

INTERNATIONAL STANDARD

IEC
60728-10

First edition
2001-03

**Cabled distribution systems for television
and sound signals –**

**Part 10:
System performance of return path**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**CABLED DISTRIBUTION SYSTEMS FOR TELEVISION
AND SOUND SIGNALS –**
Part 10: System performance of return path

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 60728-10 has been prepared by TA 5: Cable networks for television signals, sound signals and interactive services, of IEC technical committee 100: Audio, video and multimedia systems and equipment.

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

FDIS	Report on voting
100/200/FDIS	100/224/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 3.

Annex A is for information only.

Annex B forms an integral part of this standard.

The committee has decided that the contents of this publication will remain unchanged until 2003. At this date, the publication will be

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- withdrawn;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

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

INTRODUCTION

Standards of the IEC 60728 series deal with cable networks for television signals, sound signals and interactive services including equipment for:

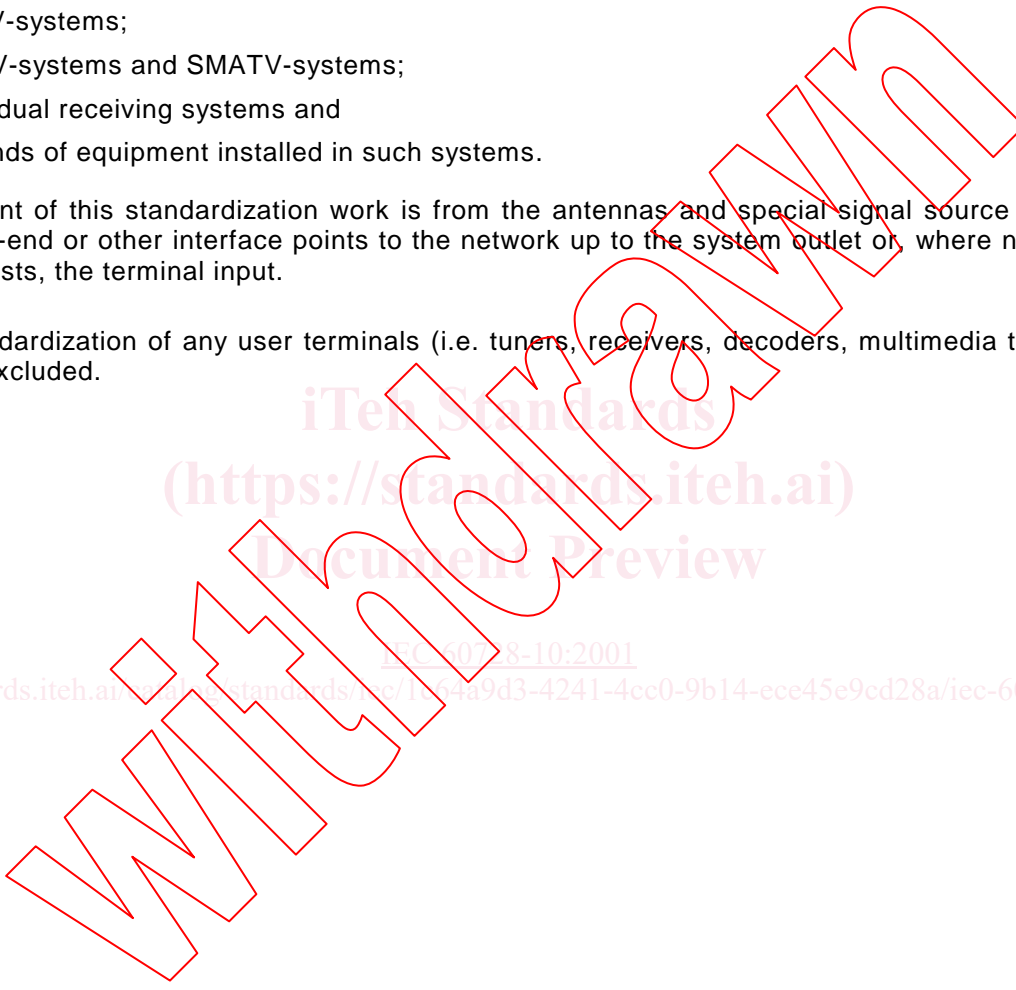
- head-end -reception, processing and distribution of television and sound signals and their associated data signals;
- processing, interfacing and transmitting all kinds of signals for interactive services using all applicable transmission media.

They apply to all kinds of networks such as:

- CATV-systems;
- MATV-systems and SMATV-systems;
- individual receiving systems and
- all kinds of equipment installed in such systems.

The extent of this standardization work is from the antennas and special signal source inputs to the head-end or other interface points to the network up to the system outlet or, where no system outlet exists, the terminal input.

The standardization of any user terminals (i.e. tuners, receivers, decoders, multimedia terminals, etc.) is excluded.



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CABLED DISTRIBUTION SYSTEMS FOR TELEVISION AND SOUND SIGNALS –

Part 10: System performance of return path

1 Scope

This part of IEC 60728 deals with the transparent return path of cable networks operated in the frequency range between 5 MHz and 65 MHz or parts thereof. Higher frequencies may be used in fibre-based networks.

NOTE In addition, it is possible to use the frequency range from 0 MHz to 5 MHz for return path transmissions, for example for NMS or other control, monitoring and signalling purposes. Applications below 5 MHz are not covered by this standard.

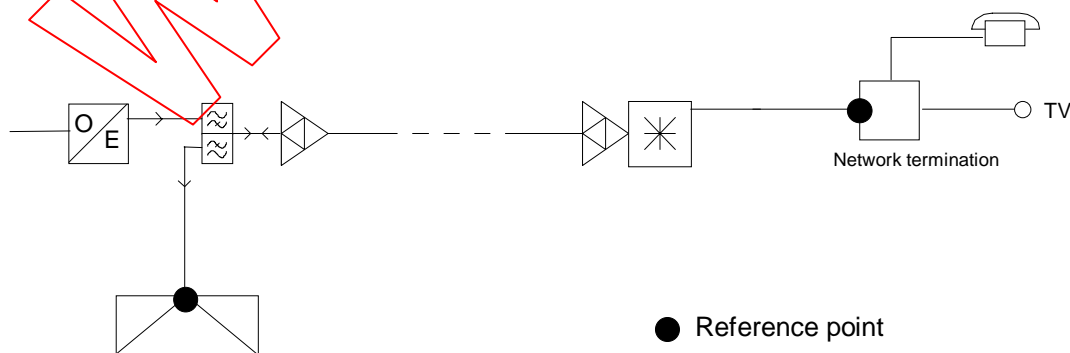
An active return path typically carries only return signals. A passive return path can be used for both return and forward signals.

This part of IEC 60728 lays down the basic methods of measurement for signals typically used in the return path of cable networks in order to assess the performance of those signals and their performance limits.

All requirements refer to the performance limits which have to be obtained between the reference points (figure 1) of the return path system.

One reference point is the network termination close to the subscriber. It is the last point where all forward and return signals are present and carried on the same cable. If no network termination point exists, the reference point is the system outlet.

The other reference point is the input of the return signal receiver (or transceiver). At this point the transparent signal path ends and beyond this point the signal is treated in a non-transparent way. The return signal receiver can be situated at the head-end but can also be at the node of the coaxial cell or at any other point of the network.



IEC 330/01

Figure 1 – Reference points of an active return path system (example)

In addition to the system performance requirements for the transparent return path, system performance recommendations are laid down in this part of IEC 60728, for example for the overall frequency allocation, for the use of specific modulation techniques for different interactive multimedia services or for different sub-bands within the return path frequency range, etc.

Specific equipment installed in cable networks for the operation of such return paths is standardized in the relevant equipment standards, parts 3 to 6 of the IEC 60728 series.

Transmission systems are not within the scope of this part of IEC 60728.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 60728. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 60728 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60728-1, *Cabled distribution systems for television and sound signals – Part 1: Systems primarily intended for sound and television signals operating between 30 MHz and 1 GHz*

IEC 60728-3, *Cabled distribution systems for television and sound signals – Part 3: Active coaxial wideband distribution equipment*

IEC 60728-4, *Cabled distribution systems for television and sound signals – Part 4: Passive coaxial wideband distribution equipment*

IEC 60728-5, *Cable networks for television signals, sound signals and interactive services – Part 5: Head-end equipment*

IEC 60728-6, *Cable networks for television signals, sound signals and interactive services – Part 6: Optical equipment*

IEC 60728-11, *Cabled distribution systems for television and sound signals – Part 11: Safety*

EN 50083, *Cable networks for television signals, sound signals and interactive services*

EN 50083-2, *Cable networks for television signals, sound signals and interactive services – Part 2: Electromagnetic compatibility for equipment*

ETS 300 800:July 1998, *Digital Video Broadcasting (DVB); Interaction channel for Cable TV distribution systems (CATV)*

ITU-T Recommendation J.61, *Transmission performance of television circuits designed for use in international connections*

ITU-R Recommendation BT.470, *Conventional television systems*

3 Terms, definitions, symbols and abbreviations

For the purpose of this part of IEC 60728, the following terms, definitions, symbols and abbreviations apply.

3.1 Terms and definitions

3.1.1

broadcast signal

signal comprising video and/or audio and/or data content which is distributed to several receivers simultaneously

3.1.2

downstream direction

direction of signal flow in a cable network from the head-end or any other central point (node) of a cable network to the subscribers' area

3.1.3

forward path (downstream)

part of a cable network by which signals are distributed in the downstream direction from the head-end or any other central point (node) of a cable network to the subscribers' area

3.1.4

frequency error

quality of supply evaluated on the basis of the actual frequency of an electrical system compared to the nominal value. Frequency error consists of initial error, short term and long term frequency stability

3.1.5

head-end

equipment which is connected between receiving antennas or other signal sources and the remainder of the cable network, to process the signals to be distributed

NOTE The head-end may, for example, comprise antenna amplifiers, frequency converters, combiners, separators and generators.

3.1.6

hybrid fibre coaxial (HFC) network

cable network which comprises optical equipment and cables and coaxial equipment and cables in different parts

3.1.7

impulse noise

noise caused by electromagnetic interference into cable networks. Impulse noise is characterized by pulses with a duration of typically $<10 \mu\text{s}$

3.1.8

ingress noise

noise caused by electromagnetic interference into cable networks. Its power decreases with increasing frequency. It is permanently present but slowly varies in its intensity as a function of time

3.1.9

interaction path

part of a cable network by which interactive signals are transmitted in the downstream direction (from the head-end or node to the subscriber) and in the upstream direction (from the subscriber to the head-end or node)

3.1.10

location specific noise

noise which occurs at a specific area of a cable network or which occurs in a cable network located in a specific environment

3.1.11

multiple interference

interfering signal which consists of two or more signals which originate from two or more sources

NOTE On the return path the multiple interference consists of ingress noise and intermodulation distortion products.

3.1.12

multimedia signal

signal comprising two or more different media contents, for example video, audio, text, data, etc.

3.1.13

network management system (NMS)

software based system for controlling and supervising cable networks

3.1.14

network segment

part of a cable network comprising a set of functions and/or a specific extent of the complete cable network

3.1.15

network termination

electrical termination of a cable network at any outlet on subscribers' side and head-end or node side

3.1.16

node

central point of a network segment at which signals can be fed into the forward path or can be gathered from a number of subscribers out of the return path

3.1.17

return path (upstream)

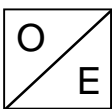

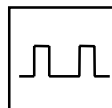
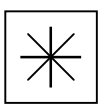

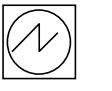
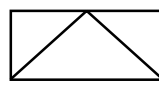
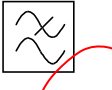
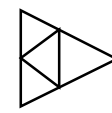


part of a cable network by which signals are transmitted in the upstream direction, from any subscriber connected to the network, to the head-end or any other central point (node) of a cable network

3.1.18

upstream direction

direction of signal flow in a cable network from a subscriber to the head-end or any other central point (node) of a cable network

3.2 Symbols

Symbol	Term	Symbol	Term
	Optical receiver		Bit error rate detector
	Test waveform generator		Passive distribution network
	System under test		Oscilloscope
	Demodulator		Low pass
	Amplifier with return path amplifier		High pass
			Modulator

3.3 Abbreviations

BER	bit error rate
BW	bandwidth, equivalent noise bandwidth
CATV	community antenna television
CB	citizens' band
C/MI	carrier-to-multiple interference ratio
C/N	carrier-to-noise ratio
EMC	electromagnetic compatibility
FM	frequency modulation
FSK	frequency shift keying
HFC	hybrid fibre coaxial
IF	intermediate frequency
ISM	industrial, scientific, medical
MATV	master antenna television (network)
NMS	network management system
OFDM	orthogonal frequency division multiplexing
PRBS	pseudo random binary sequence