



**NSAI**  
Standards

Irish Standard  
I.S. EN 60461:2011

# Time and control code (IEC 60461:2010 (EQV))

## I.S. EN 60461:2011

*Incorporating amendments/corrigenda issued since publication:*

The National Standards Authority of Ireland (NSAI) produces the following categories of formal documents:

I.S. xxx: Irish Standard – national specification based on the consensus of an expert panel and subject to public consultation.

S.R. xxx: Standard Recommendation - recommendation based on the consensus of an expert panel and subject to public consultation.

SWiFT xxx: A rapidly developed recommendatory document based on the consensus of the participants of an NSAI workshop.

<p><i>This document replaces:</i> EN 60461:2001</p>	<p><i>This document is based on:</i> EN 60461:2011 EN 60461:2001</p>	<p><i>Published:</i> 18 March, 2011 7 May, 2001</p>
<p>This document was published under the authority of the NSAI and comes into effect on:</p> <p>30 March, 2011</p>		<p>ICS number: 33.160.40 33.170</p>
<p><b>NSAI</b> 1 Swift Square, Northwood, Santry Dublin 9</p>	<p>T +353 1 807 3800 F +353 1 807 3838 E standards@nsai.ie  W NSAI.ie</p>	<p><b>Sales:</b> T +353 1 857 6730 F +353 1 857 6729 W standards.ie</p>
<p>Údarás um Chaighdeáin Náisiúnta na hÉireann</p>		

I.S. EN 60461:2011

EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 60461**

March 2011

ICS 33.160.40; 33.170

Supersedes EN 60461:2001

English version

**Time and control code**  
(IEC 60461:2010)

Code temporel et de pilotage  
(CEI 60461:2010)

Zeit- und Steuercode  
(IEC 60461:2010)

This European Standard was approved by CENELEC on 2011-01-02. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

**CENELEC**

European Committee for Electrotechnical Standardization  
Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

**Management Centre: Avenue Marnix 17, B - 1000 Brussels**

## Foreword

The text of document 100/1515/CDV, future edition 4 of IEC 60461 prepared by Technical Area 6, Professional electronics storage media, data structures and equipment, of IEC TC 100, Audio, video and multimedia systems and equipment, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60461 on 2011-01-02.

This European Standard supersedes EN 60461:2001.

EN 60461:2011 includes the following significant change with regard to EN 60461:2001: The time code for progressive television systems with a frame rate greater than 30 frames per second is added.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN and CENELEC shall not be held responsible for identifying any or all such patent rights.

The following dates were fixed:

- latest date by which the EN has to be implemented  
at national level by publication of an identical  
national standard or by endorsement (dop) 2011-10-02
- latest date by which the national standards conflicting  
with the EN have to be withdrawn (dow) 2014-01-02

Annex ZA has been added by CENELEC.

---

## Endorsement notice

The text of the International Standard IEC 60461:2010 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated:

IEC 61169-8:2007      NOTE Harmonized as EN 61169-8:2007 (not modified).

---

## Annex ZA (normative)

### Normative references to international publications with their corresponding European publications

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

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
ISO/IEC 646	1991	Information technology - ISO 7-bit coded character set for information interchange	-	-
ISO/IEC 2022	1994	Information technology - Character code structure and extension techniques	-	-
ITU-R BT.1700	2005	Characteristics of composite video signals for conventional analogue television systems	-	-
SMPTE 170M	2004	Television - Composite Analog Video Signal - NTSC for Studio Applications	-	-
SMPTE 258M	1993	Television - Transfer of Edit Decision Lists	-	-
SMPTE 262M	1995	Television, Audio and Film - Binary Groups of Time and Control Codes - Storage and Transmission of Data	-	-
SMPTE 309M	1999	Television - Transmission of Date and Time Zone Information in Binary Groups of Time and Control Code	-	-

*This page is intentionally left BLANK.*

## CONTENTS

FOREWORD.....	6
INTRODUCTION.....	8
1 Scope.....	9
2 Normative references.....	9
3 Terms, definitions and reserved.....	9
3.1 Terms and definitions.....	9
3.2 Reserved.....	11
4 Time representation in 30 frames per second and 60 frames per second systems.....	11
4.1 Definitions of real time and NTSC time.....	11
4.1.1 Definition of real time.....	11
4.1.2 Definition of NTSC time.....	11
4.2 Time address of a frame.....	11
4.2.1 Definition of time address of a frame.....	11
4.2.2 Non-drop frame – Uncompensated mode.....	12
4.2.3 Drop frame – NTSC time compensated mode.....	12
4.3 Colour frame identification in NTSC analogue composite television systems.....	12
5 Time representation in 25 frames per second and 50 frames per second systems.....	12
5.1 Definition of real time.....	12
5.2 Time address of a frame.....	12
5.3 Colour frame identification in PAL analogue composite television systems.....	13
5.3.1 Colour frame identification.....	13
5.3.2 Logical relationship.....	13
5.3.3 Arithmetic relationship.....	13
6 Time representation in 24-frame systems.....	13
6.1 Definitions of real time and NTSC time.....	13
6.1.1 Definition of real time.....	13
6.1.2 Definition of NTSC time.....	14
6.2 Time address of a frame.....	14
7 Structure of the time address and control bits.....	14
7.1 Numeric code.....	14
7.2 Time address.....	14
7.3 Flag bits.....	14
7.3.1 Definition of flag bits.....	14
7.3.2 Drop frame flag (NTSC composite television system only).....	14
7.3.3 Colour frame flag (NTSC and PAL composite television systems only).....	14
7.3.4 Binary group flags.....	15
7.3.5 Modulation method specific flag.....	15
7.4 Use of the binary groups.....	15
7.4.1 Binary group flag assignments.....	15
7.4.2 Character set not specified and unspecified clock time (BGF2=0, BGF1=0, BGF0=0).....	15
7.4.3 Eight-bit character set and unspecified clock time (BGF2=0, BGF1=0, BGF0=1).....	15
7.4.4 Date/time zone and unspecified clock time (BGF2=1, BGF1=0, BGF0=0).....	16
7.4.5 Page/line multiplex system and unspecified clock time (BGF2=1, BGF1=0, BGF0=1).....	16

7.4.6	Clock time specified and unspecified character set (BGF2=0, BGF1=1, BGF0=0).....	16
7.4.7	Unassigned binary group usage and unassigned clock time (BGF2=0, BGF1=1, BGF0=1) .....	16
7.4.8	Date/time zone and clock time (BGF2=1, BGF1=1, BGF0=0) .....	16
7.4.9	Specified clock time and page/line multiplex system (BGF2=1, BGF1=1, BGF0=1) .....	16
7.5	Clock time reference – Binary group flag combinations.....	16
8	Linear time code application.....	17
8.1	Code word format .....	17
8.2	Code word data content .....	17
8.2.1	LTC code word content .....	17
8.2.2	Time address.....	17
8.2.3	Flag bits .....	17
8.2.4	Binary groups .....	18
8.2.5	Synchronization word .....	18
8.2.6	Biphase mark polarity correction .....	19
8.3	Modulation method .....	19
8.4	Bit rate .....	20
8.5	Timing of the code word relative to a television signal .....	20
8.6	Linear time code interface electrical and mechanical characteristics.....	21
8.6.1	Measurements .....	21
8.6.2	Rise/fall time.....	21
8.6.3	Amplitude distortion .....	21
8.6.4	Timing of the transitions.....	21
8.6.5	Interface connector .....	21
8.6.6	Output impedance.....	21
8.6.7	Output amplitude .....	21
9	Vertical interval application – Analogue television systems .....	26
9.1	Code word format .....	26
9.2	Code word data content .....	26
9.2.1	VITC code word content.....	26
9.2.2	Time address.....	29
9.2.3	Flag bits .....	29
9.2.4	Binary groups .....	29
9.2.5	Field mark flag.....	30
9.2.6	Synchronization bits .....	30
9.2.7	Cyclic redundancy check code .....	30
9.3	Modulation method .....	31
9.4	Bit timing .....	31
9.5	Timing of the code word relative to the television signal .....	32
9.5.1	525/59,94 television system .....	32
9.5.2	625/50 television system .....	32
9.6	Location of the address code signal in the vertical interval .....	32
9.6.1	Location of the VITC code.....	32
9.6.2	525/59,94 television system .....	32
9.6.3	625/50 television system.....	32
9.6.4	Component television system.....	32
9.7	Redundancy .....	32



9.8	Vertical interval time code waveform characteristics .....	33
9.8.1	Waveform characteristics .....	33
9.8.2	Logic level .....	33
9.8.3	Rise/fall time .....	33
9.8.4	Amplitude distortion .....	33
10	Relationship between LTC and VITC .....	33
10.1	Time address data .....	33
10.2	Binary group data .....	33
10.2.1	General .....	33
10.2.2	Transferring vertical interval binary group data to linear binary group data .....	34
10.2.3	Transferring linear binary group data to vertical interval binary group data .....	34
10.3	VITC and LTC code word comparison .....	34
11	Progressive systems with frame rates greater than 30 frames per second .....	36
11.1	Time address of a frame pair in 50 and 60 frames per second progressive systems .....	36
11.2	Implementation guidelines .....	36
	Annex A (informative) Explanatory notes .....	37
	Annex B (informative) Converting time codes when converting video from 24 fps television systems .....	39
	Bibliography .....	42
	Figure 1 – Linear time code source output waveform .....	20
	Figure 2 – 29,97/30 frame linear time code example .....	22
	Figure 3 – 25 frame linear time code example .....	23
	Figure 4 – 24 frame linear time code example .....	24
	Figure 5 – Linear time code relationship to 59,94 frame progressive video example .....	25
	Figure 6 – 525/59,94 vertical interval time code address bit assignment and timing .....	27
	Figure 7 – 625/50 vertical interval time code address bit assignment and timing .....	28
	Figure 8 – Vertical interval time code waveform .....	31
	Figure 9 – Example of frame labeling for 50 and 60 frames per second progressive systems .....	36
	Figure B.1 – Example of conversion of 23,98 fps video to 525/59,94/I .....	40
	Figure B.2 – Example of conversion of 24 fps high definition video to 625/50/I .....	41
	Table 1 – Binary group flag assignments .....	15
	Table 2 – LTC time address bit positions .....	17
	Table 3 – LTC flag bit positions .....	18
	Table 4 – LTC binary group bit positions .....	18
	Table 5 – LTC synchronization word bit positions and values .....	19
	Table 6 – VITC time address bit positions .....	29
	Table 7 – VITC flag bit positions .....	29
	Table 8 – VITC binary group bit positions .....	30
	Table 9 – CRC bit positions .....	31
	Table 10 – VITC logic level ranges .....	33

Table 11 – Summation of VITC and LTC codeword bit definitions ..... 35

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## TIME AND CONTROL CODE

## FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60461 has been prepared by technical area 6: Professional electronics storage media, data structures and equipment, of IEC technical committee 100: Audio, video and multimedia systems and equipment.

This fourth edition cancels and replaces the third edition published in 2001, of which it constitutes a technical revision.

It includes the following significant change with regard to the previous edition: The time code for progressive television systems with a frame rate greater than 30 frames per second is added.

The text of this standard is based on the following documents:

CDV	Report on voting
100/1515/CDV	100/1616/RVC

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

**I.S. EN 60461:2011**

60461 © IEC:2010(E)

– 7 –

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

## INTRODUCTION

IEC 60461 was originally developed for analogue television recording systems and thus dealt only with interlaced television systems operating with frame rates up to 30 frames per second. It is, however, flexible enough in design to be used in digital television systems, both standard definition and high definition. The support for progressive video systems with frame rates above 30 frames per second is described in this International Standard.

Clauses 4, 5, and 6 specify the manner in which time is represented in frame-based systems. Clause 7 specifies the structure of the time address and control bits of the code, and sets guidelines for storage of user data in the code. Clause 8 specifies the modulation method and interface characteristics of a linear time code (LTC) source. Clause 9 specifies the modulation method for inserting the code into the vertical interval of a television signal. Clause 10 summarises the relationship between the two forms of time and control code. Clause 11 summarises time code implementations for video formats with frame rates greater than 30 fps.

## TIME AND CONTROL CODE

### 1 Scope

This International Standard specifies a digital time and control code for use in television, film, and accompanying audio systems operating at nominal rate of 60, 59,94, 50, 30, 29,97, 25, 24 and 23,98 frames per second. This International Standard specifies a time address, binary groups, and flag bit structure. In addition, the standard specifies a binary group flag assignment, a linear time code transport, and a vertical interval time code transport.

This International Standard defines primary data transport structures for linear time code (LTC) and vertical interval time code (VITC). This standard specifies the LTC modulation and timing for all video formats. This standard also defines the VITC modulation and location for 525/59,94 and 625/50 analogue composite and component systems only.

NOTE The digital representation of analogue VITC (D-VITC) is specified in SMPTE 266M and is defined for 525/59,94 and 625/50 digital component systems only. High definition formats, such as those documented in SMPTE 274M and SMPTE 296M, should use ancillary time code (ATC) as specified in SMPTE 12M-2 (formerly SMPTE RP 188) for transport of time code in the digital video data stream. For future implementations of time code for digital standard definition formats, the use of ATC rather than D-VITC is encouraged.

### 2 Normative references

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

ISO/IEC 646:1991, *Information processing – ISO 7-bit coded character set for information interchange*

ISO/IEC 2022:1994, *Information technology – Character code structure and extension techniques*

ITU-R BT.1700-1(2005), *Annex 2, Characteristics of composite video signals for conventional analogue television systems*

SMPTE 170M:2004, *Television – Composite Analog Video Signal – NTSC for Studio Applications*

SMPTE 258M:1993, *Television – Transfer of Edit Decision Lists*

SMPTE 262M:1995, *Television, Audio and Film – Binary Groups of Time and Control Codes – Storage and Transmission of Data*

SMPTE 309M:1999, *Television – Transmission of Date and Time Zone Information in Binary Groups of Time and Control Code*

### 3 Terms, definitions and reserved

#### 3.1 Terms and definitions

For the purposes of this document the following terms and definitions apply.

This is a free preview. Purchase the entire publication at the link below:

[Product Page](#)

- 
- [Looking for additional Standards? Visit Intertek Inform Infostore](#)
  - [Learn about LexConnect, All Jurisdictions, Standards referenced in Australian legislation](#)
-