



INTERNATIONAL TELECOMMUNICATION UNION

ITU-T G.729 **Implementors' Guide**

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SERIES G: TRANSMISSION SYSTEMS AND MEDIA,
DIGITAL SYSTEMS AND NETWORKS

Digital terminal equipments – Coding of analogue signals
by methods other than PCM

Implementors' Guide for G.729
(Coding of speech at 8 kbit/s using CS-ACELP)

Summary

This document contains the Implementors' Guide for ITU-T Recommendation G.729 that corrects defects reported at SG 16's meeting 15-25 October 2002 and 3-13 April 2006. This IG supersedes the ones approved 2002-02-15 and 2002-10-25.

This document was approved by ITU-T Study Group 16 on 13 April 2006 and obsoletes the earlier version of this Implementors' Guide approved on 15 Feb 2002 and 25 Oct 2002.

Change Log

Revision	Date	Description
1.0	15 Feb 2002	G.723.1 and G.729 IG – Modifications to fixed-point C source codes in G.729 Annexes F, G, H and I. Approved by ITU-T Study Group 16 (TD ??/PLEN)
1.1	25 Oct 2002	G.729 IG – Corrections in Annexes B, F, G, I and C+. Approved by ITU-T Study Group 16 (TD ??/PLEN)
2.0	13 Apr 2006	Added corrections to ITU-T Rec. G.729 Annexes with DTX functionality. Approved by ITU-T Study Group 16 (TD 256/PLEN)

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IMPLEMENTORS' GUIDE FOR ITU-T REC. G.729: “CODING OF SPEECH AT 8 KBIT/S USING CS-ACELP”

1 Scope

This guide resolves defects in the following categories:

- editorial errors
- technical errors, such as omissions and inconsistencies
- ambiguities

In addition, the Implementors' Guide may include explanatory text found necessary as a result of interpretation difficulties apparent from the defect reports.

This Guide will not address proposed additions, deletions, or modifications to the Recommendations that are not strictly related to implementation difficulties in the above categories. Proposals for new features should be made through contributions to the ITU-T.

2 Introduction

This Implementors' Guide contains all identified defects for ITU-T Rec. G.729. This version consolidates and supersedes all earlier Implementors' Guides for G.729.

3 Defect Resolution Procedure

Upon discovering technical defects with any components of G.729, please provide a written description directly to the applicable contact point (listed above). The template for a defect report is located in the [Annex](#) to the Guide. Contact information for these parties is included at the front of the document. Return contact information should also be supplied so a dialogue can be established to resolve the matter and an appropriate reply to the defect report can be conveyed. This defect resolution process is open to any interested party. Formal membership in the ITU is not required to participate in this process.

4 References

This document refers to the approved elements for G.729:

- [G.729 \(03/1996\)](#) – Coding of speech at 8 kbit/s using conjugate-structure algebraic-code-excited linear prediction (CS-ACELP)
- [G.729 Annex A \(11/1996\)](#) – Reduced complexity 8 kbit/s CS-ACELP speech codec
- [G.729 Annex B \(10/1996\)](#) – A silence compression scheme for G.729 optimized for terminals conforming to Recommendation V.70
- [G.729 Annex C \(09/1998\)](#) – Reference floating-point implementation for G.729 CS-ACELP 8 kbit/s speech coding
- [G.729 Annex C+ \(02/2000\)](#) – Reference floating-point implementation for integrating G.729 CS-ACELP speech coding main body with Annexes B, D and E
- [G.729 Annex D \(09/1998\)](#) – 6.4 kbit/s CS-ACELP speech coding algorithm

- G.729 Annex E (09/1998) – 11.8 kbit/s CS-ACELP speech coding algorithm
- G.729 Annex F (02/2000) – Reference implementation of G.729 Annex B DTX functionality for Annex D
- G.729 Annex G (02/2000) – Reference implementation of G.729 Annex B DTX functionality for Annex E
- G.729 Annex H (02/2000) – Reference implementation of switching procedure between G.729 Annexes D and E
- G.729 Annex I (02/2000) – Reference fixed-point implementation for integrating G.729 CS-ACELP speech coding main body with Annexes B, D and E
- G.729 Annex B (1996) Corrigendum 1 (02/1998)
- G.729 Annex B (1996) Corrigendum 2 (02/2000)
- G.729 Annex B (1996) Corrigendum 3 (03/2001)
- G.729 Annex C+ (2000) Corrigendum 1 (03/2001)
- G.729 Annex D (1998) Corrigendum 1 (02/2000)
- G.729 Annex E (1998) Corrigendum 1 (02/2000)
- G.729 Annex F (2000) Corrigendum 1 (03/2001)
- G.729 Annex G (2000) Corrigendum 1 (03/2001)
- G.729 Annex I (2000) Corrigendum 1 (03/2001)
- G.729 Appendix I (06/2001) – External synchronous reset performance for G.729 codecs in systems using external VAD/DTX/CNG
- G.729 Appendix II (08/2005) – G.729 Annex B enhancements in voice-over-IP applications - Option 1
- G.729 Appendix III (08/2005) – G.729 Annex B enhancements in voice-over-IP applications - Option 2

5 Nomenclature

In addition to traditional revision marks, the following marks and symbols are used to indicate to the reader how changes to the text of a Recommendation should be applied:

Symbol	Description
<u><i>[Begin Correction]</i></u>	Identifies the start of revision marked text based on extractions from the published Recommendations affected by the correction being described.
<u><i>[End Correction]</i></u>	Identifies the end of revision marked text based on extractions from the published Recommendations affected by the correction being described.
...	Indicates that the portion of the Recommendation between the text appearing before and after this symbol has remained unaffected by the correction being described and has been omitted for brevity.

--- *SPECIAL INSTRUCTIONS* --- {instructions} Indicates a set of special editing instructions to be followed.

6 Technical and Editorial Corrections

6.1 Modifications to fixed-point C source codes in G.729 Annexes F, G, H and I

In February 2000, SG16 approved G.729 Annexes F, G, H and I. As described in [COM16-D219](#), discrepancies between the G.729 annexes F, G, H and I fixed point source codes and the G729 main body and annex B fixed point source codes were found. Initialization of some variables is performed differently in these annexes than in the former G729 recommendations fixed point source codes.

The modifications are in the coder initialization functions `Init_Coder_ld8x()` (in files `cod_ld8x.c`, where `x` stands for f, g, h for Annexes F, G and H, respectively) and `Init_Coder_ld8c()` (in file `codld8cp.c` for annex I).

The following two lines are deleted:

```
/* to tame the coder */
static Word32 L_exc_err[4];
```

And the line:

```
for(i=0; i<4; i++) L_exc_err[i] = 0x00004000L; /* Q14 */
```

is replaced by two lines:

```
/* to tame the coder */
Init_exc_err();
```

The call of the `Init_Cod_cng()` routine is inserted at the end of the set of instructions below

```
if(dtx_enable == 1) {
    pastVad = 1;
    ppastVad = 1;
    seed = INIT_SEED;
    vad_init();
    Init_lsfq_noise();
    Init_Cod_cng ();
}
```

Table 1 gives the numbers of the lines affected by these initialization modifications.

Table 1:
Modified line numbers in the encoder initialization routines

Annex	File name	Routine name	Taming initialization		DTX initialization
			Deleted lines	Replaced line	<code>Init_cod_cng()</code> call insertion after line
F	<code>Cod_ld8f.c</code>	<code>Init_Coder_ld8f()</code>	84 & 85	154	163
G	<code>Cod_ld8g.c</code>	<code>Init_Coder_ld8g()</code>	84 & 85	176	210
H	<code>Cod_ld8h.c</code>	<code>Init_Coder_ld8g()</code>	84 & 85	169	N/A
I	<code>Codld8cp.c</code>	<code>Init_Coder_ld8c()</code>	83 & 84	175	209

6.2 Corrections to Annexes B, F, G, I and C+

6.2.1 Description of the needed changes

As described in [COM16-D244](#) (2001-2004), the problem is caused by the lack of safe initialization of LSFs indices, and the search for the SID optimal indices may terminate abnormally, resulting in a possible crash of the simulation program. The problem was identified on G.729 Annex I, but it is applicable also for Annexes B, F, G, and C+.

6.2.2 Modifications to fixed-point C source codes in G.729 Annexes B, F, G, I and C+

In the file `qsidlsf.c`, in the routine `New_ML_Search_1` at line 195, and in the routine `New_ML_Search_2` at line 264, add two lines, changing both blocks of identical code from:

```
for (q=0; q<K; q++){
  for (p=0; p<J; p++){
    for (m=0; m<MQ; m++){
      if (sub(sum[p*MQ+m], min[q]) < 0){
        min[q] = sum[p*MQ+m];
        min_indx_p[q] = p;
        min_indx_m[q] = m;
      }
    }
    sum[min_indx_p[q]*MQ+min_indx_m[q]] = MAX_16;
  }
}
```

to the new code:

```
for (q=0; q<K; q++){
  min_indx_p[q] = 0;
  min_indx_m[q] = 0;
  for (p=0; p<J; p++){
    for (m=0; m<MQ; m++){
      if (sub(sum[p*MQ+m], min[q]) < 0){
        min[q] = sum[p*MQ+m];
        min_indx_p[q] = p;
        min_indx_m[q] = m;
      }
    }
    sum[min_indx_p[q]*MQ+min_indx_m[q]] = MAX_16;
  }
}
```

Note: for Annex C+, the constant `FLT_MAX_G729` should be used, instead of the constant `MAX_16`.

6.3 Corrections to ITU-T Rec. G.729 Annexes with DTX functionality

As described in [TD 119/WP3](#), a problem has been discovered in the ANSI-C software of G729 annex BA (G729B-A) (version 1.4) delivered to ITU-T in 2000. Further investigations have shown that this problem is also present in the software of the other annexes with DTX functionality (annexes B, C+, F, G and I).

The problem appears on the decoder side with erased frames (packet lost concealment) when the last correctly received frame is active and the current erased frame is a non transmitted frame. In

this case, frame parameters are not extracted from the bitstream as it is a non transmitted frame but the current frame type is set to active frame as the last valid frame was active. In this case, invalid parameters values are used that might cause a non detection of the pitch lag error (wrong value of bad_pitch indicator) and so a call to dec_lag3 routine instead of a previous lag use.

Table 2 below gives the file name, the routine name and the proposed corrections.

Table 2 – Corrections to G.729 Annexes with DTX functionality

Annex	File name	Routine Name	Line N°	Current instructions	Proposed Corrections
B	Dec_ld8k.c	Decod_ld8k	148	if(past_ftyp == 1) ftyp = 1;	if(past_ftyp == 1) { ftyp = 1; parm[4] = 1; }
BA	Dec_ld8a.c	Decod_ld8a	152	if(past_ftyp == 1) ftyp = 1;	if(past_ftyp == 1) { ftyp = 1; parm[4] = 1; }
C+	Decld8cp.c	decod_ld8c	202	if(ftyp == 1) ftyp = 0;	if(ftyp == 1) ftyp = 0; if(ftyp > 2) { if (ftyp == 3) parm[4] = 1; else { if (prev_lp_mode == 0) parm[5] = 1; else parm[3] = 1; } }
F	Dec_ld8f.c	Decod_ld8f	158	if(ftyp == 1) ftyp = 0;	if(ftyp == 1) ftyp = 0; if (ftyp == 3) parm[4] = 1;
G	Dec_ld8g.c	Decod_ld8g	220	if(ftyp == 1) ftyp = 0;	if(ftyp == 1) ftyp = 0; if(ftyp > 2) { if (ftyp == 3) parm[4] = 1; else { if (prev_lp_mode == 0) parm[5] = 1; else parm[3] = 1; } }
I	Decld8cp.c	decod_ld8c	220	if(ftyp == 1) ftyp = 0;	if(ftyp == 1) ftyp = 0; if(ftyp > 2) { if (ftyp == 3) parm[4] = 1; else { if (prev_lp_mode == 0) parm[5] = 1; else parm[3] = 1; } }

Annex: G.729 Defect Report Form
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DATE:	
CONTACT INFORMATION NAME: COMPANY: ADDRESS: TEL: FAX: EMAIL:	
AFFECTED RECOMMENDATIONS:	
DESCRIPTION OF PROBLEM:	
SUGGESTIONS FOR RESOLUTION:	

NOTE - Attach additional pages if more space is required than is provided above.
