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Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 8:
Speech coding and transmission

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Foreword

This European Standard (Telecommunications series) has been produced by ETSI Project Digital Enhanced Cordless Telecommunications (DECT).

The present document is part 8 of a multi-part deliverable. Full details of the entire series can be found in part 1 [1].

Further details of the DECT system may be found in TR 101 178 and ETR 043 (see Bibliography).

| National transposition dates | |
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| Date of adoption of this EN: | 27 June 2003 |
| Date of latest announcement of this EN (doa): | 30 September 2003 |
| Date of latest publication of new National Standard or endorsement of this EN (dop/e): | 31 March 2004 |
| Date of withdrawal of any conflicting National Standard (dow): | 31 March 2004 |

1 Scope

The present document gives an introduction and overview of the complete Digital Enhanced Cordless Telecommunications (DECT) Common Interface (CI).

This part of the DECT CI specifies the speech coding and transmission requirements.

In order to ensure satisfactory interworking of different portable and fixed units, it is necessary to specify the transmission performance of the analogue information over the digital link. This requires not only use of a common speech algorithm, but also standardization of frequency responses, reference speech levels (or loudness) at the air interface and various other parameters.

The present document applies to DECT equipment which includes all the necessary functions to provide real-time two-way speech conversation. A 3,1 kHz telephony teleservice conveyed over a DECT link (including Fixed Part (FP) and Portable Part (PP)) which is capable of being connected (directly or indirectly) to the public network access point should comply with the requirements in the present document.

Tethered fixed point local loop applications are not required to comply with the requirements of the present document.

The speech performance characteristics defined in the present document typically conform to TBR 008, which specifies the overall performance between the handset acoustic interface and a 64 kbit/s A-law Pulse Code Modulated (PCM) digital network interface. The deviations from TBR 008 are mainly due to the consequences of non-PCM coding and transmission delay.

The additional features described in clause 8 are those which are not included in TBR 008, but which are likely to occur in a DECT system: analogue interface, loudspeaking and hand-free facilities, tandeming with a mobile radio network. Headsets are not covered by the present specifications.

For the DECT systems which connect to the Public Switched Telephone Network (PSTN) via an analogue interface, the additional requirements, which are implemented in the FP, have as much as possible been aligned with TBR 038.

ETSI/STC TM5 has prepared a technical report, ETR 041, to be used as a guide for network planning.

A summary of the control and the use of the DECT echo control functions, to guide on need for options to manufacturers and installers, is found in annex A.

Information concerning test methods can be found in EN 300 176 [3]. The test methods take into account that DECT is a digital system.

2 References

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 and/or edition number or version number) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.

Referenced documents which are not found to be publicly available in the expected location might be found at <http://docbox.etsi.org/Reference>.

- [1] ETSI EN 300 175-1: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 1: Overview".
- [2] ETSI EN 300 175-5: "Digital Enhanced Cordless Telecommunications (DECT); Common Interface (CI); Part 5: Network (NWK) layer".

- [3] ETSI EN 300 176: "Digital Enhanced Cordless Telecommunications (DECT); Approval test specification; (Part 1: Radio; Part 2: Speech)".
- [4] ITU-T Recommendation G.101 (1996): "The transmission plan".
- [5] ITU-T Recommendation G.131 (1996): "Control of talker echo".
- [6] ITU-T Recommendation G.164 (1988): "Echo suppressors".
- [7] ITU-T Recommendation G.165 (1993): "Echo cancellers".
- [8] ITU-T Recommendation G.701 (1993): "Vocabulary of digital transmission and multiplexing, and pulse code modulation (PCM) terms".
- [9] ITU-T Recommendation G.726 (1990): "40, 32, 24, 16 kbit/s Adaptive Differential Pulse Code Modulation (ADPCM)".
- [10] Void.
- [11] ITU-T Recommendation P.10: "Vocabulary of terms on telephone transmission quality and telephone sets".
- [12] ITU-T Recommendation P.340: "Transmission characteristics of hands-free telephones".
- [13] ITU-T Recommendation G.113 (1996): "Transmission impairments".
- [14] ITU-T Recommendation G.111 (1993): "Loudness Ratings (LRs) in an international connection".
- [15] ETSI ETS 300 540: "Digital cellular telecommunications system (Phase 2) (GSM); Transmission planning aspects of the speech service in the GSM Public Land Mobile Network (PLMN) system (GSM 03.50)".

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3 Definitions and abbreviations

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3.1 Definitions

For the purposes of the present document, the terms and definitions defined in ITU-T Recommendations P.10 [11], G.701 [8], in EN 300 175-1 [1] and the following apply:

dBm: absolute power level relative to 1 milliwatt, expressed in dB

dBm0: absolute power level in dBm referred to a point of zero relative level (0 dBr point)

dBPa: sound pressure level relative to 1 Pa, expressed in dB

dBPa(A): a-weighted sound pressure level relative to 1 Pa, expressed in dB

dBr: relative power level of a signal in a transmission path referred to the level at a reference point on the path (0 dBr point)

3.2 Abbreviations

For the purposes of the present document, the abbreviations defined in ITU-T Recommendations P.10 [11], G.701 [8] and the following apply:

| | |
|-------|---|
| ADPCM | Adaptive Differential Pulse Code Modulation |
| BSS | Base Station Sub-system |
| CRFP | Cordless Radio Fixed Part |
| CI | Common Interface |
| CLRR | Circuit Loudness Rating, Receiving |
| CLRS | Circuit Loudness Rating, Sending |
| DTX | Discontinuous Transmission |

| | |
|------------------|--|
| ERP | Ear Reference Point |
| ES | End System |
| EUT | Equipment Under Test |
| FP | Fixed Part |
| FT | Fixed radio Termination |
| GAP | Generic Access Profile |
| GSM | Global System for Mobile communications |
| ISDN | Integrated Services Digital Network |
| LL _e | Local echo Loss |
| LSTR | Listener SideTone Rating |
| MRP | Mouth Reference Point |
| MSC | Mobile Switching Centre |
| NLP | Non-Linear Processor |
| NWK | NetWorK |
| OLR | Overall Loudness Rating |
| PABX | Private (Automatic) Branch eXchange |
| PCM | Pulse Code Modulated |
| PP | Portable Part |
| PSTN | Public Switched Telephone Network |
| PT | Portable radio Termination |
| QDU | Quantization Distortion Unit |
| ReFP | Reference Fixed Part |
| REP | REpeater Part |
| RePP | Reference Portable Part |
| RFP | Radio Fixed Part |
| RLR _H | Receiving Loudness Rating of the Handset |
| SLR _H | Sending Loudness Rating of the Handset |
| STMR | SideTone Masking Rating |
| TA | Terminal Adaptors |
| TCLw | weighted Terminal Coupling Loss |
| TDMA | Time Division Multiple Access |
| TEL _R | Talker's Echo Loudness Rating |
| VAD | Voice Activity Detection |
| WBS | Wireless Base Station |
| WRS | Wireless Relay Station |

4 Configurations

4.1 Reference configuration

4.1.1 Basic configuration

The basic reference configuration for voice transmission over DECT is shown in figure 1.

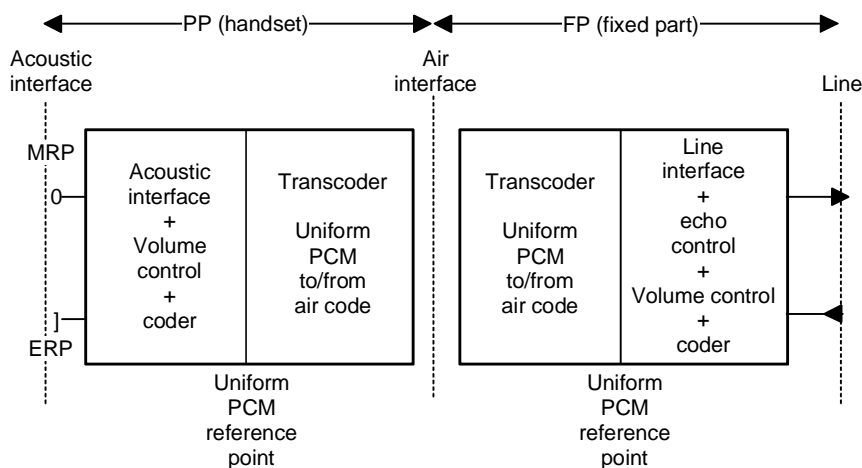


Figure 1: Basic reference configuration
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The PP and the FP are delimited by physical interfaces:

- Acoustic: from the PP towards the speaker-listener, with the Ear and Mouth Reference Points (ERP and MRP).
- Air(RF): the interface between PP and FP.
- Line: the interface from the FP towards the network.

Uniform PCM reference points shall be introduced in both the PP and the FP to materialize the limits of the transmission segment which is affected by the air interface coding scheme. This allows the transmission requirements to be specified independently from the coding at the air interface. The various transcoding algorithms are level-transparent, i.e. with an encoder and decoder connected in tandem, the "levels" of the digital signals at the uniform PCM input of the encoder and output from the decoder are identical. In a particular implementation, the reference points may be embedded within an IC, and thus will not be physically accessible.

Each of the three sections thus delimited deals with distinct functions:

- a) the PP electro-acoustic section (between acoustic interface and PP uniform PCM reference point) which includes the acoustic interface, the volume control and the analogue to digital conversion;
- b) the air-code section (between PP and FP uniform PCM reference points) considers the transcoding between uniform PCM and the air-code, as well as the transmission over the air interface;
- c) the FP line interface section (between FP uniform PCM reference point and line interface) comprises the interface to the line, digital or analogue, and the FP voice processing, e.g. echo control.

Typically, the transmission features conform to TBR 008 for the PP electro-acoustic section, and the line interface section in the case of digital interface. In the case of analogue interface, the line interface section realizes in the FP the adaptation to clause 7.12 and to the relevant attachment requirements.

4.1.2 Portable Part (PP)

4.1.2.1 Functional organization

Figure 2 represents the basic functional organization of a PP from the voice transmission point of view:

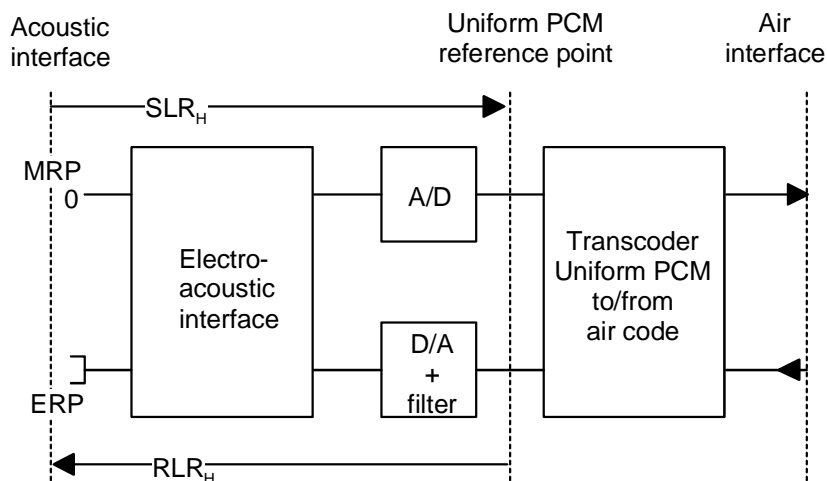


Figure 2: PP functional organization

The various functions represented in figure 2 are:

- the electro-acoustic function, which performs the interface to the transducers and the volume control. The Handset Loudness Ratings (SLR_H) and (RLR_H) are defined between the acoustic interface and the uniform PCM reference point;
- the analogue to digital and digital to analogue coding to the uniform PCM reference point;
- the transcoder between uniform PCM and air-code.

4.1.2.2 Volume control

The volume control facility is optional, and can be implemented in a number of different ways:

- in the simplest implementation, it affects only the receiving level and is under the manual control of the PP user;
- the volume adjustment may also be adaptive, e.g. taking into account the average level of ambient noise at the MRP;
- the volume control may affect both receiving and sending levels in opposite directions. This has the advantage of reducing the influence on the terminal coupling loss when the receive volume is increased. Such an implementation would fit a noisy environment, as the need for an increased receiving volume is likely to come from a loud ambient noise, and it is then combined with a loud speech level.