

2.2 Informative references

The following referenced documents are not essential to the use of the present document but they assist the user with regard to a particular subject area. For non-specific references, the latest version of the referenced document (including any amendments) applies.

- [i.1] ETSI EN 300 392-1: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 1: General network design".
- [i.2] ETSI ETS 300 392-4-1: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 4: Gateways basic operation; Sub-part 1: Public Switched Telephone Network (PSTN)".
- [i.3] ETSI ETS 300 392-4-2: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 4: Gateways basic operation; Sub-part 2: Integrated Services Digital Network (ISDN) gateway".
- [i.4] ITU-T Recommendation E.164 (1997): "The International Public Telecommunication Numbering Plan".
- [i.5] ITU-T Recommendation E.212: "The International Identification Plan for Mobile Terminals and Mobile Users".
- [i.6] ITU-T Recommendation E.331: "Minimum user-terminal interface for a human user entering address information into an ISDN terminal".
- [i.7] ETSI ETS 300 392-10-7: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 10: Supplementary services stage 1; Sub-part 7: Short number addressing".
- [i.8] ETSI ETS 300 392-12-7: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 12: Supplementary services stage 3; Sub-part 7: Short Number Addressing (SNA)".
- [i.9] ETSI EN 300 392-2: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 2: Air Interface (AI)".
- [i.10] TTR001-7: "TETRA Memorandum of Understanding (TETRA MoU); TETRA Interoperability Profile (TIP) version 4, Part 7: Fleet Specific Short Number (FSSN)".
- [i.11] Council Decision 91/396/EEC on the introduction of a single European emergency call number.
- [i.12] ETSI EN 300 392-5: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 5: Peripheral Equipment Interface (PEI)".
- [i.13] ETSI EN 300 812-2: "Terrestrial Trunked Radio (TETRA); Security aspects; Subscriber Identity Module to Mobile Equipment (SIM-ME) interface".
- [i.14] TETRA Memorandum of Understanding (TETRA MoU) TTR001-17: "Radio User Authentication (RUA)".
- [i.15] ETSI EN 300 392-7: "Terrestrial Trunked Radio (TETRA); Voice plus Data (V+D); Part 7: Security".
- [i.16] ITU-T Recommendation E.218: "Management of the allocation of terrestrial trunk radio Mobile Country Codes".

3 Definitions and abbreviations

3.1 Definitions

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

alignment: refers to the means by which the MNC of the ITSI is related to the MNC of the IMSI by both having the same numerical representation

dialling: action of selecting the number to be used in a communication

dialling algorithm: process that generates the numbering elements required by the signalling protocol based on user input to the mobile terminal

fleet: set of subscribers organized into a closed user group who can communicate using a *private numbering plan* operated within an *FSSN domain*

Fleet Specific Short Number (FSSN): private number of up to 6 decimal digits allocated to a subscriber to enable short number dialling to other members of the same FSSN domain

NOTE: An FSSN enables intra and inter-fleet dialling within each FSSN domain. The same FSSN number space can be re-used in every FSSN domain.

FSSN domain: organization of fleets using a private numbering plan to enable the members to communicate within their FSSN domain using FSSN dialling

NOTE: Multiple FSSN domains can exist within a single network, each domain using the same FSSN number space. Calls between FSSN domains are not possible using FSSN dialling.

group: set of individual subscribers for which a GTSI is defined

NOTE: The group is assigned a unique *GSSI*, which maps to the set of ISSIs. The GSSI is used to address the entire group during signalling. Individual subscribers can be members of more than one group and groups can be dynamically created, edited or deleted.

Group Short Subscriber Identity (GSSI): short form TETRA group identity

Group TETRA Subscriber Identity (GTSD): long form TETRA group identity

NOTE: The long form of group identity consists of the (T)MCC + (T)MNC + GSSI.

home network: network where a subscriber has a direct subscription

NOTE: This means that a subscriber identity has been allocated in advance of any network access.

International Mobile Subscriber Identity (IMSI): string of decimal digits that identifies a unique mobile terminal or mobile subscriber internationally

NOTE 1: The number of digits is up to a maximum of 15.

NOTE 2: The IMSI consists of three fields: the MCC, the MNC and the MSIN, refer to E.212 [i.5].

NOTE 3: TETRA uses another number resource than IMSI, refer to E.218 [i.16].

Individual Short Subscriber Identity (ISSI): short form TETRA individual identity

Individual TETRA Subscriber Identity (ITSI): long form TETRA individual identity

NOTE: The long form of individual identity consists of the (T) MCC + (T) MNC + ISSI, refer to EN 300 392-1 [i.1] and E.218 [i.16].

Mobile Subscriber Integrated Services Digital Network (MS-ISDN): E.164 number assigned to a mobile subscriber

number: number is a string of decimal digits

NOTE: Numbers are used to derive a route to a termination point in the network.

private number: number in a *private numbering plan* used for dialling to another member of a closed user group

private numbering plan: dialling scheme using private numbers for communication between members of a closed user group

NOTE: The private numbering plan enables total decoupling between a subscriber's private number and ITSI and between a subscriber's private number and E.218 [i.16] number.

Public Telecommunications Operator (PTO): network operator who offers service to the public in accordance with the rules of a national administration, and achieves annex II status, as defined in the relevant European Directive

registration: act of becoming an active and recognized TETRA user by exchange of ITSI with the SwMI (Switching and Management Infrastructure)

Radio User Number (RUN): private number used in a private numbering plan implemented using the external subscriber number field

Short Subscriber Identity (SSI): the network specific portion of a TSI

NOTE 1: An SSI is only unique within one TETRA sub-domain (one TETRA network).

NOTE 2: There are six different types of SSI (see clause 7.2.3 in EN 300 392-1 [i.1]):

- a) Individual SSI (ISSI);
- b) Group SSI (GSSI);
- c) Alias SSI (ASSI);
- d) Un-exchanged SSI (USSI);
- e) Visitor Alias SSI ((V)ASSI);
- f) Visitor Group SSI ((V)GSSI).

TETRA Mobile Network Identifier (MNI): 24 bit encoded number created by the concatenation of the (T)MCC and (T)MNC

translation: means by which the MNC of the ITSI is related to the MNC of the IMSI by both having different numerical representations

transposed FSSN: the SSI obtained by adding the base SSI to the FSSN

NOTE: The default value for the base FSSN is 15 000 000.

two stage dialling: ability to connect to a terminal using a gateway or PABX by first dialling the gateway or PABX and then dialling a subsequent number

NOTE: This applies to incoming calls.

3.2 Abbreviations

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

(T)MCC	(TETRA) Mobile Country Code
(T)MNC	(TETRA) Mobile Network Code
(V)ASSI	Visitor Alias Short Subscriber Identity
(V)GSSI	Visitor Group Short Subscriber Identity
ASSI	Alias Short Subscriber Identity
A-subscriber	MS initiating a call
B-subscriber	MS receiving a call
CCI	Communications Control Interface (dispatcher interface)
CLI	Calling Line Identity
CPI	Calling Party Identification
DDI	Direct Dialed In
DMO	Direct Mode Operation
ECTRA	European Committee of Telecom Regulatory Authorities
ENF	European Numbering Forum
ESN	External Subscriber Number
ETO	European Telecommunications Office
FSSN	Fleet Specific Short Number
GSM	Special Mobile Group
GSSI	Group Short Subscriber Identity

GTSI	Group TETRA Subscriber Identity
ID	Identity
IMSI	International Mobile Subscriber Identifier
ISDN	Integrated Services Digital Network
ISI	Inter System Interface
ISSI	Individual Short Subscriber Identity
ITSI	Individual TETRA Subscriber Identity
ITU	International Telecommunications Union
MCC	Mobile Country Code
MNC	Mobile Network Code
MNI	Mobile Network Identifier
MoU	Memorandum of Understanding
MS	Mobile Station
MSIN	Mobile Subscriber Identity Number
MS-ISDN	Mobile Subscriber ISDN
NTNA	National TETRA Numbering Administrator
PABX	Private Automatic Branch Exchange
PDU	Protocol Data Unit
PNP	Private Numbering Plan
PSTN	Public Switched Telephone Network
PTN	Private Telephony Network
PTO	Public Telecommunications Operator
RUA	Radio User Assignment
RUN	Radio User Number
SIM	Subscriber Identity Module
SNA	Short Number address
SSI	Short Subscriber Identity
SwMI	Switching and Management Infrastructure
TETRA	Terrestrial Trunk Radio Access
TIP	TETRA Inter-operability Profile
TPI	Talking Party Identification
TSI	TETRA Subscriber Identity
USSI	Un-exchanged Short Subscriber Identity

4 Background

4.1 ETO workshop

The issue of relating TETRA numbering resources to E.212 [i.5] numbering resources was discussed at two workshops in Copenhagen. Out of the first workshop came the recognition that the two resources were distinct, and that they could be seen as distinct as long as the technologies did not interact in any way. However, since some operators want to use dual mode handsets, so that they can support migration on a GSM technology that uses E.212 [i.5] numbering, issues have been raised about how the numbering regimes for the different technologies should be related to each other. As a consequence a second workshop was held (Second ETO workshop on TETRA Copenhagen, 12 January, 2000) where guidance was sought from the regulators via the European Numbering Forum.

The relevant specific actions that the workshop initiated were:

- The workshop requested ENF to monitor the progress of the activity and provide a point for the co-ordination of the technical and regulatory activities on this subject. In particular ENF can decide to establish a Topic Group on TETRA to tackle the numbering issues surrounding TETRA as they arise.
- The workshop requested ECTRA to take the appropriate steps to ensure the establishment of harmonized rules and procedures for the assignment of ITSIs. The workshop identified ECTRA/PT N as the appropriate ECTRA group to deal with this subject. The ETO report on "Harmonized national conventions for naming and addressing" was a valid starting point for the ECTRA/PT N work.
- NRAs were asked to develop national conventions for the administration and management of ITSIs used in public networks.

NOTE: ECTRA PT-N is now known as PT-3.

4.2 Conflict between identities

The following subjects were also discussed in detail at the second ETO workshop in Copenhagen.

If a numerical value assigned to a TETRA identity is also allocated to a different E.212 [i.5] identity there is a potential for conflict.

This potential for conflict is based on a relationship that was not envisaged in the development of the relevant standards. A number of assumptions have been made regarding the manner in which TETRA will interwork with GSM and these assumptions are stated below.

The description of the potential conflict assumes that:

- an allocation of a (T)MCC may be for a country, or group of countries, whilst the same digits in E.212 [i.5] are allocated to a different geographic country;
- the TETRA operator has stored the (T)MCC either in the handset, or in a standard or modified SIM card;
- the modified SIM card is based on those used for GSM; and
- either the handset or the SIM card is used in a country other than the one in which the number was assigned, i.e. it has migrated (called roamed in GSM).

4.3 Implications

The relationship between the E.212 [i.5] IMSI and the TETRA ITSI E.218 [i.16] raises a number of issues, not least because unlike the IMSI, the ITSI, in some circumstances, can be dialled. The co-existence of the two different schemes raises a number of issues for which guidance is given in the present document. The present document provides the guidance for implementers of TETRA networks in which numbering plans have to exist. Co-existence of TETRA Numbering resources (ITSIs) with similar resources of other networks is a driver for the inclusion of preferred alternatives to ITSI dialling.

5 Numbers used

5.1 Structure and format of the ITSI

5.1.1 Structure and format

The structure of ITSI is shown in figure 1, refer to EN 300 392-1 [i.1] and E.218 [i.16].

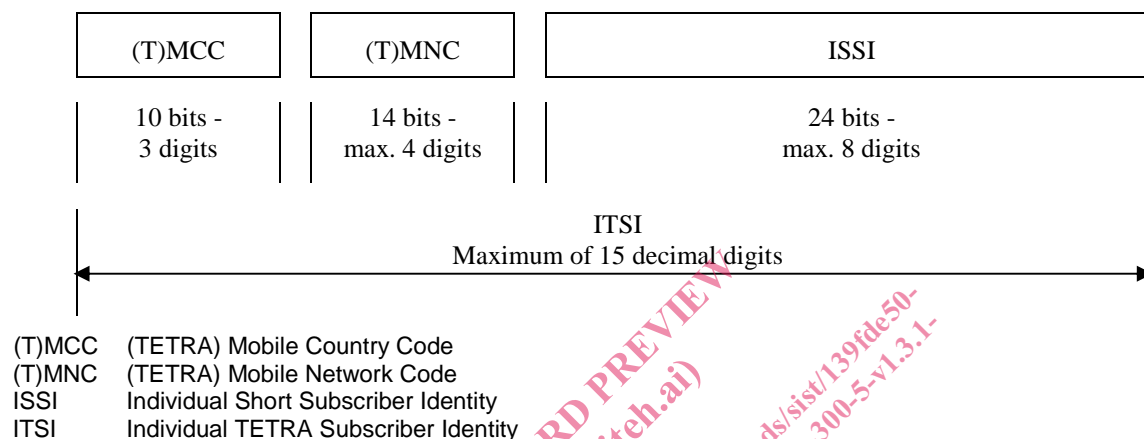


Figure 1: Structure and Format of ITSI

The Individual TETRA Subscriber Identity (ITSI) is the globally unique identity assigned to a TETRA subscriber to enable the subscriber to roam among private and public TETRA networks. The ITSI is used as the calling and called party address within the TETRA signalling. It also enables a visited TETRA network to query a TETRA subscriber's home network for subscription and billing information.

5.1.2 TETRA Mobile Country Code

The TETRA Mobile Country Code, (T)MCC, is administered on an international basis in order to ensure that there is no risk that different countries adopt the same country code. ETSI Project TETRA requested that the group of organizations and administrations who had signed the TETRA Memorandum of Understanding (MoU) should administer the (T)MCCs. The TETRA MoU decided to align the (T)MCCs with the E.212 [i.5] Mobile Country Codes in order to reduce the potential for confusion. In 2002, the TETRA MoU requested that the ITU should manage the (T)MCCs to ensure that there will be no conflict of allocation. In 2004, the ITU-T published recommendation E.218 [i.16] that defines internationally the allocation of E.218 [i.16] (T)MCCs for TETRA.

5.1.3 Multi-Vendor Networks

TETRA has seven open interfaces including one between SwMIs. The link between the SwMIs is called the ISI. Using the ISI it will be possible to build a TETRA network of SwMIs is from equipment from more than one manufacturer. TETRA does not specify any intra system interface [i.1]. The advantage is that suppliers of infrastructure are able to develop infrastructures that are optimized for different applications within the market.

The administration of the TETRA Mobile Network Codes is within the decision of the National TETRA Regulatory Authority for TETRA. The administrators will need to be aware that there are conditions under which the provision of more than one TETRA Mobile Network Code to an operator may become necessary. It is possible to construct TETRA networks from equipment from more than one supplier in which the SSI range is divided such that the equipment from one supplier uses one range and that from the other supplier uses the other range. In this manner the ISI may link the networks together and they will appear to both a home terminal and a migrating terminal as a single network.

NOTE: TETRA standards use the term migrating to refer to the same functionality as roaming in the GSM environment.