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ETSI

European Telecommunications Standards Institute

ETSI Secretariat

Postal address: F-06921 Sophia Antipolis CEDEX - FRANCE
Office address: 650 Route des Lucioles - Sophia Antipolis - Valbonne - FRANCE
X.400: c=fr, a=atlas, p=etsi, s=secretariat - **Internet:** secretariat@etsi.fr

Tel.: +33 4 92 94 42 00 - Fax: +33 4 93 65 47 16

Contents

1 Scope 7

2 Normative references 7

3 Definitions and abbreviations 7
3.1 Introduction 7
3.2 Index 8
3.3 Vocabulary 9
3.3.1 Administrative terms 9
3.3.2 Identity related terms 10
3.3.3 Services, facilities and receiver features 10
3.3.4 Network related terms 11
3.3.5 Access related terms 13
3.3.6 Area concepts 13
3.3.7 Terms related to the radio subsystem 13
3.3.8 Miscellaneous 14
3.4 Abbreviations and acronyms 14

4 Structure of the ETS 17
4.1 Part 1: General aspects 17
4.2 Part 2: Service aspects 17
4.3 Part 3: Network aspects 17
4.4 Part 4: Air interface specification 17
4.5 Part 5: Receiver conformance specification 17
4.6 Part 6: Base station conformance specification 17
4.7 Part 7: Operation and maintenance aspects 17

5 General description of the system 17
5.1 Introduction 17
5.2 General objectives 17
5.2.1 Service related objectives 17
5.2.2 Performance related objectives 18
5.3 Services 18
5.4 System architecture, entities and functions 18
5.4.1 The receiver 19
5.4.2 The base station 19
5.4.3 The paging area controller 19
5.4.4 The paging network controller 19
5.4.5 The operation and maintenance centre 20
5.4.6 System architecture, interworking and interfaces 20
5.5 The radio subsystem 21

Annex A (informative): ERMES references list 22

History 25

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Foreword

This final draft second edition European Telecommunication Standard (ETS) has been produced by the Radio Equipment and Systems (RES) Technical Committee of the European Telecommunications Standards Institute (ETSI), and is now submitted for the Voting phase of the ETSI standards approval procedure.

This ETS comprises seven parts with the generic title "Radio Equipment and Systems (RES); Enhanced Radio MEssage System (ERMES)". The title of each part is listed below:

Part 1: "General aspects";

Part 2: "Service aspects";

Part 3: "Network aspects";

Part 4: "Air interface specification";

Part 5: "Receiver conformance specification";

Part 6: "Base station specification";

Part 7: "Operation and maintenance aspects".

This part, ETS 300 133-1, gives a general description of the Enhanced Radio MEssage System (ERMES). This part also includes a vocabulary of terms and a list of abbreviations and acronyms.

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IPRs:

EP Patent No. 0090851:	Decoder for Transmitted Message Activation Codes;
EP App. No. 89909668,9:	Multiple Frequency Message System;
EP App. No. 89913131,2:	Power Conservation Method and Apparatus for a Portion of Information Signal;
EP App. No. 92901376,1:	Multiple Format Signalling Protocol for a Selective Call Receiver;
EP App. No. 90915018,7:	Nationwide Paging with Local Modes of Operation;
EP App. No. 91904526,0:	Multiple Frequency Scanning.

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1 Scope

This European Telecommunication Standard (ETS), describes the general aspects of the Enhanced Radio MEssage System (ERMES). It comprises an abstract of each part of the ETS along with a general description of:

- the objectives of the system;
- the services and facilities;
- a description of the elements and their functions.

A complete vocabulary for all parts of ETS 300 133 is given, together with a list of abbreviations and acronyms.

Normative references which are quoted in each part of ETS 300 133 are gathered together and listed in annex A (informative) of this part.

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] prETS 300 133-2 (1997): "Radio Equipment and Systems (RES); Enhanced Radio MEssage System (ERMES); Part 2: Service aspects".

[2] prETS 300 133-3 (1997): "Radio Equipment and Systems (RES); Enhanced Radio MEssage System (ERMES); Part 3: Network aspects".

[3] prETS 300 133-4 (1997): "Radio Equipment and Systems (RES); Enhanced Radio MEssage System (ERMES); Part 4: Air interface specification".

[4] prETS 300 133-5 (1997): "Radio Equipment and Systems (RES); Enhanced Radio MEssage System (ERMES); Part 5: Receiver conformance specification".

[5] prETS 300 133-6 (1997): "Radio Equipment and Systems (RES); Enhanced Radio MEssage System (ERMES); Part 6: Base station conformance specification".

[6] prETS 300 133-7 (1997): "Radio Equipment and Systems (RES); Enhanced Radio MEssage System (ERMES); Part 7: Operation and maintenance aspects".

3 Definitions and abbreviations

3.1 Introduction

The terms, definitions and abbreviations used throughout the ERMES ETS are given in this clause. A definition or a reference to a definition given in this clause is valid in all parts of the ETS even if no definition is given within a particular part.

An explanation of all the abbreviations and acronyms used in this ETS is given in alphabetical order in subclause 3.4.

The definitions are presented in eight groups. Within each group the definitions are given in a conceptual order rather than alphabetical order. Each defined term is allocated a number. To assist the reader in finding the definition of a term, an index of terms together with their associated numbers is given in subclause 3.2.

3.2 Index

505 Access method
503 Access mode
501 Access network
506 Access service
504 Access terminal
502 Access type
309 Additional receiver feature
210 Address code
702 Alert signal
703 Alert signal indicator
214 Authentication code
604 Base station area
307 Basic receiver feature
202 Basic RIC
427 Basic kernel
301 Basic service
709 Batch
710 Batch number
711 Batch type
409 Call acceptance
102 Calling party
707 Codeblock
706 Code-word
205 Country code
311 Divert AdC
712 End of Message (EOM) character
402 ERMES system
435 External interface
705 External receiver
104 Fixed subscriber
430 Fixed subscriber records database
424 Fragmentation
416 Frequency divided network
605 Geographical area
211 Group address code
431 Group database
314 Group call
405 Home network
106 Home operator
412 Home PNC (PNC-H)
418 I1 Interface
419 I2 Interface
420 I3 Interface
421 I4 Interface
422 I5 Interface
423 I6 Interface
209 Initial address
411 Input PNC (PNC-I)
434 Internal interface
213 Legitimization code
208 Local address
713 Long message
802 Message bank
801 Message delivery time
305 Message number
103 Mobile subscriber
428 Mobile subscriber AdC records database
429 Mobile subscriber RIC message database
601 Network area
105 Network operator
407 Network status

425	Network time slot
507	One-stage selection
206	Operator code
203	Operator identity
401	Operator network
603	Paging area
207	Paging area code
415	Paging area controller
303	Paging call
304	Paging message
410	Paging network controller
701	Paging signal
413	PNC-H (FS)
426	Protocol stack
201	Radio identity code
306	Receiver feature
607	Roaming area
606	Service area
312	Service identification code
212	Service number
310	Standard text
714	Sub-message
313	Subscriber feature
107	Subscriber registration
308	Supplementary receiver feature
302	Supplementary service
704	Symbol
602	System area
403	Telecommunication network
404	Telecommunications management network
408	Three state status
417	Time divided network
109	Toll ticketing
108	Traffic registration
414	Transmitting PNC (PNC-T)
508	Two-stage selection
101	User
406	Visited network
204	Zone code

3.3 Vocabulary

3.3.1 Administrative terms

101 **user:** A person or machine initiating an access to the operator network or receiving a message through the operator network. User includes mobile subscribers, fixed subscribers and non-registered customers.

102 **calling party:** A user entering paging tasks into the network.

103 **mobile subscriber:** A user who is registered in an operator network and receives paging messages or uses his subscriber features.

104 **fixed subscriber:** A calling party who is registered in a paging network and has an account for sending messages and use of subscriber features.

105 **network operator:** The administration/company which is responsible for the technical and commercial operation of the operator network.

106 **home operator:** The network operator to which a specific user has subscribed.

107 **subscriber registration:** The registration of a subscriber as a user of a particular operator network, together with information on subscribed services, supplementary services and other associated information needed for traffic handling.

108 **traffic registration:** A register of data concerning calls; needed for charging purposes and statistics.

109 **toll ticketing:** A register of all data concerning a call (calling party, date and time, call duration, mobile subscriber identity, supplementary services).

3.3.2 Identity related terms

201 **Radio Identity Code (RIC):** The number used by the system on the radio path to identify the receiver(s) for which the page is intended. RIC has a total length of 35 bits and consists of four parts: the zone code (3 bits) the country code (7 bits), the operator code (3 bits) and the local address (22 bits).

202 **basic RIC:** The prime identity of a paging receiver allocated by the network operator when service is initiated. It can not be changed without safeguards against unauthorized changes.

203 **operator identity:** The number used by the system on the radio path to identify the home operator of a receiver. It has a total length of 13 bits and consists of three parts, the zone code, the country code and the operator code.

204 **zone code:** Binary representation of the zone number defined in ETS 300 133-4 [3], annex A. The zone code consists of 3 bits.

205 **country code:** Binary representation of the country number defined in ETS 300 133-4 [3], annex A. The country code consists of 7 bits.

206 **operator code:** The number used by the system to identify an operator within a country. It consists of 3 bits.

207 **paging area code:** The number used by the system to identify the paging area.

208 **local address:** The number used by a network to identify the receivers subscribed to it. It consists of 22 bits. The four least significant bits of the local address denote the batch type of the receiver.

209 **initial address:** The 18 most significant bits of the local address.

210 **Address Code (AdC):** Identifies the RIC and the alert signal indicator.

211 **group address code:** The address code with which a group is called.

212 **service number:** The number used to gain access to a Paging Network Controller (PNC) in the two-stage selection procedure.

213 **legitimization code:** A code stated by a calling party to prove that he is authorized to carry out a particular restricted operation (an operation which is not allowed to all calling parties).

214 **authentication code:** A code used by a mobile or a fixed subscriber to allow the PNC to prove that the identity stated by this subscriber is true.

3.3.3 Services, facilities and receiver features

301 **basic service:** A basic service is one of the four paging categories; tone-only paging, numeric paging, alphanumeric or transparent data paging.

302 **supplementary service:** A supplementary service modifies or supplements a basic service. The offered supplementary services may be used by the subscribers/users at their discretion.

303 **paging call:** The complete process of delivering a paging message from the initiation by the calling party to the reception by the mobile subscriber.

304 **paging message:** The tone-only, numeric, alphanumeric or transparent data information sent to a paging receiver.

305 **message number:** The number allocated sequentially in the series 1 to 31 to each paging message.

306 **receiver feature:** A piece of equipment or a function which directly relates to the operation of the receiver. On this basis three categories of features can be distinguished: basic, supplementary and additional features.

307 **basic receiver feature:** A feature directly related to the operation of a basic service.

308 **supplementary receiver feature:** A feature directly related to the operation of a supplementary service.

309 **additional receiver feature:** A feature which is neither a basic nor a supplementary feature.

310 **standard text:** A predefined text message associated with an identification number. The texts are defined by the network operator or may be defined by fixed subscribers.

311 **divert AdC:** The AdC to which a mobile subscriber has diverted his paging messages.

312 **service identification code:** A two digit code used for the identification of a supplementary service or a subscriber feature.

313 **subscriber feature:** Service or supplementary service available to a subscriber according to his subscription. The feature may be activated on a registration basis or on demand. In this last case, it is activated by the subscriber, after authentication.

314 **group call:** A call intended for two or more mobile subscribers.

3.3.4 Network related terms

401 **operator network:** All infrastructure which is the responsibility of the network operator.

402 **ERMES system:** The totality of the operator networks.

403 **telecommunication network:** The telecommunication part of the operator network.

404 **telecommunications management network:** The operation and maintenance part of the operator network.

405 **home network:** The operator network with which a mobile subscriber has signed a subscription.

406 **visited network:** The operator network to which the paging messages are routed when they are sent outside the home network.

407 **network status:** An estimated value of the probability that the ERMES system will proceed successfully with the paging call. It is estimated on a per call basis and depends on the availability of all the elements of the system dealing with this call attempt and on message delivery time.

408 **three state status:** The criteria for the call acceptance. If the network status is above a threshold C the call is accepted. If it is below a threshold UC the call is rejected. Between these two thresholds the calling party receives information that the transmission cannot be guaranteed with the full quality of service and a confirmation of the call attempt is demanded from the calling party.

409 **call acceptance:** The response to the calling party provided by the PNC-H. This response indicates whether the call can be accepted.

410 **Paging Network Controller (PNC):** The central call processing unit associated with each operator's telecommunication network. It administers subscriber registrations and performs paging tasks.

411 **Input PNC (PNC-I):** PNC that is accessed by a calling party.

412 **Home PNC (PNC-H):** The PNC holding the subscriber registration database for a particular mobile subscriber and to which all calls for this mobile subscriber are referred for processing.

413 **PNC-H (FS):** The PNC holding the subscriber registration database for a particular fixed subscriber and to which all calls of this fixed subscriber are referred for processing.

414 **Transmitting PNC (PNC-T):** The PNC responsible for routing a particular paging message to the appropriate paging areas which are under its control.

415 **Paging Area Controller (PAC):** The functional entity controlling the base stations within one paging area.

416 **frequency divided network:** A network that uses different frequency channels in adjacent paging areas.

417 **time divided network:** A network that uses the same frequency channel during different sub-sequences (periods of a time cycle) in adjacent paging areas.

418 **I1 interface:** The radio interface between the base stations and the paging receivers.

419 **I2 interface:** An interface between the Paging Area Controller and the Base Station.

420 **I3 interface:** The interface between the PNC and the PAC.

421 **I4 interface:** The interface between two PNCs.

422 **I5 interface:** An interface between the access network selected by the user and the operator network.

423 **I6 interface:** An interface between the telecommunications terminal and the user.

424 **fragmentation:** A service offered at Open System Interconnection (OSI) layer 4 which allows the splitting of an application packet into several smaller packets.

425 **network time slot:** A particular configuration of an operator's network during a time slot which consists of only one Paging Area (PA) comprising every Base Station (BS) of the network.

426 **protocol stack:** A set of protocols defined to build up the I4 interface.

427 **basic kernel:** The minimum of functionalities required for each I4 protocol layer.

428 **mobile subscriber AdC records database:** The database giving the required information on mobile subscribers for the processing of paging calls.

429 **mobile subscriber RIC message database:** The database dealing with message numbering and storing.

430 **fixed subscriber records database:** The database giving details of the features available to a particular fixed subscriber.

431 **group database:** The database giving information on the members of a mobile subscriber group.

432 **Closed User Group (CUG) database:** The database giving information on the members of a CUG.

433 **roaming test message:** A paging message sent automatically by the PNC-H to the roaming area when the roaming is activated.

434 **internal interface:** An interface that is completely contained within an operator network.

435 **external interface:** An interface that is not completely contained within an operator network.

3.3.5 Access related terms

501 **access network:** The telecommunications network to which the access terminal is connected.

502 **access type:** Corresponds to the one-stage or two-stage selection.

503 **access mode:** The communication procedure between the calling party and the PNC. It may be interactive or non interactive.

504 **access terminal:** The terminal with which the user accesses the telecommunication network. It may be, for example, a telephone set, a telex, a videotex terminal, a PC with modem.

505 **access method:** A combination of access terminal, access network, access mode and access type.

506 **access service:** A set of access methods provided to a user to access a service and/or a supplementary service.

507 **one-stage selection:** Access type with two phases, input AdC and input message.

508 **two-stage selection:** Access type with three phases, input service number, input AdC and input message.

3.3.6 Area concepts

601 **network area:** The area served by a single operator network.

602 **system area:** The total of all network areas.

603 **paging area:** The area controlled by a PAC. It is the minimum area to which a mobile subscriber is permitted to subscribe in order to receive his paging messages.

604 **base station area:** The radio coverage area of a single base station.

605 **geographical area:** One or several paging areas in an operator network. Defined by agreements between network operators for inter network roaming or by a single operator for roaming within his own network. It is used for roaming and choice of destination supplementary services.

606 **service area:** The paging area(s) to which the mobile subscriber has subscribed and in which a paging message will normally be transmitted.

607 **roaming area:** The geographical area(s) where the mobile subscriber asks for his messages to be transmitted when he uses the roaming service.

3.3.7 Terms related to the radio subsystem

701 **paging signal:** The signal sent on the radio path to a paging receiver.

702 **alert signal:** The signal generated by the receiver as an indication of a received paging signal.

703 **alert signal indicator:** The information bits contained in the I1 message header that determines which alert signal should be generated at the receiver. It is related to the address code input by the calling party.

704 **symbol:** Two bits of information which are the basic unit of information on the air interface. It corresponds to one of the four modulation levels.

705 **external receiver:** A receiver operating in a network which is not its home network.

706 **code-word:** The ETS information unit of 30 bits length (used on the air interface).

707 **codeblock:** The unit of nine interleaved code-words used in the message partition of the air interface.

708 **Base Station (BS):** Comprises one or more transmitters together with the associated control and timing equipment.

709 **batch:** See ETS 300 133-4 [3], subclause 4.1.

710 **batch number:** The 4-bit number corresponding to a particular batch type. Batch type A corresponds to batch number 0000. Batch type P corresponds to batch number 1111.

711 **batch type:** The letter (A to P) which identifies one of the 16 batches within a subsequence.

712 **End Of Message (EOM) character:** A specific character used to indicate the end of an alphanumeric message. It corresponds to DC1 as defined in clause B.2 of ETS 300 133-2 [1], annex B.

713 **long message:** A message that has been split into two or more parts (sub-messages) for transmission.

714 **sub-message:** Part of a long message. All sub-messages of any one long message carry the same message number.

3.3.8 Miscellaneous

801 **message delivery time:** The time corresponding to the maximum value allowed between the valid input acknowledgement and the transmission of the message on the radio path. The maximum delay time depends on the level of priority.

802 **message bank:** The store of ETS text messages held in a PNC.

3.4 Abbreviations and acronyms

For the purposes of this ETS, the following abbreviations and acronyms apply:

AC	Authentication Code
ACK/NACK	Positive/Negative Acknowledgement
ACSE	Association Control Service Element
AdC	Address Code
ADF	Address Field
AH	Application Header
AIF	Additional Information Field
AII	Additional Information Indicator
AIN	Additional Information Number
AIT	Additional Information Type
ALERT	Alert signal indicator for different types of alert
APT	Address Partition Terminator
ASN.1	Abstract Syntax Notation one
ASR	Alarm State Request
BAI	Border Area Indicator
BAL	Batch Length
BC	Batch Counter
BS	Base Station
BS-OS	The part of the BS dealing with the O&M process
BSA	BS Address

BVR	Basic Version Receiver
CCITT	Comité Consultatif International Télégraphe et Téléphone
CHAN	Channel number
CSPDN	Circuit Switched Public Data Network
CTA	Common Temporary Address
CTAP	Common Temporary Address Pointer
CUG	Closed User Group
DAdC	Divert AdC
DCE	Data Circuit Equipment
DCF	Data Communication Function
DCN	Data Communication Network
DD	Deferred Delivery
DL	Distribution List
DNIC	Data Network Identification Code
DTE	Data Terminal Equipment
DTMF	Dual Tone Multi-Frequency
EB	External Bit
ECC	Error Correction Code
ECN	ERMES Code Number
ENL	Number of LSBs to be compared when operating outside home network
EOM	End of Message
ERMES	Enhanced Radio MEssage System
ETI	External Traffic Indicator
FRN	Fragmentation Reference Number
FS	Fixed Subscriber
FSI	Frequency Subset Indicator
FSN	Frequency Subset Number
GA	Geographical Area
GAdC	Group AdC
GSM	Groupe Spécial Mobile
HDLC	High level Data Link Control
HNL	Number of LSBs to be compared when operating within home network
I2	Interface PAC-BS
I4	Interface PNC-PNC
IA	Initial Address
IAB	Initial Address Buffer
IACP	Initial Address Confirmation Pointer
IASP	Initial Address Service Pointer
IDD	International Direct Dialling
IMI	Integral Message Indicator
IOMC	Interface OMC-NMC or OMC-OMC
IPM	Interpersonal Messaging
ISDN	Integrated Services Digital Network
ISO	International Standard Organisation
LAPB	Link Access Protocol Balanced
LCN	Local Communication Network
LID	List Identification (text list identification)
LSB	Least Significant Bit
MD	Mediation Device
ME	Maintenance Entity
MEF	Message Field
MEL	Message Length
MF	Mediation Function
MHS	Message Handling System
MMI	Man Machine Interface
MS	Mobile Subscriber
MSB	Most Significant Bit
NE	Network Elements
NEF	Network Element Function
NIA	Number of Initial Address
NM	Network Management
NOP	Number of Packet
O&M	Operation and Maintenance

OMC	Operation and Maintenance Centre
OPID	Operator Identity (of the home operator)
ORI	Operation or Result Identification
OS	Operation System
OSF	Operation System Function
OSI	Open System Interconnection
PA	Paging Area
PAA	PAC Address
PAC	Paging Area Controller
PAC-OS	The part of the PAC dealing with the O&M process
PC	Personal Computer
PDU	Protocol Data Unit
PN	Packet Number
PNC	Paging Network Controller
PNC-H	Home Paging Network Controller
PNC-H (DIV)	Divert AdC's Home PNC
PNC-H (FS)	Fixed Subscriber's Home PNC
PNC-I	Input Paging Network Controller
PNC-T	Transmitting Paging Network Controller
PR	Preamble
PSPDN	Packet Switched Public Data Network
PSTN	Public Switched Telephone Network
QOS	Quality of Service
RA	Roaming Area
RF	Radio Frequency
RIC	Radio Identity Code
ROSE	Remote Operation Service Element
RSVD	Reserved bits for future definition
RTD	Reference Time Device
RTSE	Reliable Transfer Service Element
SA	Service Area
SDL	Specification and Description Language
SDU	Service Data Unit
SEF	Support Entity Function
SF	Subscriber Feature
SI	Subscriber Identification
SIC	Service Identification Code
SM	Subsequence Mask
SN	Service Number
SRA	Status Request Acknowledge
SS	Supplementary Service
SSI	Supplementary System Information
SSIF	Supplementary System Information Field
SSIT	Supplementary System Information Type
SSN	Subsequence Number
SYD	System Data
SYN	Synchronization
TD	Transparent Data
TEM	Transverse Electro Magnetic
TMN	Telecommunications Management Network
TN	Telecommunication Network
TNO	Text Number (number of selected text)
TPL	Transaction Packet Length
TRN	Transaction Reference Number
TX	Transmitter
UA	User Agent
UMI	Urgent Message Indicator
UTC	Universal Time Co-ordinated
UUI	User to User Information
VIF	Variable Information Field

4 Structure of the ETS

This ERMES ETS consists of the following seven parts:

4.1 Part 1: General aspects

A general description of the system and a vocabulary of terms are given in this part.

4.2 Part 2: Service aspects

Part 2 specifies the services and facilities of the ERMES system, defines quality of service aspects and describes the receiver features.

4.3 Part 3: Network aspects

Part 3 describes the architecture of the system, the numbering, addressing and identification of the subscribers and the call processing. It specifies the methods that can be used to access the system, the internal interfaces between the various parts of the system as well as the interface between the PNCs. Finally the specifications of the PNC and the PAC are given.

4.4 Part 4: Air interface specification

All aspects of the radio subsystem are specified in Part 4 including the transmission protocol and its operation, modulation characteristics, channel coding, quasi-synchronous operation and receiver battery saving techniques.

4.5 Part 5: Receiver conformance specification

Part 5 specifies the performance requirements of the receivers together with the measurement methods for conformance testing.

4.6 Part 6: Base station conformance specification

The general structure and the functions of the BS are specified in Part 6 together with the technical characteristics of the transmitters.

4.7 Part 7: Operation and maintenance aspects

Part 7 specifies the network management and the operation and maintenance function of the system.

5 General description of the system

5.1 Introduction

This clause gives a general description of the ERMES system. It contains a definition and a summarized description of each functional element comprising the system, its function and associated performance objectives. The services and facilities that the system can offer to its users are also listed, as well as the general aspects of the radio subsystem and the operation and maintenance aspects of the system.

5.2 General objectives

5.2.1 Service related objectives

The service related objectives of the system are:

- to give the users all the basic services that the existing paging systems offer, as well as the transparent data service;

- to support a wide range of supplementary services and facilities which may be offered by the various operators according to their policy;

- to support individual calls, group calls and radio distribution services;

- to enable the mobile subscribers to use their receivers for international roaming.

5.2.2 Performance related objectives

The performance related objectives of the system are:

- to permit a high level of spectrum efficiency at a reasonable cost and be sufficiently flexible to allow each country to allocate spectrum for the service, according to its needs;

- to optimize the size and the power consumption of the receiver;

- to provide for the greatest possible compatibility with Integrated Services Digital Network (ISDN) and future standardized message handling services.

5.3 Services

Four basic services are supported by the ERMES system:

- tone only;

- numeric;

- alphanumeric;

- transparent data.

A wide range of supplementary services are also supported and can be summarized as follows:

- acknowledgements;

- services related to the destination of the call;

- services related to protection against loss of messages;

- three levels of priority;

- community of interest services;

- charging services;

- services related to the restriction of calls;

- bureau services etc.

Various methods to achieve a satisfactory level of security are also provided.

A wide range of receiver features is specified in this ETS. Some of them are optional and some essential. The essential features for each paging category define the basic version receiver which shall be fully compatible with all the operator networks.

The services, the facilities and the receiver features are described in ETS 300 133-2 [1].

5.4 System architecture, entities and functions

For the system to support the services and facilities described in the previous subclause, a series of functions are required. The description of the network functions, procedures, and the interworking between the different operator networks can be found in ETS 300 133-3 [2]. Functions are grouped into functional entities. A complete network is formed by a number of functional entities which are described in the following subclauses. The interconnection between these entities is described in subclause 5.4.6.

5.4.1 The receiver

The receiver is the physical equipment which enables a Mobile Subscriber (MS) to receive paging messages.

There are various types of receivers, according to the different paging services they are designed to provide:

- tone-only receivers which can receive tone-only messages;

- numeric receivers which can receive numeric messages in addition to tone-only messages;

- alphanumeric receivers which can receive alphanumeric messages in addition to tone-only and numeric messages;

- transparent data receivers which can receive transparent data messages. These receivers may also receive tone-only, numeric and alphanumeric messages.

All receivers shall conform with the radio interface described in ETS 300 133-4 [3]. The receiver conformance specification is given in ETS 300 133-5 [4].

5.4.2 The base station

The Base Station (BS) is the physical equipment which gives radio coverage to a specific geographical area called the base station area. The BS contains the equipment needed to receive paging messages and other necessary information from the paging area controller, to encode the messages and transmit them to the receivers through the air interface. The BS is also connected to the operation and maintenance centre via the Mediation Device (MD).

The conformance specification for the BS equipment is given in ETS 300 133-6 [5].

5.4.3 The paging area controller

The Paging Area Controller (PAC) is an intermediate entity between the Paging Network Controller (PNC) and the BS. It is connected to and controls several BSs, the BS areas of which together constitute a paging area.

The PAC function is split into two parts:

- the first part, the PAC, deals with the traffic control process. It receives paging messages from the PNC, organizes the message queuing, puts them into batches and manages the priority of the messages. Finally it delivers the messages to the base stations under its control;

- the second part, the PAC-OS, deals with the operation and maintenance functions assigned to the PAC. It also acts as a MD for the BSs controlled by the PAC. The PAC specification is given in ETS 300 133-3 [2], clause 14.

5.4.4 The paging network controller

The PNC is the central call processing unit associated with each operator's network. The PNC is linked with all other ERMES operator networks through the I4 interface. The PNC is connected also with the access networks through the I5 and I6 interfaces from which it receives paging messages and delivers them to the PACs it controls.

The PNC is also connected through the PNC-OS with the operations and maintenance centre. The PNC can perform one or more of the three following roles:

- PNC-I (input) when it is accessed by a calling party;

- PNC-H (home) when holding the subscriber registration database for a particular subscriber and accepting for processing all calls referred to this subscriber;

- PNC-T (transmit) when routing a particular paging message to the appropriate paging areas which are under its control.

The PNC specification is given in ETS 300 133-3 [2], clause 13.

5.4.5 The operation and maintenance centre

The Operation and Maintenance Centre (OMC) is the functional entity through which the network operator can monitor and control the system. It is described in ETS 300 133-7 [6].

5.4.6 System architecture, interworking and interfaces

The operator network obtained with the functional entities described above is shown in figure 1. This network comprises two major components, the telecommunication network and the operation and maintenance network. The interconnection between the functional entities is also shown in figure 1. The internal interfaces (I3 and I2) that interconnect the functional entities are described in ETS 300 133-3 [2], clauses 11 and 12.

Figure 2 shows the functional organization of the telecommunication network architecture. In this figure all telecommunication network interfaces (internal and external) are shown. The external interfaces needed to access the network and to interconnect it with other operator networks to satisfy the roaming requirements are specified in ETS 300 133-3 [2], clauses 8, 9 and 10. The I1 interface is specified in ETS 300 133-4 [3].

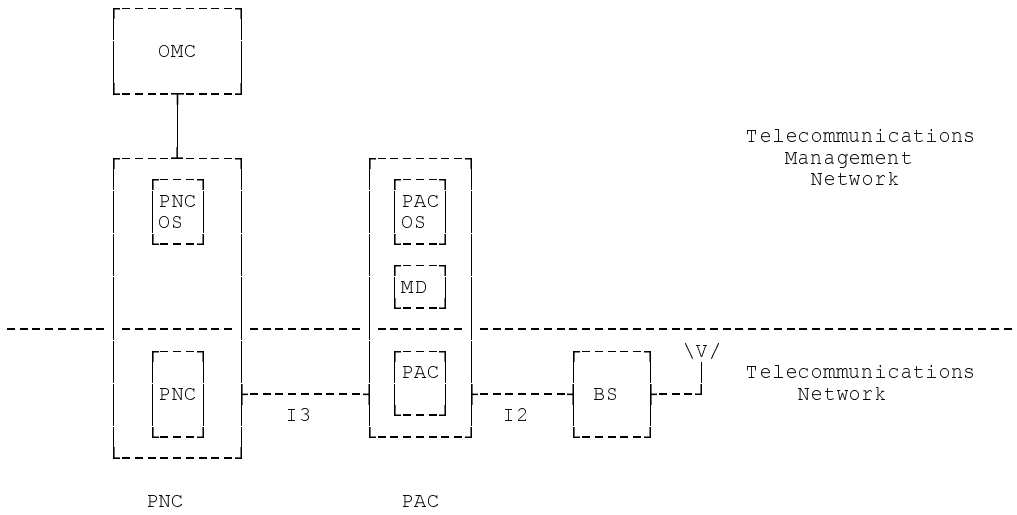

Figure 1: The operator network

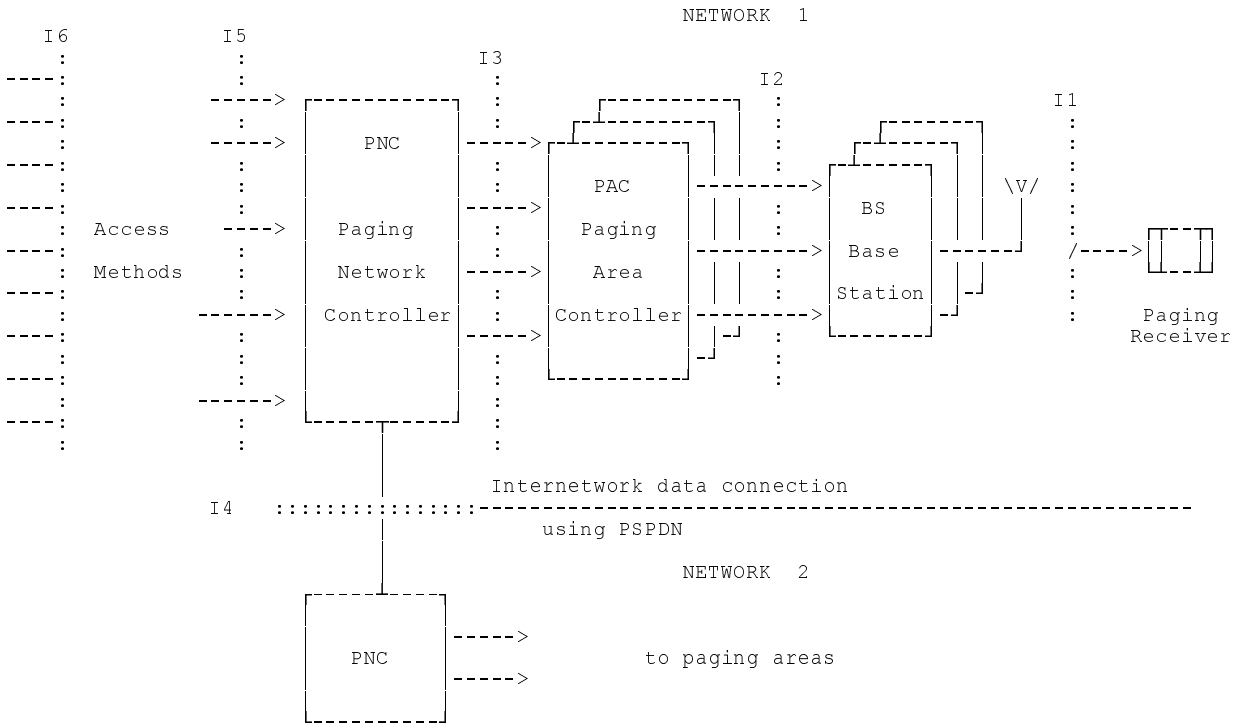

Figure 2: Functional organization of the telecommunication network architecture

5.5 The radio subsystem

The operator network transmits the paging messages to the receivers through the radio subsystem. The messages are queued in the PAC. The BS adds the synchronization and system identification information and arranges the paging data in a predefined format that can be recognized by the receivers. The address and message parts of the data are forward error correction coded with a shortened cyclic (30,18) code. The message part of the data is further error protected by code-word interleaving to a depth of 9 code-words. 4-PAM/FM modulation format is used on the radio air interface.

The radio subsystem can support frequency divided, time divided or time and frequency divided modes of operation. These implementations operate on 1 to 16 common channels in the frequency band 169,412 5 to 169,812 5 MHz, with channel spacing of 25 kHz. The centre frequency of the first channel is 169,425 MHz. The air interface specification is given in ETS 300 133-4 [3].

Annex A (informative): ERMES references list

The references used throughout the ERMES ETS are given in this annex. Each part of this ETS includes a normative reference clause which lists all the normative references pertinent to that part of the ETS.

- ITU-T Recommendation E.163: "Numbering plan for the international telephone service".
- ITU-T Recommendation E.212 (1988): "Identification plan for land mobile stations", annex A.
- ITU-T Recommendation F.69: "The international telex service - Service and operational provisions of telex destination codes and telex network identification codes".
- ITU-T Recommendation F.300: "Videotex service".
- ITU-T Recommendation F.410: "Message handling services: The public message transfer service".
- ITU-T Recommendation F.420: "Message handling services: The public interpersonal messaging service".
- ITU-T Recommendation G.106: "Terms and definitions related to quality of service, availability and reliability".
- ITU-T Recommendation M.20: "Maintenance philosophy for telecommunications networks".
- ITU-T Recommendation M.21: "Maintenance philosophy for telecommunication services".
- ITU-T Recommendation M.30 (1990): "Principles for a telecommunications management network".
- ITU-T Recommendation M.36: "Principles for the maintenance of ISDNs".
- ITU-T Recommendation M.60: "Maintenance terminology and definitions".
- ITU-T Recommendation Q.795: "Operations Maintenance and Administration Part (OMAP)".
- ITU-T Recommendation S.1: "International Telegraph Alphabet No. 2".
- ITU-T Recommendation S.2: "Coding scheme using International Telegraph Alphabet No. 2 (ITA 2) to allow the transmission of capital and small letters".
- ITU-T Recommendation X.21: "Interface between data terminal equipment (DTE) and data circuit-terminating equipment (DCE) for synchronous operation on public data networks".
- ITU-T Recommendation X.25: "Interface between data terminal equipment (DTE) and data circuit-terminating equipment (DCE) for terminals operating in the packet mode and connected to public data networks by dedicated circuit".
- ITU-T Recommendation X.121: "International numbering plan for public data networks".
- ITU-T Recommendation X.135: "Speed of service (delay and throughput) performance values for public data networks when providing international packet-switched services".
- ITU-T Recommendation X.208: "Specification of abstract syntax notation one (ASN 1)".
- ITU-T Recommendation X.209: "Specification of basic encoding rules for abstract syntax notation one (ASN 1)".
- ITU-T Recommendation X.213: "Information technology - network service definition for open systems interconnection".
- ITU-T Recommendation X.214: "Information technology - Open Systems Interconnection -Transport service definition".

- ITU-T Recommendation X.215: "Information technology - Open Systems Interconnection - Session service definition".

- ITU-T Recommendation X.216: "Information technology - Open Systems Interconnection - Presentation service definition".

- ITU-T Recommendation X.217: "Information technology - Open Systems Interconnection - Service definition for the association control service element".

- ITU-T Recommendation X.219: "Remote operations: model, notation and service definition".

- ITU-T Recommendation X.223: "Use of X.25 to provide the OSI connection-mode network service for ITU-T applications".

- ITU-T Recommendation X.224: "Protocol for providing the OSI connection-mode transport service".

- ITU-T Recommendation X.225: "Information technology - Open Systems Interconnection - connection-oriented session protocol: Protocol specification".

- ITU-T Recommendation X.226: "Information technology - Open Systems Interconnection - connection-oriented presentation protocol: Protocol specification".

- ITU-T Recommendation X.227: "Information technology - Open Systems Interconnection - Connection-oriented protocol for the association control service element: Protocol specification".

- ITU-T Recommendation X.229: "Remote operations: Protocol specification".

- ITU-T Recommendation X.400: "Message handling services: Message handling system and service overview".

- ITU-T Recommendation Z.100: "Specification and description language (SDL)".

- CEPT Recommendation T/R 25-07, Annex 1: "Frequency coordination for the Enhanced radio message system (ERMES)".

- CEPT Recommendation T/SF 31: "Services and facilities aspects of an Integrated Services Digital Network (ISDN)".

- CEPT Recommendation T/SF 31-07: "Operational requirements of ISDN supplementary services".

- prETS 300 133-1 (1997): "Radio Equipment and Systems (RES); Enhanced Radio MEssage System (ERMES); Part 1: General aspects".

- prETS 300 133-2 (1997): "Radio Equipment and Systems (RES); Enhanced Radio MEssage System (ERMES); Part 2: Service aspects".

- prETS 300 133-3 (1997): "Radio Equipment and Systems (RES); Enhanced Radio MEssage System (ERMES); Part 3: Network aspects".

- prETS 300 133-4 (1997): "Radio Equipment and Systems (RES); Enhanced Radio MEssage System (ERMES); Part 4: Air interface specification".

- prETS 300 133-5 (1997): "Radio Equipment and Systems (RES); Enhanced Radio MEssage System (ERMES); Part 5: Receiver conformance specification".

- prETS 300 133-6 (1997): "Radio Equipment and Systems (RES); Enhanced Radio MEssage System (ERMES); Part 6: Base station conformance specification".

- prETS 300 133-7 (1997): "Radio Equipment and Systems (RES); Enhanced Radio MEssage System (ERMES); Part 7: Operation and maintenance aspects".

- prETS 300 113: "Radio Equipment and Systems (RES); Land mobile service; Technical characteristics and test conditions for radio equipment intended for the transmission of data (and speech) and having an antenna connector".

- ISO 1073 parts 1 & 2: "Alphanumeric character sets for optical recognition".

- ISO 7776: "Information processing systems - Data communications - High-level data link control procedures - Description of the X.25 LAPB-compatible DTE data link procedures".

- Chinese National Standard CNS 11643, X5012: "Chinese Standard Interchange Code".

- ITU-T Recommendation T.52 (1993): "Non-Latin coded character sets for telematic services".

History

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