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Paging Systems (PS); Enhanced Radio MEssage System (ERMES); Part 4: Air interface specification

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Foreword

This European Telecommunication Standard (ETS) has been produced by the Paging Systems (PS) Technical Committee of the European Telecommunications Standards Institute (ETSI).

This ETS comprises seven parts with the generic title "Paging systems; European Radio Message System (ERMES)". The title of each part is listed below:

- ETS 300 133-1: "Part 1 - General aspects"
- ETS 300 133-2: "Part 2 - Service aspects"
- ETS 300 133-3: "Part 3 - Network aspects"
- ETS 300 133-4: "Part 4 - Air interface specification"
- ETS 300 133-5: "Part 5 - Receiver conformance specification"
- ETS 300 133-6: "Part 6 - Base station specification"
- ETS 300 133-7: "Part 7 - Operation and maintenance aspects"

This part, ETS 300 133-4, specifies the radio subsystem aspects including:

- the transmission protocol and its operation;
- modulation characteristics;
- channel coding;
- quasi-synchronous operation;
- receiver battery saving techniques.

NOTE: In this part of the ERMES ETS, some protocol bits have been "reserved for future definition". It is intended that these bits will be allocated for specific options in a future enhanced version of the standard.
Suggestions for potential enhancements to the protocol using these bits should be communicated via the normal ETS maintenance procedures to the ETSI Secretariat at the address given on the title page.

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1 Scope

This part of the seven part European Telecommunication Standard (ETS) 300 133 describes the radio air interface specification of the European Radio Message System (ERMES). All aspects of the radio subsystem are defined including the transmission protocol, information format, channel coding and modulation characteristics. Operation of the radio subsystem and procedures on the air interface are defined and described.

2 Normative references

This ETS incorporates by dated or 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] ETS 300 133-2 (1992): "Paging Systems (PS); European Radio Message System (ERMES) Part 2: Service aspects".

[2] ETS 300 133-5: (1992) "Paging Systems (PS); European Radio Message System (ERMES) Part 5: Receiver conformance specification".

[3] ETS 300 133-6: (1992) "Paging Systems (PS); European Radio Message System (ERMES) Part 6: Base station conformance specification".

[4] CCITT Recommendation E.212 (1988): "Identification plan for land mobile stations", Annex A.

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

3 Definitions

For the purposes of this part of ETS 300 133 the following definitions shall apply.

Associated Operator: one of the network operators with which the home operator has an agreement to exclusively transfer calls.

Basic RIC: the prime identity of a paging receiver allocated by the network operator when service is initiated. It shall not be changed without safeguards against unauthorised changes.

Batch number: the 4 bit number corresponding to a particular batch type. Batch type A shall correspond to batch number 0000. Batch type P shall correspond to batch number 1111.

Batch type: the letter (A to P) which identifies one of the 16 batches within a subsequence.

Codeblock: Nine codewords interleaved as a unit as used in the message partition.

Codeword: the standard information unit of 30 bits length.

Country code: binary representation of the country number defined in Annex A. The country code consists of 7 bits. (See also subclause 6.3.1.1).

End of Message (EOM) character: a specific character used to indicate the end of an alphanumeric message. It corresponds to DC1 as defined in Annex C2 of ETS 300 133-5 [2].

External Receiver: a receiver operating in a network which is not its home network.

Frequency divided network: a network that uses different frequency channels in adjacent paging areas.

Geographical Area: one or several paging areas in an operator network. Defined by agreements between network operators for internetwork roaming or by a single operator for roaming within his own network. It is used for roaming and choice of destination supplementary services.

Home Network: the operator network with which a mobile subscriber has signed a subscription.

Home Operator: the network operator to which a specific user has subscribed.

Initial Address: the 18 most significant bits of the local address.

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

I2 interface: an interface between the Paging Area Controller and the Base Station.

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 number of the receiver.

Long Message: a message that has been split into two or more parts (sub-messages) for transmission.

Operator code: the number used by the system on the radio path to identify an operator within a country. It consists of 3 bits.

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.

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.

Paging Area Code: the number used by the system to identify the paging area.

Paging Area Controller: functional entity controlling the base stations within one paging area.

Paging Message: the tone-only, numeric, alpha-numeric or transparent data information sent to a paging receiver.

Paging Signal: the signal sent on the radio path to a paging receiver.

Radio Identity Code: the number used by the system on the radio path to identify the receiver(s) for which the paging message is intended. The RIC has a total length of 35 bits and consists of five parts: the zone code (3 bits), the country code (7 bits), the operator code (3 bits), the initial address (18 bits) and the batch number (4 bits).

	Operator Identity			Local Address	
	Zone code	Country code	Operator Code	Initial address	Batch number
No. of bits	3	7	3	18	4

Reserved for future definition: the bits indicated are not specified in this edition of the standard but may be in future editions. The bits should be set to a default value of zero and not used to convey information. The function of any equipment shall be independent of these bits. No fixed pattern of reserved bits should be assumed and no combination of reserved bits shall cause equipment to malfunction.

Roaming Area: the geographical area where the mobile subscriber asks for his messages to be transmitted when he uses the roaming service.

Service Area: the paging area(s) to which the mobile subscriber has subscribed and in which a paging message will normally be transmitted.

Sub-message: part of a long message. All sub-messages of any one long message carry the same message number.

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 specified in subclause 9.3.1.

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

Zone code: binary representation of the zone number defined in Annex A. The zone code consists of 3 bits (see also subclause 6.3.1.1).

4 Abbreviations

AII	Additional Information Indicator
AIF	Additional Information Field
AIN	Additional Information Number
AIT	Additional Information Type
BAI	Border Area Indicator
BS	Base Station
CTA	Common Temporary Address
CTAP	Common Temporary Address Pointer
EB	External Bit
ENL	Number of LSBs to be compared when operating outside home network
ETI	External Traffic Indicator
FSI	Frequency Subset Indicator
FSN	Frequency Subset Number
HNL	Number of LSBs to be compared when operating within home network
LSB	Least Significant Bit
MSB	Most Significant Bit
OPID	Operator Identity
PA	Paging Area
PR	Preamble
PAC	Paging Area Controller
RF	Radio Frequency
RIC	Radio Identity Code
RSVD	Reserved bits for future definition
SM	Subsequence mask
SSIF	Supplementary System Information Field
SSIT	Supplementary System Information Type
SSN	Subsequence Number
UMI	Urgent Message Indicator
UTC	Universal Time Co-ordinated
VIF	Variable Information Field

5 Transmission protocol

5.1 General description of the protocol

The structure of the basic transmission protocol on channel one is illustrated in figure 1.

A sequence of 60 minutes total duration and comprising 60 cycles shall be provided. Sequences shall be co-ordinated with the UTC so that on the hour a new sequence commences.

A paging cycle of exactly one minute duration, co-ordinated with UTC, shall be used to allow the necessary co-ordination between different networks. Receivers may listen to one or a few cycles in a sequence in order to reduce battery consumption (see Clause 12).

Each cycle shall be divided into five subsequences commencing at 12 second intervals. To allow co-ordination between networks the SSN=0 subsequence shall always be transmitted first after the UTC minute marker.

The transmission of a subsequence may end before the full 12 seconds has elapsed. The subsequence length may be reduced by a small amount to allow for transmitter switching times. Occasionally a greater reduction may be made in order that test or system transmissions can be made by individual transmitters.

Each subsequence shall be further divided into 16 batches labelled A-P. The receiver population should be divided into 16 groups and each receiver allocated to one of the 16 batch types according to the 4 least significant bits of its basic RIC. Further RICs used by this receiver shall be of the same batch type.

Each receiver shall only be initially addressed in its own batch type transmission. When the receiver detects its initial address it should wait on the same channel for the message to be sent. The message may be sent in the same batch, in any subsequent batch of the same subsequence or in the following subsequence (see subclause 11.6 regarding time-out conditions).

An initial address may be transmitted more than once in the same batch (see subclause 11.2).

The time of transmission of a particular batch type on each frequency channel is shifted by a single time batch with respect to the others as shown in figure 2. Consequently a receiver can, if necessary, step through the paging frequency channels without losing any messages.

The first fifteen batches in every subsequence shall have length 154 codewords. The final batch in every subsequence shall have length 190 codewords. This is so that messages in time divided networks may be completed within a subsequence.

Each batch is further subdivided into four partitions. These are the synchronisation, system information, address and message partitions. A detailed description of the batch structure is given in subclause 5.4 and the contents of each partition specified in subclauses 6.2 to 6.5.

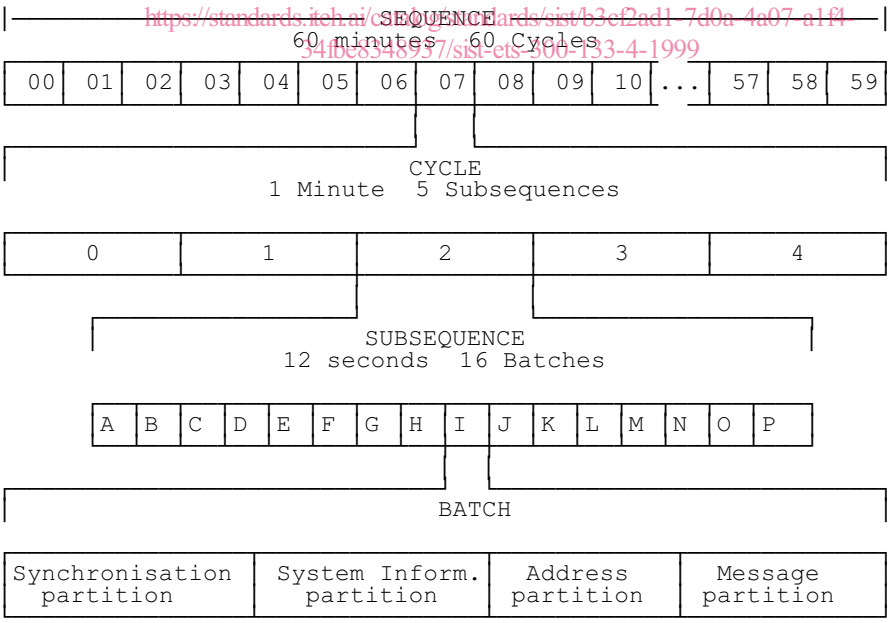

Figure 1: Structure of the radio protocol on channel one.

■ = Active batch for a batch type A receiver.

CHAN	<——— 12 secs ———>	
01	■ B C D E F G H I J K L M N O P	■ B C D E F G H I J K L
03	P ■ B C D E F G H I J K L M N O	P ■ B C D E F G H I J K
05	O P ■ B C D E F G H I J K L M N	O P ■ B C D E F G H I J
07	N O P ■ B C D E F G H I J K L M	N O P ■ B C D E F G H I
09	M N O P ■ B C D E F G H I J K L	M N O P ■ B C D E F G H
11	L M N O P ■ B C D E F G H I J K	L M N O P ■ B C D E F G
13	K L M N O P ■ B C D E F G H I J	K L M N O P ■ B C D E F
15	J K L M N O P ■ B C D E F G H I	J K L M N O P ■ B C D E
16	I J K L M N O P ■ B C D E F G H	I J K L M N O P ■ B C D
14	H I J K L M N O P ■ B C D E F G	H I J K L M N O P ■ B C
12	G H I J K L M N O P ■ B C D E F	G H I J K L M N O P ■ B
10	F G H I J K L M N O P ■ B C D E	F G H I J K L M N O P ■
08	E F G H I J K L M N O P ■ B C D	E F G H I J K L M N O P
06	D E F G H I J K L M N O P ■ B C	D E F G H I J K L M N O
04	C D E F G H I J K L M N O P ■ B	C D E F G H I J K L M N
02	B C D E F G H I J K L M N O P ■	B C D E F G H I J K L M

Figure 2: Channel synchronisation and the scanning procedure

NOTE: The relation between RF channel frequencies and channel numbers is defined in subclause 9.2.